



# **2023**

# **HYDROGEOLOGICAL STUDY REPORT**

## **Cooper Road Project**

**North Star Holdings Inc.**

**Thunder Bay, ONTARIO**

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**CSL2023-492**

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# 1 Introduction

This report consists of a hydrogeological study completed on behalf of North Star Holdings Inc. (North Star), for a proposed 12 lot subdivision on Cooper Road herein referred to as the “Site” as shown on Figure 1. The purpose of this program is to evaluate the potential for the use of individual water supply wells at the proposed commercial lots to support the water requirements of the proposed development including groundwater quantity and quality.

## 1.1 Study Objectives and Scope of Work

The study objectives for this project were to complete a field investigation and associated reporting/groundwater model for proposed commercial developments, including the development of independent work plans for the subdivision. The study objectives also included evaluating the groundwater quantity and quality at the Site. The scope of work included the following:

- Development of geological and hydrogeological framework and conceptual site model
- Evaluation of Water Demand and Potential Aquifer Yield
- Completion of a Hydrogeological Investigation
  - Excavation of two test wells
  - Instrument the test and monitoring wells with water level data recorders
  - Complete one 6-hour pumping tests at each of the test wells to evaluate potential well yields
  - Collect water samples from both test wells, including a duplicate sample, before and after pumping for water quality analysis
- Data Evaluation and Reporting

## 1.2 Background

Based on historical imagery (dating back to 2005) and the lack of records for the Site, it was determined that the Site has not been developed. Currently the Site is partially forested and remains vacant. Post installation of the two dug wells (DW1 and DW2) on October 10<sup>th</sup>, 2023, the vegetation on site was cleared and remains undeveloped.

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## 2 Site Setting

### 2.1 Site Description and Topography

The subject property is located at the end of Cooper Road, Rosslyn, Ontario, as shown on Figure 1. The Site is proposed to be separated into 12 lots (Lots 1-12) as shown on Figure 2. To the north of the Site are several industrial properties, as well as Thunder Bay Christian School and Cooper Road. Located east of the Site is a small residential subdivision. South of the Site is a rail line, Rosslyn Road, MacGregor Street, a residential neighbourhood, and the Kaministiquia River. To the west of the Site is a vacant old sawmill, a rail line, and a residential neighbourhood.

The Site topography slopes from the north side of the property to south side of the property. Based on *Ontario Geological Survey 1979. 1:100 000 scale, Ministry of Energy, Northern Development and Mines, Digital Northern Ontario Engineering Geology Terrain Study (NOEGTS), 5000 Series Colour Map, Ontario Geological Survey Map 5047, Northern Ontario Engineering Geology Terrain Study Data Base Map, Thunder Bay (NTS 52A/SW)* the site is situated on a glaciolacustrine plain with mainly low relief, and dry surface conditions.

### 2.2 Regional Geology

#### 2.2.1 Overburden

Based on *Ontario Geological Survey 1979. 1:100 000 scale, Ministry of Energy, Northern Development and Mines, Digital Northern Ontario Engineering Geology Terrain Study (NOEGTS), 5000 Series Colour Map, Ontario Geological Survey Map 5047, Northern Ontario Engineering Geology Terrain Study Data Base Map, Thunder Bay (NTS 52A/SW)* the overburden geology at the Site consists of glaciolacustrine material composed of sand and silt.

Based on *Ontario Geological Survey 2000. 1:1 000 000 scale, Quaternary Geology of Ontario, Ontario Geological Survey, Data Set 14---Revised*, the overburden geology at the Site consists of glaciolacustrine deposits comprised of silt and clay, with minor sand, basin, and quiet water deposits.

#### 2.2.2 Bedrock

Based on *Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario, Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1*, the bedrock geology at the Site consists of sedimentary rocks of the Gunflint Formation (conglomerate, taconite, algal chert, chert, carbonate rock, argillite-tuff).

### 2.3 Regional Hydrology

The Site is situated on a glaciolacustrine plain between Arthur Street W and Rosslyn Road. The southern boundary of the property is approximately 280 m northeast of the Kaministiquia River.

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The interpreted Site drainage is from the northeast to the southwest towards the Kaministiquia River across each of the proposed lots (Lots 1-12) as shown on Figure 3. The Kaministiquia River outflows into Lake Superior, located approximately 16 km from the Site.

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## 3 Study Methodology

### 3.1 Test Well Siting and Construction

Original test well locations were selected based on spacing out the test areas of the proposed development area to get a spatial understanding of the geology.

Originally, DW1 was to be installed at the proposed Lot 4 halfway between the southwest corner of the proposed Lot and the center of proposed Lot 4 and DW2's location was in the most northern proposed Lot just north of the boundary between proposed Lots 11 and 12 as shown on Figure 3.

Final locations of both wells were adjusted slightly in the field, but best efforts were made to install the wells as close as possible to the suggested well locations. Test well DW1 was installed 10 m further to the west and 12 m further to the south than the proposed location as shown on Figure 3. Test Well DW2 was installed 36 m further to the west and 15 m further to the south than the proposed location as shown on Figure 3.

#### 3.1.1 Dug Well 1 (DW1)

On October 10<sup>th</sup>, 2023, an excavator (CAT 336E) employed by Bruno's Contracting was on Site and commenced digging a hole for the purposes of installing a dug well (DW1) under the supervision of Kershaw Well services, an MECP licensed well driller as per O.Reg 903.

All excavated native material was stockpiled for backfilling purposes upon installation of the well tiles. Descriptions of the geologic strata encountered, and drilling descriptions for DW1 were provided by Doug Kershaw of Kershaw Well Services as construction of DW1 was complete when CSL's environmental field technician arrived on Site. The total depth of the excavation for DW1 was 3.66 meters below ground surface (mbgs). Due to the sides caving in, the excavation could not be deepened beyond 3.66 mbgs and the concrete well tiles were installed. Three well tiles were stacked to create the well, and well tile sealant was used between each well tile. The well tiles measured 1.22 m in inner diameter (id) and 1.22 m in height. A concrete well cap measuring 0.30 m in height was placed on top of the third well tile and the well tile sealant. DW1 was assigned well tag number A372579.

The geologic strata encountered during construction activities consisted of coarse to fine sand and lots of gravel with trace silt from surface to a depth of approximately 1.5 mbgs, underlain by gravel to a depth of approximately 3.4 mbgs. Groundwater was encountered at 0.90 mbgs. A summary of the stratigraphy encountered is provided in the table below and in borehole logs in Appendix A.

**Table 3-1: Summary of Stratigraphy in DW1**

Soil Description	Depth (m)	Additional Notes
Coarse to fine sand and lots of gravel with trace silt, loose, brown, wet	0 – 1.5 m	
Loose, brown, wet, gravel	1.5 – 3.4 m	All descriptions provided by Doug Kershaw of Kershaw Well Services. Well construction was completed upon arrival of CSL personnel.  Well could not be installed deeper due to the excavation area caving in.

### 3.1.2 Dug Well 2 (DW2)

On October 10<sup>th</sup>, 2023, an excavator (CAT 336E) employed by Bruno's Contracting was on Site and commenced digging a hole for the purposes of installing a dug well (DW2) under supervision of Kershaw Well services an MECP licensed well drillers, as per O.Reg 903.

All excavated native material was stockpiled for backfilling purposes upon installation of the well. An experienced environmental field technician from CSL was present during excavation and installation to note and record stratigraphy and soil type (i.e., colour, texture, moisture, etc.). The total depth of the excavation for DW2 was 6.71 mbgs; however, due to edges sloughing it could not be deepened further, and clean granular crushed rock was placed at the bottom then leveled before installing the well tiles. Four well tiles were installed, stacked with well tile sealant between each well tile. The well tiles measured 1.22 m in inner diameter (id) and 1.22 m in height. A concrete well cap measuring 0.30 m in height was put on top of the fourth well tile and the well tile sealant. DW2 was assigned the well tag number A372580.

The geologic strata encountered was sand with trace silt and organics to an approximate depth of 0.1 mbgs, underlain by medium to fine sand with trace silt to an approximate depth of 3.3 m, followed by a layer of clay to an approximate depth of 3.6 m. The clay layer was underlain by silty fine sand to an approximate depth of 4.6 m, underlain by fine sand with trace silt and gravel to an approximate depth of 6.0 m. Groundwater was encountered at approximately 5.79 mbgs. A summary of the stratigraphy encountered is provided in the table below and in borehole logs in Appendix A.

**Table 3-2: Summary of Stratigraphy in DW2**

Soil Description	Depth (m)	Additional Notes
Medium to fine sand with trace silt and trace organics, loose, brown/red, moist	0 – 0.1	
Medium to fine sand with trace silt, loose light brown/beige, dry	0.1 – 1.5	The top 0.75 m of material was to be removed
Medium to fine sand with trace silt, loose, light brown/beige, dry	1.5 – 3.4	
Clay, dense, red, moist	3.4 – 3.7	
Silty fine sand, loose, brown, wet	3.7 – 4.1	
Silty fine sand, loose, brown/orange, wet	4.1 – 4.6	
Fine sand with trace silt and gravel, loose, grey/blue, wet	4.6 – 6.1	
Clean crushed rock granular fill	6.1 – 6.6	At 6.71 m the material kept caving in, so the well was installed

### 3.2 Pumping Test Methodology

A six-hour pumping test was completed for each of the two dug wells to assess the groundwater quality and quantity. Prior to beginning the pumping tests, groundwater data loggers (Solinst Levellogger 5) were positioned in the test wells to record the water level over time and to measure drawdown and recovery. At the end of the pumping test, the test wells were allowed to recover and the recorded water level data from both pumping and recovery were collected to evaluate the hydrogeological setting. All water level data including pumping and recovery data are shown in Appendix B

Simple step tests were completed to assess the performance of the test wells, and to evaluate whether the pump test can stress the wells to help assess the quantity and recovery of the test wells. The step test consisted of pumping for four one-hour intervals at increasing rates starting at approximately 5 gallons/min (19 litres per minute), then increasing to 10 and 15 gallons per minute and finishing at the maximum flow capacity of the pump and equipment for the last half hour of the step test.

The pumping test was conducted using a submersible pump that was installed in the well at a depth of 1.5-5 metres below grade based on water levels and depths of the two dug test wells. The discharge generated from the test wells during the pumping tests was monitored using a calibrated flow meter and totalizer and was discharged to ground surface approximately 30 metres from the test wells.

### 3.2.1 Hydraulic Conductivity Modeling Methodology

The calculated hydraulic conductivities for DW1 and DW2 were modeled using Aquifer Test Software 11.0. The hydraulic conductivities were modeled using the pump test as a slug test, using the correlated water level data, and using the Hvorslev method. The water level data collected by the groundwater data loggers was correlated in excel by comparing it with the barologger data. Then using the manual barometric compensation and the barometric units to water column equivalent conversions provided by Solinst, the water levels were correlated and compensated.

### 3.3 Groundwater Sampling

Groundwater quality samples were collected pre and post pumping tests for both test wells and submitted to the laboratory for 'subdivision package' and 'heavy metal' parameters as shown below in Table 3-4. The groundwater samples were collected into laboratory supplied bottles and prepared/preserved in the field in accordance with the industry standard sampling, handling, and preservation procedures required by the laboratory. Field parameters were measured at periodic intervals (every 30 minutes) during the pumping tests to ensure that the groundwater chemistry was stable before sampling the groundwater. The measured field parameters and equipment used during the pumping test are provided in the Table below.

**Table 3-3: Measured Field Parameters and Equipment**

Field Parameters	Manufacturer	Model No.
pH, temperature, conductivity, total dissolved solids, dissolved oxygen, oxygen reduction potential, and turbidity	Horiba	Horiba U-52

**Table 3-4: Water Quality Analytical Parameters**

Parameters
Total coliform, E.coli, fecal coliform, heterotrophic plate count, electrical conductivity, pH, hardness, total dissolved solids, alkalinity, fluoride,

chloride, nitrate, nitrite, sulphate, ammonia, total kjeldahl nitrogen, dissolved organic carbon, pheols, hydrogen sulphide, true colour, turbidity, calcium, manganese, magnesium, potassium, sodium, aluminum, antimony, arsenic, barium, boron, cadmium, chromium, chromium VI, copper, lead, mercury, selenium, uranium, and zinc

All groundwater samples were subsequently submitted under chain of custody (COC) in insulated containers with ice and delivered to ALS Laboratories in Thunder Bay.

### 3.4 Quality Assurance/Quality Control

ALS Laboratory Group (ALS), a Canadian Association for Laboratory Accreditation (CALA) certified and accredited independent laboratory, conducted chemical analysis of the water samples. Analyses were performed following recognized standard methodologies.

CSL maintains a standard Quality Assurance/Quality Control (QA/QC) program for all environmental investigations. CSL operates under Certificates of Authorization issued by the Professional Engineers of Ontario (PEO) and the Professional Geoscientists of Ontario (PGO), and all work was carried out with due regard to PEO and PGO standards for professional practice.

Standard field QA/QC was established by following procedures outlined in the MECP Standards Development Branch Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (December 1996).

The following duplicate sample was collected and submitted to the laboratory for quality control purposes to check analytical consistency.

**Table 3-5: Duplicate Sample**

Sample Event	Sample ID	Duplicate ID
December 12, 2023	DW2AP	DUP A

Results for internal laboratory QC analyses (such as duplicate samples, standards, blanks, and matrix spikes) were reviewed.

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## 4 Results and Discussion

### 4.1 Geologic Characterization

#### 4.1.1 Overburden

The overburden material at site generally consists of sand and gravel with trace silt. The sand is a thick and extensive layer in the overburden aquifer. The overburden aquifer of DW1 is predominantly gravel with some sand and trace silt.

The overburden aquifer of DW2 is predominantly sand with trace gravel and trace silt. During the digging process for DW2 a clay layer was encountered approximately 3.4 mbgs, and the clay layer was approximately 0.3 m thick.

Based on a review of the surrounding well records, the surrounding overburden is consistent with that at the Site, and ranges in thickness down to depths ranging from approximately 10 to 33 mbgs. Overall, the overburden aquifer at Site is a thick and extensive predominantly sand aquifer.

#### 4.1.2 Bedrock

Bedrock was not encountered during this study or during well installation. Based on a review of the surrounding well records, bedrock in the area was encountered at depths ranging from approximately 33 to 39 mbgs.

### 4.2 Water Supply Investigation DW1

#### 4.2.1 DW1 – Hydraulic Testing Results

Overall, DW1 was stressed by the six-hour pumping test as evidenced by the fact the water level within the well was lowered. Although there was a measured drawdown in the well, the drawdown was minimal. Based on the results of the pumping test, the K-value for DW1 was modeled to be  $9.98 \times 10^{-4}$  m/s using Aquifer Test software.

#### 4.2.2 Aquifer Drawdown and Response

According to the data collected by the Solinst Levellogger 5 in DW1 through the duration of the pumping, the maximum drawdown recorded was 15.56 cm. Based on this information, DW1 recovered to 97.9% of the original level, after approximately three minutes (00:03:20). The maximum drawdown occurred approximately three and a half hours into the pump test (1:26 PM). A summary of the drawdown and recovery values are provided in the table below.

**Table - 4 1 Summary Values of Drawdown and Response for DW1**

	DW1
Hydraulic Conductivity (m/s)	9.98x10 <sup>-4</sup>
Duration until Max drawdown	03:21:47
Maximum Drawdown (cm)	15.56
Recovery Time (for 98 % recovery)	00:03:20
Original Water Level	1.47
Recovered Water Level	1.44
Well Depth (mbgs)	3.4
Elevation (masl)	219.2

### 4.2.3 Water Quality Results

Field testing results for DW1 are summarized below.

**Table - 4 2 Field Testing Results of DW1 Samples**

2023 Groundwater Field Testing Results			
Sample ID	pH	Temperature (°C)	Conductivity (mS/cm)
DW1BP	9.82	7.28	Not measured
DW1AP	7.10	8.91	Not measured

#### 4.2.3.1 DW1 Groundwater Analytical Results

The groundwater analytical results are summarized below and provided in Table 1 (Appendix C), and are also provided in the Laboratory Certificates of Analysis in Appendix D.

Both the before and after pumping samples for DW1 exceeded the ODWS criteria for hardness and total coliforms. The before and after samples for DW1 also had measurable concentrations of Heterotrophic Plate Count (HPC) that were greater than the laboratory's maximum detection limit.

## 4.3 Water Supply Investigation DW2

### 4.3.1 DW2 – Hydraulic Testing Results

Overall, DW2 was stressed by the six-hour pumping test as evidenced by the fact the water level within the well was lowered. Although there was a measured drawdown in the well, the drawdown during the pumping test was minimal. Based on the results of the pumping test, the K-value for DW2 was modeled to be 1.00x10<sup>-3</sup> m/s using Aquifer Test software.

### 4.3.2 Aquifer Drawdown and Response

Based on the data collected by the Solinst Levellogger 5 in DW2 through the duration of the pumping, the maximum drawdown recorded was 33.86 cm. According to the same data, the SWL in DW2 recovered to 98.0% of the original level, over an interval of approximately 42 minutes (00:42:47). The maximum drawdown occurred approximately six hours into the pump test (4:05 PM). A summary of the drawdown and recovery values are provided in table 4-3 below.

**Table - 4 3 Summary Values of Drawdown and Response for DW2**

	DW2
Hydraulic Conductivity (m/s)	1.00x10 <sup>-3</sup>
Duration until Max drawdown	06:00:59
Maximum Drawdown (cm)	33.86
Recovery Time (for 98 % recovery)	00:42:47
Original Water Level	1.79
Recovered Water Level	1.76
Well Depth (mbgs)	6.6
Elevation (masl)	220.5

### 4.3.3 Water Quality Results

Field testing results for DW2 are summarized below.

**Table - 4 4 Field Testing Results of DW2 Samples**

2023 Groundwater Field Testing Results			
Sample ID	pH	Temperature (°C)	Conductivity (mS/cm)
DW2BP	7.95	10.36	0.403
DW2AP	7.37	7.64	0.560
DW2-R	8.90	7.93	0.389

#### 4.3.3.1 DW2 Groundwater Analytical Results

The groundwater analytical results are summarized below and provided in Table 1 (Appendix C), and are also provided in the Laboratory Certificates of Analysis in Appendix D.

Both the before and after pumping samples for DW2 exceeded the ODWS criteria for hardness and total coliforms. The before pumping sample had total coliform and HPC concentrations greater than the laboratory's detection limit. The after pumping samples for DW2 also had measurable concentrations of HPC and total coliforms. In addition, the after pumping sample for DW2 had a measurable concentration of Escherichia coliforms (E. coli). The after pumping DW2 sample had concentrations of HPC that were lower than in the before pumping sample.

Because of the presence of *E. coli* in the after pumping DW2 (DW2AP) sample, it was determined another sample should be collected. On January 15, 2024, a resample for microbiological testing was collected. The results of the re-sample show non detect concentration of *E. coli* and decreased HPC concentrations compared to sample DW2AP. The re-sample still exceeded the ODWS criteria for total coliforms; however, similar to the HPC concentration, the concentration of total coliforms had decreased from the previous analytical concentration.

#### *4.3.3.2 Duplicate Sample*

The duplicate sample results are summarized in Table 1. The laboratory duplicates, blanks, and process recoveries are shown on the Laboratory Certificates of Analysis in Appendix D.

The blind duplicate, laboratory duplicates, blanks, and process recoveries results for 2023 sampling events were generally within standard tolerances and none of the maximum hold times for chemical analysis were exceeded.

The blind duplicate results for the December 2023 sampling event were all below reportable laboratory detection limits and therefore RPD values could not be calculated. The duplicate sample had a measurable concentration of *E. coli*, and similar to the after pumping DW2 sample the duplicate sample had concentrations of HPC that were lower than the Laboratory's maximum detection limit. Thermotolerant coliforms (fecal) were present in measurable concentrations in the duplicate sample.

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## 5 Impact Assessment

### 5.1 Water Quality and Drawdown

A simple analytical model was used to determining the size and geometry of a capture zone pumping 5 iGMP (33 m<sup>3</sup>/day, approximately) for a single lot (see Figure 3). A capture zone is defined as the area surrounding a pumping well that will supply groundwater recharge to the well.

The assumptions for this analytical model are as follows:

- the aquifer is homogeneous, isotropic, and infinite in horizontal scale;
- uniform NW-SE flow (steady-state) conditions prevail;
- the unconfined aquifer has a horizontal lower confining layer with no precipitation infiltration;
- the well is fully penetrating.

Aquifer thickness (6 m) and hydraulic conductivity ( $1 \times 10^{-3}$  m/s) were derived from borehole logging and hydraulic testing data, respectively, obtained during field activities. Model parameters and calculations of the capture zone are presented in Appendix E.

Based on the size and geometry of the capture zone, the area of influence of each well is confined to the lot size (see Figure 5-2); having a maximum half-width of 25 m and a stagnation point located 8 m downgradient the pumping well (see Appendix E).

### Groundwater Balance

In order to assess the sustainability of the overall yield withdrawn by the project, a simple groundwater balance calculation was conducted. To do this, the total groundwater discharge rate was given by the sum of the 12 single lots pumping at a rate of 5 iGMP each, which is 60 iGMP (396 m<sup>3</sup>/day, approximately).

The groundwater recharge rate was estimated along a 980 m control transect plane perpendicular to the NW-SE groundwater flowing towards the overall development project (see Figure 3). Assuming a thickness of 6 m, the groundwater flow recharging the development area would be 643 m<sup>3</sup>/day (see Appendix E).

Thus, the estimated groundwater extraction ratio is approximately 0.62 (62%), which can be considered a conservative scenario given that local precipitation recharge (560 mm/year) is not included in the groundwater balance.

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## 5.2 Wellhead Protection and Water Quality Impacts

Dug wells are being considered as the preferred option for the water supply in the proposed development. The wells should be completed by a suitable experienced, MOECC licensed well contractor. All wells must be completed in accordance with O.Reg. 903.

Drinking water source protection is intended to ensure that activities do not pollute sources of drinking water (Clean Water Act, 2006). Some chemicals such as liquid fuels and other chemicals are not removed from water, even with a water treatment system. To protect existing and future drinking water sources, a development source water protection plan should be developed and shared with future landholders. The plan will ensure that an activity is identified and never becomes a significant drinking water threat. Drinking water quality threats are defined as activities that may pose a risk to the drinking water quality. The Province of Ontario (MECP, 2021) lists the drinking water quality threat activities and include but not limited to:

- Sewage systems – their establishment, operation, or maintenance (including Septic Systems)
- Snow and Road salt: application, handling and storage
- Fuel: handling and storage
- Chemicals or organic solvent: handling and storage, and if/when used for de-icing: managing the runoff
- Waste disposal sites: establishing, operating and maintaining. Those sites are defined as both receivers and generators of waste
- Agricultural Practices: agricultural source material or commercial fertilizers (application to land, storage, management)
- Non-agricultural source material: application, handling and storage
- Land Associated with livestock: use of grazing, pasturing, confinement
- Fertilizer and pesticides: application, handling and storage

The vulnerability of an aquifer to surficial sources of contamination can be defined as the likelihood that a surficial source of contamination will reach an underlying aquifer of interest (Figure 3). Aquifers that are unconfined or have little protective cover are more vulnerable to surficial sources of contamination than aquifers that are overlain by thick, fine-grained confining units as fine-grained soils can attenuate or retard the downward migration of contaminants from the surface to underlying aquifers.

Based on a review of the proximal land uses including upgradient, there are very few threats to groundwater quality in this area from existing sources. The area is underdeveloped and within a rural area. Residential homes to the north and east likely have septic systems which are an adequate distance away. Further, the projected capture zones are directed away from the road way (road salting etc) and from any former industrial areas towards the west.

For future on-site potential sources, the groundwater vulnerability of impacts for this development should be classified as high as these wells will be constructed in an unconfined sand and gravel aquifer and as such, are susceptible to surficial sources of contamination. It is noted that the

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preferred well locations will place the dug wellhead at an adequate distance from the lot septic field to avoid impacts. Focusing on the above-mentioned drinking water threats, risk management measures are recommended to be drafted, communicated to the landowners and implemented based on land use activity and contaminant source that may impact the groundwater sources.

Based on the groundwater quality testing during this investigation, it is expected that the groundwater will require some form of treatment for potable water use. Groundwater chemical testing should be completed at the on-set of the lot development by the landowner and appropriate water treatment equipment tested and installed. Routine monitoring of the groundwater should be conducted by the owner to ensure a safe water supply.

### **5.3 Water Conservation**

To offset any potential issue with respect to groundwater recharge changes and the impact of the development on infiltration and groundwater levels, groundwater conservation methods are recommended that could include low impact development (LID) measures. These measures could consist of directing precipitation from the lots into infiltration swales and ponds, at strategic areas on the property. The base of these features will need to be at least one metre above the static ground water table, and their infiltration capacity will be limited by the introduced and native soils beneath them. In light of the high-water tables across many portions of the site, effective LID design may require the introduction of fill material.

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## 6 Conclusions and Recommendations

### 6.1 Conclusions

Based on the assessment and evaluation completed at the site, we offer the following conclusions.

- The overburden material at site generally consists of sand and gravel with trace silt. The sand is a thick and extensive layer in the overburden aquifer. Based on a review of the surrounding well records, the surrounding overburden is consistent with that at the Site, and ranges in thickness down to depths ranging from approximately 10 to 33 mbgs. Overall, the overburden aquifer at Site is a thick and extensive predominantly sand aquifer.
- The pumping tests completed at the two wells indicate that the groundwater recovery is sustained over a 6-hr period with minimal drawdown and fast recovery of the water level post pumping.
- The local shallow aquifer appears to be able to support groundwater extraction of shallow dug wells in the pumping range of 5 iGMP.
- Based on the size and geometry of the groundwater capture zone at each of the wells, the area of influence of each well is confined to the lot size, having a maximum half-width of 25 m and a stagnation point located 8 m downgradient the pumping well
- The overall groundwater yield withdrawn by the project, was given by the sum of the 12 single lots pumping at a rate of 5 iGMP each, which is 60 iGMP (396 m<sup>3</sup>/day, approximately). Based on the groundwater recharge rate along the control transect plane perpendicular to the NW-SE, the estimated groundwater extraction ratio is approximately 0.62 (62%), which can be considered a conservative scenario given that local precipitation recharge (560 mm/year) is not included in the groundwater balance.
- For future on-site potential sources, the groundwater vulnerability of impacts for this development should be classified as high as these wells will be constructed in an unconfined sand and gravel aquifer and as such, are susceptible to surficial sources of contamination. Aquifer protection and risk management measures are recommended to be drafted, communicated to the landowners and implemented based on land use activity and contaminant source that may impact the groundwater sources.
- To offset any future potential issue with respect to groundwater recharge changes and the impact of the development on infiltration and groundwater levels, groundwater conservation methods are recommended that could include to low impact development (LID) measures. These measures could consist of directing precipitation from the lots into infiltration swales and ponds, at strategic areas on the property.

---

## **6.2 Recommendations**

### **6.2.1 Well Construction Recommendations**

This shallow domestic water wells must be drilled/installed by a licenced well driller under O.Reg. 903. The recommended depth is on the order of 4 m below grade and adjusted for field and geological conditions. The location and depth will be selected based on proximity to the final building infrastructure including setbacks from septic systems and informed by the hydrogeological evaluations.

### **6.2.2 Water Quality Recommendations**

Groundwater chemical testing should be completed at the on-site of the lot development by the landowner and appropriate water treatment equipment tested and installed. Routine monitoring of the groundwater should be conducted by the owner to ensure a safe water supply. Based on the chemical testing, appropriate water treatment systems would be required and maintained. Routine testing of the water would also be required as per City, Municipal, Health Unit requirements or mandates.

---

## 7 Closure

We trust that the above report meets with your current requirements. If you have any questions or require clarifications, please contact the undersigned.

**CSL Environmental & Geotechnical Ltd.**

**Geocentric Environmental Inc.**

Written by:



Chris Perusse , P.Geo (ON, BC, AB)  
President/Sr. Geoscientist

Reviewed by:

A handwritten signature in black ink, appearing to read "J. Livingstone".

Steve Livingstone, M.Sc., P.Geo.  
President/ Sr. Hydrogeologist

---

## 8 References

Clean Water Act (2006). <https://www.ontario.ca/laws/statute/06c22> and [https://www.sourcewater.ca/en/how-it-works/resources/Documents/CWA\\_PlainLanguageGuide.pdf](https://www.sourcewater.ca/en/how-it-works/resources/Documents/CWA_PlainLanguageGuide.pdf)

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Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1.

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## Limitations of the Report

The information, conclusions and recommendations given herein are specific to this project and this Client only; and for the scope of work described herein. This report may not be relied upon, in whole or in part, by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions made based on it, are the responsibility of such third parties. CSL or Geocentric do not accept responsibility for damages, if any, suffered by any third party due to decisions or actions made based on this report.

The data, conclusions and recommendations which are presented in this report, and the quality thereof, are based on a scope of work authorized by the Client. This report cannot warranty that all conditions on, or off, the Site are represented by those identified at specific locations. For example, conditions between sampling locations may differ from those encountered in the investigation and observed or measured conditions may change with time.

Any recommendations and conclusions provided, that are based on conditions or assumptions reported herein, will inherently include any uncertainty associated with those conditions or assumptions. Many aspects involving professional judgment such as subsurface models and remediation criteria contain a degree of uncertainty. This uncertainty should be managed by periodic review and refinement as additional information becomes available.

Note also that standards, guidelines and practices related to environmental investigations may change with time. Those which were applied at the time of this investigation may be obsolete or unacceptable at a later date.

Any topographic benchmarks and elevations documented in this report are primarily used to establish relative elevation differences between test locations and should not be used for other purposes such as grading, excavation, planning, development, etc.

Any comments given in this report on potential remediation problems and possible methods are intended only for the guidance of the designer. The scope of work may not be sufficient to determine all of the factors that may affect construction or clean-up methods and costs.

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## Figures



B	01.23.24	ISSUED FOR REFERENCE	CC	GH
A	09.26.23	ISSUED FOR REFERENCE	CC	GH
REV	MM.DD.YY	DESCRIPTION	DRN	APV

PRELIMINARY  
NOT FOR CONSTRUCTION

LOCATION NOTES:

1. LOCAL SURVEY AND DIGITAL DATA PROJECTED IN UTM NAD83 ZONE 16U COORDINATES.
2. ALL UNITS ARE IN METRIC.



CLIENT: NORTH STAR HOLDINGS INCORPORATED				
P.O. #:	-	DRN:	CC	DATE: 09.08.23
PROJECT #:	CSL2023-492	DES:		DATE:
SHEET SIZE:	22 x 34 - D	CHK:	CP	DATE: 01.23.24
SCALE:	NTS	APV:		DATE:
PROJECT: HYDROGEOLOGICAL INVESTIGATION COOPER ROAD THUNDER BAY, ONTARIO				
TITLE: LOCATION PLAN				
DWG #: FIGURE 1				REV: B



B	01.23.24	ISSUED FOR REFERENCE	CC	GH
A	09.26.23	ISSUED FOR REFERENCE	CC	GH
REV	MM.DD.YY	DESCRIPTION	DRN	APV

**PRELIMINARY**  
**NOT FOR CONSTRUCTION**

LEGEND:  
PROPOSED LOTTING EXTENTS



CLIENT: NORTH STAR HOLDINGS INCORPORATED				
P.O.#:	-	DRN:	CC	DATE: 09.08.23
PROJECT #:	CSL2023-492	DES:		DATE:
SHEET SIZE:	22 x 34 - D	CHK:	CP	DATE: 01.23.24
SCALE:	AS SHOWN	APV:		DATE:
PROJECT: HYDROGEOLOGICAL INVESTIGATION COOPER ROAD THUNDER BAY, ONTARIO				
TITLE: PROPOSED LOTING PLAN				
DWG #: FIGURE 2				REV: B



C	01.25.24	ISSUED FOR REFERENCE	CC	GH
B	01.23.24	ISSUED FOR REFERENCE	CC	GH
A	09.26.23	ISSUED FOR REFERENCE	CC	GH
REV	MM.DD.YY	DESCRIPTION	DRN	APV

**PRELIMINARY**  
**NOT FOR CONSTRUCTION**

LEGEND:	
ASBUILT DUG WELL LOCATION	
PROPOSED DUG WELL LOCATION	
GROUNDWATER RECHARGE DIRECTION	
ESTIMATED GROUNDWATER CAPTURE ZONES	



CLIENT:			
NORTH STAR HOLDINGS INCORPORATED			
P.O.#:	-	DRN:	CC DATE: 09.08.23
PROJECT #:	CSL2023-492	DES:	DATE:
SHEET SIZE:	22 x 34 - D	CHK:	CP DATE: 01.23.24
SCALE:	AS SHOWN	APV:	DATE:
PROJECT:			
HYDROGEOLOGICAL INVESTIGATION COOPER ROAD THUNDER BAY, ONTARIO			
TITLE:			
ASBUILT DRILLING LOCATIONS SITE PLAN			
DWG #:			REV:
FIGURE 3			C

## **Appendix A**

### Well Construction Logs

## LOG OF BOREHOLE DW 1

PROJECT No.: **CSL2023-492**  
CLIENT: **1974862 Ontario Inc.**  
PROJECT: **HydroG Vibert Road**  
LOCATION: **Cooper Road**  
SURFACE ELEV.: **219.2 metres**

**Drilling Data**  
METHOD: **Excavator**  
START DATE: **2023-10-23**  
COMPLETION DATE: **2023-10-23**  
COORDINATES: **5359992 m N, 320288 m E**

[illegible]

**CSL Environmental & Geotechnical Ltd.**  
1100 Russell St, Unit 10  
Thunder Bay, ON  
PH: (807) 629-4107  
Web: [www.cslltd.ca](http://www.cslltd.ca)

### SAMPLE TYPE LEGEND



**x<sup>3</sup>** Numbers refers to Sensitivity

**ENCLOSURE 1**

# LOG OF BOREHOLE DW 2

PROJECT No.: **CSL2023-492**  
 CLIENT: **1974862 Ontario Inc.**  
 PROJECT: **HydroG Vibert Road**  
 LOCATION: **Cooper Road**  
 SURFACE ELEV.: **220.5 metres**

Drilling Data  
 METHOD: **Excavator**  
 START DATE: **2023-10-23**  
 COMPLETION DATE: **2023-10-23**  
 COORDINATES: **5360599** m N, **320319** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE				Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ×				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W <sub>p</sub>	W	W <sub>i</sub>							40	80	120	160	
			+	+	+	+						SPT (N) □	Blows/0.3m	DCPT ♦		
			20	40	60	80						20	40	60	80	
								SAND - trace silt, loose, dry, brown	1							
									2							
220																
1.0																
219									3							
2.0		▼														
218																
3.0																
217								CLAY - dense, moist, red	4							
								SAND - silty, loose, wet, brown	5							
4.0																
									6							
216																
5.0								SAND - trace gravel, trace silt, loose, wet, grey								
215									7							
6.0																
214																
								End of dug well @ 6.6 mbgs								

BOREHOLE (THUNDER BAY) CSL2023-492 PROJECT.GPJ DATA TEMPLATE.GDT 24-1-18



CSL Environmental & Geotechnical Ltd.  
 1100 Resell St, Unit 10  
 Thunder Bay, ON  
 PH: (807) 629-4107  
 Web: www.csltd.ca

## SAMPLE TYPE LEGEND

	Auger Sample		Rock Core		Bentonite
	Split Spoon Sample		Core Sample		Sand
	Bulk Sample		Shelby Tube	× <sup>3</sup>	Numbers refers to Sensitivity

ENCLOSURE 2

## **Appendix B**

### Pump Test Data

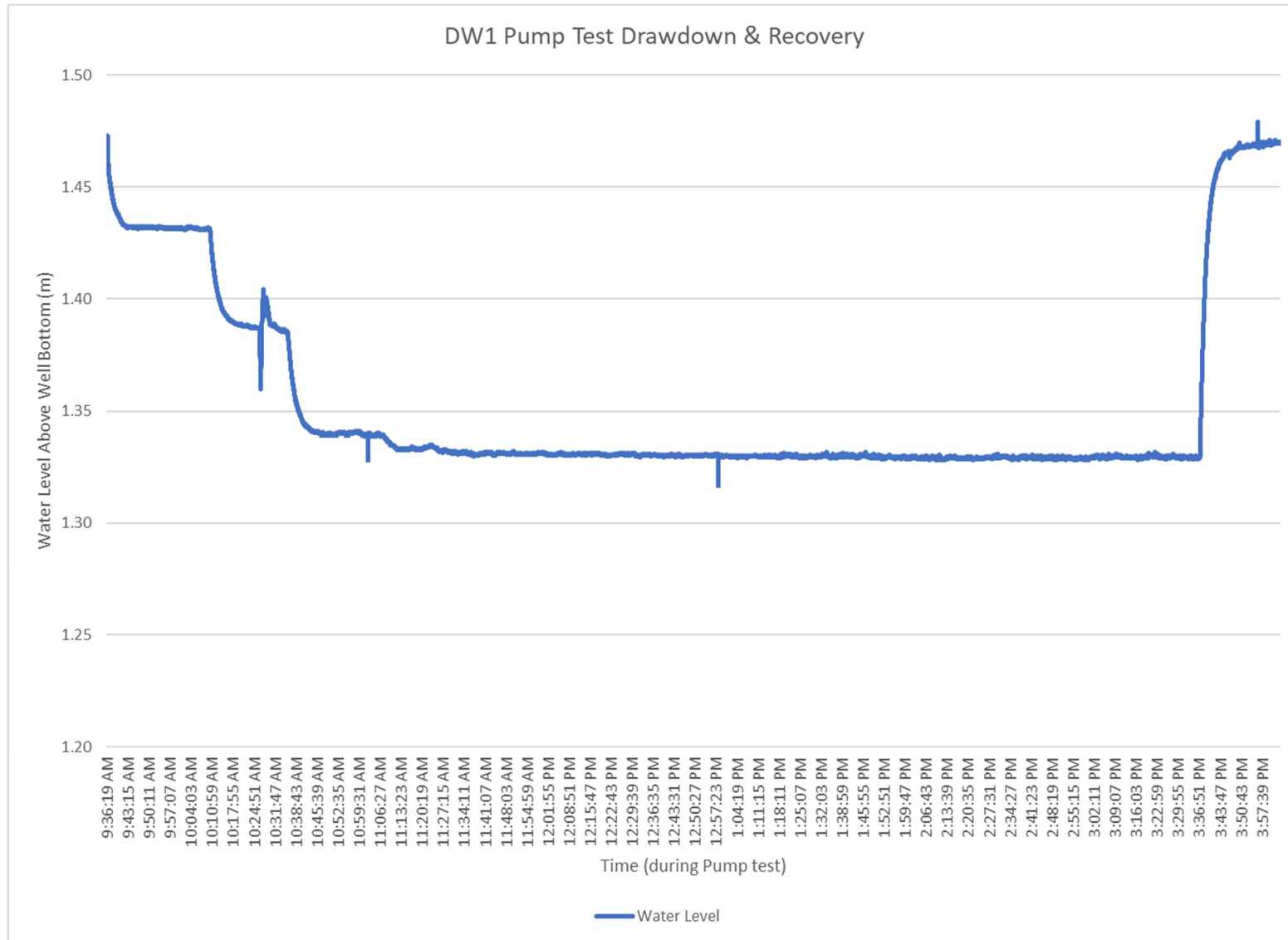
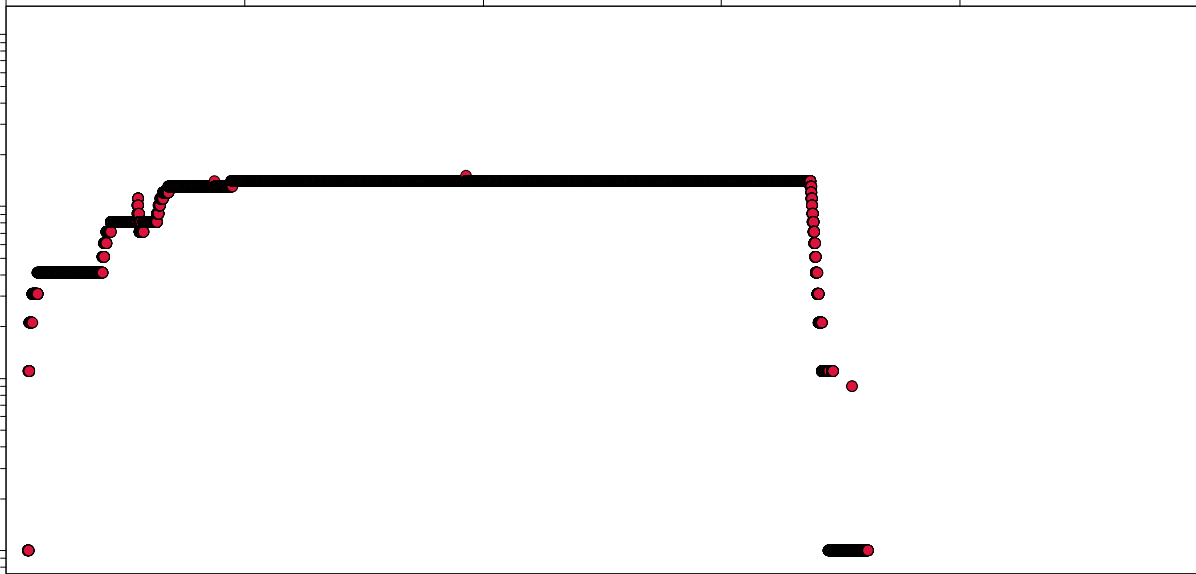


Photo 1: Water Level in DW1 during the Pump Test and Recovery.

		Slug Test Analysis Report	
		Project: Hydrogeological Study Copper Road	
		Number: CSL2023-492	
		Client: North Star Holdings Inc.	
Location: Cooper Road Project		Slug Test: DW1 Pump Test	Test Well: Well 2
Test Conducted by: NB		Test Date: 2023-12-11	
Analysis Performed by: NB		DW1 Pump Test	Analysis Date: 2024-01-10
Aquifer Thickness:			
<div><div></div><div><div>Time [s]</div><div><div><div>-605.5</div><div>5994.5</div><div>12594.5</div><div>19194.5</div><div>25794.5</div><div>32394.5</div></div><div><div>1E3</div><div>1E2</div><div>1E1</div><div>1E0</div></div><div><div>h/h0</div></div></div></div></div>			
Calculation using Hvorslev			
Observation Well	Hydraulic Conductivity [m/s]		
Well 2	9.98 × 10 <sup>-4</sup>		

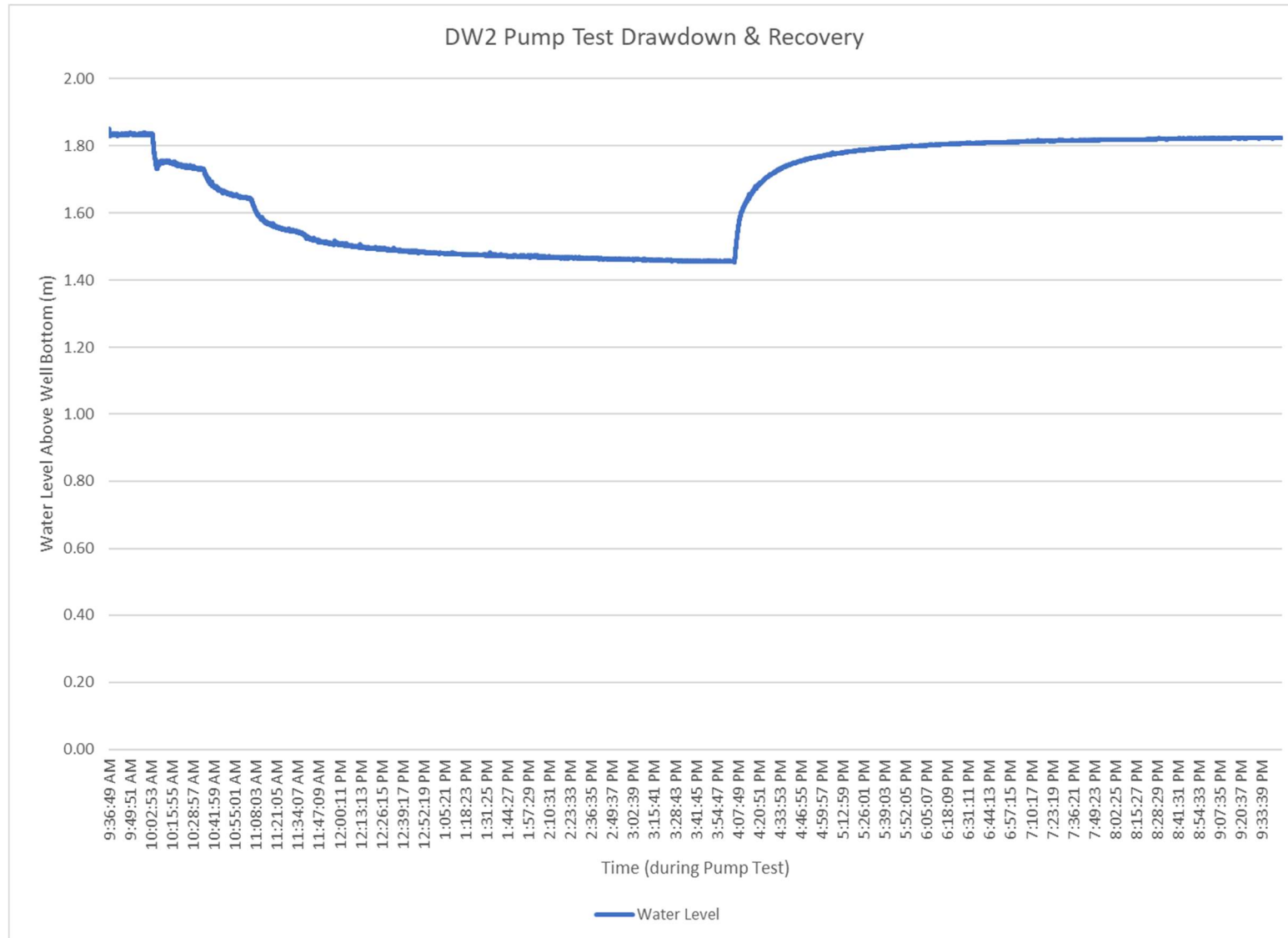


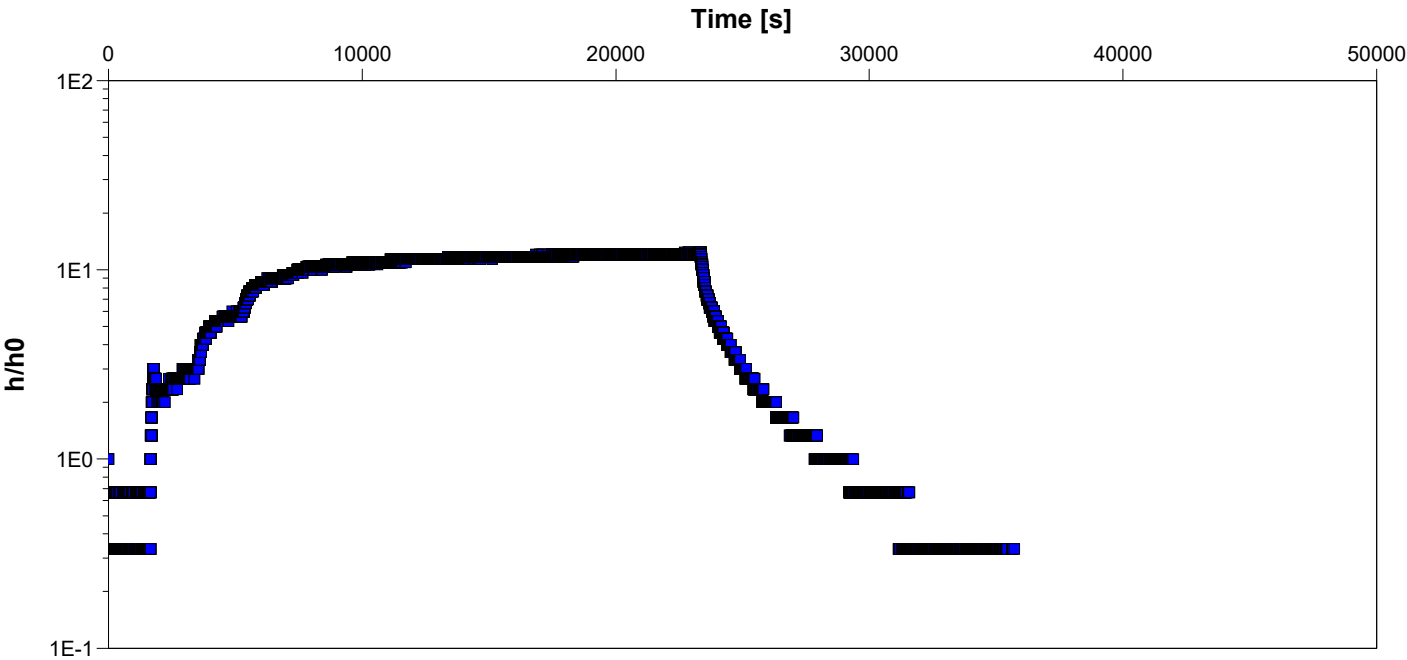
Photo 2: Water Level in DW2 during the Pump Test and Recovery.



CSL Environmental & Geotechnical Ltd.  
1100 Russell Street Unit 10  
Thunder Bay, ON, P7B 5N2

Slug Test Analysis Report	
Project:	Hydrogeological Study Copper Road
Number:	CSL2023-492
Client:	North Star Holdings Inc.

Location: Cooper Road Project	Slug Test: DW2 Pump Test	Test Well: DW2
Test Conducted by: NB		Test Date: 2023-12-12
Analysis Performed by: SJS	DW2	Analysis Date: 2024-01-08
Aquifer Thickness:		



Calculation using Hvorslev		
Observation Well	Hydraulic Conductivity [m/s]	
DW2	$1.00 \times 10^{-3}$	

## Appendix C

Table 1 (Analytical Results)

Table 1  
Analytical Groundwater Chemistry Results

Parameter	Units	MDL <sup>1</sup>	ODWS <sup>2</sup>	DW1BP	DW1AP	DW2BP	DW2AP	DUP A	DW2-R
				11-Dec-2023	11-Dec-2023	12-Dec-2023	12-Dec-2023	12-Dec-2023	15-Jan-24
<b>Physical Tests (Matrix: Water)</b>								<b>Duplicate of DW1AP</b>	<b>Resample of DW2</b>
Colour, true	CU	2	-	2.1	<2.	<2.	<2.	<2.	
Conductivity	µS/cm	1	-	261	216	390	386	394	
pH	pH units	0.1	6.5-8.5	8.43	7.9	8.3	8.19	8.23	
Solids, total dissolved [TDS]	mg/L	10	500	157	126	241	244	241	
Turbidity	NTU	0.1	5	0.68	0.82	0.59	1.73	1.73	
<b>General Chemistry</b>									
Alkalinity, total (as CaCO3)	mg/L	2	30-500	127	109	184	168	170	
Ammonia, total (as N)	mg/L	0.005	-	0.317	0.0258	0.0745	0.009	0.0069	
Chloride	mg/L	0.1	250	5.1	5.1	16.5	26.1	27.2	
Fluoride	mg/L	0.02	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	
Hardness (as CaCO3), dissolved	mg/L	0.5	80-100	101	107	196	184	184	
Kjeldahl nitrogen, total [TKN]	mg/L	0.05	-	0.43	0.092	0.112	0.077	0.075	
Nitrate (as N)	mg/L	0.02	10	0.098	0.184	0.021	<0.02	<0.02	
Nitrite (as N)	mg/L	0.01	1	<0.01	<0.01	<0.01	<0.01	<0.01	
Sulfate (as SO4)	mg/L	0.3	500	5.47	3.89	14	8.81	8.73	
<b>Organic / Inorganic Carbon</b>									
Carbon, dissolved organic [DOC]	mg/L	0.5	5	1.73	1.31	1.95	2.46	2.51	
<b>Total Sulfides</b>									
Sulfide, total (as S)	mg/L	0.0015	-	0.0175	<0.0015	0.0033	<0.0015	<0.0015	
Sulfide, total (as H2S)	mg/L	0.0016	-	0.0186	<0.0016	0.0035	<0.0016	<0.0016	
<b>Microbiological Tests</b>									
Coliforms, thermotolerant [fecal]	MPN/100mL	1	-	<1.	<1.	<1.	<1.	2	<1
Coliforms, total	MPN/100mL	1	ND	13	12	>2420.	2420	2420	649
Heterotrophic plate count [HPC]	CFU/mL	1	-	>300.	>300.	>300.	268	258	39
Coliforms, Escherichia coli [E. coli]	MPN/100mL	1	ND	<1.	<1.	<1.	3	2	<1
<b>Dissolved Metals</b>									
Aluminum, dissolved	mg/L	0.001	0.1	0.0189	0.0012	0.0029	0.0016	0.0014	
Antimony, dissolved	mg/L	0.0001	0.006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Arsenic, dissolved	mg/L	0.0001	0.01	0.00034	0.00011	0.00031	0.00023	0.00023	
Barium, dissolved	mg/L	0.0001	1	0.00512	0.00602	0.00926	0.0118	0.0116	
Beryllium, dissolved	mg/L	0.00002	-	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	
Bismuth, dissolved	mg/L	0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Boron, dissolved	mg/L	0.01	5	0.025	0.022	0.026	0.03	0.032	
Cadmium, dissolved	mg/L	0.000005	0.005	<0.000005	0.0000083	0.0000072	0.0000093	0.0000113	
Calcium, dissolved	mg/L	0.05	-	22.2	22	50.6	46.3	46.8	
Cesium, dissolved	mg/L	0.00001	-	0.000068	<0.00001	0.000024	<0.00001	<0.00001	
Chromium, dissolved	mg/L	0.0005	0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Cobalt, dissolved	mg/L	0.0001	-	0.00012	<0.0001	0.00031	0.00018	0.0002	
Copper, dissolved	mg/L	0.0002	1	0.00045	0.00024	0.00021	0.00029	0.00032	
Iron, dissolved	mg/L	0.01	0.3	0.011	<0.01	<0.01	<0.01	<0.01	
Lead, dissolved	mg/L	0.00005	0.01	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Lithium, dissolved	mg/L	0.001	-	0.0074	0.0031	0.0029	0.0018	0.0019	
Magnesium, dissolved	mg/L	0.005	-	11.1	12.6	17	16.7	16.4	
Manganese, dissolved	mg/L	0.0001	-	0.0592	0.0732	0.246	0.193	0.191	
Mercury, dissolved	mg/L	0.000005	0.001	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	
Molybdenum, dissolved	mg/L	0.00005	-	0.000372	0.000171	0.00085	0.000717	0.000666	
Nickel, dissolved	mg/L	0.0005	0.05	0.00053	0.00064	0.00129	0.00106	0.00105	
Phosphorus, dissolved	mg/L	0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	
Potassium, dissolved	mg/L	0.05	-	18.3	1.81	5.05	2.42	2.46	
Rubidium, dissolved	mg/L	0.0002	-	0.0315	0.00061	0.00627	0.00136	0.00132	
Selenium, dissolved	mg/L	0.00005	0.05	0.000142	0.000066	0.000101	0.000109	0.0001	
Silicon, dissolved	mg/L	0.05	-	11.4	10	8.18	8.28	8.22	
Silver, dissolved	mg/L	0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	
Sodium, dissolved	mg/L	0.05	200	7.16	3.15	6.5	7.38	7.29	
Strontium, dissolved	mg/L	0.0002	-	0.0616	0.0404	0.0762	0.0682	0.0674	
Sulfur, dissolved	mg/L	0.5	-	2.16	1.48	5.06	3.32	3.3	
Tellurium, dissolved	mg/L	0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Thallium, dissolved	mg/L	0.00001	-	<0.00001	<0.00001	<0.00001	<0.00001	<0.000013	
Thorium, dissolved	mg/L	0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Tin, dissolved	mg/L	0.0001	-	0.00033	<0.0001	0.00014	<0.0001	<0.0001	
Titanium, dissolved	mg/L	0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
Tungsten, dissolved	mg/L	0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Uranium, dissolved	mg/L	0.00001	0.02	0.000067	0.000042	0.000431	0.000394	0.000392	
Vanadium, dissolved	mg/L	0.0005	-	0.00122	<0.0005	<0.0005	<0.0005	<0.0005	
Zinc, dissolved	mg/L	0.001	5	0.0362	0.0054	<0.001	0.0019	0.002	
Zirconium, dissolved	mg/L	0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
<b>Speciated Metals</b>									
Chromium, hexavalent [Cr VI], dissolved	mg/L	0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
<b>Aggregate Organics</b>									
Phenols, total (4AAP)	mg/L	0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	

Notes

- 1) MDL - Minimum Detection Limit
- 2) ODWS - Ontario Drinking Water Standards
- 3) ND - Not Detectable
- 4) Exceedances of ODWS are shown by yellow highlighting
- 5) "-" means no value was provided in the ODWS for this parameter.

## **Appendix D**

### Laboratory Certificates of Analysis

## CERTIFICATE OF ANALYSIS

Work Order	: TY2312965	Page	: 1 of 5
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay ON Canada P7B 5N3
Telephone	: ----	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 13-Dec-2023 09:27
PO	: ----	Date Analysis Commenced	: 13-Dec-2023
C-O-C number	: ----	Issue Date	: 20-Dec-2023 15:45
Sampler	: ----		
Site	: Subdivision Package		
Quote number	: Standing Offer 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

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
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Cassandra Grzelewski	Team Leader - Inorganics	Inorganics, Thunder Bay, Ontario
Cassandra Grzelewski	Team Leader - Inorganics	Metals, Thunder Bay, Ontario
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Metals, Waterloo, Ontario
Julie Ruoho	Teamleader Wet Chem	Inorganics, Thunder Bay, Ontario
Taelur Kachur	Laboratory Analyst	Microbiology, Thunder Bay, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Metals, Waterloo, Ontario



## 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.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

Unit	Description
-	no units
µS/cm	microsiemens per centimetre
CFU/mL	colony forming units per millilitre
CU	colour units (1 cu = 1 mg/l pt)
mg/L	milligrams per litre
MPN/100mL	most probable number per hundred millilitres
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.



Analytical Results

Sub-Matrix: Groundwater (Matrix: Water)				Client sample ID	DW1BP	DW1AP	DW2BP	DW2AP	DUP A
Client sampling date / time					11-Dec-2023 09:10	11-Dec-2023 16:23	12-Dec-2023 09:17	12-Dec-2023 16:18	12-Dec-2023 16:20
Analyte	CAS Number	Method/Lab	LOR	Unit	TY2312965-001	TY2312965-002	TY2312965-003	TY2312965-004	TY2312965-005
					Result	Result	Result	Result	Result
Physical Tests									
Colour, true	----	E329-L/TY	2.0	CU	2.1	<2.0	<2.0	<2.0	<2.0
Conductivity	----	E100/TY	1.0	µS/cm	261	216	390	386	394
Hardness (as CaCO3), dissolved	----	EC100/TY	0.50	mg/L	101	107	196	184	184
pH	----	E108/TY	0.10	pH units	8.43	7.90	8.30	8.19	8.23
Solids, total dissolved [TDS]	----	E162/TY	10	mg/L	157	126	241	244	241
Turbidity	----	E121/TY	0.10	NTU	0.68	0.82	0.59	1.73	1.73
Alkalinity, total (as CaCO3)	----	E290/TY	2.0	mg/L	127	109	184	168	170
Anions and Nutrients									
Ammonia, total (as N)	7664-41-7	E298/TY	0.0050	mg/L	0.317	0.0258	0.0745	0.0090	0.0069
Chloride	16887-00-6	E235.Cl-L/TY	0.10	mg/L	5.10	5.10	16.5	26.1	27.2
Fluoride	16984-48-8	E235.F/TY	0.020	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020
Kjeldahl nitrogen, total [TKN]	----	E318/TY	0.050	mg/L	0.430	0.092	0.112	0.077	0.075
Nitrate (as N)	14797-55-8	E235.NO3/TY	0.020	mg/L	0.098	0.184	0.021	<0.020	<0.020
Nitrite (as N)	14797-65-0	E235.NO2/TY	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Sulfate (as SO4)	14808-79-8	E235.SO4/TY	0.30	mg/L	5.47	3.89	14.0	8.81	8.73
Organic / Inorganic Carbon									
Carbon, dissolved organic [DOC]	----	E358-L/WT	0.50	mg/L	1.73	1.31	1.95	2.46	2.51
Total Sulfides									
Sulfide, total (as S)	18496-25-8	E395/VA	0.0015	mg/L	0.0175	<0.0015	0.0033	<0.0015	<0.0015
Sulfide, total (as H2S)	7783-06-4	E395/VA	0.0016	mg/L	0.0186	<0.0016	0.0035	<0.0016	<0.0016
Microbiological Tests									
Coliforms, thermotolerant [fecal]	----	E010.FC/TY	1	MPN/100mL	Not Detected	Not Detected	Not Detected	Not Detected	2
Coliforms, total	----	E010/TY	1	MPN/100mL	13	12	>2420	2420	>2420
Heterotrophic plate count [HPC]	----	E020/TY	1	CFU/mL	>300	>300	>300	268	258
Coliforms, Escherichia coli [E. coli]	----	E010/TY	1	MPN/100mL	Not Detected	Not Detected	Not Detected	3	2
Dissolved Metals									
Aluminum, dissolved	7429-90-5	E421/TY	0.0010	mg/L	0.0189	0.0012	0.0029	0.0016	0.0014
Antimony, dissolved	7440-36-0	E421/TY	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic, dissolved	7440-38-2	E421/TY	0.00010	mg/L	0.00034	0.00011	0.00031	0.00023	0.00023



Analytical Results

Sub-Matrix: Groundwater

Client sample ID

(Matrix: Water)

					DW1BP	DW1AP	DW2BP	DW2AP	DUP A
Client sampling date / time					11-Dec-2023 09:10	11-Dec-2023 16:23	12-Dec-2023 09:17	12-Dec-2023 16:18	12-Dec-2023 16:20
Analyte	CAS Number	Method/Lab	LOR	Unit	TY2312965-001	TY2312965-002	TY2312965-003	TY2312965-004	TY2312965-005
					Result	Result	Result	Result	Result
Dissolved Metals									
Barium, dissolved	7440-39-3	E421/TY	0.00010	mg/L	0.00512	0.00602	0.00926	0.0118	0.0116
Beryllium, dissolved	7440-41-7	E421/TY	0.000020	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Bismuth, dissolved	7440-69-9	E421/TY	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron, dissolved	7440-42-8	E421/TY	0.010	mg/L	0.025	0.022	0.026	0.030	0.032
Cadmium, dissolved	7440-43-9	E421/TY	0.0000050	mg/L	<0.0000050	0.0000083	0.0000072	0.0000093	0.0000113
Calcium, dissolved	7440-70-2	E421/TY	0.050	mg/L	22.2	22.0	50.6	46.3	46.8
Cesium, dissolved	7440-46-2	E421/TY	0.000010	mg/L	0.000068	<0.000010	0.000024	<0.000010	<0.000010
Chromium, dissolved	7440-47-3	E421/TY	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt, dissolved	7440-48-4	E421/TY	0.00010	mg/L	0.00012	<0.00010	0.00031	0.00018	0.00020
Copper, dissolved	7440-50-8	E421/TY	0.00020	mg/L	0.00045	0.00024	0.00021	0.00029	0.00032
Iron, dissolved	7439-89-6	E421/TY	0.010	mg/L	0.011	<0.010	<0.010	<0.010	<0.010
Lead, dissolved	7439-92-1	E421/TY	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium, dissolved	7439-93-2	E421/TY	0.0010	mg/L	0.0074	0.0031	0.0029	0.0018	0.0019
Magnesium, dissolved	7439-95-4	E421/TY	0.0050	mg/L	11.1	12.6	17.0	16.7	16.4
Manganese, dissolved	7439-96-5	E421/TY	0.00010	mg/L	0.0592	0.0732	0.246	0.193	0.191
Mercury, dissolved	7439-97-6	E509/WT	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum, dissolved	7439-98-7	E421/TY	0.000050	mg/L	0.000372	0.000171	0.000850	0.000717	0.000666
Nickel, dissolved	7440-02-0	E421/TY	0.00050	mg/L	0.00053	0.00064	0.00129	0.00106	0.00105
Phosphorus, dissolved	7723-14-0	E421/TY	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium, dissolved	7440-09-7	E421/TY	0.050	mg/L	18.3	1.81	5.05	2.42	2.46
Rubidium, dissolved	7440-17-7	E421/TY	0.00020	mg/L	0.0315	0.00061	0.00627	0.00136	0.00132
Selenium, dissolved	7782-49-2	E421/TY	0.000050	mg/L	0.000142	0.000066	0.000101	0.000109	0.000100
Silicon, dissolved	7440-21-3	E421/TY	0.050	mg/L	11.4	10.0	8.18	8.28	8.22
Silver, dissolved	7440-22-4	E421/TY	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium, dissolved	7440-23-5	E421/TY	0.050	mg/L	7.16	3.15	6.50	7.38	7.29
Strontium, dissolved	7440-24-6	E421/TY	0.00020	mg/L	0.0616	0.0404	0.0762	0.0682	0.0674
Sulfur, dissolved	7704-34-9	E421/TY	0.50	mg/L	2.16	1.48	5.06	3.32	3.30
Tellurium, dissolved	13494-80-9	E421/TY	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium, dissolved	7440-28-0	E421/TY	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000013
Thorium, dissolved	7440-29-1	E421/TY	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010



Analytical Results

Sub-Matrix: Groundwater					Client sample ID	DW1BP	DW1AP	DW2BP	DW2AP	DUP A
(Matrix: Water)										
Client sampling date / time					11-Dec-2023 09:10	11-Dec-2023 16:23	12-Dec-2023 09:17	12-Dec-2023 16:18	12-Dec-2023 16:20	
Analyte	CAS Number	Method/Lab	LOR	Unit	TY2312965-001	TY2312965-002	TY2312965-003	TY2312965-004	TY2312965-005	
					Result	Result	Result	Result	Result	
Dissolved Metals										
Tin, dissolved	7440-31-5	E421/TY	0.00010	mg/L	0.00033	<0.00010	0.00014	<0.00010	<0.00010	
Titanium, dissolved	7440-32-6	E421/TY	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Tungsten, dissolved	7440-33-7	E421/TY	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium, dissolved	7440-61-1	E421/TY	0.000010	mg/L	0.000067	0.000042	0.000431	0.000394	0.000392	
Vanadium, dissolved	7440-62-2	E421/TY	0.00050	mg/L	0.00122	<0.00050	<0.00050	<0.00050	<0.00050	
Zinc, dissolved	7440-66-6	E421/TY	0.0010	mg/L	0.0362	0.0054	<0.0010	0.0019	0.0020	
Zirconium, dissolved	7440-67-7	E421/TY	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved mercury filtration location	----	EP509/WT	-	-	Laboratory	Laboratory	Laboratory	Laboratory	Laboratory	
Dissolved metals filtration location	----	EP421/TY	-	-	Laboratory	Laboratory	Laboratory	Laboratory	Laboratory	
Speciated Metals										
Chromium, hexavalent [Cr VI], dissolved	18540-29-9	E532A/WT	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Aggregate Organics										
Phenols, total (4AAP)	----	E562/WT	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: TY2312965	Page	: 1 of 21
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay, Ontario Canada P7B 5N3
Telephone	: ----	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 13-Dec-2023 09:27
PO	: ----	Issue Date	: 20-Dec-2023 15:48
C-O-C number	: ----		
Sampler	: ----		
Site	: Subdivision Package		
Quote number	: Standing Offer 2023		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

**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.

### **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 Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

#### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

### ***Outliers : Analysis Holding Time Compliance (Breaches)***

- Analysis Holding Time Outliers exist - please see following pages for full details.

### ***Outliers : Frequency of Quality Control Samples***

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



## 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**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP] DUP A	E562	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	6 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP] DW2AP	E562	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	6 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP] DW2BP	E562	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	6 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP] DW1AP	E562	11-Dec-2023	18-Dec-2023	28 days	7 days	✓	18-Dec-2023	28 days	7 days	✓
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) [ON MECP] DW1BP	E562	11-Dec-2023	18-Dec-2023	28 days	7 days	✓	18-Dec-2023	28 days	7 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] DUP A	E298	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	14-Dec-2023	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] DW2AP	E298	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	14-Dec-2023	28 days	2 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] DW2BP	E298	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	14-Dec-2023	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] DW1AP	E298	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	14-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP] DW1BP	E298	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	14-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE [ON MECP] DUP A	E235.Cl-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE [ON MECP] DW2AP	E235.Cl-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE [ON MECP] DW2BP	E235.Cl-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE [ON MECP] DW1AP	E235.Cl-L	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE [ON MECP] DW1BP	E235.Cl-L	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] DUP A	E235.F	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] DW2AP	E235.F	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] DW2BP	E235.F	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] DW1AP	E235.F	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] DW1BP	E235.F	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] DUP A	E235.NO3	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] DW2AP	E235.NO3	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] DW2BP	E235.NO3	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] DW1AP	E235.NO3	11-Dec-2023	14-Dec-2023	7 days	3 days	✓	15-Dec-2023	7 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] DW1BP	E235.NO3	11-Dec-2023	14-Dec-2023	7 days	3 days	✓	15-Dec-2023	7 days	4 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] DUP A	E235.NO2	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] DW2AP	E235.NO2	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] DW2BP	E235.NO2	12-Dec-2023	14-Dec-2023	7 days	2 days	✓	15-Dec-2023	7 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] DW1AP	E235.NO2	11-Dec-2023	14-Dec-2023	7 days	3 days	✓	15-Dec-2023	7 days	4 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] DW1BP	E235.NO2	11-Dec-2023	14-Dec-2023	7 days	3 days	✓	15-Dec-2023	7 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] DUP A	E235.SO4	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] DW2AP	E235.SO4	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] DW2BP	E235.SO4	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] DW1AP	E235.SO4	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] DW1BP	E235.SO4	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP] DUP A	E318	12-Dec-2023	15-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP] DW2AP	E318	12-Dec-2023	15-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP] DW2BP	E318	12-Dec-2023	15-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP] DW1AP	E318	11-Dec-2023	15-Dec-2023	28 days	4 days	✓	15-Dec-2023	28 days	4 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP] DW1BP	E318	11-Dec-2023	15-Dec-2023	28 days	4 days	✓	15-Dec-2023	28 days	4 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) DUP A	E509	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) DW2AP	E509	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) DW2BP	E509	12-Dec-2023	18-Dec-2023	28 days	6 days	✓	18-Dec-2023	28 days	0 days	✓



Matrix: **Water** Evaluation: **✖** = Holding time exceedance ; **✓** = Within Holding Time

Analyte Group : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
Container / Client Sample ID(s)			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) DW1AP	E509	11-Dec-2023	18-Dec-2023	28 days	7 days	✓	18-Dec-2023	28 days	0 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) DW1BP	E509	11-Dec-2023	18-Dec-2023	28 days	7 days	✓	18-Dec-2023	28 days	0 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DUP A	E421	12-Dec-2023	15-Dec-2023	180 days	3 days	✓	15-Dec-2023	180 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DW2AP	E421	12-Dec-2023	15-Dec-2023	180 days	3 days	✓	15-Dec-2023	180 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DW2BP	E421	12-Dec-2023	15-Dec-2023	180 days	3 days	✓	15-Dec-2023	180 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DW1AP	E421	11-Dec-2023	15-Dec-2023	180 days	4 days	✓	15-Dec-2023	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DW1BP	E421	11-Dec-2023	15-Dec-2023	180 days	4 days	✓	15-Dec-2023	180 days	4 days	✓
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DUP A	E020	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	25 hrs	✓
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2AP	E020	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	25 hrs	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2BP	E020	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	32 hrs	✓
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1AP	E020	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	49 hrs	✓
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1BP	E020	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	56 hrs	✓
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DUP A	E010.FC	12-Dec-2023	----	----	----		14-Dec-2023	48 hrs	45 hrs	✓
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2AP	E010.FC	12-Dec-2023	----	----	----		14-Dec-2023	48 hrs	45 hrs	✓
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2BP	E010.FC	12-Dec-2023	----	----	----		14-Dec-2023	48 hrs	52 hrs	✖ EHT
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1BP	E010.FC	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	54 hrs	✖ EHTL
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1AP	E010.FC	11-Dec-2023	----	----	----		14-Dec-2023	48 hrs	69 hrs	✖ EHTL
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DUP A	E010	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	24 hrs	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2AP	E010	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	24 hrs	✓
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2BP	E010	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	31 hrs	✓
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1AP	E010	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	48 hrs	✓
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW1BP	E010	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	55 hrs	✖ EHTL
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP] DUP A	E358-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	18-Dec-2023	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP] DW2AP	E358-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	18-Dec-2023	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP] DW2BP	E358-L	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	18-Dec-2023	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP] DW1AP	E358-L	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	18-Dec-2023	28 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP] DW1BP	E358-L	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	18-Dec-2023	28 days	7 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] DUP A	E290	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] DW2AP	E290	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] DW2BP	E290	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] DW1AP	E290	11-Dec-2023	14-Dec-2023	14 days	3 days	✓	15-Dec-2023	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP] DW1BP	E290	11-Dec-2023	14-Dec-2023	14 days	3 days	✓	15-Dec-2023	14 days	4 days	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] DUP A	E329-L	12-Dec-2023	13-Dec-2023	50 hrs	24 hrs	✓	13-Dec-2023	50 hrs	24 hrs	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] DW2AP	E329-L	12-Dec-2023	13-Dec-2023	50 hrs	24 hrs	✓	13-Dec-2023	50 hrs	24 hrs	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] DW1AP	E329-L	11-Dec-2023	13-Dec-2023	50 hrs	48 hrs	✓	13-Dec-2023	50 hrs	48 hrs	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] DW2BP	E329-L	12-Dec-2023	13-Dec-2023	57 hrs	31 hrs	✓	13-Dec-2023	57 hrs	31 hrs	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP] DW1BP	E329-L	11-Dec-2023	13-Dec-2023	57 hrs	55 hrs	✓	13-Dec-2023	57 hrs	55 hrs	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] DUP A	E100	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] DW2AP	E100	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] DW2BP	E100	12-Dec-2023	14-Dec-2023	28 days	2 days	✓	15-Dec-2023	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] DW1AP	E100	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE [ON MECP] DW1BP	E100	11-Dec-2023	14-Dec-2023	28 days	3 days	✓	15-Dec-2023	28 days	4 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] DUP A	E108	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] DW2AP	E108	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] DW2BP	E108	12-Dec-2023	14-Dec-2023	14 days	2 days	✓	15-Dec-2023	14 days	3 days	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : pH by Meter										
HDPE [ON MECP] DW1AP	E108	11-Dec-2023	14-Dec-2023	14 days	3 days	✓	15-Dec-2023	14 days	4 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP] DW1BP	E108	11-Dec-2023	14-Dec-2023	14 days	3 days	✓	15-Dec-2023	14 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] DUP A	E162	12-Dec-2023	----	----	----		15-Dec-2023	7 days	3 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] DW2AP	E162	12-Dec-2023	----	----	----		15-Dec-2023	7 days	3 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] DW2BP	E162	12-Dec-2023	----	----	----		15-Dec-2023	7 days	3 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] DW1AP	E162	11-Dec-2023	----	----	----		15-Dec-2023	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] DW1BP	E162	11-Dec-2023	----	----	----		15-Dec-2023	7 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] DUP A	E121	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	23 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] DW2AP	E121	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	23 hrs	✓



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] DW2BP	E121	12-Dec-2023	----	----	----		13-Dec-2023	48 hrs	30 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] DW1AP	E121	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	47 hrs	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [ON MECP] DW1BP	E121	11-Dec-2023	----	----	----		13-Dec-2023	48 hrs	55 hrs	✖ EHTL
Speciated Metals : Dissolved Hexavalent Chromium (Cr VI) by IC										
HDPE - dissolved (NaOH+Buf) [ON MECP] DUP A	E532A	12-Dec-2023	----	----	----		19-Dec-2023	28 days	7 days	✓
Speciated Metals : Dissolved Hexavalent Chromium (Cr VI) by IC										
HDPE - dissolved (NaOH+Buf) [ON MECP] DW2AP	E532A	12-Dec-2023	----	----	----		19-Dec-2023	28 days	7 days	✓
Speciated Metals : Dissolved Hexavalent Chromium (Cr VI) by IC										
HDPE - dissolved (NaOH+Buf) [ON MECP] DW2BP	E532A	12-Dec-2023	----	----	----		19-Dec-2023	28 days	7 days	✓
Speciated Metals : Dissolved Hexavalent Chromium (Cr VI) by IC										
HDPE - dissolved (NaOH+Buf) [ON MECP] DW1AP	E532A	11-Dec-2023	----	----	----		19-Dec-2023	28 days	8 days	✓
Speciated Metals : Dissolved Hexavalent Chromium (Cr VI) by IC										
HDPE - dissolved (NaOH+Buf) [ON MECP] DW1BP	E532A	11-Dec-2023	----	----	----		19-Dec-2023	28 days	8 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] DUP A	E395	12-Dec-2023	----	----	----		17-Dec-2023	7 days	5 days	✓

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 Client : CSL Environmental and Geotechnical Ltd  
 Project : CSL2023-492



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] DW2AP	E395	12-Dec-2023	----	----	----		17-Dec-2023	7 days	5 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] DW2BP	E395	12-Dec-2023	----	----	----		17-Dec-2023	7 days	5 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] DW1AP	E395	11-Dec-2023	----	----	----		17-Dec-2023	7 days	6 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) [ON MECP] DW1BP	E395	11-Dec-2023	----	----	----		17-Dec-2023	7 days	6 days	✓

#### Legend & Qualifier Definitions

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

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



## 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: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	1277253	1	10	10.0	5.0	✔
Ammonia by Fluorescence	E298	1276843	1	18	5.5	5.0	✔
Chloride in Water by IC (Low Level)	E235.Cl-L	1277257	1	5	20.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1275549	1	6	16.6	5.0	✔
Conductivity in Water	E100	1277252	1	7	14.2	5.0	✔
Dissolved Hexavalent Chromium (Cr VI) by IC	E532A	1281935	1	11	9.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	1280521	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1278158	2	21	9.5	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1280511	1	8	12.5	5.0	✔
Fluoride in Water by IC	E235.F	1277254	1	7	14.2	5.0	✔
Heterotrophic Plate Count (Pour Plate)	E020	1275535	1	20	5.0	5.0	✔
Nitrate in Water by IC	E235.NO3	1277255	1	15	6.6	5.0	✔
Nitrite in Water by IC	E235.NO2	1277258	1	15	6.6	5.0	✔
pH by Meter	E108	1277251	1	16	6.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	1280548	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	1277256	1	7	14.2	5.0	✔
TDS by Gravimetry	E162	1278047	1	7	14.2	5.0	✔
Total Coliforms and E. coli (Enzyme Substrate)	E010	1275466	0	8	0.0	5.0	✖
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1276829	1	16	6.2	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395	1280234	1	8	12.5	5.0	✔
Turbidity by Nephelometry	E121	1275510	1	6	16.6	5.0	✔
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1277253	1	10	10.0	5.0	✔
Ammonia by Fluorescence	E298	1276843	1	18	5.5	5.0	✔
Chloride in Water by IC (Low Level)	E235.Cl-L	1277257	1	5	20.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1275549	1	6	16.6	5.0	✔
Conductivity in Water	E100	1277252	1	7	14.2	5.0	✔
Dissolved Hexavalent Chromium (Cr VI) by IC	E532A	1281935	1	11	9.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	1280521	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1278158	2	21	9.5	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1280511	1	8	12.5	5.0	✔
Fluoride in Water by IC	E235.F	1277254	1	7	14.2	5.0	✔
Nitrate in Water by IC	E235.NO3	1277255	1	15	6.6	5.0	✔
Nitrite in Water by IC	E235.NO2	1277258	1	15	6.6	5.0	✔
pH by Meter	E108	1277251	1	16	6.2	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	1280548	1	20	5.0	5.0	✔



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
<b>Laboratory Control Samples (LCS) - Continued</b>							
Sulfate in Water by IC	E235.SO4	1277256	1	7	14.2	5.0	✔
TDS by Gravimetry	E162	1278047	1	7	14.2	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1276829	1	16	6.2	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395	1280234	1	8	12.5	5.0	✔
Turbidity by Nephelometry	E121	1275510	1	6	16.6	5.0	✔
<b>Method Blanks (MB)</b>							
Alkalinity Species by Titration	E290	1277253	1	10	10.0	5.0	✔
Ammonia by Fluorescence	E298	1276843	1	18	5.5	5.0	✔
Chloride in Water by IC (Low Level)	E235.Cl-L	1277257	1	5	20.0	5.0	✔
Colour (True) by Spectrometer (2 CU)	E329-L	1275549	1	6	16.6	5.0	✔
Conductivity in Water	E100	1277252	1	7	14.2	5.0	✔
Dissolved Hexavalent Chromium (Cr VI) by IC	E532A	1281935	1	11	9.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	1280521	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1278158	2	21	9.5	5.0	✔
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1280511	1	8	12.5	5.0	✔
Fluoride in Water by IC	E235.F	1277254	1	7	14.2	5.0	✔
Heterotrophic Plate Count (Pour Plate)	E020	1275535	1	20	5.0	5.0	✔
Nitrate in Water by IC	E235.NO3	1277255	1	15	6.6	5.0	✔
Nitrite in Water by IC	E235.NO2	1277258	1	15	6.6	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	1280548	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	1277256	1	7	14.2	5.0	✔
TDS by Gravimetry	E162	1278047	1	7	14.2	5.0	✔
Thermotolerant (Fecal) Coliform (Enzyme Substrate)	E010.FC	1275686	2	7	28.5	5.0	✔
Total Coliforms and E. coli (Enzyme Substrate)	E010	1275466	1	8	12.5	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1276829	1	16	6.2	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395	1280234	1	8	12.5	5.0	✔
Turbidity by Nephelometry	E121	1275510	1	6	16.6	5.0	✔
<b>Matrix Spikes (MS)</b>							
Ammonia by Fluorescence	E298	1276843	1	18	5.5	5.0	✔
Chloride in Water by IC (Low Level)	E235.Cl-L	1277257	1	5	20.0	5.0	✔
Dissolved Hexavalent Chromium (Cr VI) by IC	E532A	1281935	1	11	9.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	1280521	1	20	5.0	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	1278158	1	21	4.7	5.0	✖
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1280511	1	8	12.5	5.0	✔
Fluoride in Water by IC	E235.F	1277254	1	7	14.2	5.0	✔
Nitrate in Water by IC	E235.NO3	1277255	1	15	6.6	5.0	✔
Nitrite in Water by IC	E235.NO2	1277258	1	15	6.6	5.0	✔
Phenols (4AAP) in Water by Colorimetry	E562	1280548	1	20	5.0	5.0	✔
Sulfate in Water by IC	E235.SO4	1277256	1	7	14.2	5.0	✔

Page : 18 of 21  
 Work Order : TY2312965  
 Client : CSL Environmental and Geotechnical Ltd  
 Project : CSL2023-492



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Matrix Spikes (MS) - Continued							
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1276829	1	16	6.2	5.0	✔
Total Sulfide by Colourimetry (Automated Flow)	E395	1280234	1	8	12.5	5.0	✔



## 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
Total Coliforms and E. coli (Enzyme Substrate)	E010  ALS Environmental - Thunder Bay	Water	APHA 9223 (mod)	The enzyme substrate test simultaneously detects Total Coliforms and E. coli in a 100 mL sample after incubation at $35.0 \pm 0.5^{\circ}\text{C}$ for either 18 or 24 hours (dependent on reagent used).
Thermotolerant (Fecal) Coliform (Enzyme Substrate)	E010.FC  ALS Environmental - Thunder Bay	Water	APHA 9223 (mod)	The enzyme substrate test detects Thermotolerant Coliforms in a 100 mL sample after an 18 hour incubation at $44.5 \pm 0.2^{\circ}\text{C}$ .
Heterotrophic Plate Count (Pour Plate)	E020  ALS Environmental - Thunder Bay	Water	APHA 9215B (mod)	Culture medium is poured into plates containing test portions, incubated at $35 \pm 0.5^{\circ}\text{C}$ for 48 hours, after which the observed colonies are enumerated.
Conductivity in Water	E100  ALS Environmental - Thunder Bay	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to $25^{\circ}\text{C}$ .
pH by Meter	E108  ALS Environmental - Thunder Bay	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally $20 \pm 5^{\circ}\text{C}$ ). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121  ALS Environmental - Thunder Bay	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TDS by Gravimetry	E162  ALS Environmental - Thunder Bay	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at $180 \pm 2^{\circ}\text{C}$ for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC (Low Level)	E235.CI-L  ALS Environmental - Thunder Bay	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F  ALS Environmental - Thunder Bay	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2  ALS Environmental - Thunder Bay	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrate in Water by IC	E235.NO3  ALS Environmental - Thunder Bay	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4  ALS Environmental - Thunder Bay	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290  ALS Environmental - Thunder Bay	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298  ALS Environmental - Thunder Bay	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318  ALS Environmental - Thunder Bay	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Colour (True) by Spectrometer (2 CU)	E329-L  ALS Environmental - Thunder Bay	Water	APHA 2120 C (mod)	Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Organic Carbon by Combustion (Low Level)	E358-L  ALS Environmental - Waterloo	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO <sub>2</sub> . NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Sulfide by Colourimetry (Automated Flow)	E395  ALS Environmental - Vancouver	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methylene blue colourimetric method. Results expressed "as H <sub>2</sub> S" if reported represent the maximum possible H <sub>2</sub> S concentration based on the total sulfide concentration in the sample. The H <sub>2</sub> S calculation converts Total Sulphide as (S <sub>2</sub> -) and reports it as Total Sulphide as (H <sub>2</sub> S)
Dissolved Metals in Water by CRC ICPMS	E421  ALS Environmental - Thunder Bay	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS.  Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Mercury in Water by CVAAS	E509  ALS Environmental - Waterloo	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hexavalent Chromium (Cr VI) by IC	E532A ALS Environmental - Waterloo	Water	APHA 3500-Cr C (Ion Chromatography)	Hexavalent Chromium is measured by Ion chromatography-Post column reaction and UV detection.  sample pretreatment involved field or lab filtration following by sample preservation.
Phenols (4AAP) in Water by Colorimetry	E562 ALS Environmental - Waterloo	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide ( $K_3Fe(CN)_6$ ) and 4-amino-antipyrine (4-AAP) to form a red complex which is measured colorimetrically.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Thunder Bay	Water	APHA 2340B	"Hardness (as $CaCO_3$ ), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 ALS Environmental - Thunder Bay	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 ALS Environmental - Thunder Bay	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 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.
Preparation for Dissolved Organic Carbon for Combustion	EP358 ALS Environmental - Waterloo	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 ALS Environmental - Thunder Bay	Water	APHA 3030B	Water samples are filtered (0.45 $\mu m$ ), and preserved with $HNO_3$ .
Dissolved Mercury Water Filtration	EP509 ALS Environmental - Waterloo	Water	APHA 3030B	Water samples are filtered (0.45 $\mu m$ ), and preserved with $HCl$ .

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: TY2312965</b>	<b>Page</b>	<b>: 1 of 17</b>
<b>Client</b>	: CSL Environmental and Geotechnical Ltd	<b>Laboratory</b>	: ALS Environmental - Thunder Bay
<b>Contact</b>	: Chris Perusse	<b>Account Manager</b>	: Christine Paradis
<b>Address</b>	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	<b>Address</b>	: 1081 Barton Street Thunder Bay, Ontario Canada P7B 5N3
<b>Telephone</b>	:	<b>Telephone</b>	: +1 807 623 6463
<b>Project</b>	: CSL2023-492	<b>Date Samples Received</b>	: 13-Dec-2023 09:27
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 13-Dec-2023
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 20-Dec-2023 15:46
<b>Sampler</b>	: ----		
<b>Site</b>	: Subdivision Package		
<b>Quote number</b>	: Standing Offer 2023		
<b>No. of samples received</b>	: 5		
<b>No. of samples analysed</b>	: 5		

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:

- 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

### 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.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Cassandra Grzelewski	Team Leader - Inorganics	Thunder Bay Inorganics, Thunder Bay, Ontario
Cassandra Grzelewski	Team Leader - Inorganics	Thunder Bay Metals, Thunder Bay, Ontario
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Walt Kippenhuck	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario



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## 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

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

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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					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
Physical Tests (QC Lot: 1275510)											
TY2312960-001	Anonymous	Turbidity	----	E121	0.10	NTU	0.83	0.80	0.03	Diff <2x LOR	----
Physical Tests (QC Lot: 1275549)											
TY2312927-001	Anonymous	Colour, true	----	E329-L	2.0	CU	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1277251)											
TY2312965-001	DW1BP	pH	----	E108	0.10	pH units	8.43	8.43	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1277252)											
TY2312965-001	DW1BP	Conductivity	----	E100	1.0	µS/cm	261	261	0.00%	10%	----
Physical Tests (QC Lot: 1277253)											
TY2312965-001	DW1BP	Alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	127	128	0.629%	20%	----
Physical Tests (QC Lot: 1278047)											
TY2312935-001	Anonymous	Solids, total dissolved [TDS]	----	E162	20	mg/L	338	321	5.01%	20%	----
Anions and Nutrients (QC Lot: 1276829)											
TY2312937-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.61	1.57	2.50%	20%	----
Anions and Nutrients (QC Lot: 1276843)											
TY2312937-001	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.0250	mg/L	1.29	1.22	5.10%	20%	----
Anions and Nutrients (QC Lot: 1277254)											
TY2312965-001	DW1BP	Fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1277255)											
TY2312965-001	DW1BP	Nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.098	0.098	0.0004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1277256)											
TY2312965-001	DW1BP	Sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	5.47	5.55	1.49%	20%	----
Anions and Nutrients (QC Lot: 1277257)											
TY2312965-001	DW1BP	Chloride	16887-00-6	E235.Cl-L	0.10	mg/L	5.10	5.08	0.400%	20%	----
Anions and Nutrients (QC Lot: 1277258)											
TY2312965-001	DW1BP	Nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 1280511)											
TY2312965-001	DW1BP	Carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.73	1.84	0.11	Diff <2x LOR	----
Total Sulfides (QC Lot: 1280234)											
CG2317538-001	Anonymous	Sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	0.242	0.219	9.79%	20%	----
Microbiological Tests (QC Lot: 1275535)											



Sub-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
Microbiological Tests (QC Lot: 1275535) - continued											
TY2312947-002	Anonymous	Heterotrophic plate count [HPC]	----	E020	1	CFU/mL	<1	<1	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1278158)											
TY2312838-001	Anonymous	Aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0089	0.0092	0.0003	Diff <2x LOR	----
		Antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00050	0.00051	0.000005	Diff <2x LOR	----
		Barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0164	0.0166	1.36%	20%	----
		Beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		Bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		Cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000051	<0.0000050	0.00000009	Diff <2x LOR	----
		Calcium, dissolved	7440-70-2	E421	0.050	mg/L	49.2	48.7	0.995%	20%	----
		Cesium, dissolved	7440-46-2	E421	0.000010	mg/L	0.000057	0.000056	0.0000010	Diff <2x LOR	----
		Chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00025	0.00025	0.000002	Diff <2x LOR	----
		Copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00083	0.00081	0.00001	Diff <2x LOR	----
		Iron, dissolved	7439-89-6	E421	0.010	mg/L	0.015	0.019	0.004	Diff <2x LOR	----
		Lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	6.51	6.48	0.435%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0420	0.0424	1.00%	20%	----
		Molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000301	0.000315	0.000014	Diff <2x LOR	----
		Nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.35	1.37	1.63%	20%	----
		Rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00373	0.00381	2.14%	20%	----
		Selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000077	0.000055	0.000022	Diff <2x LOR	----
		Silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.39	1.40	0.770%	20%	----
		Silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Sodium, dissolved	7440-23-5	E421	0.050	mg/L	4.52	4.62	2.28%	20%	----
		Strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0945	0.0921	2.61%	20%	----
		Sulfur, dissolved	7704-34-9	E421	0.50	mg/L	19.8	21.0	5.59%	20%	----
		Tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		Thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000010	<0.000010	0.0000002	Diff <2x LOR	----
		Thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----



Sub-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
Dissolved Metals (QC Lot: 1278158) - continued											
TY2312838-001	Anonymous	Tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		Tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000221	0.000210	4.82%	20%	----
		Vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0030	0.0030	0.00003	Diff <2x LOR	----
		Zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1278159)											
TY2312965-005	DUP A	Aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	0.0016	0.0001	Diff <2x LOR	----
		Antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00023	0.00024	0.00001	Diff <2x LOR	----
		Barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0116	0.0119	2.59%	20%	----
		Beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		Bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Boron, dissolved	7440-42-8	E421	0.010	mg/L	0.032	0.032	0.0002	Diff <2x LOR	----
		Cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000113	0.0000103	0.0000010	Diff <2x LOR	----
		Calcium, dissolved	7440-70-2	E421	0.050	mg/L	46.8	47.5	1.41%	20%	----
		Cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	0.000010	0.00000002	Diff <2x LOR	----
		Chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00020	0.00018	0.00002	Diff <2x LOR	----
		Copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00032	0.00030	0.00002	Diff <2x LOR	----
		Iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		Lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0019	0.0018	0.0001	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	16.4	17.0	3.74%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.191	0.198	3.89%	20%	----
		Molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000666	0.000690	3.47%	20%	----
		Nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00105	0.00108	0.00003	Diff <2x LOR	----
		Phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.46	2.45	0.518%	20%	----
		Rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00132	0.00136	0.00004	Diff <2x LOR	----
		Selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000100	0.000111	0.000010	Diff <2x LOR	----
		Silicon, dissolved	7440-21-3	E421	0.050	mg/L	8.22	7.94	3.45%	20%	----
		Silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----



Sub-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
Dissolved Metals (QC Lot: 1278159) - continued											
TY2312965-005	DUP A	Sodium, dissolved	7440-23-5	E421	0.050	mg/L	7.29	7.47	2.51%	20%	----
		Strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0674	0.0697	3.37%	20%	----
		Sulfur, dissolved	7704-34-9	E421	0.50	mg/L	3.30	3.02	0.28	Diff <2x LOR	----
		Tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		Thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000013	<0.000010	0.000003	Diff <2x LOR	----
		Thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		Tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000392	0.000408	4.00%	20%	----
		Vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0020	0.0021	0.00001	Diff <2x LOR	----
		Zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1280521)											
HA2301297-001	Anonymous	Mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Speciated Metals (QC Lot: 1281935)											
TY2312965-001	DW1BP	Chromium, hexavalent [Cr VI], dissolved	18540-29-9	E532A	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 1280548)											
HA2301270-001	Anonymous	Phenols, total (4AAP)	----	E562	0.0010	mg/L	0.0026	0.0026	0.00009	Diff <2x LOR	----



## 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	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests (QCLot: 1275510)</b>						
Turbidity	----	E121	0.1	NTU	<0.10	----
<b>Physical Tests (QCLot: 1275549)</b>						
Colour, true	----	E329-L	2	CU	<2.0	----
<b>Physical Tests (QCLot: 1277252)</b>						
Conductivity	----	E100	1	µS/cm	1.0	----
<b>Physical Tests (QCLot: 1277253)</b>						
Alkalinity, total (as CaCO <sub>3</sub> )	----	E290	1	mg/L	<1.0	----
<b>Physical Tests (QCLot: 1278047)</b>						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
<b>Anions and Nutrients (QCLot: 1276829)</b>						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
<b>Anions and Nutrients (QCLot: 1276843)</b>						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
<b>Anions and Nutrients (QCLot: 1277254)</b>						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
<b>Anions and Nutrients (QCLot: 1277255)</b>						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
<b>Anions and Nutrients (QCLot: 1277256)</b>						
Sulfate (as SO <sub>4</sub> )	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
<b>Anions and Nutrients (QCLot: 1277257)</b>						
Chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
<b>Anions and Nutrients (QCLot: 1277258)</b>						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
<b>Organic / Inorganic Carbon (QCLot: 1280511)</b>						
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
<b>Total Sulfides (QCLot: 1280234)</b>						
Sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	<0.0015	----
<b>Microbiological Tests (QCLot: 1275466)</b>						
Coliforms, Escherichia coli [E. coli]	----	E010	1	MPN/100mL	<1	----
Coliforms, total	----	E010	1	MPN/100mL	<1	----
<b>Microbiological Tests (QCLot: 1275535)</b>						
Heterotrophic plate count [HPC]	----	E020	1	CFU/mL	<1	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Microbiological Tests (QCLot: 1275686)						
Coliforms, thermotolerant [fecal]	----	E010.FC	1	MPN/100mL	<1	----
Microbiological Tests (QCLot: 1276728)						
Coliforms, thermotolerant [fecal]	----	E010.FC	1	MPN/100mL	<1	----
Dissolved Metals (QCLot: 1278158)						
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dissolved Metals (QCLot: 1278158) - continued</b>						
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
<b>Dissolved Metals (QCLot: 1278159)</b>						
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 1278159) - continued						
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 1280521)						
Mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Speciated Metals (QCLot: 1281935)						
Chromium, hexavalent [Cr VI], dissolved	18540-29-9	E532A	0.0005	mg/L	<0.00050	----
Aggregate Organics (QCLot: 1280548)						
Phenols, total (4AAP)	----	E562	0.001	mg/L	<0.0010	----



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 (%)		Qualifier
					Concentration	LCS	Low	High	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1275510)									
Turbidity	----	E121	0.1	NTU	200 NTU	104	85.0	115	----
Physical Tests (QCLot: 1275549)									
Colour, true	----	E329-L	2	CU	60 CU	97.1	85.0	115	----
Physical Tests (QCLot: 1277251)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1277252)									
Conductivity	----	E100	1	µS/cm	447 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 1277253)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	200 mg/L	100	85.0	115	----
Physical Tests (QCLot: 1278047)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	99.6	85.0	115	----
Anions and Nutrients (QCLot: 1276829)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 1276843)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	110	85.0	115	----
Anions and Nutrients (QCLot: 1277254)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.5	90.0	110	----
Anions and Nutrients (QCLot: 1277255)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 1277256)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.2	90.0	110	----
Anions and Nutrients (QCLot: 1277257)									
Chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	97.6	90.0	110	----
Anions and Nutrients (QCLot: 1277258)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	101	90.0	110	----
Organic / Inorganic Carbon (QCLot: 1280511)									
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	106	80.0	120	----
Total Sulfides (QCLot: 1280234)									
Sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	0.08 mg/L	107	80.0	120	----



Sub-Matrix: Water					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Analyte	CAS Number	Method	LOR	Unit					
Dissolved Metals (QCLot: 1278158)									
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	93.0	80.0	120	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	103	80.0	120	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	103	80.0	120	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.0125 mg/L	94.9	80.0	120	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	99.9	80.0	120	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	0.05 mg/L	97.5	80.0	120	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	89.9	80.0	120	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	94.0	80.0	120	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	96.0	80.0	120	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.0025 mg/L	98.7	80.0	120	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.0125 mg/L	99.4	80.0	120	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.0125 mg/L	99.8	80.0	120	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.0125 mg/L	97.1	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	0.05 mg/L	97.6	80.0	120	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	98.5	80.0	120	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.0125 mg/L	105	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	101	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.0125 mg/L	102	80.0	120	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.0125 mg/L	99.6	80.0	120	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	99.0	80.0	120	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	0.5 mg/L	99.5	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	105	80.0	120	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.005 mg/L	102	80.0	120	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	97.2	80.0	120	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	0.5 mg/L	96.0	80.0	120	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	96.6	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	103	80.0	120	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.0125 mg/L	103	80.0	120	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	2.5 mg/L	103	80.0	120	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.005 mg/L	98.4	80.0	120	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	97.2	80.0	120	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.005 mg/L	96.9	80.0	120	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.025 mg/L	96.5	80.0	120	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.0125 mg/L	94.4	80.0	120	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.005 mg/L	98.5	80.0	120	----



Sub-Matrix: Water					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 1278158) - continued									
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.00025 mg/L	104	80.0	120	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	99.6	80.0	120	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	98.2	80.0	120	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.005 mg/L	98.0	80.0	120	----
Dissolved Metals (QCLot: 1278159)									
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	92.2	80.0	120	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.0125 mg/L	97.7	80.0	120	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	101	80.0	120	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	0.05 mg/L	92.8	80.0	120	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	97.7	80.0	120	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	94.0	80.0	120	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	101	80.0	120	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.0025 mg/L	101	80.0	120	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.0125 mg/L	98.0	80.0	120	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.0125 mg/L	99.7	80.0	120	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.0125 mg/L	96.2	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	0.05 mg/L	98.4	80.0	120	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	96.1	80.0	120	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.0125 mg/L	106	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	96.5	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.0125 mg/L	99.3	80.0	120	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.0125 mg/L	104	80.0	120	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	98.3	80.0	120	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	0.5 mg/L	91.0	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	97.6	80.0	120	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.005 mg/L	101	80.0	120	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	96.2	80.0	120	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	0.5 mg/L	95.8	80.0	120	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	98.0	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	98.8	80.0	120	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.0125 mg/L	103	80.0	120	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	2.5 mg/L	93.0	80.0	120	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.005 mg/L	103	80.0	120	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	96.4	80.0	120	----



Sub-Matrix: <b>Water</b>					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Analyte	CAS Number	Method	LOR	Unit					
Dissolved Metals (QCLot: 1278159) - continued									
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.005 mg/L	97.2	80.0	120	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.025 mg/L	96.3	80.0	120	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.0125 mg/L	95.0	80.0	120	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.005 mg/L	97.9	80.0	120	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.00025 mg/L	102	80.0	120	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	98.7	80.0	120	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	98.0	80.0	120	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.005 mg/L	99.2	80.0	120	----
Mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.1	80.0	120	----
Speciated Metals (QCLot: 1281935)									
Chromium, hexavalent [Cr VI], dissolved	18540-29-9	E532A	0.0005	mg/L	0.025 mg/L	93.9	80.0	120	----
Aggregate Organics (QCLot: 1280548)									
Phenols, total (4AAP)	----	E562	0.001	mg/L	0.02 mg/L	98.4	85.0	115	----



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 Nutrients (QCLot: 1276829)										
TY2312937-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	13.0 mg/L	2.5 mg/L	104	70.0	130	----
Anions and Nutrients (QCLot: 1276843)										
TY2312937-002	Anonymous	Ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 1277254)										
TY2312965-002	DW1AP	Fluoride	16984-48-8	E235.F	0.810 mg/L	1 mg/L	81.0	75.0	125	----
Anions and Nutrients (QCLot: 1277255)										
TY2312965-002	DW1AP	Nitrate (as N)	14797-55-8	E235.NO3	2.97 mg/L	2.5 mg/L	119	75.0	125	----
Anions and Nutrients (QCLot: 1277256)										
TY2312965-002	DW1AP	Sulfate (as SO4)	14808-79-8	E235.SO4	114 mg/L	100 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 1277257)										
TY2312965-002	DW1AP	Chloride	16887-00-6	E235.Cl-L	114 mg/L	100 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 1277258)										
TY2312965-002	DW1AP	Nitrite (as N)	14797-65-0	E235.NO2	0.519 mg/L	0.5 mg/L	104	75.0	125	----
Organic / Inorganic Carbon (QCLot: 1280511)										
TY2312965-001	DW1BP	Carbon, dissolved organic [DOC]	----	E358-L	5.81 mg/L	5 mg/L	116	70.0	130	----
Total Sulfides (QCLot: 1280234)										
CG2317538-002	Anonymous	Sulfide, total (as S)	18496-25-8	E395	ND mg/L	0.2 mg/L	ND	75.0	125	----
Dissolved Metals (QCLot: 1278158)										
TY2312838-002	Anonymous	Aluminum, dissolved	7429-90-5	E421	0.183 mg/L	0.2 mg/L	91.3	70.0	130	----
		Antimony, dissolved	7440-36-0	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		Arsenic, dissolved	7440-38-2	E421	0.0207 mg/L	0.02 mg/L	103	70.0	130	----
		Barium, dissolved	7440-39-3	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		Beryllium, dissolved	7440-41-7	E421	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		Bismuth, dissolved	7440-69-9	E421	0.00903 mg/L	0.01 mg/L	90.3	70.0	130	----
		Boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	92.2	70.0	130	----
		Cadmium, dissolved	7440-43-9	E421	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		Calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		Cesium, dissolved	7440-46-2	E421	0.0101 mg/L	0.01 mg/L	101	70.0	130	----
		Chromium, dissolved	7440-47-3	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----



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
Dissolved Metals (QCLot: 1278158) - continued										
TY2312838-002	Anonymous	Cobalt, dissolved	7440-48-4	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		Copper, dissolved	7440-50-8	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		Iron, dissolved	7439-89-6	E421	1.97 mg/L	2 mg/L	98.6	70.0	130	----
		Lead, dissolved	7439-92-1	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		Lithium, dissolved	7439-93-2	E421	0.116 mg/L	0.1 mg/L	116	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		Molybdenum, dissolved	7439-98-7	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		Nickel, dissolved	7440-02-0	E421	0.0411 mg/L	0.04 mg/L	103	70.0	130	----
		Phosphorus, dissolved	7723-14-0	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		Potassium, dissolved	7440-09-7	E421	4.14 mg/L	4 mg/L	103	70.0	130	----
		Rubidium, dissolved	7440-17-7	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		Selenium, dissolved	7782-49-2	E421	0.0434 mg/L	0.04 mg/L	109	70.0	130	----
		Silicon, dissolved	7440-21-3	E421	8.66 mg/L	10 mg/L	86.6	70.0	130	----
		Silver, dissolved	7440-22-4	E421	0.00425 mg/L	0.004 mg/L	106	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	2.09 mg/L	2 mg/L	104	70.0	130	----
		Strontium, dissolved	7440-24-6	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		Sulfur, dissolved	7704-34-9	E421	18.6 mg/L	20 mg/L	92.8	70.0	130	----
		Tellurium, dissolved	13494-80-9	E421	0.0448 mg/L	0.04 mg/L	112	70.0	130	----
		Thallium, dissolved	7440-28-0	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		Thorium, dissolved	7440-29-1	E421	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		Tin, dissolved	7440-31-5	E421	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		Titanium, dissolved	7440-32-6	E421	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		Tungsten, dissolved	7440-33-7	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		Uranium, dissolved	7440-61-1	E421	0.00414 mg/L	0.004 mg/L	103	70.0	130	----
		Vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		Zinc, dissolved	7440-66-6	E421	0.425 mg/L	0.4 mg/L	106	70.0	130	----
		Zirconium, dissolved	7440-67-7	E421	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 1280521)										
HA2301297-002	Anonymous	Mercury, dissolved	7439-97-6	E509	0.0000948 mg/L	0.0001 mg/L	94.8	70.0	130	----
Speciated Metals (QCLot: 1281935)										
TY2312965-001	DW1BP	Chromium, hexavalent [Cr VI], dissolved	18540-29-9	E532A	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
Aggregate Organics (QCLot: 1280548)										
HA2301270-001	Anonymous	Phenols, total (4AAP)	----	E562	0.0195 mg/L	0.02 mg/L	97.6	75.0	125	----





# Intake and Login Verification Form

SAMPLE INTAKE			
Priority/Emergency Service Requested	YES	<del>NO</del>	
Time Sensitive Hold Time	<del>YES</del>	NO	
Client:	CSL		
SAMPLE RECEIPT INFORMATION			
Mode of Delivery:	Courier	<del>Drop Off</del>	
Courier			
Waybill Number			
Temperature	3.1, 4.5		Cooler Count 2
Cooling Method	None	<del>Ice</del>	Ice Packs
SAMPLE MATRIX/BOTTLE INFORMATION			
Matrix:	<del>Water</del>	Soil	Air
		Biota	Other
DW Schedule 24 Bottles Correct?		Yes	<del>No</del>
DW Metals pH Check <2		Yes	<del>No</del>
Regulation Circled, Works # present		<del>Yes</del>	No - Reject?
# of Bottles:	9	Sample Count	5
Green/white	5 Routine		
Purple/white	5 Nuts, 5 Phenols, 5 Doc		
Warm red/white	5 Diss. Metals		
Yellow/black	5 Diss. Hg		
Light blue/white	5 Micro		
Orange/black			
Others (detail)	5 Sulfide 5 Chromium		
Comments on Samples and Bottles:			
Samples Requiring Preservation or Filtering:			
Layout Staff Initials	LV 12/13/23 2:20		
Date and Time of Layout			

ACCOUNT INFO VERIFICATION		
Priority/Emergency Service Requested	YES	<del>NO</del>
Confirmed all as accurate as per COC, Sample Remarks or PM		
Client	<del>Work Contact</del>	Quote
RECEIPT DETAIL		
Project	<del>PO</del>	Site/LSD
Overall Description Entered	Yes	<del>NA</del>
Received date/time as per COC		
Recipients match CoC or Sample Remarks	<del>Yes</del>	No
Billing Instruction added to remarks	<del>Yes</del>	NA
Sample Remarks/Specification Doc checked		
Submission Issues communicated	Yes	<del>NA</del>
Sample Info communicated via Remarks	Yes	<del>NA</del>
VERIFICATION CHECKLIST		
Planned Event Submission	Yes	<del>No</del>
Sample Name entered as per CoC		
Sampling Date and time entered as per CoC		
Containers selected in layout order		
Sales items entered from QUOTE ONLY (and/or verified as correct)		
Field Data/EC298A removed if not on COC	Yes	<del>NA</del>
Bottle Allocation Verified		
Guideline added or auto-allocated		
Due dates updated		
VALIDATION		
Validation errors resolved?	<del>Yes</del>	No
Internal Sublet CoC created	<del>Yes</del>	NA
Login Comments:		
Login Staff Initials:		



CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: TY2400373	Page	: 1 of 3
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay, Ontario Canada P7B 5N3
Telephone	: ----	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 15-Jan-2024 11:20
PO	: ----	Date Analysis Commenced	: 15-Jan-2024
C-O-C number	: ----	Issue Date	: 19-Jan-2024 11:35
Sampler	: NB/MB		
Site	: Subdivision package		
Quote number	: Standing Offer 2023		
No. of samples received	: 1		
No. of samples analysed	: 1		

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
Taelur Kachur	Laboratory Analyst	Microbiology, Thunder Bay, Ontario



## Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
DW2-R	Water	Coliforms, total	Total coliforms are not used as indicators of potential health effects from pathogenic microorganisms; they are used as a tool to determine how well the drinking water treatment system is operating and to indicate water quality changes in the distribution system. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.	ONDWS	MAC	649 MPN/100mL	1 MPN/100mL

## 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/mL	colony forming units per millilitre
MPN/100mL	most probable number per hundred millilitres

>: greater than.

<: less than.

Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).

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.



Analytical Results Evaluation

Matrix: Drinking Water				Client sample ID	DW2-R	----	----	----	----	----	----
				Sampling date/time	15-Jan-2024 10:15	----	----	----	----	----	----
				Sub-Matrix	Drinking Water	----	----	----	----	----	----
Analyte	CAS Number	Method/Lab	Unit	TY2400373-001	-----	-----	-----	-----	-----	-----	-----
Microbiological Tests											
Coliforms, thermotolerant [fecal]	----	E010.FC/TY	MPN/100 mL	Not Detected	----	----	----	----	----	----	----
Coliforms, total	----	E010/TY	MPN/10 0mL	649	----	----	----	----	----	----	----
Heterotrophic plate count [HPC]	----	E020/TY	CFU/mL	39	----	----	----	----	----	----	----
Coliforms, Escherichia coli [E. coli]	----	E010/TY	MPN/10 0mL	Not Detected	----	----	----	----	----	----	----

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

Summary of Guideline Limits

Analyte	CAS Number	Unit	ONDWS MAC						
Microbiological Tests									
Coliforms, Escherichia coli [E. coli]	----	MPN/100mL	1 MPN/100mL						
Coliforms, thermotolerant [fecal]	----	MPN/100mL	1 MPN/100mL						
Coliforms, total	----	MPN/100mL	1 MPN/100mL						
Heterotrophic plate count [HPC]	----	CFU/mL	--						

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

Key:

ONDWS

MAC

Ontario Drinking Water Regulation (JAN, 2020)

Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2020)

## CERTIFICATE OF ANALYSIS

Work Order	: TY2400373	Page	: 1 of 3
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay ON Canada P7B 5N3
Telephone	: ----	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 15-Jan-2024 11:20
PO	: ----	Date Analysis Commenced	: 15-Jan-2024
C-O-C number	: ----	Issue Date	: 19-Jan-2024 11:36
Sampler	: NB/MB		
Site	: Subdivision package		
Quote number	: Standing Offer 2023		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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
Taelur Kachur	Laboratory Analyst	Microbiology, Thunder Bay, Ontario



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.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances  
LOR: Limit of Reporting (detection limit).

Unit	Description
CFU/mL	colony forming units per millilitre
MPN/100mL	most probable number per hundred millilitres

<: less than.  
>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: Drinking Water  
(Matrix: Water)

Client sample ID					DW2-R	---	---	---	---
Client sampling date / time					15-Jan-2024 10:15	---	---	---	---
Analyte	CAS Number	Method/Lab	LOR	Unit	TY2400373-001	-----	-----	-----	-----
					Result	---	---	---	---
Microbiological Tests									
Coliforms, thermotolerant [fecal]	---	E010.FC/TY	1	MPN/100mL	Not Detected	---	---	---	---
Coliforms, total	---	E010/TY	1	MPN/100mL	649	---	---	---	---
Heterotrophic plate count [HPC]	---	E020/TY	1	CFU/mL	39	---	---	---	---
Coliforms, Escherichia coli [E. coli]	---	E010/TY	1	MPN/100mL	Not Detected	---	---	---	---

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

Page : 3 of 3  
Work Order : TY2400373  
Client : CSL Environmental and Geotechnical Ltd  
Project : CSL2023-492

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## QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: TY2400373	Page	: 1 of 5
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay, Ontario Canada P7B 5N3
Telephone	: ----	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 15-Jan-2024 11:20
PO	: ----	Issue Date	: 19-Jan-2024 11:36
C-O-C number	: ----		
Sampler	: NB/MB		
Site	: Subdivision package		
Quote number	: Standing Offer 2023		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

**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.

### **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 Test sample Surrogate recovery outliers exist.

#### **Outliers: Reference Material (RM) Samples**

- No Reference Material (RM) Sample outliers occur.

#### **Outliers : Analysis Holding Time Compliance (Breaches)**

- No Analysis Holding Time Outliers exist.

#### **Outliers : Frequency of Quality Control Samples**

- No Quality Control Sample Frequency Outliers occur.



## 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** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Microbiological Tests : Heterotrophic Plate Count (Pour Plate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2-R	E020	15-Jan-2024	----	----	----		15-Jan-2024	48 hrs	6 hrs	✓
Microbiological Tests : Thermotolerant (Fecal) Coliform (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2-R	E010.FC	15-Jan-2024	----	----	----		15-Jan-2024	48 hrs	4 hrs	✓
Microbiological Tests : Total Coliforms and E. coli (Enzyme Substrate)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] DW2-R	E010	15-Jan-2024	----	----	----		15-Jan-2024	48 hrs	5 hrs	✓

### Legend & Qualifier Definitions

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



## 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: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Heterotrophic Plate Count (Pour Plate)	E020	1303022	1	3	33.3	5.0	✓
Total Coliforms and E. coli (Enzyme Substrate)	E010	1302992	1	11	9.0	5.0	✓
Method Blanks (MB)							
Heterotrophic Plate Count (Pour Plate)	E020	1303022	1	3	33.3	5.0	✓
Thermotolerant (Fecal) Coliform (Enzyme Substrate)	E010.FC	1302909	1	5	20.0	5.0	✓
Total Coliforms and E. coli (Enzyme Substrate)	E010	1302992	1	11	9.0	5.0	✓



## 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
Total Coliforms and E. coli (Enzyme Substrate)	E010 ALS Environmental - Thunder Bay	Water	APHA 9223 (mod)	The enzyme substrate test simultaneously detects Total Coliforms and E. coli in a 100 mL sample after incubation at $35.0 \pm 0.5^{\circ}\text{C}$ for either 18 or 24 hours (dependent on reagent used).
Thermotolerant (Fecal) Coliform (Enzyme Substrate)	E010.FC ALS Environmental - Thunder Bay	Water	APHA 9223 (mod)	The enzyme substrate test detects Thermotolerant Coliforms in a 100 mL sample after an 18 hour incubation at $44.5 \pm 0.2^{\circ}\text{C}$ .
Heterotrophic Plate Count (Pour Plate)	E020 ALS Environmental - Thunder Bay	Water	APHA 9215B (mod)	Culture medium is poured into plates containing test portions, incubated at $35 \pm 0.5^{\circ}\text{C}$ for 48 hours, after which the observed colonies are enumerated.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 ALS Environmental - Thunder Bay	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 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.
Preparation for Dissolved Organic Carbon for Combustion	EP358 ALS Environmental - Waterloo	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon

QUALITY CONTROL REPORT

Work Order	: TY2400373	Page	: 1 of 3
Client	: CSL Environmental and Geotechnical Ltd	Laboratory	: ALS Environmental - Thunder Bay
Contact	: Chris Perusse	Account Manager	: Christine Paradis
Address	: 1100 Russell Street, Unit 10 Thunder Bay ON Canada P7B 5N2	Address	: 1081 Barton Street Thunder Bay, Ontario Canada P7B 5N3
Telephone	:	Telephone	: +1 807 623 6463
Project	: CSL2023-492	Date Samples Received	: 15-Jan-2024 11:20
PO	: ----	Date Analysis Commenced	: 15-Jan-2024
C-O-C number	: ----	Issue Date	: 19-Jan-2024 11:36
Sampler	: NB/MB ----		
Site	: Subdivision package		
Quote number	: Standing Offer 2023		
No. of samples received	: 1		
No. of samples analysed	: 1		

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:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives

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
Taelur Kachur	Laboratory Analyst	Thunder Bay Microbiology, Thunder Bay, Ontario



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.

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					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
Microbiological Tests (QC Lot: 1302992)											
TY2400372-001	Anonymous	Coliforms, Escherichia coli [E. coli]	----	E010	1	MPN/100mL	<1	<1	0	Diff <2x LOR	----
		Coliforms, total	----	E010	1	MPN/100mL	<1	<1	0	Diff <2x LOR	----
Microbiological Tests (QC Lot: 1303022)											
TY2400373-001	DW2-R	Heterotrophic plate count [HPC]	----	E020	1	CFU/mL	39	33	16.7%	65%	----

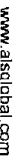


Method Blank (MB) Report

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	Method	LOR	Unit	Result	Qualifier
Microbiological Tests (QCLot: 1302909)						
Coliforms, thermotolerant [fecal]	----	E010.FC	1	MPN/100mL	<1	----
Microbiological Tests (QCLot: 1302992)						
Coliforms, Escherichia coli [E. coli]	----	E010	1	MPN/100mL	<1	----
Coliforms, total	----	E010	1	MPN/100mL	<1	----
Microbiological Tests (QCLot: 1303022)						
Heterotrophic plate count [HPC]	----	E020	1	CFU/mL	<1	----



## COC Number: 22

**Canada Toll Free: 1 800 668 9878**

Page 7 of 7

Environmental Division  
Thunder Bay  
Work Order Reference  
TY2400373

Report To						
Contact and company name below will appear on the final report.						Turnaround Time (TAT) Requested
Company:	CSL Environmental & Geotechnical LTD.					Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EOD (DIGITAL)
Contact:	Chris Perusse 807-630-7906					Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A
Phone:						<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX						
Street:	1100 Russell Street, Unit 10					Email 1 or Fax: cperusse@cslltd.ca
City/Province:	Thunder Bay, ON					Email 2: sshanle@cslltd.ca ksenidan@cslltd.ca
Postal Code:	P7B 5N2					Email 3: matthew@cslltd.ca rbelic@cslltd.ca
Invoice To	Same as Report To <input type="checkbox"/> YES <input type="checkbox"/> NO					Invoice Recipients
Copy of Invoice with Report	<input type="checkbox"/> YES <input type="checkbox"/> NO					Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX
Company:						Email 1 or Fax: accounts@cslltd.ca
Contact:						Email 2
Project Information						Oil and Gas Required Fields (client use)
ALS Client Code / QUOTE #:	GSLE100 /TY2023CGSLE1000001					AFC/Cost Center
Job / Project #:	CSL2023.492					PON#
PO / AFE:						Major/Minor Code
LSD:	Subdivision Package					Requisitioner:
Location:						
ALS Lab Work Order # (ALS use only): TY2400373						ALS Contact: CP
Sample Identification and/or Coordinates						Sampler: NB/NAB
ALS Sample # (ALS use only)	(This description will appear on the report)				Date	Time
DWA:-R					15-Jan-24	10:15
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Groundwater						
Drinking Water (DW) Samples: (client use)						Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO						DDWS
Are samples for human consumption? use? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO						Subdivision package
SHIPPMENT RELEASE (client use) Released By: [Signature] Date: 15-January-2024 Time: 11:15						INITIAL SHIPMENT RECEPTION (ALS use only)
Received by: [Signature]						Date: [Blank]
NUMBER OF CONTAINERS						Additional fees may apply to rush requests on weeks. For all tests with rush TAT's requested, please contact your A/E to confirm availability.
Subdivision Package:						Analyis Request
Alkalinity, pH, Conductivity						Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below
Total Ammonia, TKN, Phenols 4AAP						
E.coli, Total Coliform, Fecal Coliform, HPC						
TDS, Cl, F, NO2, NO3, SO4						
Dissolved Metals						
DOC, Colour, Turbidity, Hardness						
Hydrogen Sulfide						
Dissolved Mercury, Dissolved Chromium VI						
FIELD PH						B.40 7.93
FIELD TEMPERATURE						
SAMPLES ON HOLD						
EXTENDED STORAGE REQUIRED						
SUSPECTED HAZARD (see notes)						
Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED						Cooling Custody Seals Intact: <input checked="" type="checkbox"/> YES <input type="checkbox"/> N/A
Initial Cooler Temperature °C						Final Cooler Temperature °C
5.6						
FINAL SHIPMENT RECEIPT (ALS use only)						
Received by: LV						Date: 1/15/24
Time: 11:20						

REFER TO BACK PAGE FOR ALL LOCATIONS AND SAMPLING INFORMATION

Drop-off

1000's

## WAVE 2003 EFFORT

## Intake and Login Verification Form

SAMPLE INTAKE				ACCOUNT INFO VERIFICATION			
Priority/Emergency Service Requested		<input checked="" type="radio"/> YES	<input type="radio"/> NO	Priority/Emergency Service Requested		YES	NO
Time Sensitive Hold Time		YES	<input checked="" type="radio"/> NO	Confirmed all as accurate as per COC, Sample Remarks or PM			
Client: <u>CSL</u>				Client		Work Contact	Quote
SAMPLE RECEIPT INFORMATION				RECEIPT DETAIL			
Mode of Delivery: _____		<del>Courier</del> <input checked="" type="radio"/> Drop Off		Project _____		PO _____	Site/LSD _____
Courier _____				Overall Description Entered		Yes	NA
Waybill Number _____				Received date/time as per COC			
Temperature <u>5.6</u>		Cooler Count <u>1</u>		Recipients match CoC or Sample Remarks		Yes	No
Cooling Method		None	Ice	Billing Instruction added to remarks		Yes	NA
		<input checked="" type="radio"/> Ice Packs		Sample Remarks/Specification Doc checked			
SAMPLE MATRIX/BOTTLE INFORMATION				VERIFICATION CHECKLIST			
Matrix:	<input checked="" type="radio"/> Water	Soil	Air	Biota	Other		
DW Schedule 24 Bottles Correct?		<del>Yes</del> <input type="radio"/> No					
DW Metals pH Check <2		<del>Yes</del> <input type="radio"/> No					
Regulation Circled, Works # present		<del>Yes</del> <input type="radio"/> No - Reject?					
# of Bottles: <u>9</u>	Sample Count		<u>1</u>				
Green/white	<u>1 Routine</u>						
Purple/white	<u>1 Nuts, 1 Phenols, 1 DOC</u>						
Warm red/white	<u>1 Diss. Metals</u>						
Yellow/black	<u>1 Diss. Hg</u>						
Light blue/white	<u>1 Micro</u>						
Orange/black							
Others (detail)		<u>1 Sulfide</u> <u>1 Chromium VI</u>					
Comments on Samples and Bottles:							
Samples Requiring Preservation or Filtering: <u>Diss. Metals → FP</u> <u>DOC, Diss. Hg, Diss. Chromium VI → FP</u>							
Layout Staff Initials							
Date and Time of Layout		<u>LV 1/15/24 11:27</u>					
				Login Staff Initials: <u>AN8</u>			

## **Appendix E**

### Model Results

Pumping rate (Q)	33 m <sup>3</sup> /d	(5 iGMP)
Aquifer thickness (b)	6 m	
Hydraulic conductivity (K)	86.4 m/d	1.00E-03 m/s
Regional gradient (i)	0.001	1m/800m

Darcy flux (q) 0.109367 m/d

Location of stagnation point (x<sub>0</sub>) 8 m  
Maximum half-width (y<sub>max</sub>) 25 m  
Full width (2y<sub>max</sub>) 50 m

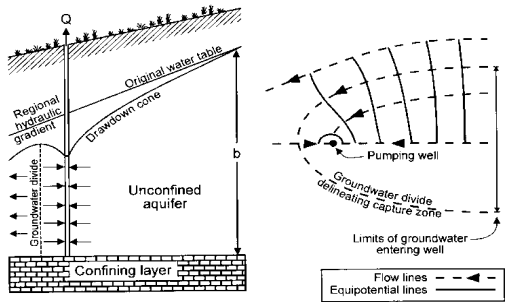


Figure 9.20. Outline of the capture zone of a well in a uniform flow field.

$$x = \frac{-y}{\tan\left[\frac{2\pi Kbiy}{Q}\right]} \quad (9.17)$$

where x and y are coordinate values defined in Figure 9.20, Q is the pumping rate of the well, K is the hydraulic conductivity of the aquifer, b is the saturated thickness of the aquifer, i is the regional (pre-pumping) hydraulic gradient, and tan [ ] is in radians.

The distance to the downgradient groundwater divide created by the well is given by:

$$x_0 = \frac{-Q}{2\pi Kbi} \quad (9.18)$$

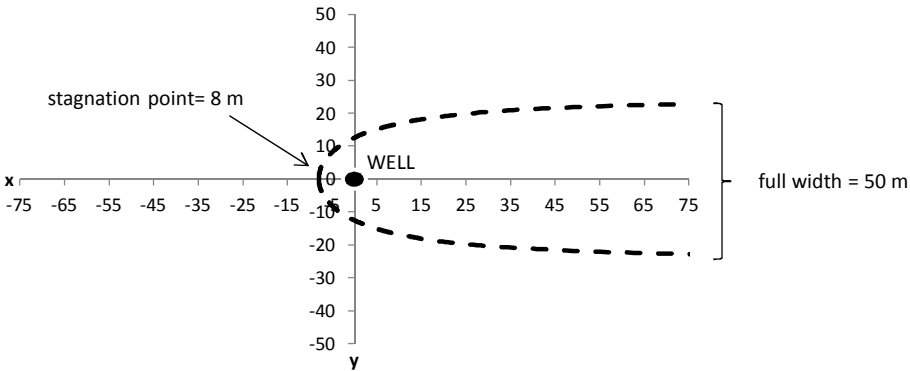
The maximum half-width of the capture zone as x approaches infinity is given by:

$$y_{\max} = \pm \frac{Q}{2Kbi} \quad (9.19)$$

from Fetter, 1980

x (calculated)	y	-y
-8	0.1	-0.1
-8	0.2	-0.2
-8	0.3	-0.3
-8	0.4	-0.4
-8	0.5	-0.5
-8	0.6	-0.6
-8	0.7	-0.7
-8	0.8	-0.8
-8	0.9	-0.9
-8	1	-1
-8	1.1	-1.1
-8	1.2	-1.2
-8	1.3	-1.3
-8	1.4	-1.4
-8	1.5	-1.5
-8	1.6	-1.6
-8	1.7	-1.7
-8	1.8	-1.8
-8	1.9	-1.9
-8	2	-2
-8	2.1	-2.1
-8	2.2	-2.2
-8	2.3	-2.3
-8	2.4	-2.4
-8	2.5	-2.5
-8	2.6	-2.6
-8	2.7	-2.7
-8	2.8	-2.8
-8	2.9	-2.9
-8	3	-3
-8	3.1	-3.1
-8	3.2	-3.2
-8	3.3	-3.3
-8	3.4	-3.4
-7	3.5	-3.5
-7	3.6	-3.6
-7	3.7	-3.7
-7	3.8	-3.8
-7	3.9	-3.9
-7	4	-4
-7	4.1	-4.1
-7	4.2	-4.2

### Capture zone



### Groundwater balance

Development project discharge rate (12 x 33 m <sup>3</sup> /d)	396 m <sup>3</sup> /d
Subsurface inflow length (control transect plane)	980 m
Groundwater flow plane area (A = length x saturated thickness)	5880 m <sup>2</sup>
Groundwater flow recharging the development area (q x A)	643 m <sup>3</sup> /d
Groundwater extraction ratio	0.62