

# **Appendix F**

**Surface Water Resources Supporting  
Documentation**

# **Appendix F.1**

## **Baseline Surface Water Monitoring Memorandum**

Our ref: 12601021

15 August 2024

**Mr. Roberto Margutti**  
Director – North American Mining Operations  
13500 Blue Diamond Road  
Las Vegas Nevada 89161  
USA

## **Baseline Surface Water Monitoring, Antrim Gypsum Project**

Dear Mr. Margutti

### **1. Introduction**

The Antrim Gypsum Project (the Project) is located approximately 50 km from Halifax, Nova Scotia (NS), near Gays River, along Lake Egmont Road in the community of Cooks Brook, NS. For the purpose of the Environmental Assessment, the Project Area (PA) is defined as the footprint of Project related infrastructure, and comprises of PIDs 40228389, 40228371, 40212409, 40229676, 40959983, 40959975, 40228009, 40228017, 41517319, 40767014, and 41152893.

GHD is assisting CertainTeed with the completion of a provincial Environmental Assessment Registration Document (EARD). The purpose of the Baseline Surface Water Monitoring Program is to support future permitting (i.e., Industrial Approval and Fisheries Act Authorization) where Nova Scotia Environment and Climate Change (NSECC) require a year's worth of baseline data prior to construction activities commencing.

The Project has documented black ash across the PA, including a concentration of trees within the northwest corner, and several individual trees within the southern portion of the PA. One tree is located within the extents of the proposed pit. This tree is proposed to be transplanted, in collaboration with the Mi'kmaq of Nova Scotia, in keeping with several other recent projects where transplantation of black ash has been allowed to support industrial and infrastructure development projects (Touquoy Gold Mine, Highway 104 and 107 upgrade projects).

A comprehensive monitoring program will be established to support Project development which will act as a research project relating to the required hydrologic regime required for the remaining black ash (all but one individual tree) that will be avoided by the Project. Surface water quantity modelling data sourced from velocity measurements collected during the Baseline Surface Water Monitoring Program will inform the Black Ash Monitoring Program.

The following tasks were conducted in support of the Baseline Surface Water Monitoring Program:

- Site reconnaissance to identify surface water monitoring locations
- Installation of five staff gauges
- Quarterly water quality monitoring (grab sampling) and in-situ water quality measurements

- Monthly discrete velocity (flow monitoring)
- Continuous surface water elevation monitoring via installation of transducers (Solinst® Leveloggers and Baro-Loggers)

Baseline surface water monitoring commenced in October 2022 with four monitoring locations. The program was later amplified to include seven locations with the submission of GHD’s Baseline Surface Water Monitoring Proposal dated February 2, 2024. While the proposal listed seven monitoring locations which had been selected primarily via desktop analysis, ongoing field assessments resulted in the reduction of the program to five locations due to safety concerns. Monitoring locations are further discussed in section 2, below.

## 2. Monitoring Locations

Surface water monitoring stations were selected to capture outputs of runoff into watercourses surrounding the PA and to provide geographic coverage within the PA. Locations were initially selected following a desktop review of watercourses, catchment areas, flow directions, and Project discharge points. Monitoring locations were later refined following field assessments, during which select locations were deemed unsafe to conduct monitoring activities at. **Table 1** summarizes the existing surface water monitoring locations, finalized in May 2024. The locations detailed in **Table 1** are additionally displayed in **Figure 1**, following text.

**Table 1** Baseline Surface Water Monitoring Locations

Station	Coordinates (UTM 20N)		Initial Sampling Date	Solinst® Levelogger Installation Date	Watercourse	Rationale
	Northing	Easting				
<b>SW-1</b>	473194	4983635	October 5, 2022	March 25, 2024	Annand Brook	Represents surface water drainage that collects within the western portion of the Project Area and leaves through Annand Brook
<b>SW-2</b>	473989	4984819	October 5, 2022	March 25, 2024	Annand Brook	Represents surface water drainage that collects within the northern portion of the Project Area and discharges further downstream of SW-1 along Annand Brook
<b>SW-3</b>	474874	4985157	May 24, 2024	May 24, 2024	Gays River	Represents surface water drainage that collects within the northern portion of the Project Area and discharges to the Gays River, located downstream of the confluence with the Gays River
<b>SW-4</b>	475910	4982897	October 5, 2022	March 25, 2024	Unnamed drainage inlet to Lake Egmont	Reference station upstream of the Project Area that drains to Lake Egmont

Station	Coordinates (UTM 20N)		Initial Sampling Date	Solinst® Levelogger Installation Date	Watercourse	Rationale
	Northing	Easting				
						and eventually Gays River
<b>SW-6</b>	475457	4983389	February 28, 2024	March 25, 2024	Unnamed tributary to Gays River immediately downstream of Lake Egmont	Represents surface water monitoring drainage from the eastern portion of the Project Area and discharges to the Gays River

## 2.1 Decommissioned Monitoring Locations

The monitoring locations listed in Table 2, below, were decommissioned for a variety of reasons. This was primarily due to concerns regarding safety during flow monitoring events which requires crossing of watercourses.

The Gays River historically has high degrees of fluctuation in response to seasonal changes and high precipitation events. While some locations were accessible during low flow conditions observed in mid-summer, water levels increased during the remainder of the year and following heavy precipitation events. Additionally, as the river typically has very low velocity rates, fine sediments are readily deposited from the water column to the riverbed. This results in exceedingly soft, thick substrate which is not wadable along the monitoring station transect during flow monitoring events. The soft substrate also contributes to creating an environment in which significant riverbed erosion can occur with little effort, causing deep pools to be scattered throughout the watercourse which are impassible year-round. These conditions were observed at the historic SW-3 and SW-5 monitoring locations.

Decommissioned location SW-3A was located next to the Lake Egmont Road bridge, which has heavy local foot traffic during the fishing season. On arrival at SW-3A on May 24, 2024, it was found that the Solinst® Levelogger which had been installed during the March 25, 2024 monitoring event had been presumably removed by a non-Project associated person. Given that it was already not possible to collect flows at SW-3A due to the deep pool at the location, the monitoring location was decommissioned from the bridge, and a new monitoring location was installed approximately 50 m downstream where vegetation camouflaged the staff gauge and Levelogger and fishing activities were less evident. As location SW-3 (historic) had also been decommissioned during the same monitoring event, the new monitoring location was named SW-3 as to maintain naming convention patterns.

**Table 2** Decommissioned Baseline Surface Water Monitoring Locations

Station	Coordinates (UTM 20N)		Initial Sampling Date	Decommission Date	Watercourse	Rationale for decommissioning
	Northing	Easting				
<b>SW-3 (historic) (decommissioned)</b>	4984831	475016	April 12, 2023	May 24, 2024	Gays River	Soft substrate, high seasonal water levels
<b>SW-3A (decommissioned)</b>	4984831	474916	April 12, 2023	May 24, 2024	Gays River	High seasonal water levels, deep pooling, high foot traffic
<b>SW-5 (decommissioned)</b>	4983385	475770	April 12, 2023	May 24, 2024	Gays River inlet to Lake Egmont	Soft substrate, high seasonal water levels

## **3. Methodology**

### **3.1 Surface Water Quality**

Surface water samples were collected by grab sampling, which was conducted by dipping the sample container directly into the stream to collect surface water, unless the sample bottles contained preservatives. If the bottle contained preservatives, sterile unpreserved bottles were used to collect the sample. Samples were collected below the surface with the sample bottles completely submerged. This prevents floating debris from entering the sample bottles, which could result in unrepresentative analytical data. The water samples were then transferred to the appropriate preserved bottles. Field measurements of surface water pH, conductivity, dissolved oxygen, and temperature were measured using a handheld multiparameter meter (i.e., Horiba U-52).

Samples were transferred to coolers with ice immediately after they were collected and maintained in cool storage until delivery to Bureau Veritas Laboratories (BV) in Bedford, NS. The Chain-of-Custody (COC) form, which was supplied by the laboratory, was filled out with the sample, time, date, and location, and was signed by field staff before being relinquished to the receiving laboratory. The surface water samples were analysed for general chemistry, total metals, suspended solids, and fluoride analysis.

QA/QC protocols included the collection of field duplicate samples (10%). The results of the QA/QC sampling were used to evaluate the reliability of the sampling and analysis methods. One surface water field duplicate was collected during each of the monitoring events.

### **3.2 Surface Water Flow**

Continuous and discrete water levels and discrete velocity measurements were monitored at all locations. Discrete velocity measurements were collected using either a handheld Marsh McBirney Flo-Mate 2000 or a HACH FH950 velocity meter. A transect was established at each monitoring location perpendicular to the direction of flow. The width of the stream was divided into intervals where velocity readings and water depth were measured. Velocities were measured at 60% of the depth below the water surface. A total flow was then calculated by computing the product of area and velocity using an average of the mean and mid flow calculation methods.

Staff gauges were installed at each monitoring location during the February 2024 monitoring event and were used for discrete surface water level measurements. In addition, continuous water level data was collected at a 15-minute interval using Solinst® Leveloggers which were installed at each location. The loggers were downloaded during each surface water monitoring event, if possible, and compensated for barometric pressure, which was collected on-site using a Baro-Diver installed near monitoring location SW-4. Continuous surface water levels were corrected using the discrete water levels collected during the monitoring event.

## **4. Results**

Below are the water quality and quantity results of the Baseline Surface Water Monitoring Program for the Project.

### **4.1 Water Quality Analytical Results**

Surface water quality results were compared to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines protective of Fresh Water Aquatic Life (FWAL), Nova Scotia Tier 1 Environmental Quality Standards (NS Tier 1 EQS), and background maximums as established from October 2022 to July 2023. Monitoring locations SW-1, SW-2, SW-3 (historic, decommissioned) and SW-4 were sampled beginning in October 2022, with locations SW-3A and SW-5 added to the sampling program in April 2023, and location

SW-6 added in February 2024. Analytical results are presented for locations SW-3 (historic, decommissioned), SW-3A (decommissioned) and SW-5 (decommissioned) prior to their decommissioning in May 2024.

Water quality results for SW-3 prior to May 2024 are sourced from SW-3 (historic, decommissioned), with results from May and July 2024 collected from the replacement SW-3 location.

Laboratory analytical certificates and tabulated results for baseline sampling events are provided in **Attachments 1 and 2**, respectively.

### **SW-1**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events since October 2022. Lab measured pH levels were below the same guidelines during the January and April 2023 and March 2024 sampling events.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all monitoring events between October 2022 and July 2024. Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during the July 2023 (1300 µg/L), March 2024 (320 µg/L) and June 2024 (1300 µg/L) sampling events. Analytical results did not exceed the background maximum of 1500 µg/L.

### **SW-2**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events since October 2022 with the exception of April 2023 (pH of 6.5). All lab measured pH levels fell within the guideline ranges.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all monitoring events between October 2022 and July 2024. The January 2023 concentration of 490 µg/L is considered to be the background maximum concentration for total aluminum.
- Total cadmium exceeded the long-term CCME FWAL guideline during the October 2022 sampling event (0.044 µg/L). This result is considered to be the background maximum concentration for total cadmium.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during the January 2023 (470 µg/L), July 2023 (1500 µg/L), and June 2024 (930 µg/L) sampling events. The July 2023 result is considered to be the background maximum concentration for total iron.

### **SW-3 (historic, decommissioned)**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events between October 2022 and May 2024, when the monitoring location was decommissioned. Lab measured pH levels were below the same guidelines during the February 2024 sampling event.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all monitoring events between October 2022 and May 2024, when the monitoring location was decommissioned. Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during the February 2024 (320 µg/L) sampling event. Analytical results did not exceed the background maximum of 1500 µg/L.

### **SW-3**

- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during the June 2024 monitoring event (130 µg/L) and in the June 2024 duplicate sample (290 µg/L). Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during the February 2024 (320 µg/L) sampling event. Analytical results did not exceed the background maximum of 1500 µg/L. Analytical results did not exceed the background maximum of 490 µg/L.

### **SW-3A (decommissioned)**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events between April 2023 and May 2024, when the monitoring location was decommissioned.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all monitoring events between April 2023 and May 2024, when the monitoring location was decommissioned. Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during the July 2023 (610 µg/L) sampling event. Analytical results did not exceed the background maximum of 1500 µg/L.

### **SW-4**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events between October 2022 and June 2024. Lab measured pH levels were below the same guidelines during the January 2023 (6.47), January 2023 field duplicate sample (6.47), February 2024 (6.33), and February 2024 field duplicate sample (6.38).
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all sampling events between October 2022 and June 2024. Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, during sampling events from July 2023 through June 2024. Analytical results did not exceed the background maximum of 1500 µg/L.

### **SW-5 (decommissioned)**

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during all sampling events between April 2023 and May 2024, when the monitoring location was decommissioned. Lab measured pH levels were below the same guidelines during the February 2024 (6.22) sampling event.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during all sampling events between April 2023 and May 2024, when the monitoring location was decommissioned. Total aluminum concentrations reported during the February 2024 sampling event (830 µg/L) exceeded the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines during the July 2023 (640 µg/L) and the February 2024 (390 µg/L) sampling events. Analytical results did not exceed the background maximum of 1500 µg/L.
- Total manganese concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines during the July 2023 (400 µg/L) sampling event. The July 2023 result is considered to be the background maximum concentration for total manganese.



## SW-6

- Field measured pH levels were beneath the long-term CCME FWAL and NSE Tier 1 EQS range of 6.5 to 9 during the February 2024 (4.79) sampling event. Lab measured pH levels were additionally below the same guidelines during the February 2024 (6.48) sampling event.
- Total aluminum concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines, which are variable depending on pH, during the February 2024 (310 µg/L) and June 2024 (350 µg/L) sampling events. Analytical results did not exceed the background maximum of 490 µg/L.
- Total iron concentrations were above the long-term CCME FWAL and NSE Tier 1 EQS guidelines during the February 2024 (380 µg/L) and June 2024 (830 µg/L) sampling events. Analytical results did not exceed the background maximum of 1500 µg/L.

## 4.2 Water Quantity Results

Discrete surface water flow monitoring results are presented below in **Table 3**. Where no flow rates are presented the monitoring location was not accessible due to environmental factors (e.g., depth of flow, accessible pathway etc.)

**Table 3** Discrete Flow Monitoring Results

Station	Flow (m)				
	2/28/2024	3/25/2024	4/30/2024	5/24/2024	6/26/2024
SW1	--	0.284	0.005	0.017	0.004
SW2	--	0.015	0.001	--	0.002
SW3	--	--	0.245	--	0.164
SW3A	--	--	0.077	0.265	--
SW4	0.059	0.071	0.003	0.002	0.001
SW5	--	--	--	--	--
SW6	0.026	0.020	0.001	0.001	0.001

The results of the flow monitoring for the Project indicate seasonal fluctuation in flows as to be expected with the peak flow rates occurring during the March 25, 2024 sampling event. Flows at SW1 peak at 0.284 m<sup>3</sup>/s during the March 25, 2024 sampling event with a minimum measured flow rate of 0.004 m<sup>3</sup>/s during the June 26, 2024 sampling event. This trend is repeated for SW2 and SW4. SW6 monitoring indicated a peak flow rate of 0.026 m<sup>3</sup>/s on February 28, 2024. SW3 and SW3A were only monitored twice during the monitoring period. SW5 was inaccessible during all sampling events.

In addition to discrete flow monitoring, level loggers were installed at each monitoring station (as per Section 3.2). The discrete flow monitoring completed to date does not provide sufficient information to develop a rating curve for each monitoring station to develop a continuous flow data set. Discrete flow monitoring will continue throughout 2024 to capture the seasonal variation of flows at each station and aid in the development of a rating curve for each monitoring station.

## 5. Conclusions

The reported surface water quality and quantity results are considered baseline or background and are representative of the sampling environment. As surface water monitoring continues through the life of the Project, results will be compared against the baseline assessment to determine if Project related impacts are occurring.

Regards,



**Sadie Jacobs-Peters, B.Sc.**  
Environmental Professional

+1 902 334-1817  
sadie.jacobs-peters@ghd.com

SJP/tj/5

Encl.

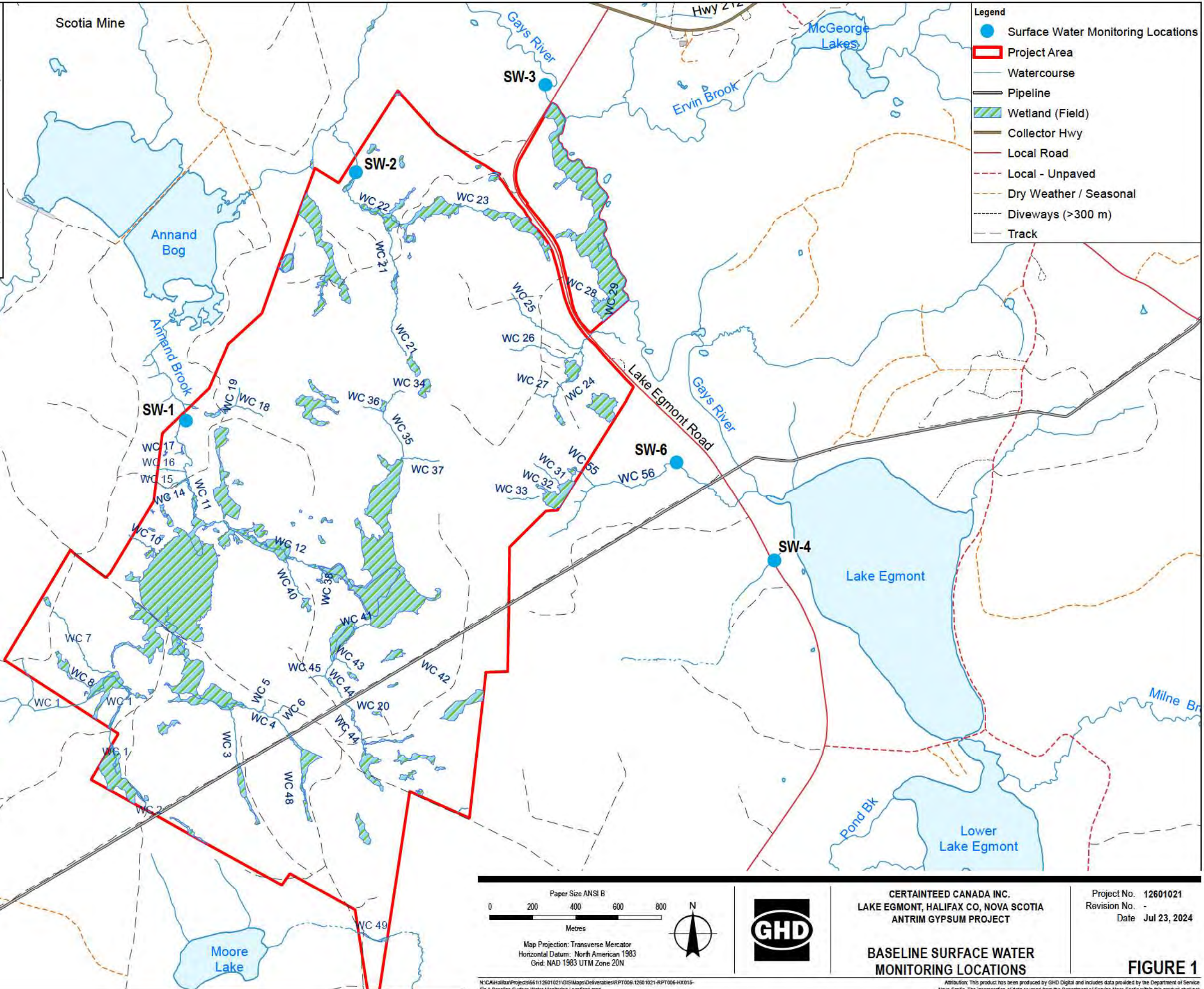
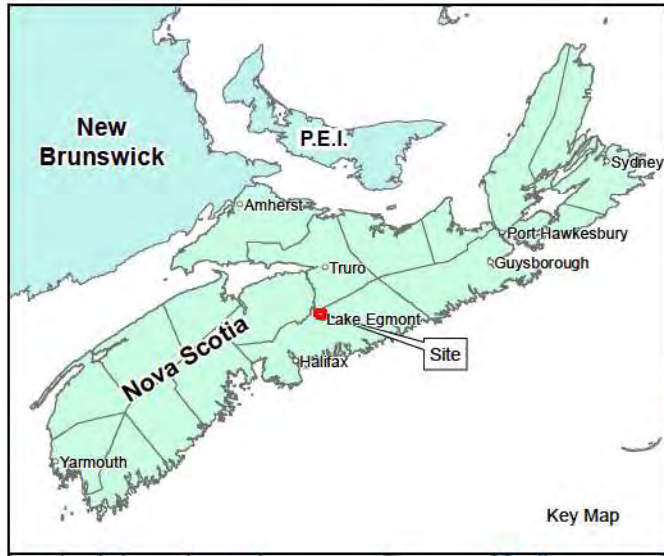


**Chris Muirhead, P.Eng.**  
Water Resources Engineer

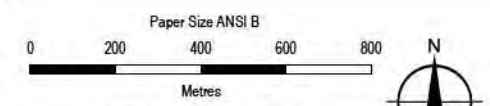
+1 519 340-4408  
christopher.muirhead@ghd.com

# Figures





Sample ID	Easting	Northing
SW-1	473194.98	4983584.99
SW-2	473989.23	4984747.36
SW-3	474874.29	4985156.74
SW-4	475943.92	4982933.39
SW-6	475488.22	4983390.03



Map Projection: Transverse Mercator  
 Horizontal Datum: North American 1983  
 Grid: NAD 1983 UTM Zone 20N



**CERTANTEED CANADA INC.**  
 LAKE EGMONT, HALIFAX CO, NOVA SCOTIA  
 ANTRIM GYPSUM PROJECT

Project No. 12601021  
 Revision No. -  
 Date Jul 23, 2024

**BASELINE SURFACE WATER MONITORING LOCATIONS**

**FIGURE 1**



# **Attachments**

# **Attachment 1**

**Laboratory Analytical Certificates**



Your P.O. #: 735-004150  
 Your Project #: 12574778-03  
 Your C.O.C. #: 894298-01-01

**Attention: Callie Andrews**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2022/10/25**  
 Report #: R7356361  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C2T4381**

**Received: 2022/10/05, 14:57**

Sample Matrix: Water  
 # Samples Received: 4

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	3	N/A	2022/10/17	N/A	SM 23 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	1	N/A	2022/10/19	N/A	SM 23 4500-CO2 D
Alkalinity	3	N/A	2022/10/17	ATL SOP 00142	SM 23 2320 B
Alkalinity	1	N/A	2022/10/18	ATL SOP 00142	SM 23 2320 B
Chloride	4	N/A	2022/10/23	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	4	N/A	2022/10/24	ATL SOP 00020	SM 23 2120C m
Conductance - water	3	N/A	2022/10/17	ATL SOP 00004	SM 23 2510B m
Conductance - water	1	N/A	2022/10/18	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	4	N/A	2022/10/21	ATL SOP 00048	Auto Calc
Metals Water Total MS	4	2022/10/18	2022/10/20	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	4	N/A	2022/10/24	N/A	Auto Calc.
Anion and Cation Sum	4	N/A	2022/10/21	N/A	Auto Calc.
Nitrogen Ammonia - water	4	N/A	2022/10/17	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	4	N/A	2022/10/24	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	4	N/A	2022/10/22	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	4	N/A	2022/10/24	ATL SOP 00018	ASTM D3867-16
pH (1)	3	N/A	2022/10/17	ATL SOP 00003	SM 23 4500-H+ B m
pH (1)	1	N/A	2022/10/18	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	4	N/A	2022/10/24	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2022/10/21	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	3	N/A	2022/10/24	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2022/10/21	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2022/10/24	ATL SOP 00049	Auto Calc.
Reactive Silica	4	N/A	2022/10/22	ATL SOP 00022	EPA 366.0 m
Sulphate	4	N/A	2022/10/22	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	4	N/A	2022/10/24	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	3	N/A	2022/10/14	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (2)	1	N/A	2022/10/15	ATL SOP 00203	SM 23 5310B m
Total Suspended Solids	4	2022/10/12	2022/10/17	ATL SOP 00007	SM 23 2540D m
Turbidity	3	N/A	2022/10/19	ATL SOP 00011	EPA 180.1 R2 m
Turbidity	1	N/A	2022/10/21	ATL SOP 00011	EPA 180.1 R2 m



Your P.O. #: 735-004150  
Your Project #: 12574778-03  
Your C.O.C. #: 894298-01-01

**Attention: Callie Andrews**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2022/10/25**  
Report #: R7356361  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C2T4381**

**Received: 2022/10/05, 14:57**

**Remarks:**

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

=====

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

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





**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		TYX988		TYX989			TYX990		
Sampling Date		2022/10/05 13:00		2022/10/05 11:30			2022/10/05 10:00		
COC Number		894298-01-01		894298-01-01			894298-01-01		
	<b>UNITS</b>	<b>SW1</b>	<b>QC Batch</b>	<b>SW2</b>	<b>RDL</b>	<b>QC Batch</b>	<b>SW3</b>	<b>RDL</b>	<b>QC Batch</b>

**Calculated Parameters**

Anion Sum	me/L	0.780	8275123	1.23	N/A	8275123	2.52	N/A	8275123
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	8275120	3.9	1.0	8275120	24	1.0	8275120
Calculated TDS	mg/L	60	8275129	87	1.0	8275129	160	1.0	8275129
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	8275120	<1.0	1.0	8275120	<1.0	1.0	8275120
Cation Sum	me/L	1.00	8275123	1.34	N/A	8275123	2.35	N/A	8275123
Hardness (CaCO3)	mg/L	42	8275121	55	1.0	8275121	110	1.0	8275121
Ion Balance (% Difference)	%	12.4	8275122	4.28	N/A	8275122	3.49	N/A	8275122
Langelier Index (@ 20C)	N/A	NC	8275127	-2.89		8275127	-1.18		8275127
Langelier Index (@ 4C)	N/A	NC	8275128	-3.14		8275128	-1.43		8275128
Nitrate (N)	mg/L	<0.050	8275124	<0.050	0.050	8275124	<0.050	0.050	8275124
Saturation pH (@ 20C)	N/A	NC	8275127	9.50		8275127	8.39		8275127
Saturation pH (@ 4C)	N/A	NC	8275128	9.75		8275128	8.65		8275128

**Inorganics**

Total Alkalinity (Total as CaCO3)	mg/L	<2.0	8286598	3.9	2.0	8286598	24	2.0	8289828
Dissolved Chloride (Cl-)	mg/L	5.5	8298338	7.8	1.0	8298338	8.6	1.0	8298338
Colour	TCU	200	8298348	52	25	8298348	48 (1)	10	8298348
Nitrate + Nitrite (N)	mg/L	<0.050	8298409	<0.050	0.050	8298409	<0.050	0.050	8298409
Nitrite (N)	mg/L	<0.010	8298414	<0.010	0.010	8298414	<0.010	0.010	8298414
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	8286822	<0.050	0.050	8286822	<0.050	0.050	8286822
Total Organic Carbon (C)	mg/L	24	8283616	11	0.50	8282758	10	0.50	8282758
Orthophosphate (P)	mg/L	<0.010	8298397	<0.010	0.010	8298397	<0.010	0.010	8298397
pH	pH	6.79	8286597	6.62		8286597	7.22		8289827
Reactive Silica (SiO2)	mg/L	4.1	8298347	5.4	0.50	8298347	2.9	0.50	8298347
Total Suspended Solids	mg/L	8.0	8277642	2.4	2.0	8277642	<1.0	1.0	8277642
Dissolved Sulphate (SO4)	mg/L	30	8298346	45	2.0	8298346	86	2.0	8298346
Turbidity	NTU	1.8	8292230	1.9	0.10	8292230	0.39	0.10	8296013
Conductivity	uS/cm	110	8286592	140	1.0	8286592	390	1.0	8289823

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Elevated reporting limit due to sample matrix.



**RESULTS OF ANALYSES OF WATER**

<b>Bureau Veritas ID</b>		TYX991		
<b>Sampling Date</b>		2022/10/05 09:45		
<b>COC Number</b>		894298-01-01		
	<b>UNITS</b>	<b>SW4</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Calculated Parameters</b>				
Anion Sum	me/L	0.790	N/A	8275123
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16	1.0	8275120
Calculated TDS	mg/L	50	1.0	8275129
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8275120
Cation Sum	me/L	0.760	N/A	8275123
Hardness (CaCO3)	mg/L	25	1.0	8275121
Ion Balance (% Difference)	%	1.94	N/A	8275122
Langelier Index (@ 20C)	N/A	-2.08		8275127
Langelier Index (@ 4C)	N/A	-2.33		8275128
Nitrate (N)	mg/L	<0.050	0.050	8275124
Saturation pH (@ 20C)	N/A	9.25		8275127
Saturation pH (@ 4C)	N/A	9.50		8275128
<b>Inorganics</b>				
Total Alkalinity (Total as CaCO3)	mg/L	16	2.0	8286598
Dissolved Chloride (Cl-)	mg/L	8.2	1.0	8298338
Colour	TCU	58	25	8298348
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	8298409
Nitrite (N)	mg/L	<0.010	0.010	8298414
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	8286822
Total Organic Carbon (C)	mg/L	8.3	0.50	8282758
Orthophosphate (P)	mg/L	<0.010	0.010	8298397
pH	pH	7.17		8286597
Reactive Silica (SiO2)	mg/L	4.8	0.50	8298347
Total Suspended Solids	mg/L	1.4	1.0	8277642
Dissolved Sulphate (SO4)	mg/L	12	2.0	8298346
Turbidity	NTU	1.4	0.10	8292230
Conductivity	uS/cm	75	1.0	8286592
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable				



**ELEMENTS BY ICP/MS (WATER)**

Bureau Veritas ID		TYX988	TYX989	TYX990	TYX991		
Sampling Date		2022/10/05 13:00	2022/10/05 11:30	2022/10/05 10:00	2022/10/05 09:45		
COC Number		894298-01-01	894298-01-01	894298-01-01	894298-01-01		
	UNITS	SW1	SW2	SW3	SW4	RDL	QC Batch
<b>Metals</b>							
Total Aluminum (Al)	ug/L	350	190	69	140	5.0	8289817
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Barium (Ba)	ug/L	12	30	16	15	1.0	8289817
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Boron (B)	ug/L	<50	<50	<50	<50	50	8289817
Total Cadmium (Cd)	ug/L	0.022	0.044	<0.010	<0.010	0.010	8289817
Total Calcium (Ca)	ug/L	15000	18000	39000	7300	100	8289817
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	8289817
Total Copper (Cu)	ug/L	0.74	0.87	<0.50	0.99	0.50	8289817
Total Iron (Fe)	ug/L	760	290	210	430	50	8289817
Total Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	8289817
Total Magnesium (Mg)	ug/L	1300	2500	1800	1700	100	8289817
Total Manganese (Mn)	ug/L	110	180	66	140	2.0	8289817
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	100	8289817
Total Potassium (K)	ug/L	470	880	700	370	100	8289817
Total Selenium (Se)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	8289817
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Sodium (Na)	ug/L	3000	4900	4800	5400	100	8289817
Total Strontium (Sr)	ug/L	52	40	160	40	2.0	8289817
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Titanium (Ti)	ug/L	5.0	4.4	2.3	3.3	2.0	8289817
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Zinc (Zn)	ug/L	5.6	9.0	<5.0	<5.0	5.0	8289817
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							



Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### GENERAL COMMENTS

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

Package 1	13.0°C
-----------	--------

Sample TYX988 [SW1] : Poor RCap Ion Balance due to sample matrix. Anion sum does not include contribution from Total Organic Carbon.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8277642	RMK	QC Standard	Total Suspended Solids	2022/10/17		97	%	80 - 120
8277642	RMK	Method Blank	Total Suspended Solids	2022/10/17	<1.0		mg/L	
8277642	RMK	RPD	Total Suspended Solids	2022/10/17	2.6		%	20
8282758	RSL	Matrix Spike	Total Organic Carbon (C)	2022/10/14		93	%	85 - 115
8282758	RSL	Spiked Blank	Total Organic Carbon (C)	2022/10/14		99	%	80 - 120
8282758	RSL	Method Blank	Total Organic Carbon (C)	2022/10/14	<0.50		mg/L	
8282758	RSL	RPD	Total Organic Carbon (C)	2022/10/14	0.48		%	15
8283616	RSL	Matrix Spike	Total Organic Carbon (C)	2022/10/15		104	%	85 - 115
8283616	RSL	Spiked Blank	Total Organic Carbon (C)	2022/10/14		98	%	80 - 120
8283616	RSL	Method Blank	Total Organic Carbon (C)	2022/10/14	<0.50		mg/L	
8283616	RSL	RPD	Total Organic Carbon (C)	2022/10/15	12		%	15
8286592	NGI	Spiked Blank	Conductivity	2022/10/17		101	%	80 - 120
8286592	NGI	Method Blank	Conductivity	2022/10/17	<1.0		uS/cm	
8286592	NGI	RPD	Conductivity	2022/10/17	4.8		%	10
8286597	NGI	Spiked Blank	pH	2022/10/17		100	%	97 - 103
8286597	NGI	RPD	pH	2022/10/17	0.58		%	N/A
8286598	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2022/10/17		105	%	80 - 120
8286598	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2022/10/17	<2.0		mg/L	
8286598	NGI	RPD	Total Alkalinity (Total as CaCO3)	2022/10/17	1.9		%	20
8286822	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2022/10/17		NC	%	80 - 120
8286822	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2022/10/17		100	%	80 - 120
8286822	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2022/10/17	<0.050		mg/L	
8286822	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2022/10/17	0.47		%	20
8289817	JHY	Matrix Spike	Total Aluminum (Al)	2022/10/19		99	%	80 - 120
			Total Antimony (Sb)	2022/10/19		100	%	80 - 120
			Total Arsenic (As)	2022/10/19		94	%	80 - 120
			Total Barium (Ba)	2022/10/19		96	%	80 - 120
			Total Beryllium (Be)	2022/10/19		96	%	80 - 120
			Total Bismuth (Bi)	2022/10/19		97	%	80 - 120
			Total Boron (B)	2022/10/19		98	%	80 - 120
			Total Cadmium (Cd)	2022/10/19		98	%	80 - 120
			Total Calcium (Ca)	2022/10/19		100	%	80 - 120
			Total Chromium (Cr)	2022/10/19		96	%	80 - 120
			Total Cobalt (Co)	2022/10/19		98	%	80 - 120
			Total Copper (Cu)	2022/10/19		97	%	80 - 120
			Total Iron (Fe)	2022/10/19		101	%	80 - 120
			Total Lead (Pb)	2022/10/19		97	%	80 - 120
			Total Magnesium (Mg)	2022/10/19		103	%	80 - 120
			Total Manganese (Mn)	2022/10/19		99	%	80 - 120
			Total Molybdenum (Mo)	2022/10/19		102	%	80 - 120
			Total Nickel (Ni)	2022/10/19		98	%	80 - 120
			Total Phosphorus (P)	2022/10/19		102	%	80 - 120
			Total Potassium (K)	2022/10/19		100	%	80 - 120
			Total Selenium (Se)	2022/10/19		99	%	80 - 120
			Total Silver (Ag)	2022/10/19		97	%	80 - 120
			Total Sodium (Na)	2022/10/19		103	%	80 - 120
			Total Strontium (Sr)	2022/10/19		NC	%	80 - 120
			Total Thallium (Tl)	2022/10/19		99	%	80 - 120
			Total Tin (Sn)	2022/10/19		99	%	80 - 120
			Total Titanium (Ti)	2022/10/19		97	%	80 - 120
			Total Uranium (U)	2022/10/19		101	%	80 - 120
			Total Vanadium (V)	2022/10/19		98	%	80 - 120
			Total Zinc (Zn)	2022/10/19		98	%	80 - 120
8289817	JHY	Spiked Blank	Total Aluminum (Al)	2022/10/19		100	%	80 - 120



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381

Report Date: 2022/10/25

GHD Limited

Client Project #: 12574778-03

Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Antimony (Sb)	2022/10/19		97	%	80 - 120
			Total Arsenic (As)	2022/10/19		90	%	80 - 120
			Total Barium (Ba)	2022/10/19		92	%	80 - 120
			Total Beryllium (Be)	2022/10/19		93	%	80 - 120
			Total Bismuth (Bi)	2022/10/19		95	%	80 - 120
			Total Boron (B)	2022/10/19		97	%	80 - 120
			Total Cadmium (Cd)	2022/10/19		96	%	80 - 120
			Total Calcium (Ca)	2022/10/19		98	%	80 - 120
			Total Chromium (Cr)	2022/10/19		93	%	80 - 120
			Total Cobalt (Co)	2022/10/19		95	%	80 - 120
			Total Copper (Cu)	2022/10/19		95	%	80 - 120
			Total Iron (Fe)	2022/10/19		101	%	80 - 120
			Total Lead (Pb)	2022/10/19		94	%	80 - 120
			Total Magnesium (Mg)	2022/10/19		102	%	80 - 120
			Total Manganese (Mn)	2022/10/19		97	%	80 - 120
			Total Molybdenum (Mo)	2022/10/19		99	%	80 - 120
			Total Nickel (Ni)	2022/10/19		96	%	80 - 120
			Total Phosphorus (P)	2022/10/19		99	%	80 - 120
			Total Potassium (K)	2022/10/19		99	%	80 - 120
			Total Selenium (Se)	2022/10/19		94	%	80 - 120
			Total Silver (Ag)	2022/10/19		93	%	80 - 120
			Total Sodium (Na)	2022/10/19		102	%	80 - 120
			Total Strontium (Sr)	2022/10/19		91	%	80 - 120
			Total Thallium (Tl)	2022/10/19		98	%	80 - 120
			Total Tin (Sn)	2022/10/19		96	%	80 - 120
			Total Titanium (Ti)	2022/10/19		97	%	80 - 120
			Total Uranium (U)	2022/10/19		97	%	80 - 120
			Total Vanadium (V)	2022/10/19		95	%	80 - 120
			Total Zinc (Zn)	2022/10/19		97	%	80 - 120
8289817	JHY	Method Blank	Total Aluminum (Al)	2022/10/19	<5.0		ug/L	
			Total Antimony (Sb)	2022/10/19	<1.0		ug/L	
			Total Arsenic (As)	2022/10/19	<1.0		ug/L	
			Total Barium (Ba)	2022/10/19	<1.0		ug/L	
			Total Beryllium (Be)	2022/10/19	<0.10		ug/L	
			Total Bismuth (Bi)	2022/10/19	<2.0		ug/L	
			Total Boron (B)	2022/10/19	<50		ug/L	
			Total Cadmium (Cd)	2022/10/19	<0.010		ug/L	
			Total Calcium (Ca)	2022/10/19	<100		ug/L	
			Total Chromium (Cr)	2022/10/19	<1.0		ug/L	
			Total Cobalt (Co)	2022/10/19	<0.40		ug/L	
			Total Copper (Cu)	2022/10/19	<0.50		ug/L	
			Total Iron (Fe)	2022/10/19	<50		ug/L	
			Total Lead (Pb)	2022/10/19	<0.50		ug/L	
			Total Magnesium (Mg)	2022/10/19	<100		ug/L	
			Total Manganese (Mn)	2022/10/19	<2.0		ug/L	
			Total Molybdenum (Mo)	2022/10/19	<2.0		ug/L	
			Total Nickel (Ni)	2022/10/19	<2.0		ug/L	
			Total Phosphorus (P)	2022/10/19	<100		ug/L	
			Total Potassium (K)	2022/10/19	<100		ug/L	
			Total Selenium (Se)	2022/10/19	<0.50		ug/L	
			Total Silver (Ag)	2022/10/19	<0.10		ug/L	
			Total Sodium (Na)	2022/10/19	<100		ug/L	
			Total Strontium (Sr)	2022/10/19	<2.0		ug/L	
			Total Thallium (Tl)	2022/10/19	<0.10		ug/L	



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381

Report Date: 2022/10/25

GHD Limited

Client Project #: 12574778-03

Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2022/10/19	<2.0		ug/L	
			Total Titanium (Ti)	2022/10/19	<2.0		ug/L	
			Total Uranium (U)	2022/10/19	<0.10		ug/L	
			Total Vanadium (V)	2022/10/19	<2.0		ug/L	
			Total Zinc (Zn)	2022/10/19	<5.0		ug/L	
8289817	JHY	RPD	Total Aluminum (Al)	2022/10/19	3.1		%	20
			Total Antimony (Sb)	2022/10/19	NC		%	20
			Total Arsenic (As)	2022/10/19	NC		%	20
			Total Barium (Ba)	2022/10/19	0.68		%	20
			Total Beryllium (Be)	2022/10/19	NC		%	20
			Total Bismuth (Bi)	2022/10/19	NC		%	20
			Total Boron (B)	2022/10/19	NC		%	20
			Total Cadmium (Cd)	2022/10/19	NC		%	20
			Total Calcium (Ca)	2022/10/19	4.9		%	20
			Total Chromium (Cr)	2022/10/19	NC		%	20
			Total Cobalt (Co)	2022/10/19	NC		%	20
			Total Copper (Cu)	2022/10/19	1.5		%	20
			Total Iron (Fe)	2022/10/19	5.1		%	20
			Total Lead (Pb)	2022/10/19	NC		%	20
			Total Magnesium (Mg)	2022/10/19	2.6		%	20
			Total Manganese (Mn)	2022/10/19	1.7		%	20
			Total Molybdenum (Mo)	2022/10/19	NC		%	20
			Total Nickel (Ni)	2022/10/19	NC		%	20
			Total Phosphorus (P)	2022/10/19	NC		%	20
			Total Potassium (K)	2022/10/19	2.6		%	20
			Total Selenium (Se)	2022/10/19	NC		%	20
			Total Silver (Ag)	2022/10/19	NC		%	20
			Total Sodium (Na)	2022/10/19	3.7		%	20
			Total Strontium (Sr)	2022/10/19	3.1		%	20
			Total Thallium (Tl)	2022/10/19	NC		%	20
			Total Tin (Sn)	2022/10/19	NC		%	20
			Total Titanium (Ti)	2022/10/19	NC		%	20
			Total Uranium (U)	2022/10/19	NC		%	20
			Total Vanadium (V)	2022/10/19	NC		%	20
			Total Zinc (Zn)	2022/10/19	NC		%	20
8289823	NGI	Spiked Blank	Conductivity	2022/10/18		98	%	80 - 120
8289823	NGI	Method Blank	Conductivity	2022/10/18	<1.0		uS/cm	
8289823	NGI	RPD	Conductivity	2022/10/18	0.66		%	10
8289827	NGI	Spiked Blank	pH	2022/10/18		100	%	97 - 103
8289827	NGI	RPD	pH	2022/10/18	0.80		%	N/A
8289828	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2022/10/18		105	%	80 - 120
8289828	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2022/10/18	<2.0		mg/L	
8289828	NGI	RPD	Total Alkalinity (Total as CaCO3)	2022/10/18	0.82		%	20
8292230	AA0	QC Standard	Turbidity	2022/10/19		109	%	80 - 120
8292230	AA0	Spiked Blank	Turbidity	2022/10/19		99	%	80 - 120
8292230	AA0	Method Blank	Turbidity	2022/10/19	<0.10		NTU	
8292230	AA0	RPD	Turbidity	2022/10/19	1.7		%	20
8296013	AA0	QC Standard	Turbidity	2022/10/21		108	%	80 - 120
8296013	AA0	Spiked Blank	Turbidity	2022/10/21		105	%	80 - 120
8296013	AA0	Method Blank	Turbidity	2022/10/21	<0.10		NTU	
8296013	AA0	RPD	Turbidity	2022/10/21	20		%	20
8298338	TGO	Matrix Spike	Dissolved Chloride (Cl-)	2022/10/23		54 (1)	%	80 - 120
8298338	TGO	Spiked Blank	Dissolved Chloride (Cl-)	2022/10/23		94	%	80 - 120
8298338	TGO	Method Blank	Dissolved Chloride (Cl-)	2022/10/23	<1.0		mg/L	



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8298338	TGO	RPD	Dissolved Chloride (Cl-)	2022/10/23	0.48		%	20
8298346	TGO	Matrix Spike	Dissolved Sulphate (SO4)	2022/10/22		NC	%	80 - 120
8298346	TGO	Spiked Blank	Dissolved Sulphate (SO4)	2022/10/22		101	%	80 - 120
8298346	TGO	Method Blank	Dissolved Sulphate (SO4)	2022/10/22	<2.0		mg/L	
8298346	TGO	RPD	Dissolved Sulphate (SO4)	2022/10/22	3.8		%	20
8298347	TGO	Matrix Spike	Reactive Silica (SiO2)	2022/10/22		NC	%	80 - 120
8298347	TGO	Spiked Blank	Reactive Silica (SiO2)	2022/10/22		94	%	80 - 120
8298347	TGO	Method Blank	Reactive Silica (SiO2)	2022/10/22	<0.50		mg/L	
8298347	TGO	RPD	Reactive Silica (SiO2)	2022/10/22	3.4		%	20
8298348	TGO	Spiked Blank	Colour	2022/10/24		96	%	80 - 120
8298348	TGO	Method Blank	Colour	2022/10/24	<5.0		TCU	
8298348	TGO	RPD	Colour	2022/10/24	NC		%	20
8298397	TGO	Matrix Spike	Orthophosphate (P)	2022/10/24		50 (1)	%	80 - 120
8298397	TGO	Spiked Blank	Orthophosphate (P)	2022/10/24		102	%	80 - 120
8298397	TGO	Method Blank	Orthophosphate (P)	2022/10/24	<0.010		mg/L	
8298397	TGO	RPD	Orthophosphate (P)	2022/10/24	NC		%	20
8298409	TGO	Matrix Spike	Nitrate + Nitrite (N)	2022/10/24		NC	%	80 - 120
8298409	TGO	Spiked Blank	Nitrate + Nitrite (N)	2022/10/24		106	%	80 - 120
8298409	TGO	Method Blank	Nitrate + Nitrite (N)	2022/10/24	<0.050		mg/L	
8298409	TGO	RPD	Nitrate + Nitrite (N)	2022/10/24	3.2		%	20
8298414	TGO	Matrix Spike	Nitrite (N)	2022/10/22		NC	%	80 - 120
8298414	TGO	Spiked Blank	Nitrite (N)	2022/10/22		106	%	80 - 120
8298414	TGO	Method Blank	Nitrite (N)	2022/10/22	<0.010		mg/L	
8298414	TGO	RPD	Nitrite (N)	2022/10/22	0.41		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

(1) Poor spike recovery due to probable sample matrix interference.





BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### VALIDATION SIGNATURE PAGE

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

Colleen Acker, B.Sc, Scientific Service Specialist



Bureau Veritas Proprietary Software  
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

---

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only					
Company Name: #3000 GHD Limited	Company Name: #30775 GHD Limited	Quotation #: C20026	Bureau Veritas Job #		Bottle Order #:						
Contact Name: Accounts payable-Bedford	Contact Name: Callie Andrews / Jessica Romo	P.O. #: <i>PPA/1116 735-009150</i>	C2 T4381				894298				
Address: 455 Phillip St Waterloo ON N2L 3X2	Address: 120 Western Parkway Bedford NS B4B 0V2	Project #: 12574778-03	Chain Of Custody Record		Project Manager						
Phone: (519) 884-0510 Fax: (519) 725-1394	Phone: (902) 468-1248 Fax:	Project Name:			Marie Muise						
Email: Invoicing-Canada@ghd.com	Email: Callie.andrews@ghd.com@ghd.com, jessica.romo@ghd.com	Site #:	C4894298-01-01								
Regulatory Criteria:	Special Instructions:	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)				Turnaround Time (TAT) Required:					
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal		Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Total Suspended Solids	Please provide advance notice for rush projects <b>Regular (Standard) TAT:</b> (will be applied if Rush TAT is not specified): Standard TAT = 5-7 Working days for most tests. <input checked="" type="checkbox"/> Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. <b>Job Specific Rush TAT (if applies to entire submission)</b> Date Required: _____ Time Required: _____ <input type="checkbox"/> # of Bottles: _____ Comments / Hazards / Other Required Analysis: _____					
SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS											
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Total Suspended Solids	# of Bottles	Comments / Hazards / Other Required Analysis	
1	SW1	22/10/05	13:00	SW			X	X	5		
2	SW2	↓	11:30	↓			X	X	5		
3	SW3	↓	10:00	↓			X	X	5		
4	SW4	↓	9:45	↓			X	X	5		
5										Attempt to Cool: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
6											
7											
8											
9										2022 OCT 5 14:57	
10											
* RELINQUISHED BY: (Signature/Print) <i>Marie Muise</i>		Date: (YY/MM/DD) 22/10/05	Time 14:54	RECEIVED BY: (Signature/Print) <i>Marie Muise</i>		Date: (YY/MM/DD)	Time	# Jars used and not submitted	Lab Use Only		
								Time Sensitive <input type="checkbox"/>	Temperature (°C) on Receipt 13.13	Custody Seal Intact on Cooler? <input type="checkbox"/> Yes <input type="checkbox"/> No	
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.										White: Bureau Veritas Yellow: Client	
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.											



Your P.O. #: 735-005520  
 Your Project #: 12601021  
 Site Location: Antrium Gypsum Project  
 Your C.O.C. #: 914888-01-01

**Attention: Callie Andrews**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2023/01/27**  
 Report #: R7486921  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C318877**

**Received: 2023/01/19, 14:30**

Sample Matrix: Water  
 # Samples Received: 5

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	5	N/A	2023/01/25	N/A	SM 23 4500-CO2 D
Alkalinity	5	N/A	2023/01/25	ATL SOP 00142	SM 23 2320 B
Chloride	5	N/A	2023/01/24	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	5	N/A	2023/01/25	ATL SOP 00020	SM 23 2120C m
Conductance - water	5	N/A	2023/01/25	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	5	N/A	2023/01/24	ATL SOP 00048	Auto Calc
Metals Water Total MS	3	2023/01/23	2023/01/23	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	2	2023/01/23	2023/01/24	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	5	N/A	2023/01/25	N/A	Auto Calc.
Anion and Cation Sum	5	N/A	2023/01/25	N/A	Auto Calc.
Nitrogen Ammonia - water	5	N/A	2023/01/25	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	5	N/A	2023/01/24	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	5	N/A	2023/01/24	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	5	N/A	2023/01/25	ATL SOP 00018	ASTM D3867-16
pH (1)	5	N/A	2023/01/25	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	5	N/A	2023/01/25	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	5	N/A	2023/01/25	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	5	N/A	2023/01/25	ATL SOP 00049	Auto Calc.
Reactive Silica	5	N/A	2023/01/25	ATL SOP 00022	EPA 366.0 m
Sulphate	5	N/A	2023/01/24	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	5	N/A	2023/01/25	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	1	N/A	2023/01/24	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (2)	4	N/A	2023/01/25	ATL SOP 00203	SM 23 5310B m
Total Suspended Solids	5	2023/01/24	2023/01/26	ATL SOP 00007	SM 23 2540D m
Turbidity	5	N/A	2023/01/25	ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**

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

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are



Your P.O. #: 735-005520  
Your Project #: 12601021  
Site Location: Antrium Gypsum Project  
Your C.O.C. #: 914888-01-01

**Attention: Callie Andrews**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2023/01/27**  
Report #: R7486921  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C318877**

**Received: 2023/01/19, 14:30**

reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

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

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



BUREAU  
VERITAS

Bureau Veritas Job #: C318877

Report Date: 2023/01/27

GHD Limited

Client Project #: 12601021

Site Location: Antrium Gypsum Project

Your P.O. #: 735-005520

Sampler Initials: JV

### RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UVW834			UVW834			UVW835		
Sampling Date		2023/01/19 13:00			2023/01/19 13:00			2023/01/19 10:40		
COC Number		914888-01-01			914888-01-01			914888-01-01		
	UNITS	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch	SW2	RDL	QC Batch

Calculated Parameters										
Anion Sum	me/L	0.320	N/A	8460111				0.380	N/A	8460111
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	3.3	1.0	8460106				5.8	1.0	8460106
Calculated TDS	mg/L	23	1.0	8460117				27	1.0	8460117
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8460106				<1.0	1.0	8460106
Cation Sum	me/L	0.360	N/A	8460111				0.470	N/A	8460111
Hardness (CaCO3)	mg/L	13	1.0	8460109				15	1.0	8460109
Ion Balance (% Difference)	%	5.88	N/A	8460110				10.6	N/A	8460110
Langelier Index (@ 20C)	N/A	-3.76		8460114				-3.11		8460114
Langelier Index (@ 4C)	N/A	-4.02		8460116				-3.36		8460116
Nitrate (N)	mg/L	<0.050	0.050	8460112				<0.050	0.050	8460112
Saturation pH (@ 20C)	N/A	10.1		8460114				9.88		8460114
Saturation pH (@ 4C)	N/A	10.4		8460116				10.1		8460116

Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	3.3	2.0	8466399				5.8	2.0	8466399
Dissolved Chloride (Cl-)	mg/L	2.4	1.0	8465944				4.1	1.0	8465944
Colour	TCU	86	25	8465937				45	5.0	8465937
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	8465935				<0.050	0.050	8465935
Nitrite (N)	mg/L	<0.010	0.010	8465643				<0.010	0.010	8465643
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	8467845	<0.050	0.050	8467845	<0.050	0.050	8467835
Total Organic Carbon (C)	mg/L	9.1	0.50	8467963				6.5	0.50	8467963
Orthophosphate (P)	mg/L	<0.010	0.010	8465936				<0.010	0.010	8465936
pH	pH	6.38		8466391				6.77		8466391
Reactive Silica (SiO2)	mg/L	2.7	0.50	8465942				2.9	0.50	8465942
Total Suspended Solids	mg/L	<1.0	1.0	8466206				2.8	1.0	8466206
Dissolved Sulphate (SO4)	mg/L	8.9	2.0	8465943				7.2	2.0	8465943
Turbidity	NTU	2.6	0.10	8467865				8.0	0.10	8467869
Conductivity	uS/cm	39	1.0	8466384				47	1.0	8466384

RDL = Reportable Detection Limit  
 QC Batch = Quality Control Batch  
 Lab-Dup = Laboratory Initiated Duplicate  
 N/A = Not Applicable



**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		UVW836		UVW837		UVW838		
Sampling Date		2023/01/19 10:00		2023/01/19 09:30		2023/01/19		
COC Number		914888-01-01		914888-01-01		914888-01-01		
	UNITS	SW3	QC Batch	SW4	QC Batch	SWDUP	RDL	QC Batch
<b>Calculated Parameters</b>								
Anion Sum	me/L	0.550	8460111	0.180	8460111	0.210	N/A	8460111
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	4.0	8460106	3.7	8460106	3.2	1.0	8460106
Calculated TDS	mg/L	39	8460117	16	8460117	17	1.0	8460117
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	8460106	<1.0	8460106	<1.0	1.0	8460106
Cation Sum	me/L	0.630	8460111	0.300	8460111	0.310	N/A	8460111
Hardness (CaCO3)	mg/L	23	8460109	7.5	8460109	7.8	1.0	8460109
Ion Balance (% Difference)	%	6.78	8460110	25.0	8460110	19.2	N/A	8460110
Langelier Index (@ 20C)	N/A	-3.17	8460114	-3.92	8460114	-3.97		8460114
Langelier Index (@ 4C)	N/A	-3.42	8460116	-4.17	8460116	-4.23		8460116
Nitrate (N)	mg/L	0.055	8460112	<0.050	8460112	<0.050	0.050	8460112
Saturation pH (@ 20C)	N/A	9.80	8460114	10.4	8460114	10.4		8460114
Saturation pH (@ 4C)	N/A	10.0	8460116	10.6	8460116	10.7		8460116
<b>Inorganics</b>								
Total Alkalinity (Total as CaCO3)	mg/L	4.0	8466399	3.7	8466399	3.2	2.0	8466399
Dissolved Chloride (Cl-)	mg/L	4.6	8465920	3.8	8465920	3.6	1.0	8465944
Colour	TCU	47	8465962	43	8465962	45	5.0	8465937
Nitrate + Nitrite (N)	mg/L	0.055	8465964	<0.050	8465964	<0.050	0.050	8465935
Nitrite (N)	mg/L	<0.010	8465965	<0.010	8465965	0.011	0.010	8465643
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	8467842	<0.050	8467842	0.059	0.050	8467845
Total Organic Carbon (C)	mg/L	6.6	8467963	6.2	8467963	6.2	0.50	8465605
Orthophosphate (P)	mg/L	<0.010	8465963	<0.010	8465963	<0.010	0.010	8465936
pH	pH	6.62	8466391	6.47	8466391	6.47		8466391
Reactive Silica (SiO2)	mg/L	2.6	8465961	3.5	8465961	3.1	0.50	8465942
Total Suspended Solids	mg/L	<1.0	8466206	<1.0	8466206	<1.0	1.0	8466206
Dissolved Sulphate (SO4)	mg/L	16	8465960	<2.0	8465960	2.1	2.0	8465943
Turbidity	NTU	4.7	8467869	2.7	8467865	3.0	0.10	8467869
Conductivity	uS/cm	68	8466384	31	8466384	31	1.0	8466384
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable								



**ELEMENTS BY ICP/MS (WATER)**

Bureau Veritas ID		UVW834	UVW835	UVW836	UVW837	UVW838		
Sampling Date		2023/01/19 13:00	2023/01/19 10:40	2023/01/19 10:00	2023/01/19 09:30	2023/01/19		
COC Number		914888-01-01	914888-01-01	914888-01-01	914888-01-01	914888-01-01		
	UNITS	SW1	SW2	SW3	SW4	SWDUP	RDL	QC Batch
<b>Metals</b>								
Total Aluminum (Al)	ug/L	220	490	280	310	310	5.0	8463731
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8463731
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8463731
Total Barium (Ba)	ug/L	4.9	8.4	8.3	7.6	7.7	1.0	8463731
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8463731
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8463731
Total Boron (B)	ug/L	<50	<50	<50	<50	<50	50	8463731
Total Cadmium (Cd)	ug/L	0.010	0.018	<0.010	0.015	0.014	0.010	8463731
Total Calcium (Ca)	ug/L	4200	4400	8100	2100	2100	100	8463731
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	8463731
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	8463731
Total Copper (Cu)	ug/L	<0.50	<0.50	0.70	0.51	0.52	0.50	8463731
Total Iron (Fe)	ug/L	230	470	230	190	190	50	8463731
Total Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	8463731
Total Magnesium (Mg)	ug/L	520	900	740	580	590	100	8463731
Total Manganese (Mn)	ug/L	17	28	6.8	18	17	2.0	8463731
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8463731
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8463731
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	<100	100	8463731
Total Potassium (K)	ug/L	220	370	310	150	160	100	8463731
Total Selenium (Se)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	8463731
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8463731
Total Sodium (Na)	ug/L	2200	3500	3600	3200	3300	100	8463731
Total Strontium (Sr)	ug/L	17	9.3	30	8.5	8.7	2.0	8463731
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8463731
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8463731
Total Titanium (Ti)	ug/L	7.2	14	6.1	6.6	6.0	2.0	8463731
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	8463731
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	8463731
Total Zinc (Zn)	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	8463731
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								



### GENERAL COMMENTS

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

Package 1	3.7°C
-----------	-------

Sample UVW834 [SW1] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample UVW835 [SW2] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample UVW836 [SW3] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample UVW837 [SW4] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample UVW838 [SWDUP] : NOX < NO2 : Both values fall within the method uncertainty for duplicates and are likely equivalent. RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

**Results relate only to the items tested.**





**QUALITY ASSURANCE REPORT**

QA/QC								
Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8463731	JHY	Matrix Spike	Total Aluminum (Al)	2023/01/23		106	%	80 - 120
			Total Antimony (Sb)	2023/01/23		103	%	80 - 120
			Total Arsenic (As)	2023/01/23		100	%	80 - 120
			Total Barium (Ba)	2023/01/23		96	%	80 - 120
			Total Beryllium (Be)	2023/01/23		102	%	80 - 120
			Total Bismuth (Bi)	2023/01/23		94	%	80 - 120
			Total Boron (B)	2023/01/23		106	%	80 - 120
			Total Cadmium (Cd)	2023/01/23		102	%	80 - 120
			Total Calcium (Ca)	2023/01/23		NC	%	80 - 120
			Total Chromium (Cr)	2023/01/23		97	%	80 - 120
			Total Cobalt (Co)	2023/01/23		98	%	80 - 120
			Total Copper (Cu)	2023/01/23		96	%	80 - 120
			Total Iron (Fe)	2023/01/23		104	%	80 - 120
			Total Lead (Pb)	2023/01/23		96	%	80 - 120
			Total Magnesium (Mg)	2023/01/23		102	%	80 - 120
			Total Manganese (Mn)	2023/01/23		100	%	80 - 120
			Total Molybdenum (Mo)	2023/01/23		112	%	80 - 120
			Total Nickel (Ni)	2023/01/23		98	%	80 - 120
			Total Phosphorus (P)	2023/01/23		107	%	80 - 120
			Total Potassium (K)	2023/01/23		NC	%	80 - 120
			Total Selenium (Se)	2023/01/23		105	%	80 - 120
			Total Silver (Ag)	2023/01/23		99	%	80 - 120
			Total Sodium (Na)	2023/01/23		NC	%	80 - 120
			Total Strontium (Sr)	2023/01/23		NC	%	80 - 120
			Total Thallium (Tl)	2023/01/23		100	%	80 - 120
			Total Tin (Sn)	2023/01/23		101	%	80 - 120
			Total Titanium (Ti)	2023/01/23		104	%	80 - 120
			Total Uranium (U)	2023/01/23		106	%	80 - 120
			Total Vanadium (V)	2023/01/23		101	%	80 - 120
			Total Zinc (Zn)	2023/01/23		100	%	80 - 120
			8463731	JHY	Spiked Blank	Total Aluminum (Al)	2023/01/23	
Total Antimony (Sb)	2023/01/23					100	%	80 - 120
Total Arsenic (As)	2023/01/23					97	%	80 - 120
Total Barium (Ba)	2023/01/23					96	%	80 - 120
Total Beryllium (Be)	2023/01/23					99	%	80 - 120
Total Bismuth (Bi)	2023/01/23					101	%	80 - 120
Total Boron (B)	2023/01/23					102	%	80 - 120
Total Cadmium (Cd)	2023/01/23					100	%	80 - 120
Total Calcium (Ca)	2023/01/23					104	%	80 - 120
Total Chromium (Cr)	2023/01/23					100	%	80 - 120
Total Cobalt (Co)	2023/01/23					101	%	80 - 120
Total Copper (Cu)	2023/01/23					101	%	80 - 120
Total Iron (Fe)	2023/01/23					107	%	80 - 120
Total Lead (Pb)	2023/01/23					98	%	80 - 120
Total Magnesium (Mg)	2023/01/23					106	%	80 - 120
Total Manganese (Mn)	2023/01/23					104	%	80 - 120
Total Molybdenum (Mo)	2023/01/23					106	%	80 - 120
Total Nickel (Ni)	2023/01/23		102	%	80 - 120			
Total Phosphorus (P)	2023/01/23		106	%	80 - 120			
Total Potassium (K)	2023/01/23		105	%	80 - 120			
Total Selenium (Se)	2023/01/23		104	%	80 - 120			
Total Silver (Ag)	2023/01/23		101	%	80 - 120			



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2023/01/23		105	%	80 - 120
			Total Strontium (Sr)	2023/01/23		99	%	80 - 120
			Total Thallium (Tl)	2023/01/23		101	%	80 - 120
			Total Tin (Sn)	2023/01/23		100	%	80 - 120
			Total Titanium (Ti)	2023/01/23		105	%	80 - 120
			Total Uranium (U)	2023/01/23		104	%	80 - 120
			Total Vanadium (V)	2023/01/23		101	%	80 - 120
			Total Zinc (Zn)	2023/01/23		105	%	80 - 120
8463731	JHY	Method Blank	Total Aluminum (Al)	2023/01/23	<5.0		ug/L	
			Total Antimony (Sb)	2023/01/23	<1.0		ug/L	
			Total Arsenic (As)	2023/01/23	<1.0		ug/L	
			Total Barium (Ba)	2023/01/23	<1.0		ug/L	
			Total Beryllium (Be)	2023/01/23	<0.10		ug/L	
			Total Bismuth (Bi)	2023/01/23	<2.0		ug/L	
			Total Boron (B)	2023/01/23	<50		ug/L	
			Total Cadmium (Cd)	2023/01/23	<0.010		ug/L	
			Total Calcium (Ca)	2023/01/23	<100		ug/L	
			Total Chromium (Cr)	2023/01/23	<1.0		ug/L	
			Total Cobalt (Co)	2023/01/23	<0.40		ug/L	
			Total Copper (Cu)	2023/01/23	<0.50		ug/L	
			Total Iron (Fe)	2023/01/23	<50		ug/L	
			Total Lead (Pb)	2023/01/23	<0.50		ug/L	
			Total Magnesium (Mg)	2023/01/23	<100		ug/L	
			Total Manganese (Mn)	2023/01/23	<2.0		ug/L	
			Total Molybdenum (Mo)	2023/01/23	<2.0		ug/L	
			Total Nickel (Ni)	2023/01/23	<2.0		ug/L	
			Total Phosphorus (P)	2023/01/23	<100		ug/L	
			Total Potassium (K)	2023/01/23	<100		ug/L	
			Total Selenium (Se)	2023/01/23	<0.50		ug/L	
			Total Silver (Ag)	2023/01/23	<0.10		ug/L	
			Total Sodium (Na)	2023/01/23	<100		ug/L	
			Total Strontium (Sr)	2023/01/23	<2.0		ug/L	
			Total Thallium (Tl)	2023/01/23	<0.10		ug/L	
			Total Tin (Sn)	2023/01/23	<2.0		ug/L	
			Total Titanium (Ti)	2023/01/23	<2.0		ug/L	
			Total Uranium (U)	2023/01/23	<0.10		ug/L	
			Total Vanadium (V)	2023/01/23	<2.0		ug/L	
			Total Zinc (Zn)	2023/01/23	<5.0		ug/L	
8463731	JHY	RPD	Total Aluminum (Al)	2023/01/23	5.1		%	20
			Total Antimony (Sb)	2023/01/23	NC		%	20
			Total Arsenic (As)	2023/01/23	NC		%	20
			Total Barium (Ba)	2023/01/23	0.20		%	20
			Total Beryllium (Be)	2023/01/23	NC		%	20
			Total Bismuth (Bi)	2023/01/23	NC		%	20
			Total Boron (B)	2023/01/23	2.1		%	20
			Total Cadmium (Cd)	2023/01/23	NC		%	20
			Total Calcium (Ca)	2023/01/23	0.19		%	20
			Total Chromium (Cr)	2023/01/23	NC		%	20
			Total Cobalt (Co)	2023/01/23	0.57		%	20
			Total Copper (Cu)	2023/01/23	7.4		%	20
			Total Iron (Fe)	2023/01/23	2.0		%	20
			Total Lead (Pb)	2023/01/23	NC		%	20



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Magnesium (Mg)	2023/01/23	3.0		%	20
			Total Manganese (Mn)	2023/01/23	1.9		%	20
			Total Molybdenum (Mo)	2023/01/23	2.2		%	20
			Total Nickel (Ni)	2023/01/23	0.82		%	20
			Total Phosphorus (P)	2023/01/23	NC		%	20
			Total Potassium (K)	2023/01/23	1.5		%	20
			Total Selenium (Se)	2023/01/23	3.9		%	20
			Total Silver (Ag)	2023/01/23	NC		%	20
			Total Sodium (Na)	2023/01/23	2.2		%	20
			Total Strontium (Sr)	2023/01/23	1.3		%	20
			Total Thallium (Tl)	2023/01/23	NC		%	20
			Total Tin (Sn)	2023/01/23	NC		%	20
			Total Titanium (Ti)	2023/01/23	11		%	20
			Total Uranium (U)	2023/01/23	NC		%	20
			Total Vanadium (V)	2023/01/23	NC		%	20
			Total Zinc (Zn)	2023/01/23	NC		%	20
8465605	SSI	Matrix Spike	Total Organic Carbon (C)	2023/01/24		100	%	85 - 115
8465605	SSI	Spiked Blank	Total Organic Carbon (C)	2023/01/24		99	%	80 - 120
8465605	SSI	Method Blank	Total Organic Carbon (C)	2023/01/24	<0.50		mg/L	
8465605	SSI	RPD	Total Organic Carbon (C)	2023/01/24	3.7		%	15
8465643	TGO	Matrix Spike	Nitrite (N)	2023/01/24		103	%	80 - 120
8465643	TGO	Spiked Blank	Nitrite (N)	2023/01/24		102	%	80 - 120
8465643	TGO	Method Blank	Nitrite (N)	2023/01/24	<0.010		mg/L	
8465643	TGO	RPD	Nitrite (N)	2023/01/24	NC		%	20
8465920	TGO	Matrix Spike	Dissolved Chloride (Cl-)	2023/01/24		NC	%	80 - 120
8465920	TGO	Spiked Blank	Dissolved Chloride (Cl-)	2023/01/24		92	%	80 - 120
8465920	TGO	Method Blank	Dissolved Chloride (Cl-)	2023/01/24	<1.0		mg/L	
8465920	TGO	RPD	Dissolved Chloride (Cl-)	2023/01/24	0.32		%	20
8465935	TGO	Matrix Spike	Nitrate + Nitrite (N)	2023/01/24		92	%	80 - 120
8465935	TGO	Spiked Blank	Nitrate + Nitrite (N)	2023/01/24		95	%	80 - 120
8465935	TGO	Method Blank	Nitrate + Nitrite (N)	2023/01/24	<0.050		mg/L	
8465935	TGO	RPD	Nitrate + Nitrite (N)	2023/01/24	NC		%	20
8465936	TGO	Matrix Spike	Orthophosphate (P)	2023/01/25		92	%	80 - 120
8465936	TGO	Spiked Blank	Orthophosphate (P)	2023/01/25		93	%	80 - 120
8465936	TGO	Method Blank	Orthophosphate (P)	2023/01/25	<0.010		mg/L	
8465936	TGO	RPD	Orthophosphate (P)	2023/01/25	NC		%	20
8465937	TGO	Spiked Blank	Colour	2023/01/25		97	%	80 - 120
8465937	TGO	Method Blank	Colour	2023/01/25	<5.0		TCU	
8465937	TGO	RPD	Colour	2023/01/25	9.8		%	20
8465942	TGO	Matrix Spike	Reactive Silica (SiO2)	2023/01/25		82	%	80 - 120
8465942	TGO	Spiked Blank	Reactive Silica (SiO2)	2023/01/25		87	%	80 - 120
8465942	TGO	Method Blank	Reactive Silica (SiO2)	2023/01/25	<0.50		mg/L	
8465942	TGO	RPD	Reactive Silica (SiO2)	2023/01/25	NC		%	20
8465943	TGO	Matrix Spike	Dissolved Sulphate (SO4)	2023/01/24		NC	%	80 - 120
8465943	TGO	Spiked Blank	Dissolved Sulphate (SO4)	2023/01/24		105	%	80 - 120
8465943	TGO	Method Blank	Dissolved Sulphate (SO4)	2023/01/24	<2.0		mg/L	
8465943	TGO	RPD	Dissolved Sulphate (SO4)	2023/01/24	1.4		%	20
8465944	TGO	Matrix Spike	Dissolved Chloride (Cl-)	2023/01/24		NC	%	80 - 120
8465944	TGO	Spiked Blank	Dissolved Chloride (Cl-)	2023/01/24		94	%	80 - 120
8465944	TGO	Method Blank	Dissolved Chloride (Cl-)	2023/01/24	<1.0		mg/L	
8465944	TGO	RPD	Dissolved Chloride (Cl-)	2023/01/24	2.6		%	20
8465960	TGO	Matrix Spike	Dissolved Sulphate (SO4)	2023/01/24		NC	%	80 - 120



### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8465960	TGO	Spiked Blank	Dissolved Sulphate (SO4)	2023/01/24		99	%	80 - 120
8465960	TGO	Method Blank	Dissolved Sulphate (SO4)	2023/01/24	<2.0		mg/L	
8465960	TGO	RPD	Dissolved Sulphate (SO4)	2023/01/24	0.93		%	20
8465961	TGO	Matrix Spike	Reactive Silica (SiO2)	2023/01/25		84	%	80 - 120
8465961	TGO	Spiked Blank	Reactive Silica (SiO2)	2023/01/25		88	%	80 - 120
8465961	TGO	Method Blank	Reactive Silica (SiO2)	2023/01/25	<0.50		mg/L	
8465961	TGO	RPD	Reactive Silica (SiO2)	2023/01/25	0.76		%	20
8465962	TGO	Spiked Blank	Colour	2023/01/25		95	%	80 - 120
8465962	TGO	Method Blank	Colour	2023/01/25	<5.0		TCU	
8465962	TGO	RPD	Colour	2023/01/25	NC		%	20
8465963	TGO	Matrix Spike	Orthophosphate (P)	2023/01/25		95	%	80 - 120
8465963	TGO	Spiked Blank	Orthophosphate (P)	2023/01/25		91	%	80 - 120
8465963	TGO	Method Blank	Orthophosphate (P)	2023/01/25	<0.010		mg/L	
8465963	TGO	RPD	Orthophosphate (P)	2023/01/25	NC		%	20
8465964	TGO	Matrix Spike	Nitrate + Nitrite (N)	2023/01/24		99	%	80 - 120
8465964	TGO	Spiked Blank	Nitrate + Nitrite (N)	2023/01/24		92	%	80 - 120
8465964	TGO	Method Blank	Nitrate + Nitrite (N)	2023/01/24	<0.050		mg/L	
8465964	TGO	RPD	Nitrate + Nitrite (N)	2023/01/24	2.1		%	20
8465965	TGO	Matrix Spike	Nitrite (N)	2023/01/24		95	%	80 - 120
8465965	TGO	Spiked Blank	Nitrite (N)	2023/01/24		101	%	80 - 120
8465965	TGO	Method Blank	Nitrite (N)	2023/01/24	<0.010		mg/L	
8465965	TGO	RPD	Nitrite (N)	2023/01/24	NC		%	20
8466206	RMK	QC Standard	Total Suspended Solids	2023/01/26		96	%	80 - 120
8466206	RMK	Method Blank	Total Suspended Solids	2023/01/26	<1.0		mg/L	
8466206	RMK	RPD	Total Suspended Solids	2023/01/26	1.8		%	20
8466384	NGI	Spiked Blank	Conductivity	2023/01/25		104	%	80 - 120
8466384	NGI	Method Blank	Conductivity	2023/01/25	1.2, RDL=1.0		uS/cm	
8466384	NGI	RPD	Conductivity	2023/01/25	1.1		%	10
8466391	NGI	Spiked Blank	pH	2023/01/25		100	%	97 - 103
8466391	NGI	RPD	pH	2023/01/25	0.60		%	N/A
8466399	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2023/01/25		96	%	80 - 120
8466399	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2023/01/25	<2.0		mg/L	
8466399	NGI	RPD	Total Alkalinity (Total as CaCO3)	2023/01/25	0.68		%	20
8467835	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2023/01/25		94	%	80 - 120
8467835	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25		97	%	80 - 120
8467835	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25	<0.050		mg/L	
8467835	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2023/01/25	NC		%	20
8467842	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2023/01/25		92	%	80 - 120
8467842	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25		91	%	80 - 120
8467842	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25	<0.050		mg/L	
8467842	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2023/01/25	NC		%	20
8467845	TGO	Matrix Spike [UVW834-03]	Nitrogen (Ammonia Nitrogen)	2023/01/25		93	%	80 - 120
8467845	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25		91	%	80 - 120
8467845	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2023/01/25	<0.050		mg/L	
8467845	TGO	RPD [UVW834-03]	Nitrogen (Ammonia Nitrogen)	2023/01/25	NC		%	20
8467865	AA0	QC Standard	Turbidity	2023/01/25		108	%	80 - 120
8467865	AA0	Spiked Blank	Turbidity	2023/01/25		101	%	80 - 120
8467865	AA0	Method Blank	Turbidity	2023/01/25	<0.10		NTU	
8467865	AA0	RPD	Turbidity	2023/01/25	2.2		%	20
8467869	AA0	QC Standard	Turbidity	2023/01/25		111	%	80 - 120



### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8467869	AA0	Spiked Blank	Turbidity	2023/01/25		101	%	80 - 120
8467869	AA0	Method Blank	Turbidity	2023/01/25	<0.10		NTU	
8467869	AA0	RPD	Turbidity	2023/01/25	2.1		%	20
8467963	CPP	Matrix Spike	Total Organic Carbon (C)	2023/01/25		99	%	85 - 115
8467963	CPP	Spiked Blank	Total Organic Carbon (C)	2023/01/25		98	%	80 - 120
8467963	CPP	Method Blank	Total Organic Carbon (C)	2023/01/25	<0.50		mg/L	
8467963	CPP	RPD	Total Organic Carbon (C)	2023/01/25	5.0		%	15

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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



Bureau Veritas Job #: C318877  
Report Date: 2023/01/27

GHD Limited  
Client Project #: 12601021  
Site Location: Antrium Gypsum Project  
Your P.O. #: 735-005520  
Sampler Initials: JV

### VALIDATION SIGNATURE PAGE

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

---

Mike MacGillivray, Scientific Specialist (Inorganics)



---

Automated Statchk

---

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



INVOICE TO:		Report Information				Project Information				Laboratory Use Only		
Company Name	#16276 GHD Limited	Company Name	Callie Andrews			Quotation #	C30069			Bureau Veritas Job #	Bottle Order #:	
Contact Name	Accounts Payable	Contact Name	Callie Andrews			P.O #	735-205520			914888	Chain Of Custody Record	
Address	120 Western Parkway Bedford NS B4B 0V2	Address				Project #	12574778-05 12601021					
Phone	(902) 468-1248 Fax: (902) 468-2207	Phone				Project Name	ANIRIA BASELINE			Project Manager	Marie Muise	
Email	AccountsPayableCDN@ghd.com	Email	callie.andrews@ghd.com			Site #				C#914888-01-01		
						Sampled By	J VENEZ, M FRASER					
Regulatory Criteria	Special Instructions				ANALYSIS REQUESTED (PLEASE BE SPECIFIC)						Turnaround Time (TAT) Required:	
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal					Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Total Suspended Solids	Please provide advance notice for rush projects			
SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS												
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix							# of Bottles	Comments / Hazards / Other Required Analysis
1	SW1	19 JAN 23	9:13:00	WATER	X	X					4	
2	SW2		10:40		X	X					4	
3	SW3		10:00		X	X					4	
4	SW4		9:30		X	X					4	
5	SWDUP				X	X					4	
6												
7												
8												
9												
10												
* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only			
J VENEZ		23/01/19	17:30	Callie Andrews					Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?	
									<input type="checkbox"/>	4 3 4	<input type="checkbox"/> Yes <input type="checkbox"/> No	
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.										White: Bureau Veritas Yellow: Client		
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.												

C318877



Your P.O. #: 735-004150  
 Your Project #: 12574778-03  
 Your C.O.C. #: 894298-01-01

**Attention: Callie Andrews**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2022/10/25**  
 Report #: R7356361  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C2T4381**

**Received: 2022/10/05, 14:57**

Sample Matrix: Water  
 # Samples Received: 4

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	3	N/A	2022/10/17	N/A	SM 23 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	1	N/A	2022/10/19	N/A	SM 23 4500-CO2 D
Alkalinity	3	N/A	2022/10/17	ATL SOP 00142	SM 23 2320 B
Alkalinity	1	N/A	2022/10/18	ATL SOP 00142	SM 23 2320 B
Chloride	4	N/A	2022/10/23	ATL SOP 00014	SM 23 4500-Cl- E m
Colour	4	N/A	2022/10/24	ATL SOP 00020	SM 23 2120C m
Conductance - water	3	N/A	2022/10/17	ATL SOP 00004	SM 23 2510B m
Conductance - water	1	N/A	2022/10/18	ATL SOP 00004	SM 23 2510B m
Hardness (calculated as CaCO3)	4	N/A	2022/10/21	ATL SOP 00048	Auto Calc
Metals Water Total MS	4	2022/10/18	2022/10/20	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	4	N/A	2022/10/24	N/A	Auto Calc.
Anion and Cation Sum	4	N/A	2022/10/21	N/A	Auto Calc.
Nitrogen Ammonia - water	4	N/A	2022/10/17	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	4	N/A	2022/10/24	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	4	N/A	2022/10/22	ATL SOP 00017	SM 23 4500-NO2- B m
Nitrogen - Nitrate (as N)	4	N/A	2022/10/24	ATL SOP 00018	ASTM D3867-16
pH (1)	3	N/A	2022/10/17	ATL SOP 00003	SM 23 4500-H+ B m
pH (1)	1	N/A	2022/10/18	ATL SOP 00003	SM 23 4500-H+ B m
Phosphorus - ortho	4	N/A	2022/10/24	ATL SOP 00021	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2022/10/21	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	3	N/A	2022/10/24	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2022/10/21	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2022/10/24	ATL SOP 00049	Auto Calc.
Reactive Silica	4	N/A	2022/10/22	ATL SOP 00022	EPA 366.0 m
Sulphate	4	N/A	2022/10/22	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	4	N/A	2022/10/24	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	3	N/A	2022/10/14	ATL SOP 00203	SM 23 5310B m
Organic carbon - Total (TOC) (2)	1	N/A	2022/10/15	ATL SOP 00203	SM 23 5310B m
Total Suspended Solids	4	2022/10/12	2022/10/17	ATL SOP 00007	SM 23 2540D m
Turbidity	3	N/A	2022/10/19	ATL SOP 00011	EPA 180.1 R2 m
Turbidity	1	N/A	2022/10/21	ATL SOP 00011	EPA 180.1 R2 m





Your P.O. #: 735-004150  
Your Project #: 12574778-03  
Your C.O.C. #: 894298-01-01

**Attention: Callie Andrews**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2022/10/25**  
Report #: R7356361  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C2T4381**

**Received: 2022/10/05, 14:57**

**Remarks:**

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

=====

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

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



**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		TYX988		TYX989			TYX990		
Sampling Date		2022/10/05 13:00		2022/10/05 11:30			2022/10/05 10:00		
COC Number		894298-01-01		894298-01-01			894298-01-01		
	<b>UNITS</b>	<b>SW1</b>	<b>QC Batch</b>	<b>SW2</b>	<b>RDL</b>	<b>QC Batch</b>	<b>SW3</b>	<b>RDL</b>	<b>QC Batch</b>

Calculated Parameters									
Anion Sum	me/L	0.780	8275123	1.23	N/A	8275123	2.52	N/A	8275123
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	8275120	3.9	1.0	8275120	24	1.0	8275120
Calculated TDS	mg/L	60	8275129	87	1.0	8275129	160	1.0	8275129
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	8275120	<1.0	1.0	8275120	<1.0	1.0	8275120
Cation Sum	me/L	1.00	8275123	1.34	N/A	8275123	2.35	N/A	8275123
Hardness (CaCO3)	mg/L	42	8275121	55	1.0	8275121	110	1.0	8275121
Ion Balance (% Difference)	%	12.4	8275122	4.28	N/A	8275122	3.49	N/A	8275122
Langelier Index (@ 20C)	N/A	NC	8275127	-2.89		8275127	-1.18		8275127
Langelier Index (@ 4C)	N/A	NC	8275128	-3.14		8275128	-1.43		8275128
Nitrate (N)	mg/L	<0.050	8275124	<0.050	0.050	8275124	<0.050	0.050	8275124
Saturation pH (@ 20C)	N/A	NC	8275127	9.50		8275127	8.39		8275127
Saturation pH (@ 4C)	N/A	NC	8275128	9.75		8275128	8.65		8275128

Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	<2.0	8286598	3.9	2.0	8286598	24	2.0	8289828
Dissolved Chloride (Cl-)	mg/L	5.5	8298338	7.8	1.0	8298338	8.6	1.0	8298338
Colour	TCU	200	8298348	52	25	8298348	48 (1)	10	8298348
Nitrate + Nitrite (N)	mg/L	<0.050	8298409	<0.050	0.050	8298409	<0.050	0.050	8298409
Nitrite (N)	mg/L	<0.010	8298414	<0.010	0.010	8298414	<0.010	0.010	8298414
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	8286822	<0.050	0.050	8286822	<0.050	0.050	8286822
Total Organic Carbon (C)	mg/L	24	8283616	11	0.50	8282758	10	0.50	8282758
Orthophosphate (P)	mg/L	<0.010	8298397	<0.010	0.010	8298397	<0.010	0.010	8298397
pH	pH	6.79	8286597	6.62		8286597	7.22		8289827
Reactive Silica (SiO2)	mg/L	4.1	8298347	5.4	0.50	8298347	2.9	0.50	8298347
Total Suspended Solids	mg/L	8.0	8277642	2.4	2.0	8277642	<1.0	1.0	8277642
Dissolved Sulphate (SO4)	mg/L	30	8298346	45	2.0	8298346	86	2.0	8298346
Turbidity	NTU	1.8	8292230	1.9	0.10	8292230	0.39	0.10	8296013
Conductivity	uS/cm	110	8286592	140	1.0	8286592	390	1.0	8289823

RDL = Reportable Detection Limit  
 QC Batch = Quality Control Batch  
 N/A = Not Applicable

(1) Elevated reporting limit due to sample matrix.



### RESULTS OF ANALYSES OF WATER

<b>Bureau Veritas ID</b>		TYX991		
<b>Sampling Date</b>		2022/10/05 09:45		
<b>COC Number</b>		894298-01-01		
	<b>UNITS</b>	<b>SW4</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Calculated Parameters</b>				
Anion Sum	me/L	0.790	N/A	8275123
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16	1.0	8275120
Calculated TDS	mg/L	50	1.0	8275129
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8275120
Cation Sum	me/L	0.760	N/A	8275123
Hardness (CaCO3)	mg/L	25	1.0	8275121
Ion Balance (% Difference)	%	1.94	N/A	8275122
Langelier Index (@ 20C)	N/A	-2.08		8275127
Langelier Index (@ 4C)	N/A	-2.33		8275128
Nitrate (N)	mg/L	<0.050	0.050	8275124
Saturation pH (@ 20C)	N/A	9.25		8275127
Saturation pH (@ 4C)	N/A	9.50		8275128
<b>Inorganics</b>				
Total Alkalinity (Total as CaCO3)	mg/L	16	2.0	8286598
Dissolved Chloride (Cl-)	mg/L	8.2	1.0	8298338
Colour	TCU	58	25	8298348
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	8298409
Nitrite (N)	mg/L	<0.010	0.010	8298414
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	8286822
Total Organic Carbon (C)	mg/L	8.3	0.50	8282758
Orthophosphate (P)	mg/L	<0.010	0.010	8298397
pH	pH	7.17		8286597
Reactive Silica (SiO2)	mg/L	4.8	0.50	8298347
Total Suspended Solids	mg/L	1.4	1.0	8277642
Dissolved Sulphate (SO4)	mg/L	12	2.0	8298346
Turbidity	NTU	1.4	0.10	8292230
Conductivity	uS/cm	75	1.0	8286592
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable				



**ELEMENTS BY ICP/MS (WATER)**

Bureau Veritas ID		TYX988	TYX989	TYX990	TYX991		
Sampling Date		2022/10/05 13:00	2022/10/05 11:30	2022/10/05 10:00	2022/10/05 09:45		
COC Number		894298-01-01	894298-01-01	894298-01-01	894298-01-01		
	UNITS	SW1	SW2	SW3	SW4	RDL	QC Batch
<b>Metals</b>							
Total Aluminum (Al)	ug/L	350	190	69	140	5.0	8289817
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Barium (Ba)	ug/L	12	30	16	15	1.0	8289817
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Boron (B)	ug/L	<50	<50	<50	<50	50	8289817
Total Cadmium (Cd)	ug/L	0.022	0.044	<0.010	<0.010	0.010	8289817
Total Calcium (Ca)	ug/L	15000	18000	39000	7300	100	8289817
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	8289817
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	8289817
Total Copper (Cu)	ug/L	0.74	0.87	<0.50	0.99	0.50	8289817
Total Iron (Fe)	ug/L	760	290	210	430	50	8289817
Total Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	8289817
Total Magnesium (Mg)	ug/L	1300	2500	1800	1700	100	8289817
Total Manganese (Mn)	ug/L	110	180	66	140	2.0	8289817
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	100	8289817
Total Potassium (K)	ug/L	470	880	700	370	100	8289817
Total Selenium (Se)	ug/L	<0.50	<0.50	<0.50	<0.50	0.50	8289817
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Sodium (Na)	ug/L	3000	4900	4800	5400	100	8289817
Total Strontium (Sr)	ug/L	52	40	160	40	2.0	8289817
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Titanium (Ti)	ug/L	5.0	4.4	2.3	3.3	2.0	8289817
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	8289817
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	2.0	8289817
Total Zinc (Zn)	ug/L	5.6	9.0	<5.0	<5.0	5.0	8289817
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							



Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### GENERAL COMMENTS

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

Package 1	13.0°C
-----------	--------

Sample TYX988 [SW1] : Poor RCap Ion Balance due to sample matrix. Anion sum does not include contribution from Total Organic Carbon.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8277642	RMK	QC Standard	Total Suspended Solids	2022/10/17		97	%	80 - 120
8277642	RMK	Method Blank	Total Suspended Solids	2022/10/17	<1.0		mg/L	
8277642	RMK	RPD	Total Suspended Solids	2022/10/17	2.6		%	20
8282758	RSL	Matrix Spike	Total Organic Carbon (C)	2022/10/14		93	%	85 - 115
8282758	RSL	Spiked Blank	Total Organic Carbon (C)	2022/10/14		99	%	80 - 120
8282758	RSL	Method Blank	Total Organic Carbon (C)	2022/10/14	<0.50		mg/L	
8282758	RSL	RPD	Total Organic Carbon (C)	2022/10/14	0.48		%	15
8283616	RSL	Matrix Spike	Total Organic Carbon (C)	2022/10/15		104	%	85 - 115
8283616	RSL	Spiked Blank	Total Organic Carbon (C)	2022/10/14		98	%	80 - 120
8283616	RSL	Method Blank	Total Organic Carbon (C)	2022/10/14	<0.50		mg/L	
8283616	RSL	RPD	Total Organic Carbon (C)	2022/10/15	12		%	15
8286592	NGI	Spiked Blank	Conductivity	2022/10/17		101	%	80 - 120
8286592	NGI	Method Blank	Conductivity	2022/10/17	<1.0		uS/cm	
8286592	NGI	RPD	Conductivity	2022/10/17	4.8		%	10
8286597	NGI	Spiked Blank	pH	2022/10/17		100	%	97 - 103
8286597	NGI	RPD	pH	2022/10/17	0.58		%	N/A
8286598	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2022/10/17		105	%	80 - 120
8286598	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2022/10/17	<2.0		mg/L	
8286598	NGI	RPD	Total Alkalinity (Total as CaCO3)	2022/10/17	1.9		%	20
8286822	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2022/10/17		NC	%	80 - 120
8286822	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2022/10/17		100	%	80 - 120
8286822	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2022/10/17	<0.050		mg/L	
8286822	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2022/10/17	0.47		%	20
8289817	JHY	Matrix Spike	Total Aluminum (Al)	2022/10/19		99	%	80 - 120
			Total Antimony (Sb)	2022/10/19		100	%	80 - 120
			Total Arsenic (As)	2022/10/19		94	%	80 - 120
			Total Barium (Ba)	2022/10/19		96	%	80 - 120
			Total Beryllium (Be)	2022/10/19		96	%	80 - 120
			Total Bismuth (Bi)	2022/10/19		97	%	80 - 120
			Total Boron (B)	2022/10/19		98	%	80 - 120
			Total Cadmium (Cd)	2022/10/19		98	%	80 - 120
			Total Calcium (Ca)	2022/10/19		100	%	80 - 120
			Total Chromium (Cr)	2022/10/19		96	%	80 - 120
			Total Cobalt (Co)	2022/10/19		98	%	80 - 120
			Total Copper (Cu)	2022/10/19		97	%	80 - 120
			Total Iron (Fe)	2022/10/19		101	%	80 - 120
			Total Lead (Pb)	2022/10/19		97	%	80 - 120
			Total Magnesium (Mg)	2022/10/19		103	%	80 - 120
			Total Manganese (Mn)	2022/10/19		99	%	80 - 120
			Total Molybdenum (Mo)	2022/10/19		102	%	80 - 120
			Total Nickel (Ni)	2022/10/19		98	%	80 - 120
			Total Phosphorus (P)	2022/10/19		102	%	80 - 120
			Total Potassium (K)	2022/10/19		100	%	80 - 120
			Total Selenium (Se)	2022/10/19		99	%	80 - 120
			Total Silver (Ag)	2022/10/19		97	%	80 - 120
			Total Sodium (Na)	2022/10/19		103	%	80 - 120
			Total Strontium (Sr)	2022/10/19		NC	%	80 - 120
			Total Thallium (Tl)	2022/10/19		99	%	80 - 120
			Total Tin (Sn)	2022/10/19		99	%	80 - 120
			Total Titanium (Ti)	2022/10/19		97	%	80 - 120
			Total Uranium (U)	2022/10/19		101	%	80 - 120
			Total Vanadium (V)	2022/10/19		98	%	80 - 120
			Total Zinc (Zn)	2022/10/19		98	%	80 - 120
8289817	JHY	Spiked Blank	Total Aluminum (Al)	2022/10/19		100	%	80 - 120



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381

Report Date: 2022/10/25

GHD Limited

Client Project #: 12574778-03

Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Antimony (Sb)	2022/10/19		97	%	80 - 120
			Total Arsenic (As)	2022/10/19		90	%	80 - 120
			Total Barium (Ba)	2022/10/19		92	%	80 - 120
			Total Beryllium (Be)	2022/10/19		93	%	80 - 120
			Total Bismuth (Bi)	2022/10/19		95	%	80 - 120
			Total Boron (B)	2022/10/19		97	%	80 - 120
			Total Cadmium (Cd)	2022/10/19		96	%	80 - 120
			Total Calcium (Ca)	2022/10/19		98	%	80 - 120
			Total Chromium (Cr)	2022/10/19		93	%	80 - 120
			Total Cobalt (Co)	2022/10/19		95	%	80 - 120
			Total Copper (Cu)	2022/10/19		95	%	80 - 120
			Total Iron (Fe)	2022/10/19		101	%	80 - 120
			Total Lead (Pb)	2022/10/19		94	%	80 - 120
			Total Magnesium (Mg)	2022/10/19		102	%	80 - 120
			Total Manganese (Mn)	2022/10/19		97	%	80 - 120
			Total Molybdenum (Mo)	2022/10/19		99	%	80 - 120
			Total Nickel (Ni)	2022/10/19		96	%	80 - 120
			Total Phosphorus (P)	2022/10/19		99	%	80 - 120
			Total Potassium (K)	2022/10/19		99	%	80 - 120
			Total Selenium (Se)	2022/10/19		94	%	80 - 120
			Total Silver (Ag)	2022/10/19		93	%	80 - 120
			Total Sodium (Na)	2022/10/19		102	%	80 - 120
			Total Strontium (Sr)	2022/10/19		91	%	80 - 120
			Total Thallium (Tl)	2022/10/19		98	%	80 - 120
			Total Tin (Sn)	2022/10/19		96	%	80 - 120
			Total Titanium (Ti)	2022/10/19		97	%	80 - 120
			Total Uranium (U)	2022/10/19		97	%	80 - 120
			Total Vanadium (V)	2022/10/19		95	%	80 - 120
			Total Zinc (Zn)	2022/10/19		97	%	80 - 120
8289817	JHY	Method Blank	Total Aluminum (Al)	2022/10/19	<5.0		ug/L	
			Total Antimony (Sb)	2022/10/19	<1.0		ug/L	
			Total Arsenic (As)	2022/10/19	<1.0		ug/L	
			Total Barium (Ba)	2022/10/19	<1.0		ug/L	
			Total Beryllium (Be)	2022/10/19	<0.10		ug/L	
			Total Bismuth (Bi)	2022/10/19	<2.0		ug/L	
			Total Boron (B)	2022/10/19	<50		ug/L	
			Total Cadmium (Cd)	2022/10/19	<0.010		ug/L	
			Total Calcium (Ca)	2022/10/19	<100		ug/L	
			Total Chromium (Cr)	2022/10/19	<1.0		ug/L	
			Total Cobalt (Co)	2022/10/19	<0.40		ug/L	
			Total Copper (Cu)	2022/10/19	<0.50		ug/L	
			Total Iron (Fe)	2022/10/19	<50		ug/L	
			Total Lead (Pb)	2022/10/19	<0.50		ug/L	
			Total Magnesium (Mg)	2022/10/19	<100		ug/L	
			Total Manganese (Mn)	2022/10/19	<2.0		ug/L	
			Total Molybdenum (Mo)	2022/10/19	<2.0		ug/L	
			Total Nickel (Ni)	2022/10/19	<2.0		ug/L	
			Total Phosphorus (P)	2022/10/19	<100		ug/L	
			Total Potassium (K)	2022/10/19	<100		ug/L	
			Total Selenium (Se)	2022/10/19	<0.50		ug/L	
			Total Silver (Ag)	2022/10/19	<0.10		ug/L	
			Total Sodium (Na)	2022/10/19	<100		ug/L	
			Total Strontium (Sr)	2022/10/19	<2.0		ug/L	
			Total Thallium (Tl)	2022/10/19	<0.10		ug/L	



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381

Report Date: 2022/10/25

GHD Limited

Client Project #: 12574778-03

Your P.O. #: 735-004150

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Tin (Sn)	2022/10/19	<2.0		ug/L	
			Total Titanium (Ti)	2022/10/19	<2.0		ug/L	
			Total Uranium (U)	2022/10/19	<0.10		ug/L	
			Total Vanadium (V)	2022/10/19	<2.0		ug/L	
			Total Zinc (Zn)	2022/10/19	<5.0		ug/L	
8289817	JHY	RPD	Total Aluminum (Al)	2022/10/19	3.1		%	20
			Total Antimony (Sb)	2022/10/19	NC		%	20
			Total Arsenic (As)	2022/10/19	NC		%	20
			Total Barium (Ba)	2022/10/19	0.68		%	20
			Total Beryllium (Be)	2022/10/19	NC		%	20
			Total Bismuth (Bi)	2022/10/19	NC		%	20
			Total Boron (B)	2022/10/19	NC		%	20
			Total Cadmium (Cd)	2022/10/19	NC		%	20
			Total Calcium (Ca)	2022/10/19	4.9		%	20
			Total Chromium (Cr)	2022/10/19	NC		%	20
			Total Cobalt (Co)	2022/10/19	NC		%	20
			Total Copper (Cu)	2022/10/19	1.5		%	20
			Total Iron (Fe)	2022/10/19	5.1		%	20
			Total Lead (Pb)	2022/10/19	NC		%	20
			Total Magnesium (Mg)	2022/10/19	2.6		%	20
			Total Manganese (Mn)	2022/10/19	1.7		%	20
			Total Molybdenum (Mo)	2022/10/19	NC		%	20
			Total Nickel (Ni)	2022/10/19	NC		%	20
			Total Phosphorus (P)	2022/10/19	NC		%	20
			Total Potassium (K)	2022/10/19	2.6		%	20
			Total Selenium (Se)	2022/10/19	NC		%	20
			Total Silver (Ag)	2022/10/19	NC		%	20
			Total Sodium (Na)	2022/10/19	3.7		%	20
			Total Strontium (Sr)	2022/10/19	3.1		%	20
			Total Thallium (Tl)	2022/10/19	NC		%	20
			Total Tin (Sn)	2022/10/19	NC		%	20
			Total Titanium (Ti)	2022/10/19	NC		%	20
			Total Uranium (U)	2022/10/19	NC		%	20
			Total Vanadium (V)	2022/10/19	NC		%	20
			Total Zinc (Zn)	2022/10/19	NC		%	20
8289823	NGI	Spiked Blank	Conductivity	2022/10/18		98	%	80 - 120
8289823	NGI	Method Blank	Conductivity	2022/10/18	<1.0		uS/cm	
8289823	NGI	RPD	Conductivity	2022/10/18	0.66		%	10
8289827	NGI	Spiked Blank	pH	2022/10/18		100	%	97 - 103
8289827	NGI	RPD	pH	2022/10/18	0.80		%	N/A
8289828	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2022/10/18		105	%	80 - 120
8289828	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2022/10/18	<2.0		mg/L	
8289828	NGI	RPD	Total Alkalinity (Total as CaCO3)	2022/10/18	0.82		%	20
8292230	AA0	QC Standard	Turbidity	2022/10/19		109	%	80 - 120
8292230	AA0	Spiked Blank	Turbidity	2022/10/19		99	%	80 - 120
8292230	AA0	Method Blank	Turbidity	2022/10/19	<0.10		NTU	
8292230	AA0	RPD	Turbidity	2022/10/19	1.7		%	20
8296013	AA0	QC Standard	Turbidity	2022/10/21		108	%	80 - 120
8296013	AA0	Spiked Blank	Turbidity	2022/10/21		105	%	80 - 120
8296013	AA0	Method Blank	Turbidity	2022/10/21	<0.10		NTU	
8296013	AA0	RPD	Turbidity	2022/10/21	20		%	20
8298338	TGO	Matrix Spike	Dissolved Chloride (Cl-)	2022/10/23		54 (1)	%	80 - 120
8298338	TGO	Spiked Blank	Dissolved Chloride (Cl-)	2022/10/23		94	%	80 - 120
8298338	TGO	Method Blank	Dissolved Chloride (Cl-)	2022/10/23	<1.0		mg/L	





**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8298338	TGO	RPD	Dissolved Chloride (Cl-)	2022/10/23	0.48		%	20
8298346	TGO	Matrix Spike	Dissolved Sulphate (SO4)	2022/10/22		NC	%	80 - 120
8298346	TGO	Spiked Blank	Dissolved Sulphate (SO4)	2022/10/22		101	%	80 - 120
8298346	TGO	Method Blank	Dissolved Sulphate (SO4)	2022/10/22	<2.0		mg/L	
8298346	TGO	RPD	Dissolved Sulphate (SO4)	2022/10/22	3.8		%	20
8298347	TGO	Matrix Spike	Reactive Silica (SiO2)	2022/10/22		NC	%	80 - 120
8298347	TGO	Spiked Blank	Reactive Silica (SiO2)	2022/10/22		94	%	80 - 120
8298347	TGO	Method Blank	Reactive Silica (SiO2)	2022/10/22	<0.50		mg/L	
8298347	TGO	RPD	Reactive Silica (SiO2)	2022/10/22	3.4		%	20
8298348	TGO	Spiked Blank	Colour	2022/10/24		96	%	80 - 120
8298348	TGO	Method Blank	Colour	2022/10/24	<5.0		TCU	
8298348	TGO	RPD	Colour	2022/10/24	NC		%	20
8298397	TGO	Matrix Spike	Orthophosphate (P)	2022/10/24		50 (1)	%	80 - 120
8298397	TGO	Spiked Blank	Orthophosphate (P)	2022/10/24		102	%	80 - 120
8298397	TGO	Method Blank	Orthophosphate (P)	2022/10/24	<0.010		mg/L	
8298397	TGO	RPD	Orthophosphate (P)	2022/10/24	NC		%	20
8298409	TGO	Matrix Spike	Nitrate + Nitrite (N)	2022/10/24		NC	%	80 - 120
8298409	TGO	Spiked Blank	Nitrate + Nitrite (N)	2022/10/24		106	%	80 - 120
8298409	TGO	Method Blank	Nitrate + Nitrite (N)	2022/10/24	<0.050		mg/L	
8298409	TGO	RPD	Nitrate + Nitrite (N)	2022/10/24	3.2		%	20
8298414	TGO	Matrix Spike	Nitrite (N)	2022/10/22		NC	%	80 - 120
8298414	TGO	Spiked Blank	Nitrite (N)	2022/10/22		106	%	80 - 120
8298414	TGO	Method Blank	Nitrite (N)	2022/10/22	<0.010		mg/L	
8298414	TGO	RPD	Nitrite (N)	2022/10/22	0.41		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

(1) Poor spike recovery due to probable sample matrix interference.



BUREAU  
VERITAS

Bureau Veritas Job #: C2T4381  
Report Date: 2022/10/25

GHD Limited  
Client Project #: 12574778-03  
Your P.O. #: 735-004150

### VALIDATION SIGNATURE PAGE

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

Colleen Acker, B.Sc, Scientific Service Specialist



Bureau Veritas Proprietary Software  
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

---

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name: #3000 GHD Limited	Company Name: #30775 GHD Limited	Quotation #: C20026	Bureau Veritas Job #		Bottle Order #:		
Contact Name: Accounts payable-Bedford	Contact Name: Callie Andrews / Jessica Romo	P.O. #: <i>PPA/1116 735-009150</i>	C2 T4381				894298
Address: 455 Phillip St Waterloo ON N2L 3X2	Address: 120 Western Parkway Bedford NS B4B 0V2	Project #: 12574778-03	Chain Of Custody Record		Project Manager		
Phone: (519) 884-0510 Fax: (519) 725-1394	Phone: (902) 468-1248 Fax:	Project Name:			Marie Muike		
Email: Invoicing-Canada@ghd.com	Email: Callie.andrews@ghd.com, jessica.romo@ghd.com	Site #:	C4894298-01-01				
Regulatory Criteria:	Special Instructions:	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)				Turnaround Time (TAT) Required:	
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal		Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Total Suspended Solids	Please provide advance notice for rush projects <b>Regular (Standard) TAT:</b> (will be applied if Rush TAT is not specified): Standard TAT = 5-7 Working days for most tests. <input checked="" type="checkbox"/> Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. <b>Job Specific Rush TAT (if applies to entire submission)</b> Date Required: _____ Time Required: _____ <input type="checkbox"/> # of Bottles: _____ Comments / Hazards / Other Required Analysis:	
SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS							
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix			
1	SW1	22/10/05	13:00	SW	X	X	5
2	SW2	↓	11:30	↓	X	X	5
3	SW3	↓	10:00	↓	X	X	5
4	SW4	↓	9:45	↓	X	X	5
5							Attempt to Cool: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
6							
7							
8							
9							2022 OCT 5 14:57
10							
RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# Jars used and not submitted	Lab Use Only
<i>Marie Muike</i>	22/10/05	14:54	<i>Marie Muike</i>				Time Sensitive: <input type="checkbox"/> Temperature (°C) on Receipt: <i>13.13</i> Custody Seal Intact on Cooler?: <input type="checkbox"/> Yes <input type="checkbox"/> No
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.							White: Bureau Veritas Yellow: Client
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.							



Your P.O. #: 735-005520  
 Your Project #: 12601021  
 Site Location: ANTRIM EA  
 Your C.O.C. #: 938147-01-01

**Attention: Callie Andrews**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2023/08/04**  
 Report #: R7750792  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C3K6673**

**Received: 2023/07/12, 16:53**

Sample Matrix: Water  
 # Samples Received: 6

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	6	N/A	2023/08/03	N/A	SM 24 4500-CO2 D
Alkalinity	6	N/A	2023/08/03	ATL SOP 00142	SM 24 2320 B
Chloride	6	N/A	2023/08/03	ATL SOP 00014	SM 24 4500-Cl- E m
Colour	6	N/A	2023/08/03	ATL SOP 00020	SM 24 2120C m
Conductance - water	6	N/A	2023/08/03	ATL SOP 00004	SM 24 2510B m
Hardness (calculated as CaCO3)	6	N/A	2023/08/03	ATL SOP 00048	Auto Calc
Metals Water Total MS	4	2023/07/31	2023/08/02	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	2	2023/07/31	2023/08/03	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	6	N/A	2023/08/04	N/A	Auto Calc.
Anion and Cation Sum	6	N/A	2023/08/03	N/A	Auto Calc.
Nitrogen Ammonia - water	6	N/A	2023/07/26	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	6	N/A	2023/08/04	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	6	N/A	2023/08/03	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	6	N/A	2023/08/04	ATL SOP 00018	ASTM D3867-16
pH (1)	6	N/A	2023/08/03	ATL SOP 00003	SM 24 4500-H+ B m
Phosphorus - ortho	6	N/A	2023/08/03	ATL SOP 00021	SM 24 4500-P E m
Sat. pH and Langelier Index (@ 20C)	6	N/A	2023/08/04	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	6	N/A	2023/08/04	ATL SOP 00049	Auto Calc.
Reactive Silica	6	N/A	2023/08/03	ATL SOP 00022	EPA 366.0 m
Sulphate	6	N/A	2023/08/03	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	6	N/A	2023/08/04	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	3	N/A	2023/07/26	ATL SOP 00203	SM 24 5310B m
Organic carbon - Total (TOC) (2)	3	N/A	2023/07/27	ATL SOP 00203	SM 24 5310B m
Total Suspended Solids	6	2023/07/19	2023/07/24	ATL SOP 00007	SM 24 2540D m
Turbidity	6	N/A	2023/08/03	ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**

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

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are



Your P.O. #: 735-005520  
Your Project #: 12601021  
Site Location: ANTRIM EA  
Your C.O.C. #: 938147-01-01

**Attention: Callie Andrews**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2023/08/04**  
Report #: R7750792  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C3K6673**

**Received: 2023/07/12, 16:53**

reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

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

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



BUREAU  
VERITAS

Bureau Veritas Job #: C3K6673  
Report Date: 2023/08/04

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM EA  
Your P.O. #: 735-005520  
Sampler Initials: RS

### RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WJG889		WJG890	WJG892	WJG893	WJG894			
Sampling Date		2023/07/12 10:39		2023/07/12 13:20	2023/07/12 14:13	2023/07/12 12:07	2023/07/12 15:26			
COC Number		938147-01-01		938147-01-01	938147-01-01	938147-01-01	938147-01-01			
	UNITS	SW1	RDL	SW2	SW3A	SW4	SW5	RDL	MDL	QC Batch

Calculated Parameters										
Anion Sum	me/L	0.850	N/A	0.730	0.960	0.180	0.790	N/A	N/A	8786105
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	13	1.0	25	14	4.9	12	1.0	0.20	8786099
Calculated TDS	mg/L	59	1.0	46	64	17	53	1.0	0.20	8786110
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.20	8786099
Cation Sum	me/L	0.950	N/A	0.850	1.05	0.330	0.840	N/A	N/A	8786105
Hardness (CaCO3)	mg/L	40	1.0	31	43	8.8	34	1.0	1.0	8786040
Ion Balance (% Difference)	%	5.56	N/A	7.59	4.48	29.4	3.07	N/A	N/A	8786167
Langelier Index (@ 20C)	N/A	-2.25		-1.91	-2.06	-3.64	-2.35			8786108
Langelier Index (@ 4C)	N/A	-2.50		-2.16	-2.31	-3.89	-2.60			8786109
Nitrate (N)	mg/L	<0.050	0.050	0.11	<0.050	0.066	<0.050	0.050	N/A	8786169
Saturation pH (@ 20C)	N/A	9.06		8.92	8.97	10.2	9.13			8786108
Saturation pH (@ 4C)	N/A	9.31		9.17	9.22	10.4	9.38			8786109

Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	13	2.0	25	14	4.9	12	2.0	N/A	8830446
Dissolved Chloride (Cl-)	mg/L	2.6	1.0	3.1	3.7	2.7	2.9	1.0	N/A	8830471
Colour	TCU	280	50	120	89	100	86	25	N/A	8830483
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	0.11	<0.050	0.066	<0.050	0.050	N/A	8830486
Nitrite (N)	mg/L	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	0.010	N/A	8830491
Nitrogen (Ammonia Nitrogen)	mg/L	0.051	0.050	<0.050	<0.050	<0.050	<0.050	0.050	N/A	8810387
Total Organic Carbon (C)	mg/L	25	0.50	15	13	15	13	0.50	N/A	8813404
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	<0.010	<0.010	<0.010	0.010	N/A	8830484
pH	pH	6.81		7.00	6.90	6.55	6.78			8830441
Reactive Silica (SiO2)	mg/L	4.2	0.50	4.2	3.1	4.1	2.8	0.50	N/A	8830481
Total Suspended Solids	mg/L	3.7	1.7	1.6	1.0	1.8	6.2	1.0	N/A	8797815
Dissolved Sulphate (SO4)	mg/L	25	2.0	6.2	27	<2.0	22	2.0	N/A	8830477
Turbidity	NTU	3.9	0.10	5.4	1.3	3.1	1.4	0.10	0.10	8830675
Conductivity	uS/cm	92	1.0	82	120	30	93	1.0	N/A	8830443

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable



**RESULTS OF ANALYSES OF WATER**

Bureau Veritas ID		WJG895			
Sampling Date		2023/07/12			
COC Number		938147-01-01			
	UNITS	SWDUP	RDL	MDL	QC Batch
<b>Calculated Parameters</b>					
Anion Sum	me/L	0.180	N/A	N/A	8786105
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	4.8	1.0	0.20	8786099
Calculated TDS	mg/L	17	1.0	0.20	8786110
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	0.20	8786099
Cation Sum	me/L	0.320	N/A	N/A	8786105
Hardness (CaCO3)	mg/L	8.5	1.0	1.0	8786040
Ion Balance (% Difference)	%	28.0	N/A	N/A	8786167
Langelier Index (@ 20C)	N/A	-3.70			8786108
Langelier Index (@ 4C)	N/A	-3.95			8786109
Nitrate (N)	mg/L	0.060	0.050	N/A	8786169
Saturation pH (@ 20C)	N/A	10.2			8786108
Saturation pH (@ 4C)	N/A	10.5			8786109
<b>Inorganics</b>					
Total Alkalinity (Total as CaCO3)	mg/L	4.8	2.0	N/A	8830446
Dissolved Chloride (Cl-)	mg/L	2.8	1.0	N/A	8830471
Colour	TCU	110	25	N/A	8830483
Nitrate + Nitrite (N)	mg/L	0.060	0.050	N/A	8830486
Nitrite (N)	mg/L	<0.010	0.010	N/A	8830491
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	N/A	8810387
Total Organic Carbon (C)	mg/L	14	0.50	N/A	8813404
Orthophosphate (P)	mg/L	<0.010	0.010	N/A	8830484
pH	pH	6.53			8830441
Reactive Silica (SiO2)	mg/L	4.2	0.50	N/A	8830481
Total Suspended Solids	mg/L	1.6	1.0	N/A	8797815
Dissolved Sulphate (SO4)	mg/L	<2.0	2.0	N/A	8830477
Turbidity	NTU	3.2	0.10	0.10	8830675
Conductivity	uS/cm	30	1.0	N/A	8830443
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable					



BUREAU  
VERITAS

Bureau Veritas Job #: C3K6673  
Report Date: 2023/08/04

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM EA  
Your P.O. #: 735-005520  
Sampler Initials: RS

### ELEMENTS BY ICP/MS (WATER)

Bureau Veritas ID		WJG889	WJG890	WJG892	WJG893	WJG894	WJG895			
Sampling Date		2023/07/12 10:39	2023/07/12 13:20	2023/07/12 14:13	2023/07/12 12:07	2023/07/12 15:26	2023/07/12			
COC Number		938147-01-01	938147-01-01	938147-01-01	938147-01-01	938147-01-01	938147-01-01			
	UNITS	SW1	SW2	SW3A	SW4	SW5	SWDUP	RDL	MDL	QC Batch

Metals										
Total Aluminum (Al)	ug/L	430	220	130	420	200	420	5.0	N/A	8825449
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	8825449
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	8825449
Total Barium (Ba)	ug/L	9.6	13	12	9.7	14	9.4	1.0	N/A	8825449
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	8825449
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	8825449
Total Boron (B)	ug/L	<50	<50	<50	<50	<50	<50	50	N/A	8825449
Total Cadmium (Cd)	ug/L	0.020	0.017	<0.010	0.015	0.028	0.022	0.010	N/A	8825449
Total Calcium (Ca)	ug/L	14000	9700	16000	2400	12000	2300	100	N/A	8825449
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	8825449
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	N/A	8825449
Total Copper (Cu)	ug/L	0.66	0.61	0.55	0.65	0.65	0.64	0.50	N/A	8825449
Total Iron (Fe)	ug/L	1300	1500	610	420	640	410	50	N/A	8825449
Total Lead (Pb)	ug/L	0.56	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	N/A	8825449
Total Magnesium (Mg)	ug/L	1200	1800	1000	650	840	650	100	N/A	8825449
Total Manganese (Mn)	ug/L	90	81	340	38	400	38	2.0	N/A	8825449
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	8825449
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	8825449
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	<100	<100	100	N/A	8825449
Total Potassium (K)	ug/L	300	620	370	150	370	150	100	N/A	8825449
Total Selenium (Se)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	N/A	8825449
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	8825449
Total Sodium (Na)	ug/L	2400	3600	3600	3000	3000	2900	100	N/A	8825449
Total Strontium (Sr)	ug/L	67	23	66	12	53	11	2.0	N/A	8825449
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	8825449
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	8825449
Total Titanium (Ti)	ug/L	9.0	6.0	2.6	8.5	3.6	6.9	2.0	N/A	8825449
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	8825449
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	8825449
Total Zinc (Zn)	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	N/A	8825449

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable





### GENERAL COMMENTS

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

Package 1	15.7°C
-----------	--------

Sample WJG889 [SW1] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample WJG890 [SW2] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample WJG893 [SW4] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample WJG895 [SWDUP] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C3K6673

Report Date: 2023/08/04

GHD Limited

Client Project #: 12601021

Site Location: ANTRIM EA

Your P.O. #: 735-005520

Sampler Initials: RS

### QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
	8797815	RDM	QC Standard	Total Suspended Solids	2023/07/24		101	%	80 - 120
	8797815	RDM	Method Blank	Total Suspended Solids	2023/07/24	<1.0		mg/L	
	8797815	RDM	RPD	Total Suspended Solids	2023/07/24	15		%	20
	8810387	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2023/07/26		89	%	80 - 120
	8810387	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2023/07/26		90	%	80 - 120
	8810387	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2023/07/26	<0.050		mg/L	
	8810387	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2023/07/26	NC		%	20
	8813404	CPP	Matrix Spike	Total Organic Carbon (C)	2023/07/26		101	%	85 - 115
	8813404	CPP	Spiked Blank	Total Organic Carbon (C)	2023/07/26		99	%	80 - 120
	8813404	CPP	Method Blank	Total Organic Carbon (C)	2023/07/26	<0.50		mg/L	
	8813404	CPP	RPD	Total Organic Carbon (C)	2023/07/26	NC		%	15
	8825449	JHY	Matrix Spike	Total Aluminum (Al)	2023/08/02		77 (1)	%	80 - 120
				Total Antimony (Sb)	2023/08/02		95	%	80 - 120
				Total Arsenic (As)	2023/08/02		94	%	80 - 120
				Total Barium (Ba)	2023/08/02		94	%	80 - 120
				Total Beryllium (Be)	2023/08/02		97	%	80 - 120
				Total Bismuth (Bi)	2023/08/02		95	%	80 - 120
				Total Boron (B)	2023/08/02		97	%	80 - 120
				Total Cadmium (Cd)	2023/08/02		99	%	80 - 120
				Total Calcium (Ca)	2023/08/02		78 (1)	%	80 - 120
				Total Chromium (Cr)	2023/08/02		96	%	80 - 120
				Total Cobalt (Co)	2023/08/02		97	%	80 - 120
				Total Copper (Cu)	2023/08/02		99	%	80 - 120
				Total Iron (Fe)	2023/08/02		82	%	80 - 120
				Total Lead (Pb)	2023/08/02		98	%	80 - 120
				Total Magnesium (Mg)	2023/08/02		81	%	80 - 120
				Total Manganese (Mn)	2023/08/02		99	%	80 - 120
				Total Molybdenum (Mo)	2023/08/02		99	%	80 - 120
				Total Nickel (Ni)	2023/08/02		99	%	80 - 120
				Total Phosphorus (P)	2023/08/02		81	%	80 - 120
				Total Potassium (K)	2023/08/02		82	%	80 - 120
				Total Selenium (Se)	2023/08/02		98	%	80 - 120
				Total Silver (Ag)	2023/08/02		96	%	80 - 120
				Total Sodium (Na)	2023/08/02		81	%	80 - 120
				Total Strontium (Sr)	2023/08/02		97	%	80 - 120
				Total Thallium (Tl)	2023/08/02		98	%	80 - 120
				Total Tin (Sn)	2023/08/02		96	%	80 - 120
				Total Titanium (Ti)	2023/08/02		98	%	80 - 120
				Total Uranium (U)	2023/08/02		103	%	80 - 120
				Total Vanadium (V)	2023/08/02		99	%	80 - 120
				Total Zinc (Zn)	2023/08/02		94	%	80 - 120
	8825449	JHY	Spiked Blank	Total Aluminum (Al)	2023/08/02		80	%	80 - 120
				Total Antimony (Sb)	2023/08/02		99	%	80 - 120
				Total Arsenic (As)	2023/08/02		96	%	80 - 120
				Total Barium (Ba)	2023/08/02		97	%	80 - 120
				Total Beryllium (Be)	2023/08/02		97	%	80 - 120
				Total Bismuth (Bi)	2023/08/02		98	%	80 - 120
				Total Boron (B)	2023/08/02		98	%	80 - 120
				Total Cadmium (Cd)	2023/08/02		101	%	80 - 120
				Total Calcium (Ca)	2023/08/02		79 (1)	%	80 - 120
				Total Chromium (Cr)	2023/08/02		99	%	80 - 120
				Total Cobalt (Co)	2023/08/02		100	%	80 - 120



BUREAU  
VERITAS

Bureau Veritas Job #: C3K6673  
Report Date: 2023/08/04

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM EA  
Your P.O. #: 735-005520  
Sampler Initials: RS

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2023/08/02		101	%	80 - 120
			Total Iron (Fe)	2023/08/02		82	%	80 - 120
			Total Lead (Pb)	2023/08/02		100	%	80 - 120
			Total Magnesium (Mg)	2023/08/02		83	%	80 - 120
			Total Manganese (Mn)	2023/08/02		102	%	80 - 120
			Total Molybdenum (Mo)	2023/08/02		101	%	80 - 120
			Total Nickel (Ni)	2023/08/02		101	%	80 - 120
			Total Phosphorus (P)	2023/08/02		80	%	80 - 120
			Total Potassium (K)	2023/08/02		80	%	80 - 120
			Total Selenium (Se)	2023/08/02		98	%	80 - 120
			Total Silver (Ag)	2023/08/02		98	%	80 - 120
			Total Sodium (Na)	2023/08/02		81	%	80 - 120
			Total Strontium (Sr)	2023/08/02		99	%	80 - 120
			Total Thallium (Tl)	2023/08/02		100	%	80 - 120
			Total Tin (Sn)	2023/08/02		96	%	80 - 120
			Total Titanium (Ti)	2023/08/02		103	%	80 - 120
			Total Uranium (U)	2023/08/02		106	%	80 - 120
			Total Vanadium (V)	2023/08/02		102	%	80 - 120
			Total Zinc (Zn)	2023/08/02		97	%	80 - 120
8825449	JHY	Method Blank	Total Aluminum (Al)	2023/08/02	<5.0		ug/L	
			Total Antimony (Sb)	2023/08/02	<1.0		ug/L	
			Total Arsenic (As)	2023/08/02	<1.0		ug/L	
			Total Barium (Ba)	2023/08/02	<1.0		ug/L	
			Total Beryllium (Be)	2023/08/02	<0.10		ug/L	
			Total Bismuth (Bi)	2023/08/02	<2.0		ug/L	
			Total Boron (B)	2023/08/02	<50		ug/L	
			Total Cadmium (Cd)	2023/08/02	<0.010		ug/L	
			Total Calcium (Ca)	2023/08/02	<100		ug/L	
			Total Chromium (Cr)	2023/08/02	<1.0		ug/L	
			Total Cobalt (Co)	2023/08/02	<0.40		ug/L	
			Total Copper (Cu)	2023/08/02	<0.50		ug/L	
			Total Iron (Fe)	2023/08/02	<50		ug/L	
			Total Lead (Pb)	2023/08/02	<0.50		ug/L	
			Total Magnesium (Mg)	2023/08/02	<100		ug/L	
			Total Manganese (Mn)	2023/08/02	<2.0		ug/L	
			Total Molybdenum (Mo)	2023/08/02	<2.0		ug/L	
			Total Nickel (Ni)	2023/08/02	<2.0		ug/L	
			Total Phosphorus (P)	2023/08/02	<100		ug/L	
			Total Potassium (K)	2023/08/02	<100		ug/L	
			Total Selenium (Se)	2023/08/02	<0.50		ug/L	
			Total Silver (Ag)	2023/08/02	<0.10		ug/L	
			Total Sodium (Na)	2023/08/02	<100		ug/L	
			Total Strontium (Sr)	2023/08/02	<2.0		ug/L	
			Total Thallium (Tl)	2023/08/02	<0.10		ug/L	
			Total Tin (Sn)	2023/08/02	<2.0		ug/L	
			Total Titanium (Ti)	2023/08/02	<2.0		ug/L	
			Total Uranium (U)	2023/08/02	<0.10		ug/L	
			Total Vanadium (V)	2023/08/02	<2.0		ug/L	
			Total Zinc (Zn)	2023/08/02	<5.0		ug/L	
8825449	JHY	RPD	Total Iron (Fe)	2023/08/02	0.99		%	20
			Total Manganese (Mn)	2023/08/02	2.0 (2)		%	20
8830441	KMC	Spiked Blank	pH	2023/08/03		100	%	97 - 103



### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
	8830441	KMC	RPD	pH	2023/08/03	0.18		%	N/A
	8830443	KMC	Spiked Blank	Conductivity	2023/08/03		101	%	80 - 120
	8830443	KMC	Method Blank	Conductivity	2023/08/03	<1.0		uS/cm	
	8830443	KMC	RPD	Conductivity	2023/08/03	0.38		%	10
	8830446	KMC	Spiked Blank	Total Alkalinity (Total as CaCO3)	2023/08/03		96	%	80 - 120
	8830446	KMC	Method Blank	Total Alkalinity (Total as CaCO3)	2023/08/03	<2.0		mg/L	
	8830446	KMC	RPD	Total Alkalinity (Total as CaCO3)	2023/08/03	4.4		%	20
	8830471	MCN	Matrix Spike	Dissolved Chloride (Cl-)	2023/08/03		89	%	80 - 120
	8830471	MCN	Spiked Blank	Dissolved Chloride (Cl-)	2023/08/03		97	%	80 - 120
	8830471	MCN	Method Blank	Dissolved Chloride (Cl-)	2023/08/03	<1.0		mg/L	
	8830471	MCN	RPD	Dissolved Chloride (Cl-)	2023/08/03	0.59		%	20
	8830477	MCN	Matrix Spike	Dissolved Sulphate (SO4)	2023/08/03		90	%	80 - 120
	8830477	MCN	Spiked Blank	Dissolved Sulphate (SO4)	2023/08/03		96	%	80 - 120
	8830477	MCN	Method Blank	Dissolved Sulphate (SO4)	2023/08/03	<2.0		mg/L	
	8830477	MCN	RPD	Dissolved Sulphate (SO4)	2023/08/03	14		%	20
	8830481	MCN	Matrix Spike	Reactive Silica (SiO2)	2023/08/03		88	%	80 - 120
	8830481	MCN	Spiked Blank	Reactive Silica (SiO2)	2023/08/03		96	%	80 - 120
	8830481	MCN	Method Blank	Reactive Silica (SiO2)	2023/08/03	<0.50		mg/L	
	8830481	MCN	RPD	Reactive Silica (SiO2)	2023/08/03	0.11		%	20
	8830483	HGV	Spiked Blank	Colour	2023/08/03		104	%	80 - 120
	8830483	HGV	Method Blank	Colour	2023/08/03	<5.0		TCU	
	8830483	HGV	RPD	Colour	2023/08/03	NC		%	20
	8830484	HGV	Matrix Spike	Orthophosphate (P)	2023/08/03		91	%	80 - 120
	8830484	HGV	Spiked Blank	Orthophosphate (P)	2023/08/03		95	%	80 - 120
	8830484	HGV	Method Blank	Orthophosphate (P)	2023/08/03	<0.010		mg/L	
	8830484	HGV	RPD	Orthophosphate (P)	2023/08/03	NC		%	20
	8830486	MCN	Matrix Spike	Nitrate + Nitrite (N)	2023/08/04		92	%	80 - 120
	8830486	MCN	Spiked Blank	Nitrate + Nitrite (N)	2023/08/04		104	%	80 - 120
	8830486	MCN	Method Blank	Nitrate + Nitrite (N)	2023/08/04	<0.050		mg/L	
	8830486	MCN	RPD	Nitrate + Nitrite (N)	2023/08/04	2.6		%	20
	8830491	MCN	Matrix Spike	Nitrite (N)	2023/08/03		97	%	80 - 120
	8830491	MCN	Spiked Blank	Nitrite (N)	2023/08/03		106	%	80 - 120
	8830491	MCN	Method Blank	Nitrite (N)	2023/08/03	<0.010		mg/L	
	8830491	MCN	RPD	Nitrite (N)	2023/08/03	NC		%	20
	8830675	KMC	QC Standard	Turbidity	2023/08/03		102	%	80 - 120
	8830675	KMC	Spiked Blank	Turbidity	2023/08/03		98	%	80 - 120
	8830675	KMC	Method Blank	Turbidity	2023/08/03	<0.10		NTU	
	8830675	KMC	RPD	Turbidity	2023/08/03	2.3		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

(1) Recovery is within QC acceptance limits. < 10 % of compounds in multi-component analysis in violation.

(2) POTENTIAL EXCEEDANCE FOR PARAMETER



Bureau Veritas Job #: C3K6673  
Report Date: 2023/08/04

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM EA  
Your P.O. #: 735-005520  
Sampler Initials: RS

### VALIDATION SIGNATURE PAGE

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

Colleen Acker, B.Sc, Scientific Service Specialist



Automated Statchk

---

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.



Bureau Veritas  
200 Bluewater Road, Bedford, Nova Scotia Canada B4B 1G9 Tel: (902) 420-0203 Toll-free: 800-563-6266 Fax: (902) 420-8612 www.bvna.com

Attempt to Cool:  
Yes

Chain Of Custody Record

<b>INVOICE TO:</b>		<b>Report Information</b>		<b>Project Information</b>		<b>Laboratory Use Only</b>	
Company Name	#16276 GHD Limited	Company Name	Callie Andrews/Jessica Romo	Quotation #	C30069	Bureau Veritas Job #	Bottle Order #:
Contact Name	Accounts Payable	Contact Name	Callie Andrews/Jessica Romo	P.O. #	735-005520	3K6673	936147
Address	120 Western Parkway Bedford NS B4B 0V2	Address		Project #	12601021	Chain Of Custody Record	Project Manager
Phone	(902) 468-1248 Fax: (902) 468-2207	Phone		Project Name	Antim EA	Marie Muise	
Email	AccountsPayableCDN@ghd.com	Email	callie.andrews@ghd.com,jessica.romo@ghd.com	Site #			
				Sampled By	Robyn Simpson + J.V		

Regulatory Criteria:	Special Instructions	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)						Turnaround Time (TAT) Required:	
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal		Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAp-MS Total Metals in Water	Total Suspended Solids				Please provide advance notice for rush projects
									Regular (Standard) TAT: (will be applied if Rush TAT is not specified): Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. <input checked="" type="checkbox"/>
									Job Specific Rush TAT (if applies to entire submission) Date Required: _____ Time Required: _____ <input type="checkbox"/>

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS										
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAp-MS Total Metals in Water	Total Suspended Solids	# of Bottles	Comments / Hazards / Other Required Analysis
1	SW1	12/07/23	9:10:39	Water			X	X	5	
2	SW2	12/07/23	13:20	Water			X	X	5	
3	SW3						X	X		
4	SW3A	12/07/03	14:13	Water			X	X	5	
5	SW4	12/07/03	12:07	Water			X	X	5	
6	SW5	12/07/03	15:26	Water			X	X	5	
7	SWDUP	12/07/03	---	Water			X	X	5	
8										
9										
10										

* RELINQUISHED BY: (Signature/Print) Robyn Simpson / Robyn Simpson	Date: (YY/MM/DD) 23/07/12	Time 16:50	RECEIVED BY: (Signature/Print) Callie Andrews	Date: (YY/MM/DD)	Time	# jars used and not submitted	Time Sensitive <input type="checkbox"/>	Temperature (°C) on Receipt 19.15.15	Custody Seal Intact on Cooler? <input type="checkbox"/> Yes <input type="checkbox"/> No
---	------------------------------	---------------	--	------------------	------	-------------------------------	---	---	--

\* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.  
\* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.



Your P.O. #: 735-009466  
 Your Project #: 12601021-15  
 Your C.O.C. #: C#976732-01-01

**Attention: Jessica Romo**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2024/03/05**  
 Report #: R8053614  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C460020**

**Received: 2024/02/28, 16:34**

Sample Matrix: Surface Water  
 # Samples Received: 7

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	7	N/A	2024/03/04	N/A	SM 24 4500-CO2 D
Alkalinity	7	N/A	2024/03/04	ATL SOP 00142	SM 24 2320 B
Chloride	7	N/A	2024/03/04	ATL SOP 00014	SM 24 4500-Cl- E m
Colour	7	N/A	2024/03/04	ATL SOP 00020	SM 24 2120C m
Conductance - water	7	N/A	2024/03/04	ATL SOP 00004	SM 24 2510B m
Fluoride	7	N/A	2024/03/04	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	4	N/A	2024/03/04	ATL SOP 00048	Auto Calc
Hardness (calculated as CaCO3)	3	N/A	2024/03/05	ATL SOP 00048	Auto Calc
Metals Water Total MS	1	2024/03/01	2024/03/01	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	3	2024/03/01	2024/03/02	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	3	2024/03/01	2024/03/04	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	7	N/A	2024/03/05	N/A	Auto Calc.
Anion and Cation Sum	3	N/A	2024/03/04	N/A	Auto Calc.
Anion and Cation Sum	4	N/A	2024/03/05	N/A	Auto Calc.
Nitrogen Ammonia - water	3	N/A	2024/03/04	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen Ammonia - water	4	N/A	2024/03/05	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	7	N/A	2024/03/04	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	7	N/A	2024/03/04	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	7	N/A	2024/03/05	ATL SOP 00018	ASTM D3867-16
pH (1)	7	N/A	2024/03/04	ATL SOP 00003	SM 24 4500-H+ B m
Phosphorus - ortho	7	N/A	2024/03/04	ATL SOP 00021	SM 24 4500-P E m
Sat. pH and Langelier Index (@ 20C)	7	N/A	2024/03/05	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	7	N/A	2024/03/05	ATL SOP 00049	Auto Calc.
Reactive Silica	7	N/A	2024/03/04	ATL SOP 00022	EPA 366.0 m
Sulphate	7	N/A	2024/03/04	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	7	N/A	2024/03/05	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	6	N/A	2024/02/29	ATL SOP 00203	SM 24 5310B m
Organic carbon - Total (TOC) (2)	1	N/A	2024/03/01	ATL SOP 00203	SM 24 5310B m
Total Suspended Solids	7	2024/02/29	2024/02/29	ATL SOP 00007	SM 24 2540D m
Turbidity	7	N/A	2024/03/01	ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**



Your P.O. #: 735-009466  
Your Project #: 12601021-15  
Your C.O.C. #: C#976732-01-01

**Attention: Jessica Romo**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2024/03/05**  
Report #: R8053614  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C460020**

**Received: 2024/02/28, 16:34**

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

=====

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

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.

For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Suzanne Rogers, General Manager responsible for Nova Scotia Environmental laboratory operations.





**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		YMO976	YMO977		YMO978			
Sampling Date		2024/02/28 13:15	2024/02/28 12:10		2024/02/28 11:50			
COC Number		C#976732-01-01	C#976732-01-01		C#976732-01-01			
	UNITS	SW-2	SW-3	RDL	SW-3A	RDL	MDL	QC Batch
<b>Calculated Parameters</b>								
Anion Sum	me/L	0.670	0.820	N/A	1.33	N/A	N/A	9244602
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8.5	6.4	1.0	8.8	1.0	0.20	9244598
Calculated TDS	mg/L	41	51	1.0	84	1.0	0.20	9244608
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	<1.0	1.0	<1.0	1.0	0.20	9244598
Cation Sum	me/L	0.630	0.720	N/A	1.22	N/A	N/A	9244602
Hardness (CaCO3)	mg/L	19	26	1.0	47	1.0	1.0	9244600
Ion Balance (% Difference)	%	3.08	6.49	N/A	4.31	N/A	N/A	9244601
Langelier Index (@ 20C)	N/A	-3.11	-3.07		-2.32			9244606
Langelier Index (@ 4C)	N/A	-3.36	-3.33		-2.57			9244607
Nitrate (N)	mg/L	0.070	0.10	0.050	0.17	0.050	N/A	9244603
Saturation pH (@ 20C)	N/A	9.62	9.54		9.16			9244606
Saturation pH (@ 4C)	N/A	9.88	9.79		9.41			9244607
<b>Inorganics</b>								
Total Alkalinity (Total as CaCO3)	mg/L	8.5	6.4	2.0	8.8	2.0	N/A	9253069
Dissolved Chloride (Cl-)	mg/L	12	8.5	1.0	13	1.0	N/A	9251103
Colour	TCU	27	38	5.0	27	5.0	N/A	9251125
Dissolved Fluoride (F-)	mg/L	<0.10	<0.10	0.10	<0.10	0.10	0.050	9253070
Nitrate + Nitrite (N)	mg/L	0.070	0.10	0.050	0.17	0.050	N/A	9251133
Nitrite (N)	mg/L	<0.010	<0.010	0.010	<0.010	0.010	N/A	9251135
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.075	0.050	<0.050	0.050	N/A	9250894
Total Organic Carbon (C)	mg/L	4.4	5.3	0.50	4.0	0.50	N/A	9247793
Orthophosphate (P)	mg/L	<0.010	<0.010	0.010	<0.010	0.010	N/A	9251131
pH	pH	6.51	6.46		6.85			9253067
Reactive Silica (SiO2)	mg/L	3.2	2.3	0.50	3.1	0.50	N/A	9251119
Total Suspended Solids	mg/L	1.4	1.8	1.0	2.8	2.0	N/A	9247438
Dissolved Sulphate (SO4)	mg/L	7.6	21	2.0	37	2.0	N/A	9251117
Turbidity	NTU	4.9	6.1	0.10	7.6	0.10	0.10	9249811
Conductivity	uS/cm	69	87	1.0	140	1.0	N/A	9253068
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable								



BUREAU VERITAS

Bureau Veritas Job #: C460020  
Report Date: 2024/03/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: JVS

### RESULTS OF ANALYSES OF SURFACE WATER

<b>Bureau Veritas ID</b>		YMO978				YMO980		YMO981			
<b>Sampling Date</b>		2024/02/28 11:50				2024/02/28 09:28		2024/02/28 10:10			
<b>COC Number</b>		C#976732-01-01				C#976732-01-01		C#976732-01-01			
	<b>UNITS</b>	<b>SW-3A Lab-Dup</b>	<b>RDL</b>	<b>MDL</b>	<b>QC Batch</b>	<b>SW-4</b>	<b>RDL</b>	<b>SW-5</b>	<b>RDL</b>	<b>MDL</b>	<b>QC Batch</b>

<b>Calculated Parameters</b>											
Anion Sum	me/L					0.490	N/A	0.480	N/A	N/A	9244602
Bicarb. Alkalinity (calc. as CaCO3)	mg/L					4.3	1.0	4.6	1.0	0.20	9244598
Calculated TDS	mg/L					32	1.0	32	1.0	0.20	9244608
Carb. Alkalinity (calc. as CaCO3)	mg/L					<1.0	1.0	<1.0	1.0	0.20	9244598
Cation Sum	me/L					0.500	N/A	0.440	N/A	N/A	9244602
Hardness (CaCO3)	mg/L					9.7	1.0	15	1.0	1.0	9244600
Ion Balance (% Difference)	%					1.01	N/A	4.35	N/A	N/A	9244601
Langelier Index (@ 20C)	N/A					-3.90		-3.73			9244606
Langelier Index (@ 4C)	N/A					-4.15		-3.98			9244607
Nitrate (N)	mg/L					<0.050	0.050	<0.050	0.050	N/A	9244603
Saturation pH (@ 20C)	N/A					10.2		9.95			9244606
Saturation pH (@ 4C)	N/A					10.5		10.2			9244607
<b>Inorganics</b>											
Total Alkalinity (Total as CaCO3)	mg/L					4.3	2.0	4.6	2.0	N/A	9253069
Dissolved Chloride (Cl-)	mg/L					10	1.0	5.8	1.0	N/A	9251103
Colour	TCU					37	5.0	72	25	N/A	9251125
Dissolved Fluoride (F-)	mg/L					<0.10	0.10	<0.10	0.10	0.050	9253070
Nitrate + Nitrite (N)	mg/L					<0.050	0.050	<0.050	0.050	N/A	9251133
Nitrite (N)	mg/L					<0.010	0.010	<0.010	0.010	N/A	9251135
Nitrogen (Ammonia Nitrogen)	mg/L					<0.050	0.050	<0.050	0.050	N/A	9253756
Total Organic Carbon (C)	mg/L					4.8	0.50	7.2	0.50	N/A	9247793
Orthophosphate (P)	mg/L					<0.010	0.010	<0.010	0.010	N/A	9251131
pH	pH					6.33		6.22			9253067
Reactive Silica (SiO2)	mg/L					2.9	0.50	3.6	0.50	N/A	9251119
Total Suspended Solids	mg/L	3.6	2.0	N/A	9247438	7.6	1.0	1.8	1.0	N/A	9247438
Dissolved Sulphate (SO4)	mg/L					5.9	2.0	11	2.0	N/A	9251117
Turbidity	NTU					6.8	0.10	6.7	0.10	0.10	9249811
Conductivity	uS/cm					45	1.0	48	1.0	N/A	9253068

RDL = Reportable Detection Limit  
 QC Batch = Quality Control Batch  
 Lab-Dup = Laboratory Initiated Duplicate  
 N/A = Not Applicable



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		YMO982				YMO982			
Sampling Date		2024/02/28 11:10				2024/02/28 11:10			
COC Number		C#976732-01-01				C#976732-01-01			
	UNITS	SW-6	RDL	MDL	QC Batch	SW-6 Lab-Dup	RDL	MDL	QC Batch
<b>Calculated Parameters</b>									
Anion Sum	me/L	0.790	N/A	N/A	9244602				
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6.1	1.0	0.20	9244598				
Calculated TDS	mg/L	52	1.0	0.20	9244608				
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	0.20	9244598				
Cation Sum	me/L	0.770	N/A	N/A	9244602				
Hardness (CaCO3)	mg/L	28	1.0	1.0	9244600				
Ion Balance (% Difference)	%	1.28	N/A	N/A	9244601				
Langelier Index (@ 20C)	N/A	-3.04			9244606				
Langelier Index (@ 4C)	N/A	-3.29			9244607				
Nitrate (N)	mg/L	0.095	0.050	N/A	9244603				
Saturation pH (@ 20C)	N/A	9.52			9244606				
Saturation pH (@ 4C)	N/A	9.77			9244607				
<b>Inorganics</b>									
Total Alkalinity (Total as CaCO3)	mg/L	6.1	2.0	N/A	9253069				
Dissolved Chloride (Cl-)	mg/L	8.3	1.0	N/A	9251136	8.5	1.0	N/A	9251136
Colour	TCU	40	5.0	N/A	9251144	38	5.0	N/A	9251144
Dissolved Fluoride (F-)	mg/L	<0.10	0.10	0.050	9253070				
Nitrate + Nitrite (N)	mg/L	0.095	0.050	N/A	9251189	0.097	0.050	N/A	9251189
Nitrite (N)	mg/L	<0.010	0.010	N/A	9251211	<0.010	0.010	N/A	9251211
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	N/A	9253756				
Total Organic Carbon (C)	mg/L	5.1	0.50	N/A	9247793				
Orthophosphate (P)	mg/L	<0.010	0.010	N/A	9251172	<0.010	0.010	N/A	9251172
pH	pH	6.48			9253067				
Reactive Silica (SiO2)	mg/L	2.5	0.50	N/A	9251141	2.9	0.50	N/A	9251141
Total Suspended Solids	mg/L	2.0	1.0	N/A	9247438				
Dissolved Sulphate (SO4)	mg/L	21	2.0	N/A	9251140	21	2.0	N/A	9251140
Turbidity	NTU	6.8	0.10	0.10	9249811				
Conductivity	uS/cm	88	1.0	N/A	9253068				
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable									



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		YMO983					YMO983			
Sampling Date		2024/02/28					2024/02/28			
COC Number		C#976732-01-01					C#976732-01-01			
	UNITS	SWDUP	RDL	MDL	QC Batch	SWDUP Lab-Dup	RDL	MDL	QC Batch	
<b>Calculated Parameters</b>										
Anion Sum	me/L	0.440	N/A	N/A	9244602					
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	3.1	1.0	0.20	9244598					
Calculated TDS	mg/L	30	1.0	0.20	9244608					
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	0.20	9244598					
Cation Sum	me/L	0.520	N/A	N/A	9244602					
Hardness (CaCO3)	mg/L	9.9	1.0	1.0	9244600					
Ion Balance (% Difference)	%	8.33	N/A	N/A	9244601					
Langelier Index (@ 20C)	N/A	-3.98			9244606					
Langelier Index (@ 4C)	N/A	-4.23			9244607					
Nitrate (N)	mg/L	<0.050	0.050	N/A	9244603					
Saturation pH (@ 20C)	N/A	10.4			9244606					
Saturation pH (@ 4C)	N/A	10.6			9244607					
<b>Inorganics</b>										
Total Alkalinity (Total as CaCO3)	mg/L	3.1	2.0	N/A	9253069	3.1	2.0	N/A	9253069	
Dissolved Chloride (Cl-)	mg/L	10	1.0	N/A	9251103					
Colour	TCU	38	5.0	N/A	9251125					
Dissolved Fluoride (F-)	mg/L	<0.10	0.10	0.050	9253070	<0.10	0.10	0.050	9253070	
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	N/A	9251133					
Nitrite (N)	mg/L	<0.010	0.010	N/A	9251135					
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	N/A	9253756	<0.050	0.050	N/A	9253756	
Total Organic Carbon (C)	mg/L	4.7	0.50	N/A	9250718					
Orthophosphate (P)	mg/L	<0.010	0.010	N/A	9251131					
pH	pH	6.38			9253067	6.37			9253067	
Reactive Silica (SiO2)	mg/L	2.9	0.50	N/A	9251119					
Total Suspended Solids	mg/L	6.2	1.0	N/A	9247438					
Dissolved Sulphate (SO4)	mg/L	3.9	2.0	N/A	9251117					
Turbidity	NTU	5.9	0.10	0.10	9249811					
Conductivity	uS/cm	44	1.0	N/A	9253068	44	1.0	N/A	9253068	
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable										



BUREAU  
VERITAS

Bureau Veritas Job #: C460020  
Report Date: 2024/03/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: JVS

### ELEMENTS BY ICP/MS (SURFACE WATER)

Bureau Veritas ID		YMO976	YMO977	YMO978	YMO980	YMO981			
Sampling Date		2024/02/28 13:15	2024/02/28 12:10	2024/02/28 11:50	2024/02/28 09:28	2024/02/28 10:10			
COC Number		C#976732-01-01	C#976732-01-01	C#976732-01-01	C#976732-01-01	C#976732-01-01			
	UNITS	SW-2	SW-3	SW-3A	SW-4	SW-5	RDL	MDL	QC Batch

Metals									
Total Aluminum (Al)	ug/L	300	280	290	430	830	5.0	N/A	9249823
Total Antimony (Sb)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	9249823
Total Arsenic (As)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	9249823
Total Barium (Ba)	ug/L	12	9.6	11	9.4	7.0	1.0	N/A	9249823
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	9249823
Total Bismuth (Bi)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	9249823
Total Boron (B)	ug/L	<50	<50	<50	<50	<50	50	N/A	9249823
Total Cadmium (Cd)	ug/L	0.012	0.011	0.014	0.012	0.015	0.010	N/A	9249823
Total Calcium (Ca)	ug/L	5600	9300	17000	2700	4900	100	N/A	9249823
Total Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	N/A	9249823
Total Cobalt (Co)	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	N/A	9249823
Total Copper (Cu)	ug/L	<0.50	0.50	0.61	<0.50	<0.50	0.50	N/A	9249823
Total Iron (Fe)	ug/L	280	320	290	330	390	50	N/A	9249823
Total Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	N/A	9249823
Total Magnesium (Mg)	ug/L	1300	750	1200	720	680	100	N/A	9249823
Total Manganese (Mn)	ug/L	26	99	79	40	32	2.0	N/A	9249823
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	9249823
Total Nickel (Ni)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	9249823
Total Phosphorus (P)	ug/L	<100	<100	<100	<100	<100	100	N/A	9249823
Total Potassium (K)	ug/L	570	400	410	330	390	100	N/A	9249823
Total Selenium (Se)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	N/A	9249823
Total Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	9249823
Total Sodium (Na)	ug/L	5200	3900	6000	6600	2600	100	N/A	9249823
Total Strontium (Sr)	ug/L	13	37	65	9.8	18	2.0	N/A	9249823
Total Thallium (Tl)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	9249823
Total Tin (Sn)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	9249823
Total Titanium (Ti)	ug/L	6.6	7.1	5.8	7.1	6.0	2.0	N/A	9249823
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	N/A	9249823
Total Vanadium (V)	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	N/A	9249823
Total Zinc (Zn)	ug/L	7.8	<5.0	<5.0	<5.0	<5.0	5.0	N/A	9249823

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable



**ELEMENTS BY ICP/MS (SURFACE WATER)**

Bureau Veritas ID		YMO982	YMO983			
Sampling Date		2024/02/28 11:10	2024/02/28			
COC Number		C#976732-01-01	C#976732-01-01			
	UNITS	SW-6	SWDUP	RDL	MDL	QC Batch
<b>Metals</b>						
Total Aluminum (Al)	ug/L	310	440	5.0	N/A	9249823
Total Antimony (Sb)	ug/L	<1.0	<1.0	1.0	N/A	9249823
Total Arsenic (As)	ug/L	<1.0	<1.0	1.0	N/A	9249823
Total Barium (Ba)	ug/L	9.2	9.5	1.0	N/A	9249823
Total Beryllium (Be)	ug/L	<0.10	<0.10	0.10	N/A	9249823
Total Bismuth (Bi)	ug/L	<2.0	<2.0	2.0	N/A	9249823
Total Boron (B)	ug/L	<50	<50	50	N/A	9249823
Total Cadmium (Cd)	ug/L	0.012	0.012	0.010	N/A	9249823
Total Calcium (Ca)	ug/L	10000	2700	100	N/A	9249823
Total Chromium (Cr)	ug/L	<1.0	<1.0	1.0	N/A	9249823
Total Cobalt (Co)	ug/L	<0.40	<0.40	0.40	N/A	9249823
Total Copper (Cu)	ug/L	0.62	<0.50	0.50	N/A	9249823
Total Iron (Fe)	ug/L	380	340	50	N/A	9249823
Total Lead (Pb)	ug/L	<0.50	<0.50	0.50	N/A	9249823
Total Magnesium (Mg)	ug/L	800	750	100	N/A	9249823
Total Manganese (Mn)	ug/L	130	41	2.0	N/A	9249823
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	2.0	N/A	9249823
Total Nickel (Ni)	ug/L	<2.0	<2.0	2.0	N/A	9249823
Total Phosphorus (P)	ug/L	<100	<100	100	N/A	9249823
Total Potassium (K)	ug/L	390	370	100	N/A	9249823
Total Selenium (Se)	ug/L	<0.50	<0.50	0.50	N/A	9249823
Total Silver (Ag)	ug/L	<0.10	<0.10	0.10	N/A	9249823
Total Sodium (Na)	ug/L	4200	6900	100	N/A	9249823
Total Strontium (Sr)	ug/L	40	9.9	2.0	N/A	9249823
Total Thallium (Tl)	ug/L	<0.10	<0.10	0.10	N/A	9249823
Total Tin (Sn)	ug/L	<2.0	<2.0	2.0	N/A	9249823
Total Titanium (Ti)	ug/L	4.3	12	2.0	N/A	9249823
Total Uranium (U)	ug/L	<0.10	<0.10	0.10	N/A	9249823
Total Vanadium (V)	ug/L	<2.0	<2.0	2.0	N/A	9249823
Total Zinc (Zn)	ug/L	<5.0	<5.0	5.0	N/A	9249823
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable						



### GENERAL COMMENTS

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

Package 1	3.7°C
-----------	-------

Sample YMO977 [SW-3] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample YMO983 [SWDUP] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C460020

Report Date: 2024/03/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: JVS

### QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
	9247438	ACK	QC Standard	Total Suspended Solids	2024/02/29		99	%	80 - 120
	9247438	ACK	Method Blank	Total Suspended Solids	2024/02/29	<1.0		mg/L	
	9247438	ACK	RPD [YMO978-01]	Total Suspended Solids	2024/02/29	NC		%	20
	9247793	CPP	Matrix Spike	Total Organic Carbon (C)	2024/02/29		101	%	85 - 115
	9247793	CPP	Spiked Blank	Total Organic Carbon (C)	2024/02/29		100	%	80 - 120
	9247793	CPP	Method Blank	Total Organic Carbon (C)	2024/02/29	<0.50		mg/L	
	9247793	CPP	RPD	Total Organic Carbon (C)	2024/02/29	NC		%	15
	9249811	LJV	QC Standard	Turbidity	2024/03/01		115	%	80 - 120
	9249811	LJV	Spiked Blank	Turbidity	2024/03/01		108	%	80 - 120
	9249811	LJV	Method Blank	Turbidity	2024/03/01	<0.10		NTU	
	9249811	LJV	RPD	Turbidity	2024/03/01	9.5		%	20
	9249823	MTZ	Matrix Spike	Total Aluminum (Al)	2024/03/01		98	%	80 - 120
				Total Antimony (Sb)	2024/03/01		101	%	80 - 120
				Total Arsenic (As)	2024/03/01		101	%	80 - 120
				Total Barium (Ba)	2024/03/01		NC	%	80 - 120
				Total Beryllium (Be)	2024/03/01		98	%	80 - 120
				Total Bismuth (Bi)	2024/03/01		96	%	80 - 120
				Total Boron (B)	2024/03/01		98	%	80 - 120
				Total Cadmium (Cd)	2024/03/01		99	%	80 - 120
				Total Calcium (Ca)	2024/03/01		NC	%	80 - 120
				Total Chromium (Cr)	2024/03/01		103	%	80 - 120
				Total Cobalt (Co)	2024/03/01		94	%	80 - 120
				Total Copper (Cu)	2024/03/01		93	%	80 - 120
				Total Iron (Fe)	2024/03/01		103	%	80 - 120
				Total Lead (Pb)	2024/03/01		95	%	80 - 120
				Total Magnesium (Mg)	2024/03/01		NC	%	80 - 120
				Total Manganese (Mn)	2024/03/01		99	%	80 - 120
				Total Molybdenum (Mo)	2024/03/01		107	%	80 - 120
				Total Nickel (Ni)	2024/03/01		98	%	80 - 120
				Total Phosphorus (P)	2024/03/01		105	%	80 - 120
				Total Potassium (K)	2024/03/01		97	%	80 - 120
				Total Selenium (Se)	2024/03/01		98	%	80 - 120
				Total Silver (Ag)	2024/03/01		100	%	80 - 120
				Total Sodium (Na)	2024/03/01		102	%	80 - 120
				Total Strontium (Sr)	2024/03/01		NC	%	80 - 120
				Total Thallium (Tl)	2024/03/01		99	%	80 - 120
				Total Tin (Sn)	2024/03/01		104	%	80 - 120
				Total Titanium (Ti)	2024/03/01		99	%	80 - 120
				Total Uranium (U)	2024/03/01		104	%	80 - 120
				Total Vanadium (V)	2024/03/01		103	%	80 - 120
				Total Zinc (Zn)	2024/03/01		98	%	80 - 120
	9249823	MTZ	Spiked Blank	Total Aluminum (Al)	2024/03/01		101	%	80 - 120
				Total Antimony (Sb)	2024/03/01		99	%	80 - 120
				Total Arsenic (As)	2024/03/01		100	%	80 - 120
				Total Barium (Ba)	2024/03/01		94	%	80 - 120
				Total Beryllium (Be)	2024/03/01		96	%	80 - 120
				Total Bismuth (Bi)	2024/03/01		99	%	80 - 120
				Total Boron (B)	2024/03/01		100	%	80 - 120
				Total Cadmium (Cd)	2024/03/01		98	%	80 - 120
				Total Calcium (Ca)	2024/03/01		99	%	80 - 120
				Total Chromium (Cr)	2024/03/01		103	%	80 - 120
				Total Cobalt (Co)	2024/03/01		97	%	80 - 120
				Total Copper (Cu)	2024/03/01		99	%	80 - 120





BUREAU  
VERITAS

Bureau Veritas Job #: C460020

Report Date: 2024/03/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: JVS

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Iron (Fe)	2024/03/01		105	%	80 - 120
			Total Lead (Pb)	2024/03/01		96	%	80 - 120
			Total Magnesium (Mg)	2024/03/01		105	%	80 - 120
			Total Manganese (Mn)	2024/03/01		101	%	80 - 120
			Total Molybdenum (Mo)	2024/03/01		103	%	80 - 120
			Total Nickel (Ni)	2024/03/01		102	%	80 - 120
			Total Phosphorus (P)	2024/03/01		105	%	80 - 120
			Total Potassium (K)	2024/03/01		101	%	80 - 120
			Total Selenium (Se)	2024/03/01		96	%	80 - 120
			Total Silver (Ag)	2024/03/01		95	%	80 - 120
			Total Sodium (Na)	2024/03/01		108	%	80 - 120
			Total Strontium (Sr)	2024/03/01		100	%	80 - 120
			Total Thallium (Tl)	2024/03/01		99	%	80 - 120
			Total Tin (Sn)	2024/03/01		96	%	80 - 120
			Total Titanium (Ti)	2024/03/01		101	%	80 - 120
			Total Uranium (U)	2024/03/01		104	%	80 - 120
			Total Vanadium (V)	2024/03/01		105	%	80 - 120
			Total Zinc (Zn)	2024/03/01		101	%	80 - 120
9249823	MTZ	Method Blank	Total Aluminum (Al)	2024/03/01	<5.0		ug/L	
			Total Antimony (Sb)	2024/03/01	<1.0		ug/L	
			Total Arsenic (As)	2024/03/01	<1.0		ug/L	
			Total Barium (Ba)	2024/03/01	<1.0		ug/L	
			Total Beryllium (Be)	2024/03/01	<0.10		ug/L	
			Total Bismuth (Bi)	2024/03/01	<2.0		ug/L	
			Total Boron (B)	2024/03/01	<50		ug/L	
			Total Cadmium (Cd)	2024/03/01	<0.010		ug/L	
			Total Calcium (Ca)	2024/03/01	<100		ug/L	
			Total Chromium (Cr)	2024/03/01	<1.0		ug/L	
			Total Cobalt (Co)	2024/03/01	<0.40		ug/L	
			Total Copper (Cu)	2024/03/01	<0.50		ug/L	
			Total Iron (Fe)	2024/03/01	<50		ug/L	
			Total Lead (Pb)	2024/03/01	<0.50		ug/L	
			Total Magnesium (Mg)	2024/03/01	<100		ug/L	
			Total Manganese (Mn)	2024/03/01	<2.0		ug/L	
			Total Molybdenum (Mo)	2024/03/01	<2.0		ug/L	
			Total Nickel (Ni)	2024/03/01	<2.0		ug/L	
			Total Phosphorus (P)	2024/03/01	<100		ug/L	
			Total Potassium (K)	2024/03/01	<100		ug/L	
			Total Selenium (Se)	2024/03/01	<0.50		ug/L	
			Total Silver (Ag)	2024/03/01	<0.10		ug/L	
			Total Sodium (Na)	2024/03/01	<100		ug/L	
			Total Strontium (Sr)	2024/03/01	<2.0		ug/L	
			Total Thallium (Tl)	2024/03/01	<0.10		ug/L	
			Total Tin (Sn)	2024/03/01	<2.0		ug/L	
			Total Titanium (Ti)	2024/03/01	<2.0		ug/L	
			Total Uranium (U)	2024/03/01	<0.10		ug/L	
			Total Vanadium (V)	2024/03/01	<2.0		ug/L	
			Total Zinc (Zn)	2024/03/01	<5.0		ug/L	
9249823	MTZ	RPD	Total Aluminum (Al)	2024/03/01	5.2		%	20
			Total Boron (B)	2024/03/01	5.0		%	20
			Total Copper (Cu)	2024/03/01	4.4		%	20
			Total Iron (Fe)	2024/03/01	NC		%	20
			Total Phosphorus (P)	2024/03/01	11		%	20



BUREAU  
VERITAS

Bureau Veritas Job #: C460020  
Report Date: 2024/03/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: JVS

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Zinc (Zn)	2024/03/01	4.1		%	20
9250718	CPP	Matrix Spike	Total Organic Carbon (C)	2024/03/01		98	%	85 - 115
9250718	CPP	Spiked Blank	Total Organic Carbon (C)	2024/03/01		97	%	80 - 120
9250718	CPP	Method Blank	Total Organic Carbon (C)	2024/03/01	<0.50		mg/L	
9250718	CPP	RPD	Total Organic Carbon (C)	2024/03/01	4.5		%	15
9250894	EMT	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2024/03/04		96	%	80 - 120
9250894	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2024/03/04		95	%	80 - 120
9250894	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2024/03/04	<0.050		mg/L	
9250894	EMT	RPD	Nitrogen (Ammonia Nitrogen)	2024/03/04	7.5		%	20
9251103	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2024/03/04		109	%	80 - 120
9251103	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2024/03/04		96	%	80 - 120
9251103	EMT	Method Blank	Dissolved Chloride (Cl-)	2024/03/04	<1.0		mg/L	
9251103	EMT	RPD	Dissolved Chloride (Cl-)	2024/03/04	7.9		%	20
9251117	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2024/03/04		NC	%	80 - 120
9251117	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2024/03/04		98	%	80 - 120
9251117	EMT	Method Blank	Dissolved Sulphate (SO4)	2024/03/04	<2.0		mg/L	
9251117	EMT	RPD	Dissolved Sulphate (SO4)	2024/03/04	0.63		%	20
9251119	EMT	Matrix Spike	Reactive Silica (SiO2)	2024/03/04		96	%	80 - 120
9251119	EMT	Spiked Blank	Reactive Silica (SiO2)	2024/03/04		101	%	80 - 120
9251119	EMT	Method Blank	Reactive Silica (SiO2)	2024/03/04	<0.50		mg/L	
9251119	EMT	RPD	Reactive Silica (SiO2)	2024/03/04	7.8		%	20
9251125	MCN	Spiked Blank	Colour	2024/03/04		118	%	80 - 120
9251125	MCN	Method Blank	Colour	2024/03/04	<5.0		TCU	
9251125	MCN	RPD	Colour	2024/03/04	6.6		%	20
9251131	MCN	Matrix Spike	Orthophosphate (P)	2024/03/04		90	%	80 - 120
9251131	MCN	Spiked Blank	Orthophosphate (P)	2024/03/04		97	%	80 - 120
9251131	MCN	Method Blank	Orthophosphate (P)	2024/03/04	<0.010		mg/L	
9251131	MCN	RPD	Orthophosphate (P)	2024/03/04	NC		%	20
9251133	MCN	Matrix Spike	Nitrate + Nitrite (N)	2024/03/04		97	%	80 - 120
9251133	MCN	Spiked Blank	Nitrate + Nitrite (N)	2024/03/04		100	%	80 - 120
9251133	MCN	Method Blank	Nitrate + Nitrite (N)	2024/03/04	<0.050		mg/L	
9251133	MCN	RPD	Nitrate + Nitrite (N)	2024/03/04	NC		%	20
9251135	EMT	Matrix Spike	Nitrite (N)	2024/03/04		101	%	80 - 120
9251135	EMT	Spiked Blank	Nitrite (N)	2024/03/04		103	%	80 - 120
9251135	EMT	Method Blank	Nitrite (N)	2024/03/04	<0.010		mg/L	
9251135	EMT	RPD	Nitrite (N)	2024/03/04	NC		%	20
9251136	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2024/03/04		113	%	80 - 120
		[YMO982-02]						
9251136	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2024/03/04		99	%	80 - 120
9251136	EMT	Method Blank	Dissolved Chloride (Cl-)	2024/03/04	<1.0		mg/L	
9251136	EMT	RPD [YMO982-02]	Dissolved Chloride (Cl-)	2024/03/04	2.7		%	20
9251140	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2024/03/04		105	%	80 - 120
		[YMO982-02]						
9251140	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2024/03/04		102	%	80 - 120
9251140	EMT	Method Blank	Dissolved Sulphate (SO4)	2024/03/04	<2.0		mg/L	
9251140	EMT	RPD [YMO982-02]	Dissolved Sulphate (SO4)	2024/03/04	2.8		%	20
9251141	EMT	Matrix Spike	Reactive Silica (SiO2)	2024/03/04		94	%	80 - 120
		[YMO982-02]						
9251141	EMT	Spiked Blank	Reactive Silica (SiO2)	2024/03/04		101	%	80 - 120
9251141	EMT	Method Blank	Reactive Silica (SiO2)	2024/03/04	<0.50		mg/L	
9251141	EMT	RPD [YMO982-02]	Reactive Silica (SiO2)	2024/03/04	13		%	20
9251144	MCN	Spiked Blank	Colour	2024/03/04		120	%	80 - 120
9251144	MCN	Method Blank	Colour	2024/03/04	<5.0		TCU	



BUREAU  
VERITAS

Bureau Veritas Job #: C460020

Report Date: 2024/03/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: JVS

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9251144	MCN	RPD [YMO982-02]	Colour	2024/03/04	2.9		%	20
9251172	MCN	Matrix Spike [YMO982-02]	Orthophosphate (P)	2024/03/04		93	%	80 - 120
9251172	MCN	Spiked Blank	Orthophosphate (P)	2024/03/04		98	%	80 - 120
9251172	MCN	Method Blank	Orthophosphate (P)	2024/03/04	<0.010		mg/L	
9251172	MCN	RPD [YMO982-02]	Orthophosphate (P)	2024/03/04	NC		%	20
9251189	MCN	Matrix Spike [YMO982-02]	Nitrate + Nitrite (N)	2024/03/04		98	%	80 - 120
9251189	MCN	Spiked Blank	Nitrate + Nitrite (N)	2024/03/04		103	%	80 - 120
9251189	MCN	Method Blank	Nitrate + Nitrite (N)	2024/03/04	<0.050		mg/L	
9251189	MCN	RPD [YMO982-02]	Nitrate + Nitrite (N)	2024/03/04	1.6		%	20
9251211	EMT	Matrix Spike [YMO982-02]	Nitrite (N)	2024/03/04		96	%	80 - 120
9251211	EMT	Spiked Blank	Nitrite (N)	2024/03/04		103	%	80 - 120
9251211	EMT	Method Blank	Nitrite (N)	2024/03/04	<0.010		mg/L	
9251211	EMT	RPD [YMO982-02]	Nitrite (N)	2024/03/04	NC		%	20
9253067	KMC	Spiked Blank	pH	2024/03/04		100	%	97 - 103
9253067	KMC	RPD [YMO983-02]	pH	2024/03/04	0.23		%	N/A
9253068	KMC	Spiked Blank	Conductivity	2024/03/04		101	%	80 - 120
9253068	KMC	Method Blank	Conductivity	2024/03/04	<1.0		uS/cm	
9253068	KMC	RPD [YMO983-02]	Conductivity	2024/03/04	0.23		%	10
9253069	KMC	Spiked Blank	Total Alkalinity (Total as CaCO <sub>3</sub> )	2024/03/04		99	%	80 - 120
9253069	KMC	Method Blank	Total Alkalinity (Total as CaCO <sub>3</sub> )	2024/03/04	<2.0		mg/L	
9253069	KMC	RPD [YMO983-02]	Total Alkalinity (Total as CaCO <sub>3</sub> )	2024/03/04	0.86		%	20
9253070	KMC	Matrix Spike	Dissolved Fluoride (F <sup>-</sup> )	2024/03/04		87	%	80 - 120
9253070	KMC	Spiked Blank	Dissolved Fluoride (F <sup>-</sup> )	2024/03/04		96	%	80 - 120
9253070	KMC	Method Blank	Dissolved Fluoride (F <sup>-</sup> )	2024/03/04	<0.10		mg/L	
9253070	KMC	RPD [YMO983-02]	Dissolved Fluoride (F <sup>-</sup> )	2024/03/04	NC		%	20
9253756	EMT	Matrix Spike [YMO983-05]	Nitrogen (Ammonia Nitrogen)	2024/03/05		94	%	80 - 120
9253756	EMT	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2024/03/05		94	%	80 - 120
9253756	EMT	Method Blank	Nitrogen (Ammonia Nitrogen)	2024/03/05	<0.050		mg/L	
9253756	EMT	RPD [YMO983-05]	Nitrogen (Ammonia Nitrogen)	2024/03/05	NC		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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



Bureau Veritas Job #: C460020  
Report Date: 2024/03/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: JVS

### VALIDATION SIGNATURE PAGE

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



---

Automated Statchk

---

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



Bureau Veritas  
200 Bluewater Road Bedford, Nova Scotia, Canada B4B 1G6 Tel: (902) 420-0203 Toll-free: 800-563-6266 Fax: (902) 420-6612 www.bvna.com



BEDF-2024-02-1910

<b>INVOICE TO:</b>		<b>Report Information</b>		<b>Project Information</b>	
Company Name: #16276 GHD Limited	Contact Name: Accounts Payable	Address: 120 Western Parkway Bedford NS B4B 0V2	Phone: (902) 468-1248 Fax: (902) 468-2207	Email: AccountsPayableCDN@ghd.com	
Company Name: Jessica Romo	Contact Name: Jessica Romo	Address:	Phone:	Fax:	
Quotation #: C40238	P.O. #: 735-009466	Project #: 12601021-15	Project Name:	Site #:	Sampled By: JV/SJP
Bottle Order #: 876732	Chain Of Custody Record	Project Manager	Barcode: CA976732-01-01		

Regulatory Criteria:	Special Instructions:	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)					Turnaround Time (TAT) Required:
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal		Field Filtered & Preserved Lab Filtration Required	Atlantic RCB-MS Total Metals in Water	Fluoride	Total Suspended Solids	Please provide advance notice for rush projects	
						<b>Regular (Standard) TAT:</b> (will be applied if Rush TAT is not specified). Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
						<b>Job Specific Rush TAT (if applies to entire submission)</b> Date Required: Time Required:	

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS						Field Filtered & Preserved Lab Filtration Required	Atlantic RCB-MS Total Metals in Water	Fluoride	Total Suspended Solids	# of Bottles	Comments / Hazards / Other Required Analysis
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix							
1	SW-1	240228	1315	SW		X	X	X			
2	SW-2	240228	1315	SW		X	X	X	S		
3	SW-3	240228	1210	SW		X	X	X	S		
4	SW-3A	240228	1150	SW		X	X	X	S		
5	SW-4	240228	0928	SW		X	X	X	S		
6	SW-5	240228	1010	SW		X	X	X	S		
7	SW-6	240228	1110	SW		X	X	X	S		
8	SWDUP	240228		SW		X	X	X	S		
9											
10											

RELINQUISHED BY: (Signature/Print) Cool R. Sadie Jacobs-Peters	Date: (YY/MM/DD) 240228	Time 1625	RECEIVED BY: (Signature/Print) J.P. de Klerk R. de Klerk	Date: (YY/MM/DD)	Time	# jars used and not submitted	Time Sensitive	Temperature (°C) on Receipt 3, 4, 4	Custody Seal Intact on Cooler?
							<input type="checkbox"/>		<input type="checkbox"/> Yes <input type="checkbox"/> No

\* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.  
 \*\* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

ICE: YES

2024 FEB 28 16:34



Your P.O. #: 735-009466  
 Your Project #: 12601021  
 Site Location: ANTRIM  
 Your C.O.C. #: N/A

**Attention: Jessica Romo**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2024/04/03**  
 Report #: R8091377  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C489618**

**Received: 2024/03/26, 12:27**

Sample Matrix: Surface Water  
 # Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Carbonate, Bicarbonate and Hydroxide	1	N/A	2024/04/03	N/A	SM 24 4500-CO2 D
Alkalinity	1	N/A	2024/04/02	ATL SOP 00142	SM 24 2320 B
Chloride	1	N/A	2024/04/02	ATL SOP 00014	SM 24 4500-Cl- E m
Colour	1	N/A	2024/04/02	ATL SOP 00020	SM 24 2120C m
Conductance - water	1	N/A	2024/04/02	ATL SOP 00004	SM 24 2510B m
Fluoride	1	N/A	2024/04/02	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	1	N/A	2024/04/01	ATL SOP 00048	Auto Calc
Metals Water Total MS	1	2024/03/28	2024/04/01	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	1	N/A	2024/04/03	N/A	Auto Calc.
Anion and Cation Sum	1	N/A	2024/04/03	N/A	Auto Calc.
Nitrogen Ammonia - water	1	N/A	2024/04/01	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	1	N/A	2024/04/02	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	1	N/A	2024/04/02	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	1	N/A	2024/04/03	ATL SOP 00018	ASTM D3867-16
pH (1)	1	N/A	2024/04/02	ATL SOP 00003	SM 24 4500-H+ B m
Phosphorus - ortho	1	N/A	2024/04/03	ATL SOP 00021	SM 24 4500-P E m
Sat. pH and Langelier Index (@ 20C)	1	N/A	2024/04/03	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	1	N/A	2024/04/03	ATL SOP 00049	Auto Calc.
Reactive Silica	1	N/A	2024/04/02	ATL SOP 00022	EPA 366.0 m
Sulphate	1	N/A	2024/04/02	ATL SOP 00023	ASTM D516-16 m
Total Dissolved Solids (TDS calc)	1	N/A	2024/04/03	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	1	N/A	2024/04/01	ATL SOP 00203	SM 24 5310B m
Total Suspended Solids	1	2024/03/28	2024/04/02	ATL SOP 00007	SM 24 2540D m
Turbidity	1	N/A	2024/04/01	ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**

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

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





Your P.O. #: 735-009466  
Your Project #: 12601021  
Site Location: ANTRIM  
Your C.O.C. #: N/A

**Attention: Jessica Romo**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2024/04/03**  
Report #: R8091377  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C489618**

**Received: 2024/03/26, 12:27**

Uncertainty has not been accounted for when stating conformity to the referenced standard.

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to:

Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

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

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



### RESULTS OF ANALYSES OF SURFACE WATER

Bureau Veritas ID		YSQ876			
Sampling Date		2024/03/25 10:00			
COC Number		N/A			
	UNITS	SW-1	RDL	MDL	QC Batch
<b>Calculated Parameters</b>					
Anion Sum	me/L	0.260	N/A	N/A	9296708
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	0.20	9296703
Calculated TDS	mg/L	21	1.0	0.20	9296716
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	0.20	9296703
Cation Sum	me/L	0.350	N/A	N/A	9296708
Hardness (CaCO3)	mg/L	11	1.0	1.0	9296704
Ion Balance (% Difference)	%	14.8	N/A	N/A	9296707
Langelier Index (@ 20C)	N/A	NC			9296714
Langelier Index (@ 4C)	N/A	NC			9296715
Nitrate (N)	mg/L	<0.050	0.050	N/A	9296711
Saturation pH (@ 20C)	N/A	NC			9296714
Saturation pH (@ 4C)	N/A	NC			9296715
<b>Inorganics</b>					
Total Alkalinity (Total as CaCO3)	mg/L	<2.0	2.0	N/A	9308243
Dissolved Chloride (Cl-)	mg/L	3.6	1.0	N/A	9307197
Colour	TCU	52	25	N/A	9307206
Dissolved Fluoride (F-)	mg/L	<0.10	0.10	0.050	9308244
Nitrate + Nitrite (N)	mg/L	<0.050	0.050	N/A	9307215
Nitrite (N)	mg/L	<0.010	0.010	N/A	9307217
Nitrogen (Ammonia Nitrogen)	mg/L	0.061	0.050	N/A	9306384
Total Organic Carbon (C)	mg/L	6.2	0.50	N/A	9306341
Orthophosphate (P)	mg/L	<0.010	0.010	N/A	9307207
pH	pH	6.04			9308238
Reactive Silica (SiO2)	mg/L	2.0	0.50	N/A	9307203
Total Suspended Solids	mg/L	2.0	1.0	N/A	9302691
Dissolved Sulphate (SO4)	mg/L	7.8	2.0	N/A	9307201
Turbidity	NTU	6.2	0.10	0.10	9306579
Conductivity	uS/cm	36	1.0	N/A	9308240
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable					





**ELEMENTS BY ICP/MS (SURFACE WATER)**

Bureau Veritas ID		YSQ876			
Sampling Date		2024/03/25 10:00			
COC Number		N/A			
	UNITS	SW-1	RDL	MDL	QC Batch
<b>Metals</b>					
Total Aluminum (Al)	ug/L	310	5.0	N/A	9302183
Total Antimony (Sb)	ug/L	<1.0	1.0	N/A	9302183
Total Arsenic (As)	ug/L	<1.0	1.0	N/A	9302183
Total Barium (Ba)	ug/L	6.3	1.0	N/A	9302183
Total Beryllium (Be)	ug/L	<0.10	0.10	N/A	9302183
Total Bismuth (Bi)	ug/L	<2.0	2.0	N/A	9302183
Total Boron (B)	ug/L	<50	50	N/A	9302183
Total Cadmium (Cd)	ug/L	0.011	0.010	N/A	9302183
Total Calcium (Ca)	ug/L	3200	100	N/A	9302183
Total Chromium (Cr)	ug/L	<1.0	1.0	N/A	9302183
Total Cobalt (Co)	ug/L	<0.40	0.40	N/A	9302183
Total Copper (Cu)	ug/L	<0.50	0.50	N/A	9302183
Total Iron (Fe)	ug/L	320	50	N/A	9302183
Total Lead (Pb)	ug/L	<0.50	0.50	N/A	9302183
Total Magnesium (Mg)	ug/L	590	100	N/A	9302183
Total Manganese (Mn)	ug/L	19	2.0	N/A	9302183
Total Molybdenum (Mo)	ug/L	<2.0	2.0	N/A	9302183
Total Nickel (Ni)	ug/L	<2.0	2.0	N/A	9302183
Total Phosphorus (P)	ug/L	<100	100	N/A	9302183
Total Potassium (K)	ug/L	400	100	N/A	9302183
Total Selenium (Se)	ug/L	<0.50	0.50	N/A	9302183
Total Silver (Ag)	ug/L	<0.10	0.10	N/A	9302183
Total Sodium (Na)	ug/L	2500	100	N/A	9302183
Total Strontium (Sr)	ug/L	12	2.0	N/A	9302183
Total Thallium (Tl)	ug/L	<0.10	0.10	N/A	9302183
Total Tin (Sn)	ug/L	<2.0	2.0	N/A	9302183
Total Titanium (Ti)	ug/L	6.9	2.0	N/A	9302183
Total Uranium (U)	ug/L	<0.10	0.10	N/A	9302183
Total Vanadium (V)	ug/L	<2.0	2.0	N/A	9302183
Total Zinc (Zn)	ug/L	<5.0	5.0	N/A	9302183
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable					



Bureau Veritas Job #: C489618  
Report Date: 2024/04/03

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM  
Your P.O. #: 735-009466  
Sampler Initials: JV

### GENERAL COMMENTS

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

Package 1	4.0°C
-----------	-------

Sample YSQ876 [SW-1] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C489618  
Report Date: 2024/04/03

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM  
Your P.O. #: 735-009466  
Sampler Initials: JV

### QUALITY ASSURANCE REPORT

QA/QC								
Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9302183	MTZ	Matrix Spike	Total Aluminum (Al)	2024/03/28		99	%	80 - 120
			Total Antimony (Sb)	2024/03/28		104	%	80 - 120
			Total Arsenic (As)	2024/03/28		103	%	80 - 120
			Total Barium (Ba)	2024/03/28		99	%	80 - 120
			Total Beryllium (Be)	2024/03/28		99	%	80 - 120
			Total Bismuth (Bi)	2024/03/28		101	%	80 - 120
			Total Boron (B)	2024/03/28		98	%	80 - 120
			Total Cadmium (Cd)	2024/03/28		103	%	80 - 120
			Total Calcium (Ca)	2024/03/28		100	%	80 - 120
			Total Chromium (Cr)	2024/03/28		101	%	80 - 120
			Total Cobalt (Co)	2024/03/28		102	%	80 - 120
			Total Copper (Cu)	2024/03/28		101	%	80 - 120
			Total Iron (Fe)	2024/03/28		101	%	80 - 120
			Total Lead (Pb)	2024/03/28		103	%	80 - 120
			Total Magnesium (Mg)	2024/03/28		104	%	80 - 120
			Total Manganese (Mn)	2024/03/28		103	%	80 - 120
			Total Molybdenum (Mo)	2024/03/28		104	%	80 - 120
			Total Nickel (Ni)	2024/03/28		100	%	80 - 120
			Total Phosphorus (P)	2024/03/28		104	%	80 - 120
			Total Potassium (K)	2024/03/28		105	%	80 - 120
			Total Selenium (Se)	2024/03/28		101	%	80 - 120
			Total Silver (Ag)	2024/03/28		100	%	80 - 120
			Total Sodium (Na)	2024/03/28		NC	%	80 - 120
			Total Strontium (Sr)	2024/03/28		103	%	80 - 120
			Total Thallium (Tl)	2024/03/28		102	%	80 - 120
			Total Tin (Sn)	2024/03/28		104	%	80 - 120
			Total Titanium (Ti)	2024/03/28		104	%	80 - 120
			Total Uranium (U)	2024/03/28		112	%	80 - 120
			Total Vanadium (V)	2024/03/28		102	%	80 - 120
			Total Zinc (Zn)	2024/03/28		99	%	80 - 120
			9302183	MTZ	Spiked Blank	Total Aluminum (Al)	2024/03/28	
Total Antimony (Sb)	2024/03/28					105	%	80 - 120
Total Arsenic (As)	2024/03/28					103	%	80 - 120
Total Barium (Ba)	2024/03/28					100	%	80 - 120
Total Beryllium (Be)	2024/03/28					99	%	80 - 120
Total Bismuth (Bi)	2024/03/28					104	%	80 - 120
Total Boron (B)	2024/03/28					99	%	80 - 120
Total Cadmium (Cd)	2024/03/28					104	%	80 - 120
Total Calcium (Ca)	2024/03/28					104	%	80 - 120
Total Chromium (Cr)	2024/03/28					103	%	80 - 120
Total Cobalt (Co)	2024/03/28					103	%	80 - 120
Total Copper (Cu)	2024/03/28					102	%	80 - 120
Total Iron (Fe)	2024/03/28					102	%	80 - 120
Total Lead (Pb)	2024/03/28					105	%	80 - 120
Total Magnesium (Mg)	2024/03/28					105	%	80 - 120
Total Manganese (Mn)	2024/03/28					105	%	80 - 120
Total Molybdenum (Mo)	2024/03/28					105	%	80 - 120
Total Nickel (Ni)	2024/03/28		104	%	80 - 120			
Total Phosphorus (P)	2024/03/28		105	%	80 - 120			
Total Potassium (K)	2024/03/28		107	%	80 - 120			
Total Selenium (Se)	2024/03/28		104	%	80 - 120			
Total Silver (Ag)	2024/03/28		102	%	80 - 120			



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Sodium (Na)	2024/03/28		103	%	80 - 120
			Total Strontium (Sr)	2024/03/28		105	%	80 - 120
			Total Thallium (Tl)	2024/03/28		104	%	80 - 120
			Total Tin (Sn)	2024/03/28		105	%	80 - 120
			Total Titanium (Ti)	2024/03/28		109	%	80 - 120
			Total Uranium (U)	2024/03/28		111	%	80 - 120
			Total Vanadium (V)	2024/03/28		103	%	80 - 120
			Total Zinc (Zn)	2024/03/28		102	%	80 - 120
9302183	MTZ	Method Blank	Total Aluminum (Al)	2024/03/28	<5.0		ug/L	
			Total Antimony (Sb)	2024/03/28	<1.0		ug/L	
			Total Arsenic (As)	2024/03/28	<1.0		ug/L	
			Total Barium (Ba)	2024/03/28	<1.0		ug/L	
			Total Beryllium (Be)	2024/03/28	<0.10		ug/L	
			Total Bismuth (Bi)	2024/03/28	<2.0		ug/L	
			Total Boron (B)	2024/03/28	<50		ug/L	
			Total Cadmium (Cd)	2024/03/28	<0.010		ug/L	
			Total Calcium (Ca)	2024/03/28	<100		ug/L	
			Total Chromium (Cr)	2024/03/28	<1.0		ug/L	
			Total Cobalt (Co)	2024/03/28	<0.40		ug/L	
			Total Copper (Cu)	2024/03/28	<0.50		ug/L	
			Total Iron (Fe)	2024/03/28	<50		ug/L	
			Total Lead (Pb)	2024/03/28	<0.50		ug/L	
			Total Magnesium (Mg)	2024/03/28	<100		ug/L	
			Total Manganese (Mn)	2024/03/28	<2.0		ug/L	
			Total Molybdenum (Mo)	2024/03/28	<2.0		ug/L	
			Total Nickel (Ni)	2024/03/28	<2.0		ug/L	
			Total Phosphorus (P)	2024/03/28	<100		ug/L	
			Total Potassium (K)	2024/03/28	<100		ug/L	
			Total Selenium (Se)	2024/03/28	<0.50		ug/L	
			Total Silver (Ag)	2024/03/28	<0.10		ug/L	
			Total Sodium (Na)	2024/03/28	<100		ug/L	
			Total Strontium (Sr)	2024/03/28	<2.0		ug/L	
			Total Thallium (Tl)	2024/03/28	<0.10		ug/L	
			Total Tin (Sn)	2024/03/28	<2.0		ug/L	
			Total Titanium (Ti)	2024/03/28	<2.0		ug/L	
			Total Uranium (U)	2024/03/28	<0.10		ug/L	
			Total Vanadium (V)	2024/03/28	<2.0		ug/L	
			Total Zinc (Zn)	2024/03/28	<5.0		ug/L	
9302183	MTZ	RPD	Total Aluminum (Al)	2024/03/28	NC		%	20
			Total Antimony (Sb)	2024/03/28	NC		%	20
			Total Arsenic (As)	2024/03/28	NC		%	20
			Total Barium (Ba)	2024/03/28	0.15		%	20
			Total Boron (B)	2024/03/28	NC		%	20
			Total Cadmium (Cd)	2024/03/28	NC		%	20
			Total Calcium (Ca)	2024/03/28	1.5		%	20
			Total Chromium (Cr)	2024/03/28	NC		%	20
			Total Copper (Cu)	2024/03/28	NC		%	20
			Total Iron (Fe)	2024/03/28	NC		%	20
			Total Lead (Pb)	2024/03/28	NC		%	20
			Total Magnesium (Mg)	2024/03/28	1.5		%	20
			Total Manganese (Mn)	2024/03/28	NC		%	20
			Total Potassium (K)	2024/03/28	0.72		%	20



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Selenium (Se)	2024/03/28	8.9		%	20
			Total Sodium (Na)	2024/03/28	0.15		%	20
			Total Strontium (Sr)	2024/03/28	0.11		%	20
			Total Uranium (U)	2024/03/28	2.7		%	20
			Total Zinc (Zn)	2024/03/28	NC		%	20
9302691	DME	QC Standard	Total Suspended Solids	2024/04/02		97	%	80 - 120
9302691	DME	Method Blank	Total Suspended Solids	2024/04/02	<1.0		mg/L	
9302691	DME	RPD	Total Suspended Solids	2024/04/02	0.74		%	20
9306341	SSI	Matrix Spike	Total Organic Carbon (C)	2024/04/01		98	%	85 - 115
9306341	SSI	Spiked Blank	Total Organic Carbon (C)	2024/04/01		102	%	80 - 120
9306341	SSI	Method Blank	Total Organic Carbon (C)	2024/04/01	<0.50		mg/L	
9306341	SSI	RPD	Total Organic Carbon (C)	2024/04/01	1.8		%	15
9306384	MCN	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2024/04/01		NC	%	80 - 120
9306384	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2024/04/01		103	%	80 - 120
9306384	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2024/04/01	<0.050		mg/L	
9306384	MCN	RPD	Nitrogen (Ammonia Nitrogen)	2024/04/01	1.3		%	20
9306579	LJV	QC Standard	Turbidity	2024/04/01		97	%	80 - 120
9306579	LJV	Spiked Blank	Turbidity	2024/04/01		110	%	80 - 120
9306579	LJV	Method Blank	Turbidity	2024/04/01	<0.10		NTU	
9306579	LJV	RPD	Turbidity	2024/04/01	7.3		%	20
9307197	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2024/04/02		98	%	80 - 120
9307197	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2024/04/02		102	%	80 - 120
9307197	EMT	Method Blank	Dissolved Chloride (Cl-)	2024/04/02	<1.0		mg/L	
9307197	EMT	RPD	Dissolved Chloride (Cl-)	2024/04/02	0.68		%	20
9307201	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2024/04/02		99	%	80 - 120
9307201	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2024/04/02		104	%	80 - 120
9307201	EMT	Method Blank	Dissolved Sulphate (SO4)	2024/04/02	<2.0		mg/L	
9307201	EMT	RPD	Dissolved Sulphate (SO4)	2024/04/02	20		%	20
9307203	EMT	Matrix Spike	Reactive Silica (SiO2)	2024/04/02		89	%	80 - 120
9307203	EMT	Spiked Blank	Reactive Silica (SiO2)	2024/04/02		95	%	80 - 120
9307203	EMT	Method Blank	Reactive Silica (SiO2)	2024/04/02	<0.50		mg/L	
9307203	EMT	RPD	Reactive Silica (SiO2)	2024/04/02	4.7		%	20
9307206	EMT	Spiked Blank	Colour	2024/04/02		109	%	80 - 120
9307206	EMT	Method Blank	Colour	2024/04/02	<5.0		TCU	
9307206	EMT	RPD	Colour	2024/04/02	NC		%	20
9307207	EMT	Matrix Spike	Orthophosphate (P)	2024/04/03		80 (1)	%	80 - 120
9307207	EMT	Spiked Blank	Orthophosphate (P)	2024/04/03		84	%	80 - 120
9307207	EMT	Method Blank	Orthophosphate (P)	2024/04/03	<0.010		mg/L	
9307207	EMT	RPD	Orthophosphate (P)	2024/04/03	3.7		%	20
9307215	MCN	Matrix Spike	Nitrate + Nitrite (N)	2024/04/02		96	%	80 - 120
9307215	MCN	Spiked Blank	Nitrate + Nitrite (N)	2024/04/02		98	%	80 - 120
9307215	MCN	Method Blank	Nitrate + Nitrite (N)	2024/04/02	<0.050		mg/L	
9307215	MCN	RPD	Nitrate + Nitrite (N)	2024/04/02	NC		%	20
9307217	EMT	Matrix Spike	Nitrite (N)	2024/04/02		102	%	80 - 120
9307217	EMT	Spiked Blank	Nitrite (N)	2024/04/02		100	%	80 - 120
9307217	EMT	Method Blank	Nitrite (N)	2024/04/02	<0.010		mg/L	
9307217	EMT	RPD	Nitrite (N)	2024/04/02	NC		%	20
9308238	LJV	Spiked Blank	pH	2024/04/02		101	%	97 - 103
9308238	LJV	RPD	pH	2024/04/02	0.31		%	N/A
9308240	LJV	Spiked Blank	Conductivity	2024/04/02		101	%	80 - 120
9308240	LJV	Method Blank	Conductivity	2024/04/02	<1.0		uS/cm	
9308240	LJV	RPD	Conductivity	2024/04/02	0.85		%	10



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9308243	LJV	Spiked Blank	Total Alkalinity (Total as CaCO3)	2024/04/02		100	%	80 - 120
9308243	LJV	Method Blank	Total Alkalinity (Total as CaCO3)	2024/04/02	<2.0		mg/L	
9308243	LJV	RPD	Total Alkalinity (Total as CaCO3)	2024/04/02	1.2		%	20
9308244	LJV	Matrix Spike	Dissolved Fluoride (F-)	2024/04/02		84	%	80 - 120
9308244	LJV	Spiked Blank	Dissolved Fluoride (F-)	2024/04/02		92	%	80 - 120
9308244	LJV	Method Blank	Dissolved Fluoride (F-)	2024/04/02	<0.10		mg/L	
9308244	LJV	RPD	Dissolved Fluoride (F-)	2024/04/02	NC		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

(1) Poor spike recovery due to probable sample matrix interference.



Bureau Veritas Job #: C489618  
Report Date: 2024/04/03

GHD Limited  
Client Project #: 12601021  
Site Location: ANTRIM  
Your P.O. #: 735-009466  
Sampler Initials: JV

### VALIDATION SIGNATURE PAGE

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

Colleen Acker, B.Sc, Scientific Service Specialist



Automated Statchk

---

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





www.bvna.com

105-200 Bluewater Road, Bedford, NS B4B 1G9  
49-55 Elizabeth Avenue, St John's, NL A1A 1W9  
465 George Street, Unit G, Sydney, NS B1P 1K5

Tel: 902-420-0203 Fax: 902-420-8612 Toll Free: 1-800-565-7227  
Tel: 709-754-0203 Fax: 709-754-8612 Toll Free: 1-888-492-7227  
Tel: 902-567-1255 Fax: 902-539-6504 Toll Free: 1-888-535-7770

CHAIN OF CUSTODY RECORD  
ENV COC - 00016v3



BEDF-2024-03-1212

Invoice Information				Report Information (if differs from invoice)				Project Information			
Invoice to (requires report) <input type="checkbox"/>				Company: GHD Ltd				Quotation #:			
Company: #126276 GHD Ltd				Contact Name: Jessica Romo				P.O. #/ AFE#:			
Contact Name: Accounts Payable				Street Address: 120 Western Parkway				Project #:			
Street Address: 120 Western Parkway				City: Bedford Prov: NS Postal Code: B4B0V2				Site #:			
City: Bedford Prov: NS Postal Code: B4B0V2				Phone: 902-468-1248				Site Location: Antrim			
Phone: 902-468-1248				Email: accounts payableCDN@ghd.com				Site Location Province: NS			
Email: accounts payableCDN@ghd.com				Copies:				Sampled By: J Venlot, S. Jacob-Peters			
Copies:											

Regulatory Criteria		Regulation		Matrix		Regular Turnaround Time (TAT)																								
**Specify matrix for each regulation: surface water (SW)/groundwater (GW)/tap water/sewage/effluent/seawater/potable water/non-potable water/tissue/soil/sludge/metal						<input checked="" type="checkbox"/> 5 to 7 Day <input type="checkbox"/> 10 Day Rush Turnaround Time (TAT) Surcharges apply <input type="checkbox"/> Same Day <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 4 Day Date Required: YY MM DD Comments:																								
SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS																														
Sample Identification	Date Sampled			Time (24hr)		Matrix	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
	YY	MM	DD	HH	MM																									
1 SW-1	24	03	25	10	00	Water - Surface				X	X	X																		
2																														
3																														
4																														
5																														
6																														
7																														
8																														
9																														
10																														
11																														
12																														

\*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY			LAB USE ONLY			LAB USE ONLY			Temperature reading by:
Yes	No	°C	Yes	No	°C	Yes	No	°C	
Seal present		4 5 3	Seal present			Seal present			
Seal intact			Seal intact			Seal intact			
Cooling media present	<input checked="" type="checkbox"/>		Cooling media present			Cooling media present			

Relinquished by: (Signature/ Print)	Date					Received by: (Signature/ Print)	Date					Special instructions
	YY	MM	DD	HH	MM		YY	MM	DD	HH	MM	
1 J Venlot	2024	03	26	12	20	1 J Venlot						
2						2						

2024 MAR 26 12:27





Your P.O. #: 735-009466  
 Your Project #: 12601021-15  
 Your C.O.C. #: C#993792-01-01

**Attention: Jessica Romo**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2024/07/05**  
 Report #: R8222278  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C4J5336**

**Received: 2024/06/26, 16:06**

Sample Matrix: Surface Water  
 # Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Carbonate, Bicarbonate and Hydroxide	1	N/A	2024/07/03	N/A	SM 24 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	5	N/A	2024/07/04	N/A	SM 24 4500-CO2 D
Alkalinity	1	N/A	2024/07/02	ATL SOP 00142	SM 24 2320 B
Alkalinity	5	N/A	2024/07/03	ATL SOP 00142	SM 24 2320 B
Chloride	6	N/A	2024/07/03	ATL SOP 00014	SM 24 4500-Cl- E m
Colour	6	N/A	2024/07/03	ATL SOP 00020	SM 24 2120C m
Conductance - water	1	N/A	2024/07/02	ATL SOP 00004	SM 24 2510B m
Conductance - water	5	N/A	2024/07/03	ATL SOP 00004	SM 24 2510B m
Fluoride	1	N/A	2024/07/02	ATL SOP 00043	SM 24 4500-F- C m
Fluoride	5	N/A	2024/07/03	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	3	N/A	2024/07/04	ATL SOP 00048	Auto Calc
Hardness (calculated as CaCO3)	3	N/A	2024/07/05	ATL SOP 00048	Auto Calc
Metals Water Total MS	5	2024/07/03	2024/07/04	ATL SOP 00058	EPA 6020B R2 m
Metals Water Total MS	1	2024/07/03	2024/07/05	ATL SOP 00058	EPA 6020B R2 m
Ion Balance (% Difference)	3	N/A	2024/07/04	N/A	Auto Calc.
Ion Balance (% Difference)	3	N/A	2024/07/05	N/A	Auto Calc.
Anion and Cation Sum	3	N/A	2024/07/04	N/A	Auto Calc.
Anion and Cation Sum	3	N/A	2024/07/05	N/A	Auto Calc.
Nitrogen Ammonia - water	4	N/A	2024/07/02	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen Ammonia - water	2	N/A	2024/07/03	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	6	N/A	2024/07/03	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	6	N/A	2024/07/03	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	6	N/A	2024/07/04	ATL SOP 00018	ASTM D3867-16
pH (1)	1	N/A	2024/07/02	ATL SOP 00003	SM 24 4500-H+ B m
pH (1)	5	N/A	2024/07/03	ATL SOP 00003	SM 24 4500-H+ B m
Phosphorus - ortho	6	N/A	2024/07/03	ATL SOP 00021	SM 24 4500-P E m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2024/07/04	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 20C)	3	N/A	2024/07/05	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2024/07/04	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C)	3	N/A	2024/07/05	ATL SOP 00049	Auto Calc.
Reactive Silica	6	N/A	2024/07/03	ATL SOP 00022	EPA 366.0 m
Sulphate	6	N/A	2024/07/03	ATL SOP 00023	ASTM D516-16 m



Your P.O. #: 735-009466  
 Your Project #: 12601021-15  
 Your C.O.C. #: C#993792-01-01

**Attention: Jessica Romo**

GHD Limited  
 120 Western Parkway  
 Bedford, NS  
 CANADA B4B 0V2

**Report Date: 2024/07/05**  
 Report #: R8222278  
 Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C4J5336**

**Received: 2024/06/26, 16:06**

Sample Matrix: Surface Water  
 # Samples Received: 6

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Total Dissolved Solids (TDS calc)	3	N/A	2024/07/04	N/A	Auto Calc.
Total Dissolved Solids (TDS calc)	3	N/A	2024/07/05	N/A	Auto Calc.
Organic carbon - Total (TOC) (2)	6	N/A	2024/06/28	ATL SOP 00203	SM 24 5310B m
Total Suspended Solids	6	2024/06/28	2024/07/02	ATL SOP 00007	SM 24 2540D m
Turbidity	1	N/A	2024/07/03	ATL SOP 00011	EPA 180.1 R2 m
Turbidity	5	N/A	2024/07/04	ATL SOP 00011	EPA 180.1 R2 m

**Remarks:**

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

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

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

(1) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.

(2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.



Your P.O. #: 735-009466  
Your Project #: 12601021-15  
Your C.O.C. #: C#993792-01-01

**Attention: Jessica Romo**

GHD Limited  
120 Western Parkway  
Bedford, NS  
CANADA B4B 0V2

**Report Date: 2024/07/05**  
Report #: R8222278  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BUREAU VERITAS JOB #: C4J5336**

**Received: 2024/06/26, 16:06**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:  
Marie Muise, Key Account Specialist  
Email: Marie.MUISE@bureauveritas.com  
Phone# (902)420-0203 Ext:253

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



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		ZON059		ZON060			
Sampling Date		2024/06/24 10:05		2024/06/24 12:45			
COC Number		C#993792-01-01		C#993792-01-01			
	UNITS	SW1	QC Batch	SW2	RDL	MDL	QC Batch
<b>Calculated Parameters</b>							
Anion Sum	me/L	1.31	9481614	1.15	N/A	N/A	9481614
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16	9481609	21	1.0	0.20	9481609
Calculated TDS	mg/L	88	9481622	75	1.0	0.20	9481622
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	9481609	<1.0	1.0	0.20	9481609
Cation Sum	me/L	1.43	9481614	1.26	N/A	N/A	9481614
Hardness (CaCO3)	mg/L	62	9481611	50	1.0	1.0	9481611
Ion Balance (% Difference)	%	4.38	9481612	4.56	N/A	N/A	9481612
Langelier Index (@ 20C)	N/A	-1.71	9481619	-1.85			9481619
Langelier Index (@ 4C)	N/A	-1.97	9481621	-2.10			9481621
Nitrate (N)	mg/L	0.075	9481616	0.14	0.050	N/A	9481616
Saturation pH (@ 20C)	N/A	8.76	9481619	8.77			9481619
Saturation pH (@ 4C)	N/A	9.02	9481621	9.03			9481621
<b>Inorganics</b>							
Total Alkalinity (Total as CaCO3)	mg/L	16	9491114	21	2.0	N/A	9491114
Dissolved Chloride (Cl-)	mg/L	3.0	9491072	3.6	1.0	N/A	9491072
Colour	TCU	170	9491075	70	25	N/A	9491075
Dissolved Fluoride (F-)	mg/L	<0.10	9491115	<0.10	0.10	0.050	9491115
Nitrate + Nitrite (N)	mg/L	0.075	9491077	0.14	0.050	N/A	9491077
Nitrite (N)	mg/L	<0.010	9491078	<0.010	0.010	N/A	9491078
Nitrogen (Ammonia Nitrogen)	mg/L	0.095	9489421	0.062	0.050	N/A	9491485
Total Organic Carbon (C)	mg/L	18	9484744	11	0.50	N/A	9484744
Orthophosphate (P)	mg/L	0.010	9491076	<0.010	0.010	N/A	9491076
pH	pH	7.05	9491110	6.92			9491110
Reactive Silica (SiO2)	mg/L	3.0	9491074	3.2	0.50	N/A	9491074
Total Suspended Solids	mg/L	1.6	9485418	2.0	1.0	N/A	9485418
Dissolved Sulphate (SO4)	mg/L	43	9491073	29	2.0	N/A	9491073
Turbidity	NTU	3.6	9493829	6.5	0.10	0.10	9493829
Conductivity	uS/cm	71	9491113	62	1.0	N/A	9491113
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable							



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		ZON060				ZON061			
Sampling Date		2024/06/24 12:45				2024/06/24 11:35			
COC Number		C#993792-01-01				C#993792-01-01			
	UNITS	SW2 Lab-Dup	RDL	MDL	QC Batch	SW3	RDL	MDL	QC Batch
<b>Calculated Parameters</b>									
Anion Sum	me/L					4.89	N/A	N/A	9481614
Bicarb. Alkalinity (calc. as CaCO3)	mg/L					40	1.0	0.20	9481609
Calculated TDS	mg/L					320	1.0	0.20	9481622
Carb. Alkalinity (calc. as CaCO3)	mg/L					<1.0	1.0	0.20	9481609
Cation Sum	me/L					5.15	N/A	N/A	9481614
Hardness (CaCO3)	mg/L					190	1.0	1.0	9481611
Ion Balance (% Difference)	%					2.59	N/A	N/A	9481612
Langelier Index (@ 20C)	N/A					-0.490			9481619
Langelier Index (@ 4C)	N/A					-0.739			9481621
Nitrate (N)	mg/L					0.098	0.050	N/A	9481616
Saturation pH (@ 20C)	N/A					8.03			9481619
Saturation pH (@ 4C)	N/A					8.28			9481621
<b>Inorganics</b>									
Total Alkalinity (Total as CaCO3)	mg/L					40	2.0	N/A	9488695
Dissolved Chloride (Cl-)	mg/L					11	1.0	N/A	9491087
Colour	TCU					29	5.0	N/A	9491091
Dissolved Fluoride (F-)	mg/L					<0.10	0.10	0.050	9488697
Nitrate + Nitrite (N)	mg/L					0.098	0.050	N/A	9491093
Nitrite (N)	mg/L					<0.010	0.010	N/A	9491094
Nitrogen (Ammonia Nitrogen)	mg/L	0.082	0.050	N/A	9491485	<0.050	0.050	N/A	9489421
Total Organic Carbon (C)	mg/L					5.4	0.50	N/A	9484738
Orthophosphate (P)	mg/L					<0.010	0.010	N/A	9491092
pH	pH					7.54			9488693
Reactive Silica (SiO2)	mg/L					2.5	0.50	N/A	9491089
Total Suspended Solids	mg/L					<1.0	1.0	N/A	9485418
Dissolved Sulphate (SO4)	mg/L					180	10	N/A	9491088
Turbidity	NTU					0.93	0.10	0.10	9491202
Conductivity	uS/cm					530	1.0	N/A	9488694
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable									



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		ZON061				ZON062			
Sampling Date		2024/06/24 11:35				2024/06/24 13:40			
COC Number		C#993792-01-01				C#993792-01-01			
	UNITS	SW3 Lab-Dup	RDL	MDL	QC Batch	SW6	RDL	MDL	QC Batch
<b>Calculated Parameters</b>									
Anion Sum	me/L					2.49	N/A	N/A	9481614
Bicarb. Alkalinity (calc. as CaCO3)	mg/L					26	1.0	0.20	9481609
Calculated TDS	mg/L					170	1.0	0.20	9481622
Carb. Alkalinity (calc. as CaCO3)	mg/L					<1.0	1.0	0.20	9481609
Cation Sum	me/L					2.60	N/A	N/A	9481614
Hardness (CaCO3)	mg/L					120	1.0	1.0	9481611
Ion Balance (% Difference)	%					2.16	N/A	N/A	9481612
Langelier Index (@ 20C)	N/A					-1.07			9481619
Langelier Index (@ 4C)	N/A					-1.32			9481621
Nitrate (N)	mg/L					0.078	0.050	N/A	9481616
Saturation pH (@ 20C)	N/A					8.31			9481619
Saturation pH (@ 4C)	N/A					8.56			9481621
<b>Inorganics</b>									
Total Alkalinity (Total as CaCO3)	mg/L					26	2.0	N/A	9491114
Dissolved Chloride (Cl-)	mg/L	11	1.0	N/A	9491087	3.5	1.0	N/A	9491072
Colour	TCU	28	5.0	N/A	9491091	100	25	N/A	9491075
Dissolved Fluoride (F-)	mg/L					<0.10	0.10	0.050	9491115
Nitrate + Nitrite (N)	mg/L	0.094	0.050	N/A	9491093	0.078	0.050	N/A	9491077
Nitrite (N)	mg/L	<0.010	0.010	N/A	9491094	<0.010	0.010	N/A	9491078
Nitrogen (Ammonia Nitrogen)	mg/L					0.063	0.050	N/A	9491485
Total Organic Carbon (C)	mg/L	5.3	0.50	N/A	9484738	15	0.50	N/A	9484744
Orthophosphate (P)	mg/L	<0.010	0.010	N/A	9491092	0.011	0.010	N/A	9491076
pH	pH					7.24			9491110
Reactive Silica (SiO2)	mg/L	2.4	0.50	N/A	9491089	4.6	0.50	N/A	9491074
Total Suspended Solids	mg/L					3.8	1.0	N/A	9485418
Dissolved Sulphate (SO4)	mg/L	180	10	N/A	9491088	89	2.0	N/A	9491073
Turbidity	NTU					6.5	0.10	0.10	9493829
Conductivity	uS/cm					130	1.0	N/A	9491113
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate N/A = Not Applicable									



**RESULTS OF ANALYSES OF SURFACE WATER**

Bureau Veritas ID		ZON063		ZON064			
Sampling Date		2024/06/24 14:00		2024/06/24			
COC Number		C#993792-01-01		C#993792-01-01			
	UNITS	SW4	RDL	SWDUP	RDL	MDL	QC Batch
<b>Calculated Parameters</b>							
Anion Sum	me/L	0.640	N/A	4.88	N/A	N/A	9481614
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17	1.0	39	1.0	0.20	9481609
Calculated TDS	mg/L	42	1.0	320	1.0	0.20	9481622
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	<1.0	1.0	0.20	9481609
Cation Sum	me/L	0.720	N/A	5.00	N/A	N/A	9481614
Hardness (CaCO3)	mg/L	22	1.0	230	1.0	1.0	9481611
Ion Balance (% Difference)	%	5.88	N/A	1.21	N/A	N/A	9481612
Langelier Index (@ 20C)	N/A	-2.05		-0.356			9481619
Langelier Index (@ 4C)	N/A	-2.31		-0.605			9481621
Nitrate (N)	mg/L	0.084	0.050	0.094	0.050	N/A	9481616
Saturation pH (@ 20C)	N/A	9.27		7.90			9481619
Saturation pH (@ 4C)	N/A	9.52		8.15			9481621
<b>Inorganics</b>							
Total Alkalinity (Total as CaCO3)	mg/L	17	2.0	39	2.0	N/A	9491114
Dissolved Chloride (Cl-)	mg/L	6.2	1.0	11	1.0	N/A	9491072
Colour	TCU	76	25	32	5.0	N/A	9491075
Dissolved Fluoride (F-)	mg/L	<0.10	0.10	<0.10	0.10	0.050	9491115
Nitrate + Nitrite (N)	mg/L	0.084	0.050	0.094	0.050	N/A	9491077
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	N/A	9491078
Nitrogen (Ammonia Nitrogen)	mg/L	<0.050	0.050	0.063	0.050	N/A	9489421
Total Organic Carbon (C)	mg/L	11	0.50	5.4	0.50	N/A	9484744
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	N/A	9491076
pH	pH	7.22		7.55			9491110
Reactive Silica (SiO2)	mg/L	4.3	0.50	2.3	0.50	N/A	9491074
Total Suspended Solids	mg/L	3.6	1.0	<1.0	1.0	N/A	9485418
Dissolved Sulphate (SO4)	mg/L	6.1	2.0	180	10	N/A	9491073
Turbidity	NTU	3.9	0.10	0.90	0.10	0.10	9493829
Conductivity	uS/cm	36	1.0	390	1.0	N/A	9491113
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable							



BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336  
Report Date: 2024/07/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: SJP

### ELEMENTS BY ICP/MS (SURFACE WATER)

Bureau Veritas ID		ZON059		ZON060		ZON061			
Sampling Date		2024/06/24 10:05		2024/06/24 12:45		2024/06/24 11:35			
COC Number		C#993792-01-01		C#993792-01-01		C#993792-01-01			
	UNITS	SW1	QC Batch	SW2	QC Batch	SW3	RDL	MDL	QC Batch
<b>Metals</b>									
Total Aluminum (Al)	ug/L	190	9492245	350	9492224	23	5.0	N/A	9492245
Total Antimony (Sb)	ug/L	<1.0	9492245	<1.0	9492224	<1.0	1.0	N/A	9492245
Total Arsenic (As)	ug/L	<1.0	9492245	<1.0	9492224	14	1.0	N/A	9492245
Total Barium (Ba)	ug/L	11	9492245	18	9492224	25	1.0	N/A	9492245
Total Beryllium (Be)	ug/L	<0.10	9492245	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Bismuth (Bi)	ug/L	<2.0	9492245	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Boron (B)	ug/L	<50	9492245	<50	9492224	<50	50	N/A	9492245
Total Cadmium (Cd)	ug/L	0.016	9492245	0.028	9492224	<0.010	0.010	N/A	9492245
Total Calcium (Ca)	ug/L	23000	9492245	17000	9492224	63000	100	N/A	9492245
Total Chromium (Cr)	ug/L	<1.0	9492245	<1.0	9492224	<1.0	1.0	N/A	9492245
Total Cobalt (Co)	ug/L	<0.40	9492245	<0.40	9492224	1.6	0.40	N/A	9492245
Total Copper (Cu)	ug/L	<0.50	9492245	0.82	9492224	<0.50	0.50	N/A	9492245
Total Iron (Fe)	ug/L	1300	9492245	930	9492224	310	50	N/A	9492245
Total Lead (Pb)	ug/L	<0.50	9492245	<0.50	9492224	<0.50	0.50	N/A	9492245
Total Magnesium (Mg)	ug/L	1300	9492245	2100	9492224	8000	100	N/A	9492245
Total Manganese (Mn)	ug/L	130	9492245	120	9492224	150	2.0	N/A	9492245
Total Molybdenum (Mo)	ug/L	<2.0	9492245	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Nickel (Ni)	ug/L	<2.0	9492245	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Phosphorus (P)	ug/L	<100	9492245	<100	9492224	<100	100	N/A	9492245
Total Potassium (K)	ug/L	490	9492245	690	9492224	3900	100	N/A	9492245
Total Selenium (Se)	ug/L	<0.50	9492245	<0.50	9492224	<0.50	0.50	N/A	9492245
Total Silver (Ag)	ug/L	<0.10	9492245	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Sodium (Na)	ug/L	2700	9492245	4500	9492224	28000	100	N/A	9492245
Total Strontium (Sr)	ug/L	83	9492245	38	9492224	190	2.0	N/A	9492245
Total Thallium (Tl)	ug/L	<0.10	9492245	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Tin (Sn)	ug/L	<2.0	9492245	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Titanium (Ti)	ug/L	4.6	9492245	9.9	9492224	<2.0	2.0	N/A	9492245
Total Uranium (U)	ug/L	<0.10	9492245	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Vanadium (V)	ug/L	<2.0	9492245	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Zinc (Zn)	ug/L	<5.0	9492245	<5.0	9492224	<5.0	5.0	N/A	9492245
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
N/A = Not Applicable									





**ELEMENTS BY ICP/MS (SURFACE WATER)**

Bureau Veritas ID		ZON062	ZON063		ZON064			
Sampling Date		2024/06/24 13:40	2024/06/24 14:00		2024/06/24			
COC Number		C#993792-01-01	C#993792-01-01		C#993792-01-01			
	UNITS	SW6	SW4	QC Batch	SWDUP	RDL	MDL	QC Batch
<b>Metals</b>								
Total Aluminum (Al)	ug/L	350	230	9492224	28	5.0	N/A	9492245
Total Antimony (Sb)	ug/L	<1.0	<1.0	9492224	<1.0	1.0	N/A	9492245
Total Arsenic (As)	ug/L	<1.0	<1.0	9492224	<1.0	1.0	N/A	9492245
Total Barium (Ba)	ug/L	12	11	9492224	20	1.0	N/A	9492245
Total Beryllium (Be)	ug/L	<0.10	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Bismuth (Bi)	ug/L	<2.0	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Boron (B)	ug/L	<50	<50	9492224	<50	50	N/A	9492245
Total Cadmium (Cd)	ug/L	0.014	0.016	9492224	<0.010	0.010	N/A	9492245
Total Calcium (Ca)	ug/L	45000	6400	9492224	86000	100	N/A	9492245
Total Chromium (Cr)	ug/L	<1.0	<1.0	9492224	<1.0	1.0	N/A	9492245
Total Cobalt (Co)	ug/L	<0.40	<0.40	9492224	<0.40	0.40	N/A	9492245
Total Copper (Cu)	ug/L	0.59	<0.50	9492224	<0.50	0.50	N/A	9492245
Total Iron (Fe)	ug/L	830	780	9492224	180	50	N/A	9492245
Total Lead (Pb)	ug/L	<0.50	<0.50	9492224	<0.50	0.50	N/A	9492245
Total Magnesium (Mg)	ug/L	2000	1400	9492224	3800	100	N/A	9492245
Total Manganese (Mn)	ug/L	82	110	9492224	250	2.0	N/A	9492245
Total Molybdenum (Mo)	ug/L	<2.0	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Nickel (Ni)	ug/L	<2.0	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Phosphorus (P)	ug/L	<100	<100	9492224	<100	100	N/A	9492245
Total Potassium (K)	ug/L	600	530	9492224	400	100	N/A	9492245
Total Selenium (Se)	ug/L	<0.50	<0.50	9492224	<0.50	0.50	N/A	9492245
Total Silver (Ag)	ug/L	<0.10	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Sodium (Na)	ug/L	3600	5600	9492224	8700	100	N/A	9492245
Total Strontium (Sr)	ug/L	180	39	9492224	380	2.0	N/A	9492245
Total Thallium (Tl)	ug/L	<0.10	<0.10	9492224	<0.10	0.10	N/A	9492245
Total Tin (Sn)	ug/L	<2.0	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Titanium (Ti)	ug/L	8.9	6.8	9492224	<2.0	2.0	N/A	9492245
Total Uranium (U)	ug/L	<0.10	<0.10	9492224	0.13	0.10	N/A	9492245
Total Vanadium (V)	ug/L	<2.0	<2.0	9492224	<2.0	2.0	N/A	9492245
Total Zinc (Zn)	ug/L	<5.0	<5.0	9492224	<5.0	5.0	N/A	9492245
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable								



### GENERAL COMMENTS

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

Package 1	8.3°C
-----------	-------

Sample ZON059 [SW1] : ortho-Phosphate > Phosphorus: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample ZON062 [SW6] : ortho-Phosphate > Phosphorus: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample ZON063 [SW4] : RCap Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

**Results relate only to the items tested.**



BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336  
Report Date: 2024/07/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: SJP

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9484738	MKY	Matrix Spike [ZON061-05]	Total Organic Carbon (C)	2024/06/28		105	%	85 - 115
9484738	MKY	Spiked Blank	Total Organic Carbon (C)	2024/06/28		98	%	80 - 120
9484738	MKY	Method Blank	Total Organic Carbon (C)	2024/06/28	<0.50		mg/L	
9484738	MKY	RPD [ZON061-05]	Total Organic Carbon (C)	2024/06/28	1.0		%	15
9484744	MKY	Matrix Spike	Total Organic Carbon (C)	2024/06/28		104	%	85 - 115
9484744	MKY	Spiked Blank	Total Organic Carbon (C)	2024/06/28		99	%	80 - 120
9484744	MKY	Method Blank	Total Organic Carbon (C)	2024/06/28	<0.50		mg/L	
9484744	MKY	RPD	Total Organic Carbon (C)	2024/06/28	0.10		%	15
9485418	DME	QC Standard	Total Suspended Solids	2024/07/02		96	%	80 - 120
9485418	DME	Method Blank	Total Suspended Solids	2024/07/02	<1.0		mg/L	
9485418	DME	RPD	Total Suspended Solids	2024/07/02	5.4		%	20
9488693	LJV	Spiked Blank	pH	2024/07/02		99	%	97 - 103
9488693	LJV	RPD	pH	2024/07/02	0.19		%	N/A
9488694	LJV	Spiked Blank	Conductivity	2024/07/02		101	%	80 - 120
9488694	LJV	Method Blank	Conductivity	2024/07/02	<1.0		uS/cm	
9488694	LJV	RPD	Conductivity	2024/07/02	0.57		%	10
9488695	LJV	Spiked Blank	Total Alkalinity (Total as CaCO3)	2024/07/02		97	%	80 - 120
9488695	LJV	Method Blank	Total Alkalinity (Total as CaCO3)	2024/07/02	<2.0		mg/L	
9488695	LJV	RPD	Total Alkalinity (Total as CaCO3)	2024/07/02	5.5		%	20
9488697	LJV	Matrix Spike	Dissolved Fluoride (F-)	2024/07/02		80 (1)	%	80 - 120
9488697	LJV	Spiked Blank	Dissolved Fluoride (F-)	2024/07/02		90	%	80 - 120
9488697	LJV	Method Blank	Dissolved Fluoride (F-)	2024/07/02	<0.10		mg/L	
9488697	LJV	RPD	Dissolved Fluoride (F-)	2024/07/02	NC		%	20
9489421	MCN	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2024/07/02		92	%	80 - 120
9489421	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2024/07/02		98	%	80 - 120
9489421	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2024/07/02	<0.050		mg/L	
9489421	MCN	RPD	Nitrogen (Ammonia Nitrogen)	2024/07/02	20		%	20
9491072	EMT	Matrix Spike	Dissolved Chloride (Cl-)	2024/07/03		NC	%	80 - 120
9491072	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2024/07/03		93	%	80 - 120
9491072	EMT	Method Blank	Dissolved Chloride (Cl-)	2024/07/03	<1.0		mg/L	
9491072	EMT	RPD	Dissolved Chloride (Cl-)	2024/07/03	1.3		%	20
9491073	EMT	Matrix Spike	Dissolved Sulphate (SO4)	2024/07/03		NC	%	80 - 120
9491073	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2024/07/03		94	%	80 - 120
9491073	EMT	Method Blank	Dissolved Sulphate (SO4)	2024/07/03	<2.0		mg/L	
9491073	EMT	RPD	Dissolved Sulphate (SO4)	2024/07/03	0.53		%	20
9491074	EMT	Matrix Spike	Reactive Silica (SiO2)	2024/07/03		NC	%	80 - 120
9491074	EMT	Spiked Blank	Reactive Silica (SiO2)	2024/07/03		97	%	80 - 120
9491074	EMT	Method Blank	Reactive Silica (SiO2)	2024/07/03	<0.50		mg/L	
9491074	EMT	RPD	Reactive Silica (SiO2)	2024/07/03	0.31		%	20
9491075	EMT	Spiked Blank	Colour	2024/07/03		92	%	80 - 120
9491075	EMT	Method Blank	Colour	2024/07/03	<5.0		TCU	
9491075	EMT	RPD	Colour	2024/07/03	16		%	20
9491076	EMT	Matrix Spike	Orthophosphate (P)	2024/07/03		63 (2)	%	80 - 120
9491076	EMT	Spiked Blank	Orthophosphate (P)	2024/07/03		99	%	80 - 120
9491076	EMT	Method Blank	Orthophosphate (P)	2024/07/03	<0.010		mg/L	
9491076	EMT	RPD	Orthophosphate (P)	2024/07/03	NC		%	20
9491077	EMT	Matrix Spike	Nitrate + Nitrite (N)	2024/07/03		87	%	80 - 120
9491077	EMT	Spiked Blank	Nitrate + Nitrite (N)	2024/07/03		103	%	80 - 120
9491077	EMT	Method Blank	Nitrate + Nitrite (N)	2024/07/03	<0.050		mg/L	
9491077	EMT	RPD	Nitrate + Nitrite (N)	2024/07/03	NC		%	20
9491078	EMT	Matrix Spike	Nitrite (N)	2024/07/03		44 (2)	%	80 - 120
9491078	EMT	Spiked Blank	Nitrite (N)	2024/07/03		102	%	80 - 120
9491078	EMT	Method Blank	Nitrite (N)	2024/07/03	<0.010		mg/L	



**QUALITY ASSURANCE REPORT(CONT'D)**

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9491078	EMT	RPD	Nitrite (N)	2024/07/03	NC		%	20
9491087	EMT	Matrix Spike [ZON061-02]	Dissolved Chloride (Cl-)	2024/07/03		91	%	80 - 120
9491087	EMT	Spiked Blank	Dissolved Chloride (Cl-)	2024/07/03		91	%	80 - 120
9491087	EMT	Method Blank	Dissolved Chloride (Cl-)	2024/07/03	<1.0		mg/L	
9491087	EMT	RPD [ZON061-02]	Dissolved Chloride (Cl-)	2024/07/03	0.53		%	20
9491088	EMT	Matrix Spike [ZON061-02]	Dissolved Sulphate (SO4)	2024/07/03		NC	%	80 - 120
9491088	EMT	Spiked Blank	Dissolved Sulphate (SO4)	2024/07/03		95	%	80 - 120
9491088	EMT	Method Blank	Dissolved Sulphate (SO4)	2024/07/03	<2.0		mg/L	
9491088	EMT	RPD [ZON061-02]	Dissolved Sulphate (SO4)	2024/07/03	0.39		%	20
9491089	EMT	Matrix Spike [ZON061-02]	Reactive Silica (SiO2)	2024/07/03		95	%	80 - 120
9491089	EMT	Spiked Blank	Reactive Silica (SiO2)	2024/07/03		99	%	80 - 120
9491089	EMT	Method Blank	Reactive Silica (SiO2)	2024/07/03	<0.50		mg/L	
9491089	EMT	RPD [ZON061-02]	Reactive Silica (SiO2)	2024/07/03	2.9		%	20
9491091	EMT	Spiked Blank	Colour	2024/07/03		103	%	80 - 120
9491091	EMT	Method Blank	Colour	2024/07/03	<5.0		TCU	
9491091	EMT	RPD [ZON061-02]	Colour	2024/07/03	3.0		%	20
9491092	EMT	Matrix Spike [ZON061-02]	Orthophosphate (P)	2024/07/03		96	%	80 - 120
9491092	EMT	Spiked Blank	Orthophosphate (P)	2024/07/03		101	%	80 - 120
9491092	EMT	Method Blank	Orthophosphate (P)	2024/07/03	<0.010		mg/L	
9491092	EMT	RPD [ZON061-02]	Orthophosphate (P)	2024/07/03	NC		%	20
9491093	EMT	Matrix Spike [ZON061-02]	Nitrate + Nitrite (N)	2024/07/03		99	%	80 - 120
9491093	EMT	Spiked Blank	Nitrate + Nitrite (N)	2024/07/03		108	%	80 - 120
9491093	EMT	Method Blank	Nitrate + Nitrite (N)	2024/07/03	<0.050		mg/L	
9491093	EMT	RPD [ZON061-02]	Nitrate + Nitrite (N)	2024/07/03	3.8		%	20
9491094	EMT	Matrix Spike [ZON061-02]	Nitrite (N)	2024/07/03		99	%	80 - 120
9491094	EMT	Spiked Blank	Nitrite (N)	2024/07/03		102	%	80 - 120
9491094	EMT	Method Blank	Nitrite (N)	2024/07/03	<0.010		mg/L	
9491094	EMT	RPD [ZON061-02]	Nitrite (N)	2024/07/03	NC		%	20
9491110	LJV	Spiked Blank	pH	2024/07/03		99	%	97 - 103
9491110	LJV	RPD	pH	2024/07/03	0.0016		%	N/A
9491113	LJV	Spiked Blank	Conductivity	2024/07/03		103	%	80 - 120
9491113	LJV	Method Blank	Conductivity	2024/07/03	<1.0		uS/cm	
9491113	LJV	RPD	Conductivity	2024/07/03	0.15		%	10
9491114	LJV	Spiked Blank	Total Alkalinity (Total as CaCO3)	2024/07/03		94	%	80 - 120
9491114	LJV	Method Blank	Total Alkalinity (Total as CaCO3)	2024/07/03	<2.0		mg/L	
9491114	LJV	RPD	Total Alkalinity (Total as CaCO3)	2024/07/03	1.8		%	20
9491115	LJV	Matrix Spike	Dissolved Fluoride (F-)	2024/07/03		94	%	80 - 120
9491115	LJV	Spiked Blank	Dissolved Fluoride (F-)	2024/07/03		95	%	80 - 120
9491115	LJV	Method Blank	Dissolved Fluoride (F-)	2024/07/03	<0.10		mg/L	
9491115	LJV	RPD	Dissolved Fluoride (F-)	2024/07/03	NC		%	20
9491202	LJV	QC Standard	Turbidity	2024/07/03		84	%	80 - 120
9491202	LJV	Spiked Blank	Turbidity	2024/07/03		107	%	80 - 120
9491202	LJV	Method Blank	Turbidity	2024/07/03	<0.10		NTU	
9491202	LJV	RPD	Turbidity	2024/07/03	0.36		%	20
9491485	MCN	Matrix Spike [ZON060-06]	Nitrogen (Ammonia Nitrogen)	2024/07/03		92	%	80 - 120
9491485	MCN	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2024/07/03		99	%	80 - 120
9491485	MCN	Method Blank	Nitrogen (Ammonia Nitrogen)	2024/07/03	<0.050		mg/L	
9491485	MCN	RPD [ZON060-06]	Nitrogen (Ammonia Nitrogen)	2024/07/03	NC		%	20
9492224	MTZ	Matrix Spike	Total Aluminum (Al)	2024/07/04		100	%	80 - 120
			Total Antimony (Sb)	2024/07/04		104	%	80 - 120
			Total Arsenic (As)	2024/07/04		98	%	80 - 120
			Total Barium (Ba)	2024/07/04		93	%	80 - 120
			Total Beryllium (Be)	2024/07/04		102	%	80 - 120



BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336

Report Date: 2024/07/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: SJP

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Bismuth (Bi)	2024/07/04		98	%	80 - 120
			Total Boron (B)	2024/07/04		100	%	80 - 120
			Total Cadmium (Cd)	2024/07/04		97	%	80 - 120
			Total Calcium (Ca)	2024/07/04		101	%	80 - 120
			Total Chromium (Cr)	2024/07/04		98	%	80 - 120
			Total Cobalt (Co)	2024/07/04		97	%	80 - 120
			Total Copper (Cu)	2024/07/04		97	%	80 - 120
			Total Iron (Fe)	2024/07/04		102	%	80 - 120
			Total Lead (Pb)	2024/07/04		96	%	80 - 120
			Total Magnesium (Mg)	2024/07/04		104	%	80 - 120
			Total Manganese (Mn)	2024/07/04		102	%	80 - 120
			Total Molybdenum (Mo)	2024/07/04		103	%	80 - 120
			Total Nickel (Ni)	2024/07/04		99	%	80 - 120
			Total Phosphorus (P)	2024/07/04		103	%	80 - 120
			Total Potassium (K)	2024/07/04		100	%	80 - 120
			Total Selenium (Se)	2024/07/04		99	%	80 - 120
			Total Silver (Ag)	2024/07/04		98	%	80 - 120
			Total Sodium (Na)	2024/07/04		103	%	80 - 120
			Total Strontium (Sr)	2024/07/04		100	%	80 - 120
			Total Thallium (Tl)	2024/07/04		99	%	80 - 120
			Total Tin (Sn)	2024/07/04		101	%	80 - 120
			Total Titanium (Ti)	2024/07/04		99	%	80 - 120
			Total Uranium (U)	2024/07/04		102	%	80 - 120
			Total Vanadium (V)	2024/07/04		99	%	80 - 120
			Total Zinc (Zn)	2024/07/04		99	%	80 - 120
9492224	MTZ	Spiked Blank	Total Aluminum (Al)	2024/07/04		99	%	80 - 120
			Total Antimony (Sb)	2024/07/04		101	%	80 - 120
			Total Arsenic (As)	2024/07/04		98	%	80 - 120
			Total Barium (Ba)	2024/07/04		95	%	80 - 120
			Total Beryllium (Be)	2024/07/04		99	%	80 - 120
			Total Bismuth (Bi)	2024/07/04		99	%	80 - 120
			Total Boron (B)	2024/07/04		99	%	80 - 120
			Total Cadmium (Cd)	2024/07/04		96	%	80 - 120
			Total Calcium (Ca)	2024/07/04		102	%	80 - 120
			Total Chromium (Cr)	2024/07/04		98	%	80 - 120
			Total Cobalt (Co)	2024/07/04		96	%	80 - 120
			Total Copper (Cu)	2024/07/04		96	%	80 - 120
			Total Iron (Fe)	2024/07/04		102	%	80 - 120
			Total Lead (Pb)	2024/07/04		97	%	80 - 120
			Total Magnesium (Mg)	2024/07/04		104	%	80 - 120
			Total Manganese (Mn)	2024/07/04		100	%	80 - 120
			Total Molybdenum (Mo)	2024/07/04		102	%	80 - 120
			Total Nickel (Ni)	2024/07/04		98	%	80 - 120
			Total Phosphorus (P)	2024/07/04		102	%	80 - 120
			Total Potassium (K)	2024/07/04		100	%	80 - 120
			Total Selenium (Se)	2024/07/04		97	%	80 - 120
			Total Silver (Ag)	2024/07/04		97	%	80 - 120
			Total Sodium (Na)	2024/07/04		102	%	80 - 120
			Total Strontium (Sr)	2024/07/04		98	%	80 - 120
			Total Thallium (Tl)	2024/07/04		100	%	80 - 120
			Total Tin (Sn)	2024/07/04		99	%	80 - 120
			Total Titanium (Ti)	2024/07/04		98	%	80 - 120
			Total Uranium (U)	2024/07/04		103	%	80 - 120



BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336

Report Date: 2024/07/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: SJP

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits	
9492224	MTZ	Method Blank	Total Vanadium (V)	2024/07/04		100	%	80 - 120	
			Total Zinc (Zn)	2024/07/04		99	%	80 - 120	
			Total Aluminum (Al)	2024/07/04	<5.0			ug/L	
			Total Antimony (Sb)	2024/07/04	<1.0			ug/L	
			Total Arsenic (As)	2024/07/04	<1.0			ug/L	
			Total Barium (Ba)	2024/07/04	<1.0			ug/L	
			Total Beryllium (Be)	2024/07/04	<0.10			ug/L	
			Total Bismuth (Bi)	2024/07/04	<2.0			ug/L	
			Total Boron (B)	2024/07/04	<50			ug/L	
			Total Cadmium (Cd)	2024/07/04	<0.010			ug/L	
			Total Calcium (Ca)	2024/07/04	<100			ug/L	
			Total Chromium (Cr)	2024/07/04	<1.0			ug/L	
			Total Cobalt (Co)	2024/07/04	<0.40			ug/L	
			Total Copper (Cu)	2024/07/04	<0.50			ug/L	
			Total Iron (Fe)	2024/07/04	<50			ug/L	
			Total Lead (Pb)	2024/07/04	<0.50			ug/L	
			Total Magnesium (Mg)	2024/07/04	<100			ug/L	
			Total Manganese (Mn)	2024/07/04	<2.0			ug/L	
			Total Molybdenum (Mo)	2024/07/04	<2.0			ug/L	
			Total Nickel (Ni)	2024/07/04	<2.0			ug/L	
			Total Phosphorus (P)	2024/07/04	<100			ug/L	
			Total Potassium (K)	2024/07/04	<100			ug/L	
			Total Selenium (Se)	2024/07/04	<0.50			ug/L	
			Total Silver (Ag)	2024/07/04	<0.10			ug/L	
Total Sodium (Na)	2024/07/04	<100			ug/L				
Total Strontium (Sr)	2024/07/04	<2.0			ug/L				
Total Thallium (Tl)	2024/07/04	<0.10			ug/L				
Total Tin (Sn)	2024/07/04	<2.0			ug/L				
Total Titanium (Ti)	2024/07/04	<2.0			ug/L				
Total Uranium (U)	2024/07/04	<0.10			ug/L				
Total Vanadium (V)	2024/07/04	<2.0			ug/L				
Total Zinc (Zn)	2024/07/04	<5.0			ug/L				
9492224	MTZ	RPD	Total Aluminum (Al)	2024/07/04	2.1		%	20	
			Total Antimony (Sb)	2024/07/04	NC		%	20	
			Total Arsenic (As)	2024/07/04	NC		%	20	
			Total Barium (Ba)	2024/07/04	1.1		%	20	
			Total Boron (B)	2024/07/04	NC		%	20	
			Total Cadmium (Cd)	2024/07/04	NC		%	20	
			Total Calcium (Ca)	2024/07/04	0.97		%	20	
			Total Chromium (Cr)	2024/07/04	NC		%	20	
			Total Copper (Cu)	2024/07/04	1.1		%	20	
			Total Iron (Fe)	2024/07/04	NC		%	20	
			Total Lead (Pb)	2024/07/04	0.065 (3)		%	20	
			Total Magnesium (Mg)	2024/07/04	1.7		%	20	
			Total Manganese (Mn)	2024/07/04	1.0		%	20	
			Total Nickel (Ni)	2024/07/04	NC		%	20	
			Total Phosphorus (P)	2024/07/04	NC		%	20	
			Total Potassium (K)	2024/07/04	4.1		%	20	
			Total Selenium (Se)	2024/07/04	NC		%	20	
			Total Sodium (Na)	2024/07/04	1.4		%	20	
			Total Strontium (Sr)	2024/07/04	4.0		%	20	
			Total Uranium (U)	2024/07/04	NC		%	20	
			Total Zinc (Zn)	2024/07/04	2.4		%	20	



BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336

Report Date: 2024/07/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: SJP

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
	9492245	MTZ	Matrix Spike	Total Aluminum (Al)	2024/07/04		98	%	80 - 120
				Total Antimony (Sb)	2024/07/04		103	%	80 - 120
				Total Arsenic (As)	2024/07/04		96	%	80 - 120
				Total Barium (Ba)	2024/07/04		93	%	80 - 120
				Total Beryllium (Be)	2024/07/04		100	%	80 - 120
				Total Bismuth (Bi)	2024/07/04		99	%	80 - 120
				Total Boron (B)	2024/07/04		98	%	80 - 120
				Total Cadmium (Cd)	2024/07/04		98	%	80 - 120
				Total Calcium (Ca)	2024/07/04		101	%	80 - 120
				Total Chromium (Cr)	2024/07/04		97	%	80 - 120
				Total Cobalt (Co)	2024/07/04		95	%	80 - 120
				Total Copper (Cu)	2024/07/04		94	%	80 - 120
				Total Iron (Fe)	2024/07/04		98	%	80 - 120
				Total Lead (Pb)	2024/07/04		97	%	80 - 120
				Total Magnesium (Mg)	2024/07/04		102	%	80 - 120
				Total Manganese (Mn)	2024/07/04		98	%	80 - 120
				Total Molybdenum (Mo)	2024/07/04		102	%	80 - 120
				Total Nickel (Ni)	2024/07/04		97	%	80 - 120
				Total Phosphorus (P)	2024/07/04		104	%	80 - 120
				Total Potassium (K)	2024/07/04		100	%	80 - 120
				Total Selenium (Se)	2024/07/04		99	%	80 - 120
				Total Silver (Ag)	2024/07/04		97	%	80 - 120
				Total Sodium (Na)	2024/07/04		100	%	80 - 120
				Total Strontium (Sr)	2024/07/04		96	%	80 - 120
				Total Thallium (Tl)	2024/07/04		100	%	80 - 120
				Total Tin (Sn)	2024/07/04		101	%	80 - 120
				Total Titanium (Ti)	2024/07/04		101	%	80 - 120
				Total Uranium (U)	2024/07/04		103	%	80 - 120
				Total Vanadium (V)	2024/07/04		99	%	80 - 120
				Total Zinc (Zn)	2024/07/04		96	%	80 - 120
	9492245	MTZ	Spiked Blank	Total Aluminum (Al)	2024/07/04		99	%	80 - 120
				Total Antimony (Sb)	2024/07/04		101	%	80 - 120
				Total Arsenic (As)	2024/07/04		97	%	80 - 120
				Total Barium (Ba)	2024/07/04		94	%	80 - 120
				Total Beryllium (Be)	2024/07/04		102	%	80 - 120
				Total Bismuth (Bi)	2024/07/04		100	%	80 - 120
				Total Boron (B)	2024/07/04		103	%	80 - 120
				Total Cadmium (Cd)	2024/07/04		95	%	80 - 120
				Total Calcium (Ca)	2024/07/04		100	%	80 - 120
				Total Chromium (Cr)	2024/07/04		97	%	80 - 120
				Total Cobalt (Co)	2024/07/04		96	%	80 - 120
				Total Copper (Cu)	2024/07/04		95	%	80 - 120
				Total Iron (Fe)	2024/07/04		101	%	80 - 120
				Total Lead (Pb)	2024/07/04		98	%	80 - 120
				Total Magnesium (Mg)	2024/07/04		102	%	80 - 120
				Total Manganese (Mn)	2024/07/04		99	%	80 - 120
				Total Molybdenum (Mo)	2024/07/04		100	%	80 - 120
				Total Nickel (Ni)	2024/07/04		98	%	80 - 120
				Total Phosphorus (P)	2024/07/04		100	%	80 - 120
				Total Potassium (K)	2024/07/04		99	%	80 - 120
				Total Selenium (Se)	2024/07/04		97	%	80 - 120
				Total Silver (Ag)	2024/07/04		96	%	80 - 120
				Total Sodium (Na)	2024/07/04		103	%	80 - 120





BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336

Report Date: 2024/07/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: SJP

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Strontium (Sr)	2024/07/04		96	%	80 - 120
			Total Thallium (Tl)	2024/07/04		99	%	80 - 120
			Total Tin (Sn)	2024/07/04		97	%	80 - 120
			Total Titanium (Ti)	2024/07/04		100	%	80 - 120
			Total Uranium (U)	2024/07/04		104	%	80 - 120
			Total Vanadium (V)	2024/07/04		99	%	80 - 120
			Total Zinc (Zn)	2024/07/04		97	%	80 - 120
9492245	MTZ	Method Blank	Total Aluminum (Al)	2024/07/04	<5.0		ug/L	
			Total Antimony (Sb)	2024/07/04	<1.0		ug/L	
			Total Arsenic (As)	2024/07/04	<1.0		ug/L	
			Total Barium (Ba)	2024/07/04	<1.0		ug/L	
			Total Beryllium (Be)	2024/07/04	<0.10		ug/L	
			Total Bismuth (Bi)	2024/07/04	<2.0		ug/L	
			Total Boron (B)	2024/07/04	<50		ug/L	
			Total Cadmium (Cd)	2024/07/04	<0.010		ug/L	
			Total Calcium (Ca)	2024/07/04	<100		ug/L	
			Total Chromium (Cr)	2024/07/04	<1.0		ug/L	
			Total Cobalt (Co)	2024/07/04	<0.40		ug/L	
			Total Copper (Cu)	2024/07/04	<0.50		ug/L	
			Total Iron (Fe)	2024/07/04	<50		ug/L	
			Total Lead (Pb)	2024/07/04	<0.50		ug/L	
			Total Magnesium (Mg)	2024/07/04	<100		ug/L	
			Total Manganese (Mn)	2024/07/04	<2.0		ug/L	
			Total Molybdenum (Mo)	2024/07/04	<2.0		ug/L	
			Total Nickel (Ni)	2024/07/04	<2.0		ug/L	
			Total Phosphorus (P)	2024/07/04	<100		ug/L	
			Total Potassium (K)	2024/07/04	<100		ug/L	
			Total Selenium (Se)	2024/07/04	<0.50		ug/L	
			Total Silver (Ag)	2024/07/04	<0.10		ug/L	
			Total Sodium (Na)	2024/07/04	<100		ug/L	
			Total Strontium (Sr)	2024/07/04	<2.0		ug/L	
			Total Thallium (Tl)	2024/07/04	<0.10		ug/L	
			Total Tin (Sn)	2024/07/04	<2.0		ug/L	
			Total Titanium (Ti)	2024/07/04	<2.0		ug/L	
			Total Uranium (U)	2024/07/04	<0.10		ug/L	
			Total Vanadium (V)	2024/07/04	<2.0		ug/L	
			Total Zinc (Zn)	2024/07/04	<5.0		ug/L	
9492245	MTZ	RPD	Total Aluminum (Al)	2024/07/04	NC		%	20
			Total Antimony (Sb)	2024/07/04	NC		%	20
			Total Arsenic (As)	2024/07/04	NC		%	20
			Total Barium (Ba)	2024/07/04	NC		%	20
			Total Beryllium (Be)	2024/07/04	NC		%	20
			Total Bismuth (Bi)	2024/07/04	NC		%	20
			Total Boron (B)	2024/07/04	NC		%	20
			Total Cadmium (Cd)	2024/07/04	NC		%	20
			Total Calcium (Ca)	2024/07/04	1.1		%	20
			Total Chromium (Cr)	2024/07/04	NC		%	20
			Total Cobalt (Co)	2024/07/04	NC		%	20
			Total Copper (Cu)	2024/07/04	1.2		%	20
			Total Iron (Fe)	2024/07/04	NC		%	20
			Total Lead (Pb)	2024/07/04	NC		%	20
			Total Magnesium (Mg)	2024/07/04	2.9		%	20
			Total Manganese (Mn)	2024/07/04	NC		%	20





BUREAU  
VERITAS

Bureau Veritas Job #: C4J5336

Report Date: 2024/07/05

GHD Limited

Client Project #: 12601021-15

Your P.O. #: 735-009466

Sampler Initials: SJP

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Molybdenum (Mo)	2024/07/04	NC		%	20
			Total Nickel (Ni)	2024/07/04	NC		%	20
			Total Phosphorus (P)	2024/07/04	NC		%	20
			Total Potassium (K)	2024/07/04	4.6		%	20
			Total Selenium (Se)	2024/07/04	NC		%	20
			Total Silver (Ag)	2024/07/04	NC		%	20
			Total Sodium (Na)	2024/07/04	1.1		%	20
			Total Strontium (Sr)	2024/07/04	3.3		%	20
			Total Thallium (Tl)	2024/07/04	NC		%	20
			Total Tin (Sn)	2024/07/04	NC		%	20
			Total Titanium (Ti)	2024/07/04	NC		%	20
			Total Uranium (U)	2024/07/04	2.1		%	20
			Total Vanadium (V)	2024/07/04	NC		%	20
			Total Zinc (Zn)	2024/07/04	2.7		%	20
9493829	LJV	QC Standard	Turbidity	2024/07/04		85	%	80 - 120
9493829	LJV	Spiked Blank	Turbidity	2024/07/04		107	%	80 - 120
9493829	LJV	Method Blank	Turbidity	2024/07/04	<0.10		NTU	
9493829	LJV	RPD	Turbidity	2024/07/04	5.0		%	20

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

(1) Poor spike recovery due to probable sample matrix interference.

(2) Poor spike recovery due to sample matrix, recovery confirmed by repeat analysis.

(3) POTENTIAL EXCEEDANCE FOR PARAMETER



Bureau Veritas Job #: C4J5336  
Report Date: 2024/07/05

GHD Limited  
Client Project #: 12601021-15  
Your P.O. #: 735-009466  
Sampler Initials: SJP

### VALIDATION SIGNATURE PAGE

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

Janah Rhyno, Scientific Specialist



Automated Statchk

---


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



Bureau Veritas  
200 Bluewater Road, Bedford, Nova Scotia Canada B4B 1G9 Tel (902) 420-0203 Toll-free 800-563-6266 Fax:(902) 420-8612 www.bvna.com

Chain Of Custody Record

<b>INVOICE TO:</b>		<b>Report Information</b>		<b>Project Information</b>		<b>Laboratory Use Only</b>	
Company Name	#16276 GHD Limited	Company Name		Quotation #	C40238	Bureau Veritas Job #	Bottle Order #:
Contact Name	Accounts Payable	Contact Name	Jessica Romo/Sadie Jacobs-Peters, Callie Andrews	P.O. #	735-009466		993792
Address	120 Western Parkway Bedford NS B4B 0V2	Address		Project #	12601021-15	Chain Of Custody Record	Project Manager
Phone	(902) 468-1248 Fax: (902) 468-2207	Phone		Project Name			Marie Muisse
Email	AccountsPayableCDN@ghd.com	Email	Jessica.Romo@ghd.com, Sadie.Jacobs-Peters@ghd.co	Site #			
				Sampled By	JRP/SJ		

Regulatory Criteria:	Special Instructions:	ANALYSIS REQUESTED (PLEASE BE SPECIFIC)			Turnaround Time (TAT) Required:	
** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Sewewater Potable/Nonpotable/Tissue/Soil/Sludge/Metal		Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Fluoride	Total Suspended Solids
		 BEDF-2024-06-1523			Regular (Standard) TAT: <input checked="" type="checkbox"/> (will be applied if Rush TAT is not specified). Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
					Job Specific Rush TAT (if applies to entire submission) Date Required: _____ Time Required: _____	

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered & Preserved	Lab Filtration Required	Atlantic RCAP-MS Total Metals in Water	Fluoride	Total Suspended Solids	# of Bottles	Comments / Hazards / Other Required Analysis
1 SID#65407	SW1	26-Jun-24	1005	SW			X	X	X	6	
2 SID#65408	SW2	26-Jun-24	1245				X	X	X	6	
3 SID#65409	SW3	26-Jun-24	1135				X	X	X	6	
4 SID#65410	SW4 SW6	26-Jun-24	1340				X	X	X	6	
5 SID#65411	SW6 SW4	26-Jun-24	1400				X	X	X	6	
6 SID#65412	SWDUP	26-Jun-24	—				X	X	X	6	2024 JUN 26 16:34
7											
8											
9											
10											

* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only		
<i>Callie Jacobs-Peters</i>		24/06/26	1605	<i>AP</i>					Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
				<i>AP</i>					<input type="checkbox"/>	7.9.9	<input type="checkbox"/> Yes <input type="checkbox"/> No
* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COG-TERMS-AND-CONDITIONS.										White: Bureau Veritas Yellow: Client	
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.											

# **Attachment 2**

**Surface Water Quality Data 2022-2024**



Parameters	Units	CCME; FWAL	NS Tier 1 EQS	Baseline Maximum	SW4								SW5 (decommissioned)			SW6			
					SW4	SW4	SW4-Dup	SW4	SW4	SWDUP (FD of SW4)	SW4	SWDUP (FD of SW4)	SW4	SW5	SW5	SW5	SW6	SW6	
Date					10/5/2022	1/19/2023	1/19/2023	4/12/2023	7/12/2023	7/12/2023	2/28/2024	2/28/2024	6/24/2024	4/12/2023	7/12/2023	2/28/2024	2/28/2024	6/24/2024	
<b>Organics</b>																			
Anion Sum	me/L	NV	NV	2,520	0.79	0.18	0.21	0.31	0.18	0.18	0.49	0.44	0.64	1.17	0.79	0.48	0.79	2.49	
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	NV	NV	25	16	3.7	3.2	5.6	4.9	4.8	4.3	3.1	17	6.1	12	4.6	6.1	26	
Calculated TDS	mg/L	NV	NV	160	50	16	17	23	17	17	32	30	42	78	53	32	52	170	
Carb. Alkalinity (calc. as CaCO3)	mg/L	NV	NV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
Cation Sum	me/L	NV	NV	2.35	0.76	0.3	0.31	0.4	0.33	0.32	0.5	0.52	0.72	1.24	0.84	0.44	0.77	2.6	
Hardness (CaCO3)	mg/L	NV	NV	110	25	7.5	7.8	11	8.8	8.5	9.7	9.9	22	52	34	15	28	120	
Ion Balance (% Difference)	%	NV	NV	29.4	1.94	25	19.2	12.7	29.4	28	1.01	8.33	5.88	2.9	3.07	4.35	1.28	2.16	
Langelier Index (@ 20C)	N/A	NV	NV	-1.18	-2.08	-3.92	-3.97	-3.23	-3.64	-3.7	-3.9	-3.98	-2.05	-2.37	-2.35	-3.73	-3.04	-1.07	
Langelier Index (@ 4C)	N/A	NV	NV	-1.43	-2.33	-4.17	-4.23	-3.49	-3.89	-3.95	-4.15	-4.23	-2.31	-2.62	-2.6	-3.98	-3.29	-1.32	
Nitrate (N)	mg/L	13	13	0.11	<0.050	<0.050	<0.050	<0.050	0.066	0.06	<0.050	<0.050	0.084	<0.050	<0.050	<0.050	0.095	0.078	
Saturation pH (@ 20C)	N/A	NV	NV	10.4	9.25	10.4	10.4	10.1	10.2	10.2	10.2	10.4	9.27	9.26	9.13	9.95	9.52	8.31	
Saturation pH (@ 4C)	N/A	NV	NV	10.6	9.5	10.6	10.7	10.3	10.4	10.5	10.5	10.6	9.52	9.51	9.38	10.2	9.77	8.56	
<b>Inorganics</b>																			
Total Alkalinity (Total as CaCO3)	mg/L	NV	NV	25	16	3.7	3.2	5.6	4.9	4.8	4.3	3.1	17	6.1	12	4.6	6.1	26	
Dissolved Chloride (Cl-)	mg/L	120	120	8.6	8.2	3.8	3.6	4.9	2.7	2.8	10	10	6.2	6.4	2.9	5.8	8.3	3.5	
Colour	TCU	NV	NV	280	58	43	45	35	100	110	37	38	76	25	86	72	40	100	
Dissolved Fluoride (F-)	mg/L	120	120	<0.10	NC	NC	NC	NC	NC	NC	<0.10	<0.10	<0.10	NC	NC	<0.10	<0.10	<0.10	
Nitrate + Nitrite (N)	mg/L	NV	NV	0.11	<0.050	<0.050	<0.050	<0.050	0.066	0.06	<0.050	<0.050	0.084	<0.050	<0.050	<0.050	0.095	0.078	
Nitrite (N)	mg/L	0.06	0.06	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Nitrogen (Ammonia Nitrogen)	mg/L	(see note)a	(see note)a	0.064	<0.050	<0.050	0.06	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.063	
Total Organic Carbon (C)	mg/L	NV	NV	25	8.3	6.2	6.2	5.2	15	14	4.8	4.7	11	4.8	13	7.2	5.1	15	
Orthophosphate (P)	mg/L	NV	NV	0	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.011	
pH	pH	6.5 - 9.0	6.5 - 9.0	7.22	7.17	6.47	6.47	6.82	6.55	6.53	6.33	6.38	7.22	6.9	6.78	6.22	6.48	7.24	
Reactive Silica (SiO2)	mg/L	NV	NV	5.4	4.8	3.5	3.1	3.2	4.1	4.2	2.9	2.9	4.3	0.89	2.8	3.6	2.5	4.6	
Total Suspended Solids	mg/L	NV	NV	8	1.4	<1.0	<1.0	<1.0	1.8	1.6	7.6	6.2	3.6	1.6	6.2	1.8	2	3.8	
Dissolved Sulphate (SO4)	mg/L	NV	NV	86	12	<2.0	2.1	3	<2.0	<2.0	5.9	3.9	6.1	42	22	11	21	89	
Turbidity	NTU	NV	NV	8	1.4	2.7	3	2.1	3.1	3.2	6.8	5.9	3.9	1.3	1.4	6.7	6.8	6.5	
Conductivity	uS/cm	NV	NV	390	75	31	31	41	30	30	45	44	36	140	93	48	88	130	
<b>Field Parameters</b>																			
Temperature	°C	NV	NV	NV	9.51	3.24	3.24	5.23	15.97	15.97	-0.23	-0.23	19.27	8.96	23.17	0.37	-0.09	22.03	
pH	pH	6.5-9.0	6.5-9.0	6.55	5.43	5.53	5.53	6.38	5.5	5.5	4.63	4.63	6.31	6.27	5.78	5.69	4.79	6.72	
Oxygen Reduction Potential (ORP)	N/A	NV	NV	280	191	196	196	208	229	229	262	262	-	47	195	198	226	-	
Conductivity	mS/cm	NV	NV	1.193	1.193	0.016	0.016	0.021	0.035	0.035	0.02	0.02	0.104	0.069	0.101	0.042	0.024	0.28	
Turbidity	NTU	NV	NV	46	0	0	0	5	0.7	0.7	0	0	2.1	46	0	1000	0	3.3	
Dissolved Oxygen	mg/L	NV	NV	18.16	9.13	15.5	15.5	17.52	7.6	7.6	9.9	9.9	5.46	11.04	3.33	10.58	7.23	1.01	
Dissolved Oxygen	%	NV	NV	135.9	79.7	118.7	118.7	93.8	77.4	77.4	69.2	69.2	-	95.9	38.5	74.9	50.9	-	

**Notes:**

General chemistry parameters are generally not considered  
 NV - No value; FWAL - Freshwater aquatic life; NC - not calculated  
 nd = non detect value. Detection limits were not reported  
 -- Not applicable

a - Nitrogen (Ammonia Nitrogen) guideline calculated using Table 2. Water quality guidelines for total ammonia for the protection of aquatic life (mg/L NH3) provided in the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life: Ammonia. All results were compared to guidelines in effect at the time of sampling.

**Screening:**

Shaded indicates values are greater than CCME FWAL

**Bold** indicates values are greater than NS Tier 1 EQS

indicates values are greater than maximum

Underlined background concentrations reported between October 2022 and July 2023

**References:**

Canadian Council of Ministers of the Environment (CCME), current to 2021.  
 Canadian Water Quality Guidelines (WQGs) for the Protection of Aquatic Life (freshwater, long term)

Surface Water Quality Data - Total Metals  
Antrim Project, Gays River, NS

Parameters	Units	CCME FWAL	NS Tier 1 EQS	Baseline Maximum	SW1					SW2					SW3					
					SW1	SW1	SW1	SW1	SW1	SW2	SW2	SW2	SW2	SW-2	SW-2	SW3 (historic, decommissioned)	SW3 (historic, decommissioned)	SW3 (historic, decommissioned)	SW3 (historic, decommissioned)	SW3
Date					1/19/2023	4/12/2023	7/12/2023	3/25/2024	6/24/2024	10/5/2022	1/19/2023	4/12/2023	7/12/2023	2/28/2024	6/24/2024	10/5/2022	1/19/2023	4/12/2023	2/28/2024	6/24/2024
Total Aluminum (Al)	ug/L	(see note)a	5	490	220	190	430	310	190	190	490	210	220	300	350	69	280	250	280	25
Total Antimony (Sb)	ug/L	NV	9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Arsenic (As)	ug/L	5	5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Barium (Ba)	ug/L	NV	1000	30	4.9	5.7	9.6	6.3	11	30	8.4	9.8	13	12	18	16	8.3	9.9	9.6	21
Total Beryllium (Be)	ug/L	NV	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Bismuth (Bi)	ug/L	NV	NV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Boron (B)	ug/L	1500	1500	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Total Cadmium (Cd)	ug/L	(see note)b	0.09	0.044	0.01	0.01	0.02	0.011	0.016	0.044	0.018	<0.010	0.017	0.012	0.028	<0.010	<0.010	<0.010	0.011	<0.010
Total Calcium (Ca)	ug/L	NV	NV	39000	4200	7400	14000	3200	23000	18000	4400	6900	9700	5600	17000	39000	8100	19000	9300	84000
Total Chromium (Cr)	ug/L	NV	8.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Cobalt (Co)	ug/L	NV	1	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Total Copper (Cu)	ug/L	(see note)c	2	0.99	<0.50	0.55	0.66	<0.50	<0.50	0.87	<0.50	<0.50	0.61	<0.50	0.82	<0.50	0.7	<0.50	0.5	<0.50
Total Iron (Fe)	ug/L	300	300	1500	230	220	1300	320	1300	290	470	170	1500	280	930	210	230	280	320	170
Total Lead (Pb)	ug/L	(see note)d	1	0.56	<0.50	<0.50	0.56	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Magnesium (Mg)	ug/L	NV	NV	2500	520	650	1200	590	1300	2500	900	1100	1800	1300	2100	1800	740	1100	750	3700
Total Manganese (Mn)	ug/L	(see note)e	430	400	17	19	90	19	130	180	28	9.7	81	26	120	66	6.8	110	99	240
Total Molybdenum (Mo)	ug/L	73	73	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Nickel (Ni)	ug/L	(see note)f	25	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Phosphorus (P)	ug/L	NV	NV	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Total Potassium (K)	ug/L	NV	NV	880	220	270	300	400	490	880	370	370	620	570	690	700	310	320	400	400
Total Selenium (Se)	ug/L	1	1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Silver (Ag)	ug/L	0.25	0.25	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Sodium (Na)	ug/L	NV	NV	6600	2200	2200	2400	2500	2700	4900	3500	4800	3600	5200	4500	4800	3600	4500	3900	8500
Total Strontium (Sr)	ug/L	NV	21000	160	17	29	67	12	83	40	9.3	15	23	13	38	160	30	79	37	380
Total Thallium (Tl)	ug/L	0.8	0.8	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total Tin (Sn)	ug/L	NV	NV	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Titanium (Ti)	ug/L	NV	NV	14	7.2	3.7	9	6.9	4.6	4.4	14	6.4	6	6.6	9.9	2.3	6.1	6.2	7.1	<2.0
Total Uranium (U)	ug/L	15	15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12
Total Vanadium (V)	ug/L	NV	120	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Zinc (Zn)	ug/L	NV	7	9	<5.0	<5.0	<5.0	<5.0	<5.0	9	<5.0	<5.0	<5.0	7.8	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

**Notes:**

NV - No value; FWAL - Freshwater aquatic life

-- Not applicable

nd = non detect value. Detection limits were not reported

a - Aluminum guideline for FWAL = 5 µg/L for pH <6.5 and 100 µg/L for pH ≥6.5.

b - Cadmium guideline for FWAL is 0.04 ug/L at hardness <17 mg/L, otherwise calculated as  $10^{(0.83[\log(\text{hardness}))-2.46]}$

c - Copper guideline = When water hardness is 0 to <82 mg/L, the guideline is 2 µg/L; when hardness is > 82 to < 180 mg/L equation:  $e^{0.845[\ln(\text{hardness})] - 1.465} \times 0.2$  µg/L is used to determine the copper guideline. At hardness >180 mg/L the guideline is 4 µg/L. Water hardness at all locations are <82 mg/L and as such, the guideline is 2 µg/L.

d - Lead guideline = When water hardness is 0 to <60 mg/L, the guideline is 1ug/L; when hardness is >60 to < 180 mg/L equation:  $e^{1.273[\ln(\text{hardness})] - 4.705}$  ug/L is used to determine the lead guideline. At hardness >180 mg/L the guideline is 7 ug/L.

e - Manganese guideline calculated using the Manganese - Canadian Water Quality Guideline and Benchmark Calculator provided in Appendix B of the Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life. Criteria for manganese was posted December 19, 2019. All results were compared to guidelines in effect at the time of sampling.

f - Nickel guideline = When water hardness is 0 to <60 mg/L, the guideline is 25 ug/L; when hardness is > 60 to < 180 mg/L equation:  $e^{0.76[\ln(\text{hardness})] + 1.06}$  ug/L is used to determine the nickel guideline. At hardness >180 mg/L the guideline is 150 ug/L.

**Screening:**

Shaded indicates values are greater than CCME FWAL

Bold indicates values are greater than NS Tier 1 EQS

Underlined indicates values are greater than maximum background concentrations reported between October 2022 and July 2023

**References:**

Canadian Council of Ministers of the Environment (CCME), current to 2021. Canadian Water Quality Guidelines (WQGs) for the Protection of Aquatic Life (freshwater, long term)







# **Appendix F.2**

## **Water Balance Assessment**


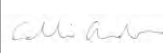


# **Water Balance Assessment**

**Antrim Gypsum Project Nova Scotia**

CertainTeed Canada, Inc.

15 August 2024

<b>Project name</b>		Antrim EA					
<b>Document title</b>		Water Balance Assessment   Antrim Gypsum Project Nova Scotia					
<b>Project number</b>		12601021					
<b>File name</b>		12601021-RPT-7-Water Balance Assessment.docx					
<b>Status Code</b>	<b>Revision</b>	<b>Author</b>	<b>Reviewer</b>		<b>Approved for issue</b>		
			<b>Name</b>	<b>Signature</b>	<b>Name</b>	<b>Signature</b>	<b>Date</b>
S3	00	Sarah Irwin Aidan Van Heyst	Chris Muirhead	Draft	Callie Andrews	Draft	23/07/24
S4	01	Sarah Irwin Aidan Van Heyst	Chris Muirhead		Callie Andrews		15/08/24

**GHD Limited**

Contact: Chris Muirhead, Engineer | GHD  
 110, 120 Western Parkway,  
 Bedford, Nova Scotia B4B 0V2, Canada  
 T +1 902 468 1248 | F +1 902 468 2207 | E info-northamerica@ghd.com | [ghd.com](http://ghd.com)

© GHD 2024

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
1.1	Purpose of this report	1
1.2	Scope and limitations	1
<b>2.</b>	<b>Background</b>	<b>2</b>
2.1	Project Overview	2
2.2	Mine Water Management Overview	2
<b>3.</b>	<b>Data Collection</b>	<b>6</b>
3.1	Existing Soil Characterization	6
3.2	Topographic Data	6
3.3	Climate Data	6
<b>4.</b>	<b>Water Balance Methodology</b>	<b>7</b>
4.1	Flow Estimation	7
4.2	Groundwater Model Output	9
4.3	Mine Water Management System	9
<b>5.</b>	<b>Water Balance Results</b>	<b>12</b>
5.1	Impacts to the Receiving Environment	12
5.1.1	Water Balance Assessment	12
5.1.1.1	Supplemental Flow Requirements	13
5.1.1.2	Water Balance Assessment Results	13
5.1.2	Water Balance Assessment Discussion	14
5.2	Pit Filling Calculations	14
<b>6.</b>	<b>Summary</b>	<b>14</b>
<b>7.</b>	<b>References</b>	<b>15</b>

## Table index

Table 2.1	Summary of assessment points	5
Table 3.1	Monthly and annual average climate data calculated from the ECCC Halifax Stanfield climate station.	7
Table 4.1	Runoff coefficient summary	7
Table 4.2	Mine development phase summary	9
Table 4.3	Water transfers during Phase 1	10
Table 4.4	Water transfers during Phase 2	10
Table 4.5	Water transfers during Pit Filling	10
Table 5.1	Assessment point summary results for mean annual conditions	12
Table 5.2	Supplemental flow rates	13
Table 5.3	Pit filling times under various precipitation and backfill scenarios	14

## Figure index

Figure 2.1	Project area map and assessment point locations	4
Figure 4.1	Discharge locations	11

## Appendices

Appendix A	Monthly Water Balance Results
Appendix B	Preliminary Supplemental Flow Requirement Assessment

# 1. Introduction

## 1.1 Purpose of this report

CertainTeed Canada Inc. (CertainTeed) has retained GHD Limited (GHD) to provide technical and permitting services in support of a Provincial Class 1 Environmental Assessment Registration Document (EARD) submission to Nova Scotia Environment and Climate Change (NSECC) for the Antrim Gypsum Project (Project), located in Cooks Brook, Nova Scotia (NS). GHD's scope of work includes the development of a water balance model (WBM) for the Project to support the EARD. For the purpose of the EARD and this assessment, a Project Area (PA) was defined as the footprint of Project related infrastructure covering an area of approximately 602 hectares (ha).

The WBM simulates the interactions between the local climate, hydrologic responses of the assessed catchment areas, and water management operations to model the distribution of water through the site and predict impacts to the surrounding natural water features. Results from the WBM were used to address the following objectives:

- Evaluate the impact of mine development on drainage patterns in the receiving environment by comparing runoff volumes between baseline (i.e., pre-development) and predicted post-developed conditions to support the assessment of impacts to black ash, and fish and fish habitat.
- Estimate the time to fill the open pit with water as part of the closure plan for reclamation following backfill activities.

The purpose of this report is to document the data inputs and methodology behind the development of the WBM and summarize the model outputs as they pertain to the study objectives. The WBM was used to analyze results for five phases of Project development as summarized below:

- Baseline: Existing conditions at the PA prior to any development activities.
- Phase 1 Conditions: The first phase of excavation and processing of gypsum. The northern portion of the open pit has been excavated and the northern portion of the proposed overburden stockpile has been developed.
- Phase 2 Conditions: Full build-out conditions for the PA including excavation of the open pit, backfilling of the northern portion of the pit and development of all stockpiles.
- Pit Filling Conditions: Active mining has finished, and reclamation activities have commenced. Stockpiles have been covered and seeded and any administrative areas have been restored. The open pit is filling with direct precipitation, groundwater inflows, overflow from the South Settling Pond, and surface flows from upstream catchments
- Closure Conditions: All mine infrastructure has been removed. The open pit is filled to an elevation of 25.1 meters above sea level (masl). No further closure activities to be conducted.

The results of the water balance analysis are organized to follow the framework of the study objectives.

## 1.2 Scope and limitations

*This report: has been prepared by GHD for CertainTeed Canada, Inc. and may only be used and relied on by CertainTeed Canada, Inc. and Nova Scotia Environment and Climate Change (NSECC) for the purpose agreed between GHD and CertainTeed Canada, Inc. as set out in section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than CertainTeed Canada, Inc. and NSECC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 2 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

## **2. Background**

### **2.1 Project Overview**

The Project is located approximately 50 kilometres (km) northeast from Halifax, near Gays River, along Lake Egmont Road in the community of Cooks Brook, NS. CertainTeed proposes to develop the Project as a conventional gypsum mining operation, including an open pit, combined overburden and waste rock stockpile (referred to herein as the overburden stockpile), topsoil stockpiles, rock processing plant, as well as water management infrastructure. The Project will produce marketable gypsum and anhydrate at an estimated average rate of production of 1.5 million tonnes per year. The gypsum and anhydrate products will be transported via trucks to a port facility in Sheet Harbour, approximately 82 km from the PA, for shipment to manufacturing facilities either in Canada or the United States. The operating life of the Project is proposed to be 23 years.

The scope of the Project includes activities associated with construction, operation, and closure. Project construction activities will include clearing and grubbing the topsoil stockpiles, overburden stockpile, run-of-mine (ROM) stockpile, mine pit, and construction of the processing facility (i.e., sizer buildings, conveyor, screening building, etc.), access roads, fuelling infrastructure, surface water management and other Project infrastructure. The operation phase will include extraction (surface miner, loading, and hauling), processing, and waste management. Blasting may be used for extraction if required. Gypsum will be screened while stockpiled. The closure phase will include earthworks and demolition required to return the Project Area to a safe, stable, and vegetated state, and all monitoring and treatment, if required. Reclamation and Closure Plan requirements are governed by the *Nova Scotia Mineral Resources Act*.

The Project has documented black ash across the PA, including a concentration of trees within the northwest corner, and several individual trees within the southern portion of the PA. One tree is located within the extents of the proposed open pit. This tree is proposed to be transplanted, in collaboration with the Mi'kmaq of Nova Scotia, in keeping with several other recent projects where transplantation of black ash has been allowed to support industrial and infrastructure development projects (Touquoy Gold Mine, Highway 104 and 107 upgrade projects).

A comprehensive monitoring program will be established to support Project development which will act as a research project relating to the required hydrologic regime required for the remaining black ash (all but one individual tree) that will be avoided by the Project.

### **2.2 Mine Water Management Overview**

The Project is located in the catchment area of the Gays River – a tributary of the Shubenacadie River. The total PA is 602 hectares (ha) and the total catchment area downstream of the PA, along the Gays River is approximately 8,577 ha. The PA is drained by several tributaries, including Annand Brook, which flows west through the neighbouring Scotia Mine property and polishing pond before entering the Gays River. The Scotia Mine property is located immediately west of the of the Project. Scotia Mine is a surface lead/zinc mine that consists of an open pit (currently filled with water) and associated mine infrastructure, including a tailings pond, polishing pond, roads and buildings. Under existing conditions a tributary of Annand Brook flows through the Project Area before flowing into the Scotia Mine polishing pond.

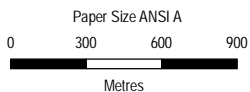
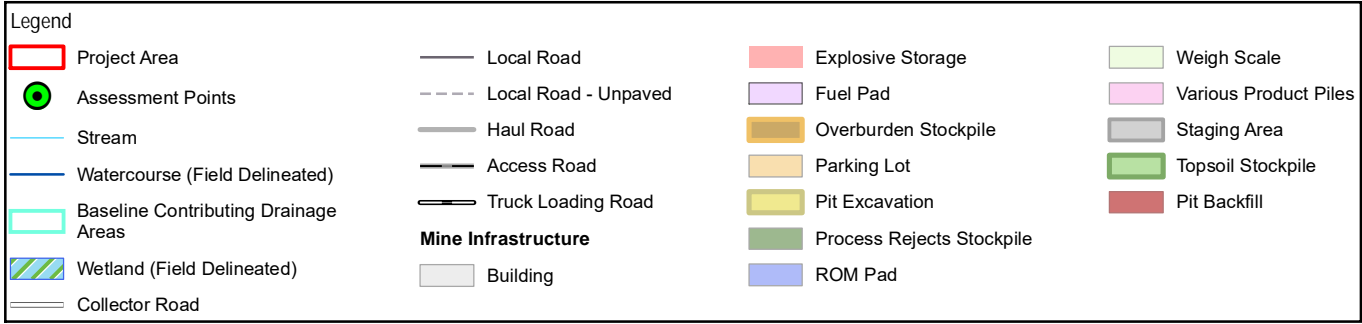
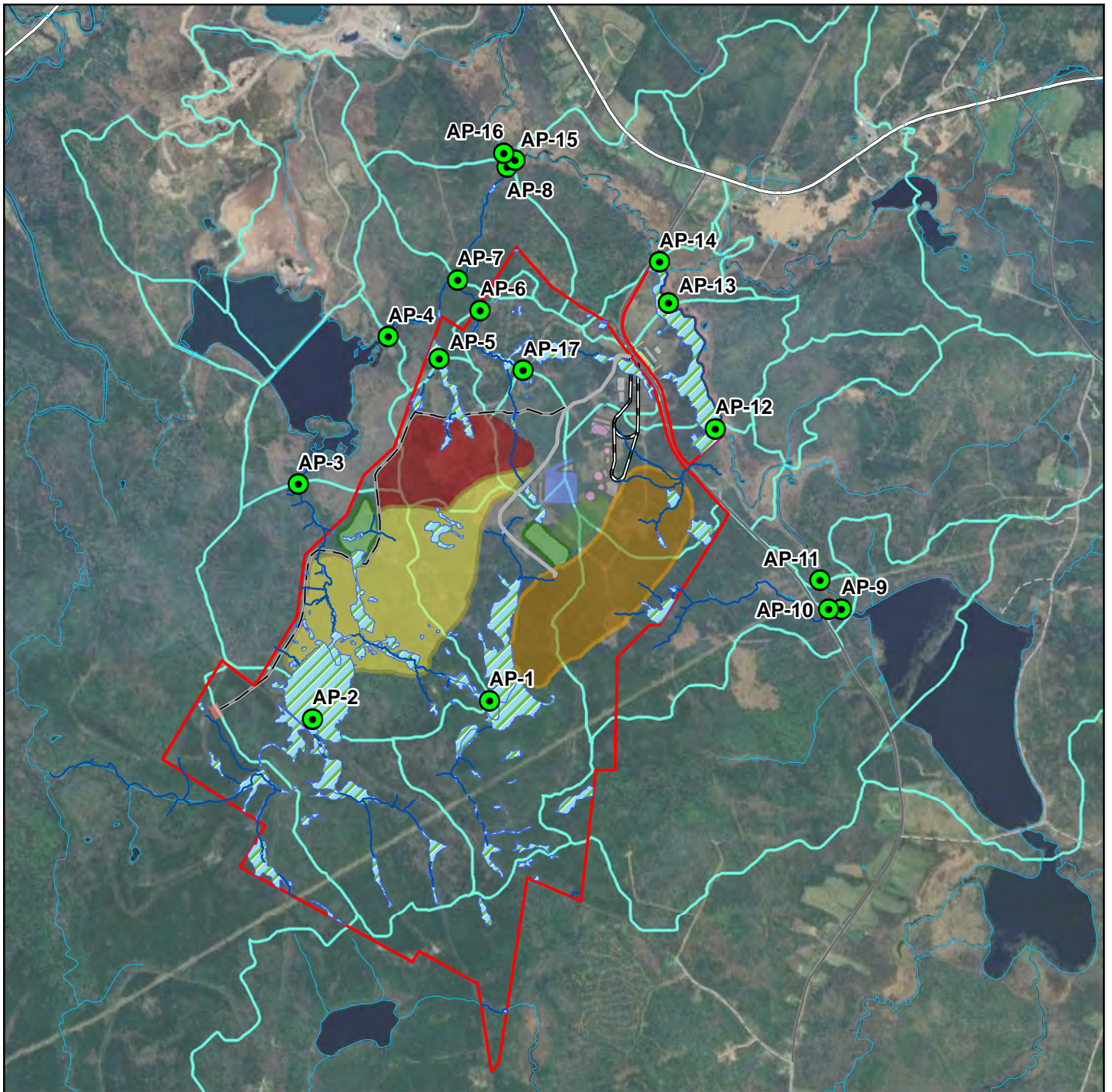


The land cover of the PA is comprised of numerous wetlands, watercourses, and forested lands. Figure 2.1 presents a map of the Project, including field verified and provincially mapped watercourses.

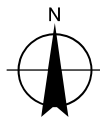
In operation, the mine water management system will discharge to the receiving environment at five (5) locations, including the North Settling Pond, South Settling Pond as well as 3 discharge points to supplement flows to the natural environment. In closure, the open pit will receive water from the natural environment while also discharging directly to the environment. **Figure 2.1** also shows a map of the proposed mine features, including the mine water sources, collection ponds, and discharge points to the Gays River system.

To assess the impact of the Project on the receiving environment, the WBM simulates monthly flow volumes for baseline, Phase 1 operation, Phase 2 operation, and closure conditions, which are compared at various points along the tributaries and main branch of the Gays River system referred to as “assessment points”. These assessment points have been selected to support the evaluation on impacts on fish and fish habitat. **Figure 2.1** shows the location of the assessment points and corresponding subcatchment areas. **Table 2.1** summarizes the identification number (ID), subcatchment area, location, and justification for the selection of the assessment points. The sizes of the subcatchment areas will change overtime as a result of the Project development. The Baseline, Phase 1, Phase 2, Pit Filling, and Closure phases are described in Section 3.3 of the report.

For additional information regarding the conceptual water management plan for the Project, refer to the Antrim Gypsum Project Conceptual Water Management Plan (GHD, 2024a).



Map Projection: Transverse Mercator  
Horizontal Datum: North American 1983  
Grid: NAD 1983 UTM Zone 20N



CERTAINTEED CANADA, INC  
LAKE EGMONT, HALIFAX CO, NOVA SCOTIA  
ANTRIM GYPSUM PROJECT

WATER BALANCE ANALYSIS  
ASSESSMENT POINT LOCATIONS

Project No. 12601021  
Revision No. -  
Date Aug 14, 2024

FIGURE 2.1

Table 2.1 Summary of assessment points

Assessment Point	Catchment Area at Select Mine Phases (ha)				Description
	Baseline	Phase 1	Phase 2	Closure	
AP1	136.38	120.39	88.84	97.12	Located on Watercourse (WC) 41, a tributary of Annand Brook. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows within the tributary.
AP2	85.07	85.07	85.07	85.07	Located on WC 3, a tributary of Annand Brook. Provides an upstream control point.
AP3	351.17	335.18	258.63	266.17	Located on Annand Brook upstream of the Scotia Mine Polishing Pond and downstream of AP1 and AP2. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows within Annand Brook.
AP4	513.97	466.36	453.47	459.96	Located on Annand Brook downstream of the Scotia Mine Polishing Pond. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows within Annand Brook.
AP5	32.98	10.89	31.11	32.84	Located along Wetland 34 before draining to Annand Brook. Used to assess the direct impacts of the pit on mean annual flows leading to the identified black ash habitat.
AP6	61.28	38.63	42.7	64.74	Located on WC22, a tributary to Annand Brook downstream of AP17. Used to assess the direct impacts of the pit on mean annual flows leading to the identified black ash habitat.
AP7	128.88	84.14	108.42	132.2	Located on Annand Brook downstream of AP4, AP5, and AP6. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows within Annand Brook.
AP8	179.29	134.55	158.84	182.6	Located on Annand Brook downstream of AP7 and upstream of the confluence with the Gays River. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows within Annand Brook.
AP9	4053.81	4053.81	4053.81	4053.81	Located on the Gays River. Provides an upstream control point.
AP10	93.16	76.33	72.14	72.14	Located on an unlabelled tributary to the Gays River. Used to assess the direct impacts of mine infrastructure on mean annual flows within the tributary.
AP11	4151.15	4134.31	4130.12	4130.12	Located on the Gays River downstream of AP9 and AP10. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.
AP12	61.98	26.14	26.14	34.34	Located on WC26, tributary to the Gays River. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.
AP13	4435.57	4381.64	4377.44	4385.63	Located on the Gays River downstream of AP11 and AP12. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.
AP14	7951.00	7896.92	7892.73	7901.10	Located on the Gays River downstream of AP13. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.

Assessment Point	Catchment Area at Select Mine Phases (ha)				Description
	Baseline	Phase 1	Phase 2	Closure	
AP15	8023.30	7969.22	7965.03	7973.37	Located on the Gays River downstream of AP14. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.
AP16	8716.56	8570.13	8577.34	8615.93	Located on the Gays River downstream of AP8 and AP15. Used to assess the direct impacts of mine infrastructure on mean annual flows within the Gays River.
AP17	20.6	9.37	13.38	22.62	Located on WC 21, a tributary to Annand Brook upstream of AP6. Used to assess the direct impacts of mine infrastructure and the pit on mean annual flows to the identified Black ash habitat.

### 3. Data Collection

#### 3.1 Existing Soil Characterization

The existing soil characterization to inform the water balance assessment was quantified by the Detailed Soil Survey for Nova Scotia. The PA was identified to consist of 98% Sandy Clay Loam.

#### 3.2 Topographic Data

A Nova Scotia Department of Natural Resources Digital Elevation Model (DEM) was used to perform the delineation of the baseline subcatchments in the Gays River system using the watershed delineation tool in PCSWMM. PCSWMM is a combined hydrologic and hydraulic modelling software with geospatial tools for assessing contributing drainage areas based upon DEM data. The DEM elevation data was collected in 2011. It has a planar resolution of 1 m x 1m. The horizontal datum is the North American Datum of 1983 UTM Zone 20 (NAD83 UTM Zone 20). Contours were generated from the DEM to verify the baseline subcatchment boundaries. Digitally generated subcatchment were verified manually for baseline conditions. Phase 1, Phase 2, Pit Filling and Closure subcatchments were manually delineated around Project infrastructure. Proposed contours of the mine infrastructure including the stockpiles and open pits were generated by Moose Mountain and were used to support the delineation of the subcatchments under post-development conditions.

#### 3.3 Climate Data

The WBM uses daily climate data inputs including daily precipitation (rainfall and snowfall), daily average temperature, and calculated daily potential evaporation. A 50-year record of daily precipitation and average temperature values were obtained from the Halifax Stanfield International Airport Environment Canada Climate Change (ECCC) climate station (ID 8202251) for the years between 1964-2023. The Halifax Stanfield climate station is located approximately 21 km southwest from the PA. Alternatively the Upper Stewiacke climate station is located 75 km north of the PA. The Upper Stewiacke climate station has a lengthy period of record (1915-2024). Neither climate stations represented significant shifts in proximity to the coast, as such, Halifax Stanfield International Airport was determined as the appropriate station due to the closer proximity to the PA.

Potential evapotranspiration (PET) values were calculated using the Hamon method, which estimates PET based on the empirical relationship between mean daily air temperature, saturated water vapour concentration and day length (hours of sunshine). Daily average temperature values from the Halifax Stanfield climate record were used to calculate daily PET values. The daily PET values were then input into a soil-water balance model to calculate Actual Evapotranspiration (AET) for the corresponding 50-year climate record.

**Table 3.1** summarizes the average monthly values of the climate data used in the water balance analysis.

**Table 3.1** Monthly and annual average climate data calculated from the ECCC Halifax Stanfield climate station.

Climate Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (mm)	144.4	122.1	124.3	115.7	105.3	100.8	93.3	99.0	105.4	131.2	153.9	163.7	1459.2
Rainfall (mm)	85.2	67.9	81.6	96.9	103.0	100.8	93.3	99.0	105.4	129.7	139.6	117.5	1219.9
Snowfall (mm)	59.2	54.2	42.7	18.8	2.3	0.0	0.0	0.0	0.0	1.5	14.4	46.2	239.3
Mean Temperature (°C)	-5.6	-5.5	-1.4	4.1	9.8	15.0	18.8	18.7	14.6	9.0	3.5	-2.2	--
Potential Evapotranspiration (mm)	3.9	3.9	12.1	33.5	59.2	82.5	104.1	95.3	64.4	41.1	21.3	8.0	529.4

## 4. Water Balance Methodology

This section of the report describes the water balance modelling methodology, including the Baseline, Phase 1, Phase 2, Pit Filling and Closure flow estimates, incorporation of the groundwater model output, and water transfers between mine infrastructure. The WBM was developed using the GoldSim software.

GoldSim is a highly graphical program used for carrying out dynamic simulations to support decision making (<https://www.goldsim.com/Web/Home/>, last accessed 4 July 2024). GoldSim is especially well-suited to simulate dynamic, computationally intensive, but well-defined network models such as a water balance. GoldSim can perform Monte Carlo simulations, track outputs from those simulations, and provide a graphical interface to facilitate the review and identification of interactions between system components.

The WBM was developed to utilize climate inputs at a daily time-step, allowing for the results to be summarized at monthly and annual time intervals. The WBM was used to estimate flow volumes at the proposed mine water management features and 17 assessment points located on the tributaries of the Gays River system over the duration of the Project.

### 4.1 Flow Estimation

Flow volumes were estimated at the assessment points as the product of precipitation, catchment area, and a runoff coefficient, which is a measure of the amount of runoff generated by a precipitation event that varies depending on the land cover and antecedent moisture conditions of the surficial soils. **Table 4.1** summarizes the mean annual runoff coefficients by land cover type and provides a breakdown of the proportion of runoff that is contributed by surface water and baseflow from groundwater sources.

**Table 4.1** Runoff coefficient summary

Land Cover Type	Runoff Coefficient	Surface Water Contribution	Groundwater Contribution
Undisturbed	0.69	0.55	0.14
Open Water	1.00	1.00	0.00
Hard Mine	0.80	0.85	0.00
Topsoil	0.62-0.72	0.48-0.58	0.14
Waste Rock	0.49-0.79	0.35-0.66	0.14

The proportion of the flow contributed by baseflow was determined from the average annual recharge rate of 200 millimetres per year (mm/year) (GHD, 2024b). A baseflow component of the runoff coefficient was estimated for undisturbed, waste rock, and topsoil land cover types by dividing the mean annual recharge rate by mean annual precipitation for the PA, resulting in a value of 0.14. The baseflow contribution is consistent for the three land cover types, because the waste rock and topsoil stockpiles will sit on top of the undisturbed land. The hard mine and open water land cover types are impervious and therefore are disconnected from the groundwater system. The surface runoff component of the runoff coefficient was then estimated by subtracting 0.14 from the runoff coefficient.

### **Undisturbed Land Cover**

The undisturbed land cover type represents the natural ground cover, which is primarily comprised of natural stand forest with wetlands and open water features. To estimate the runoff coefficient for this composite land cover, observed data was utilized. A long-term hydrometric record from the Beaverbank near Kinsac Water Survey Canada (WSC) gauge station was used to calculate the mean unit flow rate, which was then divided by the mean precipitation for the PA calculated over the same period (from 1965 to 2020), resulting in a mean annual runoff coefficient of 0.69. The Beaverbank near Kinsac hydrometric record was selected for the analysis because it is near to the Halifax Stanfield International Airport climate station (chosen for this study), its catchment area has similar land cover type (primarily forested), and its catchment area is comparable to Assessment Point 16 on the Gays River (within 10%).

### **Impervious Land Cover**

The open water runoff coefficient of 1.0 was applied to the collection ponds, polishing pond at the Scotia Mine polishing pond, and the pit lake post-closure. All open water sources were modelled as reservoirs, which experience evaporative losses from their surface area.

In the absence of observed data or standard literature values, the hard mine runoff coefficient of 0.80 was estimated assuming the first 2 mm of rainfall is captured in depression storage on the ground and evaporated.

### **Stockpile Land Cover**

The overburden stockpile and topsoil runoff coefficients were estimated using a simple continuous hydrological model developed using the HEC-HMS software.

The topsoil stockpile was modelled as a subcatchment of uniform land cover characterized as sandy clay loam. The overburden stockpile was modelled as a silty sand to provide a conservative estimate for infiltration rates into the stockpile. The underlying soil was assumed to be a compacted sandy clay loam.

The topsoil stockpile results predict that total precipitation will generate 37% surface runoff, 28% evaporation, and 35% infiltration based on the average annual climate conditions. Infiltration is further broken down into 14% groundwater recharge and 21% seepage discharge.

The overburden stockpile results predict that total precipitation will generate 5% surface runoff, 20% evaporation, and 75% infiltration, which is further partitioned into 14% groundwater recharge and 61% seepage. If the stockpiles have not reached saturation, then a portion of the infiltration volume will be absorbed, reducing the amount of water that discharges as seepage. As such, a range of seepage rates are considered in this assessment: from half to the full seepage rate at saturation.

In closure, it is assumed that the topsoil stockpile will have been used to facilitate reclamation process and that the overburden stockpile will be covered to mimic the natural ground cover.

### **Seasonal Variation**

To account for the seasonal variation in antecedent moisture conditions of the undisturbed, topsoil, and waste rock land cover types, the runoff coefficients were calculated monthly.



## 4.2 Groundwater Model Output

In baseline conditions, it is assumed that the groundwater flow patterns will follow the surficial subcatchment boundaries, meaning groundwater recharge (9% of precipitation on average) will return to the surface as baseflow at the subcatchment outlets (i.e., the assessment points). After the open pit has been mined, the assumption that groundwater flow patterns follow the subcatchment boundaries is no longer valid. The development of the open pit will alter groundwater flow patterns from baseline conditions, which is demonstrated in the radius of influence map presented in the Hydrogeological Modelling report (GHD, 2024b).

### Baseflow Impacts

Baseflow volume variations to the natural lakes and watercourses were determined using the Project groundwater model (GHD, 2024b). The baseflow impacts were incorporated into the WBM as percent changes from baseline conditions at each assessment point.

### Open Pit Inflow

Groundwater inflow rates to the open pits were also obtained from the Project groundwater model (GHD, 2024b). Predicted groundwater inflow rates range from 1,237 m<sup>3</sup>/day in Phase 1, to 2,718 m<sup>3</sup>/day in Phase 2, to 63 m<sup>3</sup>/day in closure when the pit lake is fully formed. Groundwater inflow rates are predicted to continue into closure because the eventual pit lake elevation is lower than the current ground elevation is for certain portions on the pit lake.

## 4.3 Mine Water Management System

The proposed mine water management system will discharge through five discharge points to the Gays River and to Annand Brook over the duration of the Project. This discharge points include the North Settling Pond overflow to the Gays River at AP12, North Settling Pond supplemental pumping to support black ash hydrology at AP5, AP6, and AP17, and South Settling pond/pit dewatering discharge to Annand Brook at AP3. The discharge points from the PA are shown on **Figure 4.1**.

**Table 4.2** describes the four mine development stages in the context of the water balance modelling approach. **Table 4.3** and **Table 4.4** describe the water transfers presented in the flow diagrams.

*Table 4.2 Mine development phase summary*

Mine Development Phase	Description
Phase 1	<ul style="list-style-type: none"> <li>Year 1-6 of the Project</li> <li>Ore extraction and mine infrastructure remain within private land</li> <li>Open pit is sized to allow for backfill to support the black ash</li> </ul>
Phase 2	<ul style="list-style-type: none"> <li>Year 7-23 of the Project</li> <li>Ore extraction and mine infrastructure expand into Crown land</li> <li>Backfill to original elevation and contours in the northern portion of the open pit to support black ash</li> </ul>
Pit Filling	<ul style="list-style-type: none"> <li>Year 23+ of the Project</li> <li>Represents the first full year when the open pit is mined to its full extent and will begin to fill with water</li> <li>It is assumed that the administrative and crusher pad areas are restored to resemble baseline conditions.</li> </ul>

Mine Development Phase	Description
Closure	<ul style="list-style-type: none"> <li>Year 23+ of the Project when the Pit is filled with water</li> <li>Open pit overflow will be directed to Annand Brook along the western boundary of the PA</li> <li>Surface water ditched surrounding mine infrastructure will continue to discharge to the Gays River</li> </ul>

**Table 4.3** Water transfers during Phase 1

Infrastructure Element	Sources of Inflow	Discharge Point
North Settling Pond	<ul style="list-style-type: none"> <li>Surface runoff from overburden and topsoil stockpiles</li> <li>Surface runoff from administrative and crusher pad areas</li> <li>Dewatering pump from Phase 1 open pit</li> </ul>	<ul style="list-style-type: none"> <li>Supplemental pumping to AP3</li> <li>Supplemental pumping to AP5</li> <li>Supplemental pumping to AP6</li> <li>Supplemental pumping to AP17</li> <li>WC26</li> </ul>
Phase 1 Pit	<ul style="list-style-type: none"> <li>Pit wall runoff</li> <li>Groundwater inflow</li> </ul>	<ul style="list-style-type: none"> <li>North Settling Pond</li> </ul>

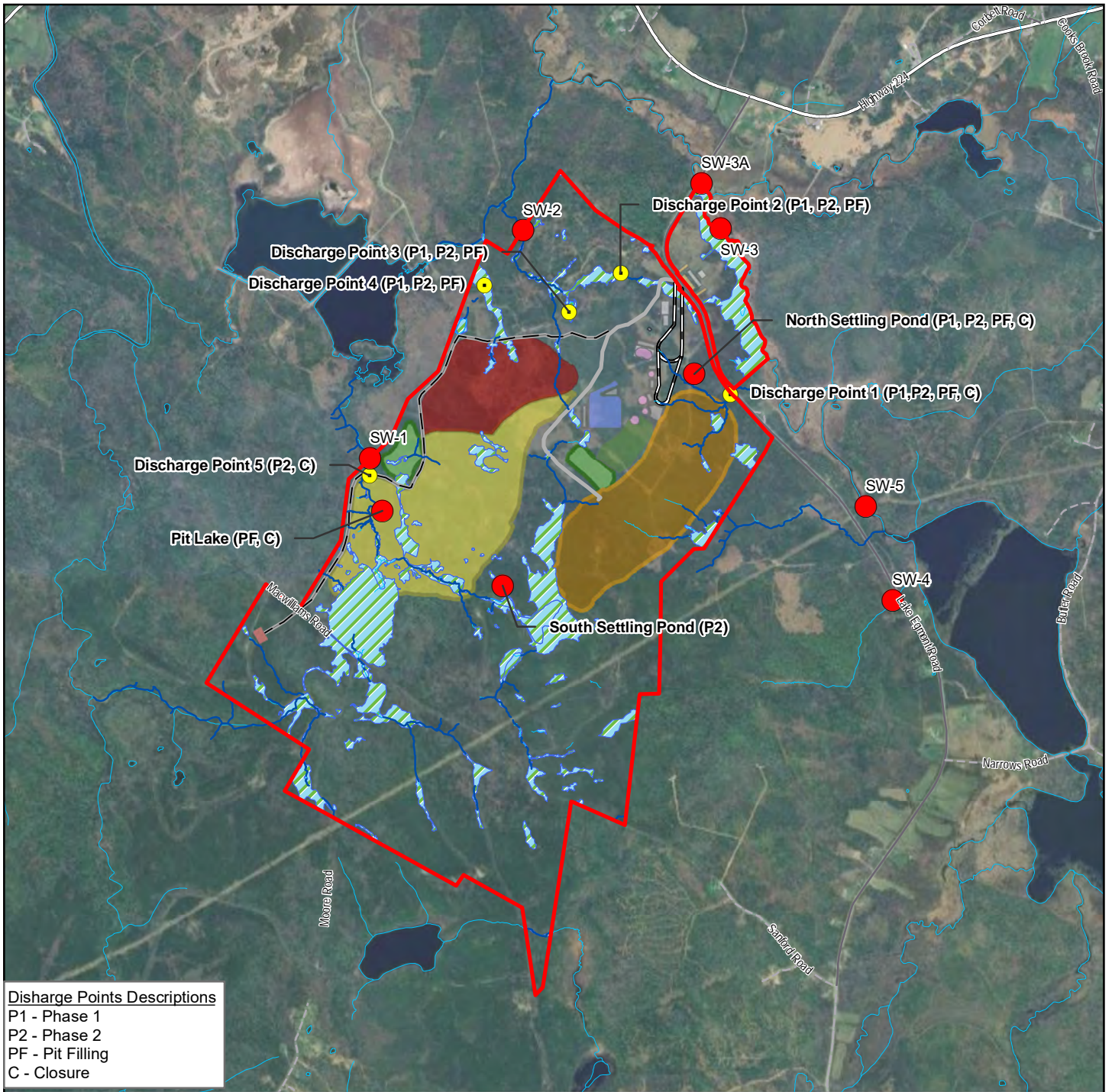
**Table 4.4** Water transfers during Phase 2

Infrastructure Element	Sources of Inflow	Discharge Point
North Settling Pond	<ul style="list-style-type: none"> <li>Surface runoff from waste rock and topsoil stockpiles</li> <li>Surface runoff from administrative and crusher pad areas</li> </ul>	<ul style="list-style-type: none"> <li>Supplemental pumping to AP5</li> <li>Supplemental pumping to AP6</li> <li>Supplemental pumping to AP17</li> <li>WC26</li> </ul>
South Settling Pond	<ul style="list-style-type: none"> <li>Stockpile runoff from overburden stockpiles</li> <li>Surface runoff from AP1 catchment</li> <li>Dewatering pump from Phase 2 open pit</li> </ul>	<ul style="list-style-type: none"> <li>Annand Brook via AP3</li> </ul>
Phase 2 Pit	<ul style="list-style-type: none"> <li>Pit wall runoff</li> <li>Groundwater inflow</li> </ul>	<ul style="list-style-type: none"> <li>South Settling Pond</li> </ul>

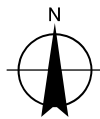
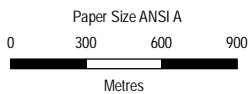
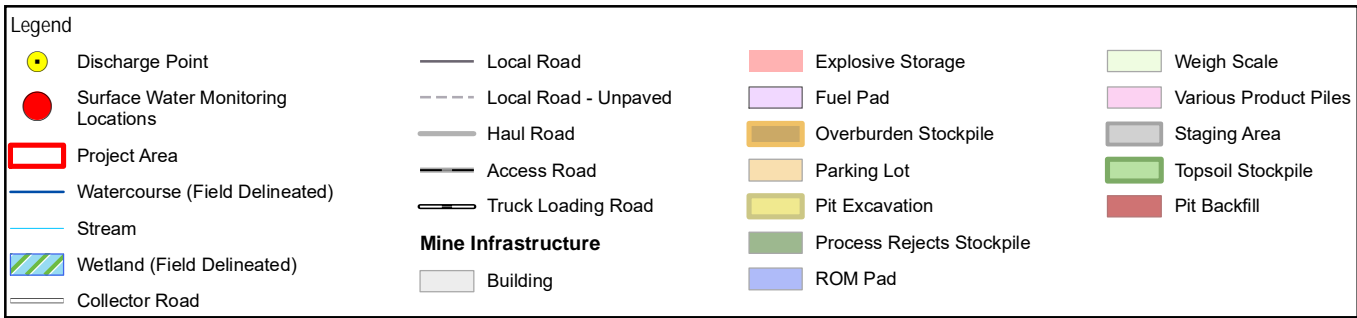
**Table 4.5** Water transfers during Pit Filling

Infrastructure Element	Sources of Inflow	Discharge Point
North Settling Pond	<ul style="list-style-type: none"> <li>Surface runoff from overburden and topsoil stockpiles</li> <li>Surface runoff from administrative and crusher pad areas</li> </ul>	<ul style="list-style-type: none"> <li>Supplemental pumping to AP5</li> <li>Supplemental pumping to AP6</li> <li>Supplemental pumping to AP17</li> <li>WC26</li> </ul>
South Settling Pond	<ul style="list-style-type: none"> <li>Stockpile runoff from overburden stockpiles</li> <li>Surface runoff from AP1 catchment</li> </ul>	<ul style="list-style-type: none"> <li>Phase 2 Pit</li> </ul>
Phase 2 Pit	<ul style="list-style-type: none"> <li>Pit wall runoff</li> <li>Groundwater inflow</li> <li>South Settling Pond Inflow</li> <li>Inflow from AP1 and AP2 catchments</li> </ul>	<ul style="list-style-type: none"> <li>No Discharge Point</li> </ul>





**Discharge Points Descriptions**  
P1 - Phase 1  
P2 - Phase 2  
PF - Pit Filling  
C - Closure



CERTAINTEED CANADA, INC  
LAKE EGMONT, HALIFAX CO, NOVA SCOTIA  
ANTRIM GYPSUM PROJECT

Project No. 12601021  
Revision No. -  
Date Aug 14, 2024

CONTACT WATER  
DISCHARGE LOCATIONS

FIGURE 4.1

# 5. Water Balance Results

The water balance results are summarised in two sections: impacts to the receiving environment and pit filling calculations. The results are presented below.

## 5.1 Impacts to the Receiving Environment

### 5.1.1 Water Balance Assessment

A summary of average annual flow impacts during Baseline, Phase 1, Phase 2, Pit Filling and Closure development phases at each of the 17 assessment points are presented in **Table 5.1** based on the proposed Project development. Detailed monthly water balance results can be found in **Appendix A**.

*Table 5.1 Assessment point summary results for mean annual conditions*

Assessment Point	Baseline Flow Volume (m3)	Baseline Flow Rate (L/s)	Percent Change from Baseline			
			Phase 1	Phase 2	Pit Filling	Closure
1	1,241,581	39.4	-16%	-37%	-31%	-31%
2	847,327	26.9	1%	-3%	-3%	-1%
3	3,397,509	107.7	0%	15%	-2%	-6%
4	5,778,887	183.2	3%	11%	2%	1%
5	257,870	8.2	0%	0%	0%	0%
6	592,872	18.8	0%	0%	0%	0%
7	6,859,151	217.5	1%	7%	-1%	1%
8	7,343,483	232.9	1%	7%	-1%	1%
9	37,484,739	1,188.6	0%	0%	0%	0%
10	874,711	27.7	-22%	-25%	-25%	-25%
11	38,384,011	1,217.1	0%	-1%	-1%	-1%
12	626,188	19.9	47%	56%	3%	14%
13	41,014,330	1,300.6	0%	0%	-1%	0%
14	72,387,000	2,295.4	0%	0%	0%	0%
15	73,038,000	2,316.0	0%	0%	0%	0%
16	80,384,000	2,549.0	0%	1%	0%	0%
17	187,538	5.9	0%	0%	0%	0%

The assessment points are split into two main river systems: the Gays River and Annand Brook. Annand Brook includes AP1, AP2, AP3, AP4, AP5, AP6, AP7, AP8, and AP17. Identified water balance concerns for the PA include the presence of black ash within catchments for AP5, AP6 and AP17 as well as potential impacts to the Scotia Mine Polishing Pond (located between AP3 and AP4).

As per the Black Ash (*Fraxinus nigra*) Tolerance and Sensitivity – Antrim Gypsum Project (Strum, 2024), black ash is an endangered species and is highly sensitive to water level fluctuations. In addition, fluctuations in flow through the Scotia Mine polishing pond will be reduced to reduce alterations to the existing hydrology of the system.

### 5.1.1.1 Supplemental Flow Requirements

The main area of concern along Annand Brook includes AP3 and AP4 (as these assessment points are associated with the Scotia Mine polishing pond) and AP5, AP6, and AP17 (as these assessment points are associated with the black ash populations). To minimize impacts to these areas, a preliminary water balance assessment was completed to determine required supplemental flows for these locations. The results of this preliminary water balance are shown in **Appendix B**. Supplemental flows are required to ensure minimal impacts to AP3, AP4, AP5, AP6 and AP17 during Phase 1, Phase 2 and Pit Filling conditions. No supplemental flows are required during Closure conditions for any catchment. Since AP4 is immediately downstream of AP3, supplemental flows are directed to AP3 with no additional flows required to be added at AP4. The supplemental flows required to reduce impacts to the black ash and maintain the flow through the Scotia Mine polishing pond are indicated in **Table 5.2**.

*Table 5.2 Supplemental flow rates*

Assessment Point	Phase 1 Supplemental Flows (L/s)	Phase 2 Supplemental Flow (L/s)	Pit Filling Supplemental Flow (L/s)
3	12.0	NA	80.6
5	5.5	0.5	NA
6	4.3	4.7	1.5
17	3.6	2.6	0.34

The flow rates presented in **Table 5.2** depict average flow rates required to minimize the annual changes in flow to AP3, AP4, AP5, AP6 and AP17 during the Project life cycle. The flow rates will be refined based on additional environmental data collection/monitoring, pump design, outlet design and operating procedures during future phases of design.

### 5.1.1.2 Water Balance Assessment Results

In Phase 1, supplemental flows will be taken from North Settling Pond and will be pumped to AP5, AP6 and AP17 at rates of 5.5 L/s, 4.3 L/s and 3.6 L/s, respectively. AP3 will be supplemented by open pit dewatering at a rate of 12 L/s, with the remainder of the pit dewatering flows being discharged to the North Settling Pond. The North Settling Pond ultimately discharges to AP12. As shown in **Table 5.1**, there are negligible impacts at AP3, AP4, AP5, AP6, and AP17 on an annual basis. The downstream points on the Gays River show a negligible impact from mining activities.

In Phase 2, similar pumping schemes are used, with slightly lower flow rates as some of the areas to AP5 and AP17 have been recuperated through backfilling. Supplemental flows will be taken from South Settling Pond and will be pumped to AP5, AP6, and AP17 at rates of 0.5 L/s, 4.7 L/s, and 2.6 L/s, respectively. In this phase, AP3 does not require any flow supplementation, as the South Settling Pond is to be pumped around the pit and discharged to AP3. As shown in **Table 5.1**, the impacts at AP5, AP6 and AP17 are negligible on an annual basis. No supplemental flows were required for AP3 and the Scotia Mine Polishing Pond as the pit is discharging to the South Settling Pond in this phase, which ultimately discharges to AP3.

During pit filling, flows to AP3 are required to be supplemented and the supplemental flow rate will be pumped directly from the pit. The supplemental flow rate from the pit to AP3 is 80.6 L/s. Supplemental flows will be taken from the North Settling Pond and will be pumped to AP6 and AP17 at rates of 1.5 L/s and 0.34 L/s, respectively.

During closure, the mine will be decommissioned including pumps, ponds, and other mine infrastructure such as the administration area. Since supplemental pumping to the affected black ash population is not possible in this phase, the PA will be graded such that the drainage area leading to the identified black ash locations provides sufficient water to maintain flow rates as per Baseline, Phase 1, Phase 2 and Pit Filling conditions. Grading will be required at the location of the decommissioned administrative and crusher pad areas to achieve the required drainage areas to the black ash catchments. As shown on **Table 5.2**, regrading of the decommissioned administrative and crusher pad areas results in negligible changes in flow to AP5, AP6, and AP17 to support the black ash community.

## 5.1.2 Water Balance Assessment Discussion

The water balance assessment above presents a summary of the annual impacts to each assessment point while monthly results are presented in **Appendix A**. The annual analysis indicates there are negligible impacts to the black ash contributing drainage areas, however, the monthly water balance indicates that the preliminary supplemental flow schedule presented above will not balance the flows on a monthly basis. It is recognized that the hydrology of the flows interacting with the black ash locations must remain unchanged from baseline conditions on a smaller scale than on a yearly basis. The water balance presented above has sufficiently indicated that there is enough water on the property to ensure the hydrology can be balanced on a monthly basis.

The operations of the supplemental flow pumps and outlet structures will be designed during future design phases of the project in such a way as to mimic the baseline hydrology on a month-to-month basis. This can be accomplished using a multitude of methods including but not limited to; a small pond at the outlet of the pump, scheduled pumping times, outlet wetlands to slow the release of water or level spreaders to mimic overland flow. These potential outlet structures will be assessed in conjunction with mine operating procedures and water balance requirements to ensure the month-to-month hydrology of the black ash communities are unaffected.

## 5.2 Pit Filling Calculations

After the open pit has been mined to completion and backfill has been placed accordingly, it will begin to fill with water to form a lake. During this time, pit inflows include direct precipitation, groundwater inflows, overflow from the South Settling Pond, and surface flows from upstream catchments (AP1 and AP2) to help reduce the time required to form the lake and stabilize the groundwater flow patterns. The outputs from the pit during filling will be evaporation and supplemental pumping to AP3 to maintain flows through the Scotia Mine polishing pond.

The open pit will discharge to Annand Brook upstream of the Scotia Mine polishing pond after it is filled. The pit has a maximum capacity of 23 Mm<sup>3</sup> corresponding to an overflow elevation of 25.1 m. The pit will be backfilled with a total of 16 Mm<sup>3</sup> of waste rock beginning at the end of Phase 1. The backfill will be placed in the northern end of the pit to reduce impacts to black ash populations while mining continues to the south and will be placed to match the existing grade. Approximately 11.5 Mm<sup>3</sup> of waste rock will be placed below the overflow elevation of 25.1 m. It is assumed that the waste rock has a void space ratio of 0.3, which was estimated based on the waste rock properties of similar mining projects. As such, the volume of water required to fill the pit will be approximately 15.6 Mm<sup>3</sup>.

*Table 5.3 Pit filling times under various precipitation and backfill scenarios*

	Average Precipitation Conditions	Average 10-yr Maximum Precipitation	Average 10-yr Minimum Precipitation
No Backfill Scenario	18.9	17.4	20.8
Backfill Scenario	13.9	12.7	15.5

## 6. Summary

A water balance model was developed to understand the potential impacts of the Project on the way water flows at the PA and in the surrounding systems: Annand Brook and the Gays River. The water balance output was used to assess the impact of the project on the baseline drainage patterns at 17 assessment points on the watercourses of the Annand Brook and Gays River catchments and determine potential mitigation strategies required to support the fish and fish habitat effects assessment.

The water balance assessment determined that mitigation measures were needed to supplement flows to black ash habitat as well as the Scotia Mine Polishing Pond. Upon use of supplemental flows to mitigate flow loss, the results of

the water balance showed negligible impacts on annual flows to the Black ash habitat and negligible loss of flow to the Scotia Mine Polishing Pond.

The water balance assessment was used to determine that under average annual climate conditions the pit is estimated to fill in 13.9 years assuming placement of backfill along the northern portion of the pit to aid in development of the pit lake while reducing groundwater impacts to the surrounding watercourses.

## 7. References

GHD, 2024a, Conceptual Water Management Plan, Antrim Gypsum Project Nova Scotia

GHD, 2024b, Hydrogeological Modelling Report, Antrim Gypsum Project Nova Scotia

Strum Consulting (formerly McCallum Environmental), 2024, Black ash (*Fraxinus Nigra*) Tolerance and Sensitivity – Antrim Gypsum Project

# Appendices

# **Appendix A**

## **Monthly Water Balance Results**

Table A-2: Monthly Water Balance Results for the Supplemental Flow Scenario

Baseline Flow Volumes (m)																	
Month	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9	AP10	AP11	AP12	AP13	AP14	AP15	AP16	AP17
January	127,935	85,370	344,746	566,179	27,700	60,159	685,482	734,726	3,847,000	89,424	3,939,000	62,874	4,209,000	7,459,000	7,526,000	8,261,000	19,324
February	106,111	71,280	287,240	476,744	22,699	50,124	575,262	616,272	3,195,000	74,342	3,271,000	52,551	3,495,000	6,186,000	6,243,000	6,859,000	16,028
March	162,833	109,384	440,786	731,591	34,833	76,918	880,790	943,723	4,902,000	114,082	5,020,000	80,643	5,364,000	9,493,000	9,580,000	10,520,000	24,596
April	181,446	120,898	488,448	800,284	39,390	85,235	963,408	1,033,000	5,455,000	126,761	5,586,000	89,020	5,968,000	10,580,000	10,670,000	11,710,000	27,407
May	117,087	78,727	317,153	527,160	25,005	55,344	626,648	671,926	3,526,000	82,058	3,610,000	58,049	3,858,000	6,826,000	6,888,000	7,560,000	17,686
June	59,779	42,373	167,919	302,033	11,499	29,302	344,657	368,539	1,817,000	42,690	1,861,000	31,489	1,988,000	3,485,000	3,517,000	3,885,000	9,029
July	27,504	21,835	83,698	174,277	3,930	14,605	186,078	197,887	854,700	20,496	875,223	16,477	935,189	1,603,000	1,618,000	1,816,000	4,154
August	24,628	20,213	76,765	166,037	3,135	13,396	176,899	187,706	770,573	18,594	789,076	15,316	843,141	1,436,000	1,449,000	1,637,000	3,720
September	29,752	23,861	91,201	192,158	4,111	15,915	211,123	223,983	926,466	22,259	948,712	18,028	1,014,000	1,735,000	1,750,000	1,974,000	4,494
October	81,627	57,558	228,461	407,866	15,877	39,867	477,361	509,866	2,479,000	58,183	2,539,000	42,742	2,713,000	4,759,000	4,802,000	5,312,000	12,330
November	150,694	101,419	408,449	679,924	32,126	71,275	816,798	875,105	4,538,000	105,647	4,647,000	74,793	4,966,000	8,785,000	8,865,000	9,740,000	22,762
December	172,185	114,409	462,643	754,634	37,565	80,732	914,645	980,750	5,174,000	120,175	5,298,000	84,206	5,661,000	10,040,000	10,130,000	11,110,000	26,008
Annual Average	1,241,581	847,327	3,397,509	5,778,887	257,870	592,872	6,859,151	7,343,483	37,484,739	874,711	38,384,011	626,188	41,014,330	72,387,000	73,038,000	80,384,000	187,538

Phase 1 - Percent Change from Baseline																	
Month	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9	AP10	AP11	AP12	AP13	AP14	AP15	AP16	AP17
January	-15%	0%	0%	4%	-14%	-6%	2%	2%	0%	-21%	0%	39%	0%	0%	0%	0%	-9%
February	-15%	1%	0%	4%	-8%	-3%	2%	2%	0%	-21%	0%	36%	0%	0%	0%	0%	-5%
March	-15%	1%	-3%	2%	-25%	-14%	-1%	-1%	0%	-21%	0%	42%	0%	0%	0%	0%	-20%
April	-15%	0%	-3%	2%	-31%	-17%	-2%	-2%	0%	-21%	0%	37%	0%	0%	0%	0%	-25%
May	-15%	1%	0%	4%	-8%	-3%	0%	0%	0%	-21%	0%	27%	0%	0%	0%	0%	-5%
June	-17%	1%	5%	5%	57%	26%	3%	2%	0%	-23%	-1%	53%	0%	0%	0%	0%	40%
July	-23%	2%	17%	8%	308%	95%	9%	8%	0%	-28%	-1%	90%	1%	1%	1%	1%	160%
August	-25%	2%	18%	8%	403%	106%	9%	8%	0%	-29%	-1%	122%	1%	1%	1%	2%	184%
September	-23%	2%	12%	5%	280%	78%	7%	6%	0%	-28%	-1%	119%	1%	1%	1%	2%	134%
October	-17%	1%	1%	3%	26%	9%	1%	1%	0%	-23%	-1%	73%	1%	0%	0%	0%	15%
November	-15%	1%	-3%	2%	-23%	-12%	-1%	-1%	0%	-21%	0%	45%	0%	0%	0%	0%	-19%
December	-14%	0%	-2%	3%	-28%	-14%	-1%	-1%	0%	-21%	0%	36%	0%	0%	0%	0%	-22%
Annual Average	-16%	1%	0%	3%	0%	0%	1%	1%	0%	-22%	0%	47%	0%	0%	0%	0%	0%

Phase 2 - Percent Change from Baseline																	
Month	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9	AP10	AP11	AP12	AP13	AP14	AP15	AP16	AP17
January	-36%	-2%	7%	8%	-1%	-4%	6%	5%	0%	-25%	-1%	41%	0%	0%	0%	1%	-6%
February	-36%	-2%	10%	9%	0%	-2%	7%	7%	0%	-25%	-1%	49%	0%	0%	0%	1%	-3%
March	-36%	-2%	4%	6%	-2%	-12%	3%	3%	0%	-25%	-1%	46%	0%	0%	0%	0%	-14%
April	-36%	-2%	0%	4%	-2%	-15%	1%	1%	0%	-25%	-1%	35%	0%	0%	0%	0%	-17%
May	-36%	-2%	9%	9%	0%	-2%	5%	4%	0%	-25%	-1%	37%	0%	0%	0%	0%	-3%
June	-38%	-4%	36%	22%	6%	22%	14%	13%	0%	-27%	-1%	75%	1%	0%	0%	2%	26%
July	-40%	-6%	95%	45%	28%	81%	31%	29%	0%	-31%	-1%	151%	2%	1%	1%	4%	106%
August	-41%	-7%	108%	49%	37%	90%	35%	33%	0%	-32%	-1%	174%	2%	1%	1%	5%	121%
September	-40%	-7%	90%	42%	26%	65%	33%	31%	0%	-31%	-1%	182%	2%	1%	2%	5%	87%
October	-37%	-3%	27%	17%	3%	7%	12%	12%	0%	-27%	-1%	86%	1%	0%	0%	2%	9%
November	-36%	-2%	5%	6%	-2%	-11%	3%	3%	0%	-25%	-1%	47%	0%	0%	0%	0%	-13%
December	-36%	-2%	1%	5%	-2%	-12%	2%	2%	0%	-25%	-1%	37%	0%	0%	0%	0%	-15%
Annual Average	-37%	-3%	15%	11%	0%	0%	7%	7%	0%	-25%	-1%	56%	0%	0%	0%	1%	0%



Table A-2: Monthly Water Balance Results for the Supplemental Flow Scenario

Pit Filling Phase - Percent Change from Baseline																				
Month	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9	AP10	AP11	AP12	AP13	AP14	AP15	AP16	AP17			
January	-31%	-2%	-21%	-9%	0%	2%	-8%	-7%	0%	-25%	-1%	10%	0%	0%	0%	0%	-1%	3%		
February	-31%	-2%	-9%	-2%	0%	2%	-2%	-2%	0%	-25%	-1%	7%	0%	0%	0%	0%	0%	2%		
March	-31%	-2%	-26%	-12%	0%	-1%	-11%	-10%	0%	-25%	-1%	9%	0%	0%	0%	0%	-1%	1%		
April	-31%	-2%	-31%	-15%	0%	0%	-14%	-13%	0%	-25%	-1%	10%	0%	0%	0%	0%	-1%	2%		
May	-31%	-2%	-6%	0%	0%	1%	-3%	-3%	0%	-25%	-1%	5%	-1%	0%	0%	0%	0%	2%		
June	-33%	-4%	47%	28%	0%	0%	17%	16%	0%	-27%	-1%	-9%	-1%	0%	0%	0%	1%	-3%		
July	-37%	-6%	174%	82%	0%	-1%	59%	55%	0%	-31%	-1%	-32%	-1%	-1%	-1%	5%	-13%			
August	-38%	-7%	191%	87%	0%	-4%	63%	59%	0%	-32%	-1%	-33%	-1%	-1%	-1%	6%	-18%			
September	-37%	-7%	142%	66%	0%	-7%	50%	47%	0%	-31%	-1%	-38%	-1%	-1%	-1%	5%	-18%			
October	-33%	-3%	17%	11%	0%	-3%	7%	6%	0%	-27%	-1%	-10%	-1%	0%	0%	0%	-4%			
November	-31%	-2%	-23%	-11%	0%	-1%	-10%	-9%	0%	-25%	-1%	7%	0%	0%	0%	-1%	1%			
December	-31%	-2%	-27%	-13%	0%	1%	-11%	-10%	0%	-25%	-1%	11%	0%	0%	0%	-1%	3%			
Annual Average	-31%	-3%	-2%	2%	0%	0%	-1%	-1%	0%	-25%	-1%	3%	-1%	0%	0%	0%	0%			

Closure Phase - Percent Change from Baseline																				
Month	AP1	AP2	AP3	AP4	AP5	AP6	AP7	AP8	AP9	AP10	AP11	AP12	AP13	AP14	AP15	AP16	AP17			
January	-30%	-1%	-1%	3%	-8%	0%	1%	1%	0%	-24%	-1%	14%	0%	0%	0%	0%	2%			
February	-31%	-1%	0%	4%	-8%	-1%	2%	2%	0%	-25%	-1%	13%	0%	0%	0%	0%	1%			
March	-31%	-1%	-1%	3%	-8%	-1%	1%	1%	0%	-25%	-1%	13%	0%	0%	0%	0%	1%			
April	-30%	-1%	-5%	0%	-8%	0%	-1%	-1%	0%	-24%	-1%	13%	0%	0%	0%	0%	2%			
May	-31%	-1%	-10%	-2%	-8%	-1%	-3%	-3%	0%	-25%	-1%	11%	0%	0%	0%	0%	1%			
June	-32%	-2%	-13%	-4%	-8%	-4%	-5%	-5%	0%	-26%	-1%	4%	0%	0%	0%	-1%	-6%			
July	-35%	-3%	-24%	-10%	-8%	-11%	-10%	-10%	0%	-30%	-1%	-11%	-1%	0%	0%	-1%	-20%			
August	-36%	-4%	-19%	-7%	-8%	-12%	-8%	-8%	0%	-31%	-1%	-13%	-1%	0%	0%	-1%	-25%			
September	-35%	-3%	-23%	-9%	-8%	-11%	-10%	-9%	0%	-30%	-1%	-7%	-1%	0%	0%	-1%	-22%			
October	-32%	-2%	-7%	-1%	-8%	-4%	-2%	-2%	0%	-26%	-1%	8%	0%	0%	0%	0%	-5%			
November	-31%	-1%	-5%	1%	-8%	-1%	0%	0%	0%	-25%	-1%	13%	0%	0%	0%	0%	1%			
December	-30%	-1%	-3%	2%	-8%	0%	0%	0%	0%	-24%	-1%	14%	0%	0%	0%	0%	2%			
Annual Average	-31%	-1%	-6%	0%	-8%	-2%	-1%	-1%	0%	-25%	-1%	10%	0%	0%	0%	0%	-1%			

# **Appendix B**

## **Preliminary Supplemental Flow Requirement Assessment**

Assessment Point	Flow Rate (L/s)				
	Baseline	Phase 1	Phase 2	Pit Filling	Closure
3	107.7	95.7	127.7	27.1	101.3
4	183.2	177.2	208.5	107.7	184.8
5	8.2	2.7	7.7	8.1	8.1
6	18.8	16.4	11.5	16.9	18.8
12	19.9	68.1	31.3	22.3	22.6
17	5.9	2.3	3.3	5.6	5.9



[ghd.com](http://ghd.com)

➔ **The Power of Commitment**

# **Appendix F.3**

## **Conceptual Surface Water Management Plan**





# **Conceptual Surface Water Management Plan**

**Antrim Gypsum Project Nova Scotia**

CertainTeed Canada, Inc.

19 August 2024

<b>Project name</b>		Antrim EA					
<b>Document title</b>		Conceptual Surface Water Management Plan   Antrim Gypsum Project Nova Scotia					
<b>Project number</b>		12601021					
<b>File name</b>		12601021-RPT-13-Conceptual Surface Water Management Plan.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	00	Aidan Van Heyst	Chris Muirhead	Draft	Callie Andrews	Draft	23/07/24
S4	01	Aidan Van Heyst	Chris Muirhead		Callie Andrews		19/08/24

**GHD Limited**

Contact: Chris Muirhead, Engineer | GHD  
 110, 120 Western Parkway,  
 Bedford, Nova Scotia B4B 0V2, Canada

T +1 902 468 1248 | F +1 902 468 2207 | E info-northamerica@ghd.com | [ghd.com](https://www.ghd.com)

© GHD 2024

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

# Contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
1.1	Purpose of this report	1
1.2	Scope and limitations	1
<b>2.</b>	<b>Physical Setting</b>	<b>2</b>
2.1	Site Characteristics	2
2.2	Climate	2
2.3	Surface Water	2
<b>3.</b>	<b>Water Management</b>	<b>3</b>
3.1	Water Management Objectives and Strategies	3
3.2	Water Management Facilities	3
3.3	Stages of Mine Development	4
3.3.1	Phase 1	4
3.3.2	Phase 2	4
3.3.3	Pit Filling	4
3.3.4	Closure	4
<b>4.</b>	<b>Design of Water Management Facilities</b>	<b>4</b>
4.1	Water Management Design Basis	4
4.1.1	Collection Ditches and Culverts	5
4.1.2	Settling Ponds	5
4.1.3	Pumping Systems and Pipelines	6
4.1.4	Erosion and Sediment Control Measures	6
4.1.5	Pit Dewatering	6
4.2	Conceptual Water Management Phases	6
4.2.1	Phase 1	6
4.2.2	Phase 2	9
4.2.3	Pit Filling	11
4.2.4	Closure	13
<b>5.</b>	<b>Conclusions</b>	<b>15</b>
<b>6.</b>	<b>References</b>	<b>15</b>



## Table index

Table 2.1	Design storms used in the SWM design	2
Table 4.1	Water Management Infrastructure Design Basis Criteria Summary	4

## Figure index

Figure 4.1	Conceptual Water Management Plan for Phase 1 of Mine Development	8
Figure 4.2	Conceptual Water Management Plan for Phase 2 of Mine Development	10
Figure 4.3	Conceptual Water Management Plan for Pit Filling	12
Figure 4.4	Conceptual Water Management Plan for Closure Conditions	14

# 1. Introduction

## 1.1 Purpose of this report

CertainTeed Canada Inc. (CertainTeed) has retained GHD Limited (GHD) to provide technical and permitting services in support of a Provincial Class 1 Environmental Assessment Registration Document (EARD) submission to Nova Scotia Environment and Climate Change (NSECC) for the Antrim Gypsum Project (Project), located in Cooks Brook, Nova Scotia. GHD's scope of work includes the development of a conceptual water management plan (CWMP) for the Project to support the EARD.

The CWMP describes the strategies proposed for water and sediment management throughout the main stages of the Project, including Phase 1, Phase 2 and Closure. The CWMP has been prepared during the preliminary design stage. The proposed infrastructure layout is preliminary; therefore, the final alignments and dimensions will be confirmed during the next stages of design and may be subject to change based on ongoing data collection, regulatory and community engagement, and design iterations.

The CWMP is organized as follows:

- **Section 1 – Introduction:** Introduces the project, purpose, and roles and responsibilities of the CWMP for the Project.
- **Section 2 – Summary of Physical Conditions:** Briefly summarizes the physical site characteristics, and local climate, surface water and groundwater conditions.
- **Section 3 – Water Management:** Presents an overview of the water management objectives and strategies, facilities, stages of Mine development and applicable site water management during these stages.
- **Section 4 – Design of Water Management Facilities:** Presents the basis of design of the mine water management facilities as well as a summary of the conceptual water management infrastructure present at each phase of Project development.

## 1.2 Scope and limitations

*This report: has been prepared by GHD for CertainTeed Canada, Inc. and may only be used and relied on by CertainTeed Canada, Inc. and Nova Scotia Environment and Climate Change (NSECC) for the purpose agreed between GHD and CertainTeed Canada, Inc. as set out in section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than CertainTeed Canada, Inc. and NSECC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

### Accessibility of documents

*If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.*

## 2. Physical Setting

### 2.1 Site Characteristics

The Project Area (PA) is 602 ha and is located immediately south of the existing Scotia Mine. A portion of the development will occur in the catchment area of the Scotia Mine polishing pond.

Black ash species has been identified within the PA, which has led to the creation of the black ash exclusion zone. This buffer zone helps to protect habitat and biological value of the black ash. One tree is located within the extents of the proposed open pit. This tree is proposed to be transplanted, in collaboration with the Mi'kmaq of Nova Scotia, in keeping with several other recent projects where transplantation of black ash has been allowed to support industrial and infrastructure development projects (Touquoy Gold Mine, Highway 104 and 107 upgrade projects).

A comprehensive monitoring program will be established to support Project development which will act as a research project relating to the required hydrologic regime required for the remaining black ash (all but one individual tree) that will be avoided by the Project.

### 2.2 Climate

The PA is located inland and somewhat removed from the immediate climactic influence of the Atlantic Ocean. It is characterized by warmer summers and cooler winters.

Impacts due to climate change were considered when developing design storms for Projects with long durations. Up to date climate change data was obtained for the Halifax International Airport ([www.climatedata.ca](http://www.climatedata.ca), last accessed July 12, 2024). Climatedata.ca is a collaboration between Environment and Climate Change Canada, the Computer Research Institute of Montreal (CRIM), CLIMAtlantic, Ouranos, the Pacific Climate Impacts Consortium (PCIC), the Prairie Climate Center (PCC), and HabitatSeven, aimed at providing readily available future climate projections. The predicted IDF Curve based upon Coupled Model Intercomparison Project 5 (CMIP5) Representative Concentration Pathways 4.5 (RCP4.5) for the years of 2031-2060 were used in this assessment. **Table 2.1** provides a summary of the design storms.

*Table 2.1 Design storms used in the SWM design*

Design Storm	5-year Climate Change	100-year Climate Change
Cumulative Precipitation (mm)	105.6	163.2
Duration (hour)	24	24
Distribution	Chicago	Chicago

### 2.3 Surface Water

The PA lies within the Gays River drainage basin, which is part of the larger Shubenacadie River drainage basin. The watershed occupies an area of roughly 205 km<sup>2</sup>.

The area is characterized by rolling till plains, drumlin fields, extensive rockland, and numerous freshwater lakes, streams, bogs, and wetlands having relatively low relief and hummocky type terrain.

The Gays River drainage basin discharges to the Shubenacadie River from southeast to northwest. Elevations within the catchment vary from approximately 181 meters above sea level (masl) in the headwater areas and gradually decrease to 8 masl where the Gays River outlets to the Shubenacadie River. The Shubenacadie River eventually outlets into Cobequid Bay near Maitland. The headwaters of the Gays River basin are located along the topographic divide separating the Musquodoboit River Valley to the southeast. The Gays River and Annand Brook are the main mapped linear watercourses in the mine site, while Lake Egmont and the Scotia Mine Polishing Pond are the major lakes.

# 3. Water Management

This section describes a description of the proposed CWMP for the Project, including the water management objectives and strategies, a brief description of the proposed water management facilities and the proposed water management plan through different stages of the Project development.

## 3.1 Water Management Objectives and Strategies

The objective of the CWMP is to support and guide mine water management through Phase 1, Phase 2, Pit Filling, and Closure stages of mine development. The primary objectives of water management are to reduce operational risks and environmental impacts of the Project. The following strategies are planned to achieve the primary objectives:

- Mitigate water quantity impacts on receiving waters and identified areas of concern
- Provide treatment of suspended solids from contact water
- Incorporate system flexibility to manage water under variable climatic conditions

The CWMP provides an overview of the water supply source, water management and water treatment associated with the mine site.

## 3.2 Water Management Facilities

Project infrastructure includes an open pit, materials and storage facilities, roads, infrastructure for crushing, water management (i.e., settling ponds, ditches, culverts, pumps), hauling, truck maintenance, administration, and road upgrades.

The CWMP encompasses the main water management facilities described in further detail below:

- **Overburden and Topsoil Stockpiles** | The stockpiles are all located in the east portion of the PA with some material to be used to backfill the open pit during Phase 2 conditions.
- **Runoff collection ditches and culverts** | The surface water ditches include contact water ditches that collect runoff from all mine infrastructure. The contact water ditches drain to one of two settling ponds located in the north and in the south of the PA.
- **North Settling Pond** | The North Settling Pond is located northeast of the mine infrastructure and the open pit and will collect surface water runoff and seepage from the crusher pad and administrative areas, the topsoil and overburden stockpiles, and the roads surrounding these facilities. It will also receive pumped pit dewatering during Phase 1 of operations. The North Settling Pond will be constructed during Phase 1 of development and will remain in operation until closure
- **South Settling Pond** | The South Settling Pond is located south of the Project infrastructure and east of the open pit and will collect surface water runoff and seepage from the southern portion of the Phase 2 waste rock stockpile. It will also receive pumped pit dewatering during Phase 2 of operations. The South Settling Pond will be constructed during Phase 2 of development and will remain in operation through to the end of operations of the Site.
- **Pumping Systems** | There will be several pumps located across the mine site in order to provide supplemental flows to areas of concern. Further discussion regarding the pumping systems during each phase are present in Section 4. For further information regarding the need for supplemental flow in certain areas of the mine, refer to the Water Balance Assessment (GHD, 2024)

## 3.3 Stages of Mine Development

### 3.3.1 Phase 1

Spanning a duration of 6 years, Project activities are focused on mining and maintenance activities within the current PA boundary. These include mining using the surface miner, pit dewatering, ore management, waste material management, surface water management, dust and noise management, and maintenance and repairs. The open pit will be progressively backfilled in Phase 1 to minimize the hydrological changes to the area of the black ash.

### 3.3.2 Phase 2

Spanning a duration of 17 years, Phase 2 activities are the same as Phase 1 activities with the main difference being that the Project activities are expanded onto Crown land.

### 3.3.3 Pit Filling

Upon completion of mining activities and during reclamation of the Project, water will no longer be dewatered from the pit and the open pit will be allowed to fill with water. During this time, despite the PA largely being in a reclaimed state, water management will still be required to mitigate environmental concerns for black ash and to mitigate impacts to Annand Brook.

### 3.3.4 Closure

Closure begins following the completion of Phase 2 of mining and will encompass Pit Filling. Closure activities are mainly focused on reclaiming the areas affected by Project and directing water to the open pit for refilling, which includes the removal of all facilities, allowing the pit to fill with water to form a pit lake, capping the stockpiles and revegetation and regrading of disturbed areas. Closure conditions, distinct from Pit Filling conditions, refer to the period in time following the filling of the open pit with water when no further surface water management will be required.

## 4. Design of Water Management Facilities

It is noted that the infrastructure sizing provided in this document is conceptual only and will be further developed during the next stages of design.

### 4.1 Water Management Design Basis

Water management for the Project will consist of the collection and management of mine water.

The criteria used for design development and analyses of the water management infrastructure are based on the conceptual mine plan, operational requirements, and environmental conditions. The design basis criteria for storm events utilized for the CWMP design are summarized in **Table 4.1** below.

*Table 4.1 Water Management Infrastructure Design Basis Criteria Summary*

Item	Design Basis
Contact Water Ditches	Designed to convey stormwater runoff resulting from the 1 in 100 year, 24-hour climate change event.

Item	Design Basis
Settling Ponds	<p>Phase 1 North Settling Pond is designed to contain runoff resulting from the 5-year, 24-hour climate change rainfall volume during an emergency shut-off (i.e., no pond outflow is allowed, emergency operating conditions only).</p> <p>Phase 1 North Settling Pond emergency spillway to pass the 100 year, 24-hour climate change event.</p> <p>Phase 2 South Settling Pond is designed for minimum 24-hour detention for the 100-year, 24-hour climate change event (with 0.3 m freeboard).</p>
Pump Systems	Designed to convey the desired supplemental flow rates to areas of environmental concern.

The PA was modelled using PCSWMM (Version 7.6.3695) which is a hydrologic and hydraulic modelling software that uses the EPA SWMM (Version 5.1.015) engine. PCSWMM was used to develop the design storm hydrographs, estimate peak flow rates and runoff volumes for the design storm events. To add contingency to the SWMM design, the impacts due to climate change were considered when developing design storms. Halifax Regional Municipality and Halifax Water provides climate change adjusted IDF curves and design storms.

Two design storms were used to develop and confirm the CWMP infrastructure:

- 1 in 5-year 24-hour Chicago Storm temporal distribution
- 1 in 100-year 24-hour Chicago Storm temporal distribution

### 4.1.1 Collection Ditches and Culverts

CWMP will consist of a series of surface water ditches collecting all Project stormwater runoff. The surface water ditches include contact water ditches, which collect runoff from all infrastructure. Surface water ditches will collect stormwater runoff from the topsoil and waste rock stockpiles and will direct it towards one of two settling ponds.

Contact water ditches will be lined with a geotextile liner and a layer of riprap to protect the ditch from erosion. Detailed outlet design of the ditches into the settling ponds will be completed during later design stages. The ditches are proposed to be open channel ditches with trapezoidal cross-sections.

### 4.1.2 Settling Ponds

Settling ponds will be constructed during Phase 1 and Phase 2, with the North Settling Pond located on private land in the north of the PA, and South Settling Pond located on Crown land. The North Settling Pond will be constructed in Phase 1 prior to the waste rock stockpile development. Settling ponds collect runoff from the overburden stockpiles, till and organic material stockpiles, and the processing area.

The ponds will be lined with geotextile and a layer of riprap to prevent erosion from water entering the pond. Further assessment of the inlet and outlet structures will be completed during future design phases.

The settling ponds will each contain emergency overflow spillways. The overflow channel will convey flows resulting from storm events greater than the 1 in 100-year, 24-hour climate change adjusted design storm event. The North Settling Pond will direct the overflow spillway towards the Gays River at AP12, while South Settling Pond will direct emergency overflow towards the open pit.

Effluent from the North Settling Pond will be pumped to various mitigation points to provide supplemental flows for areas of concern. The remainder of the North Settling Pond water will discharge into AP12 which will then flow north into the Gays River. Effluent from South Settling Pond will be pumped around the open pit and discharged to Annand Brook upstream of the Scotia Mine Polishing Pond.

The settling ponds will provide water treatment of stormwater runoff for total suspended solids (TSS). No other water quality treatment is predicted to be required as the Project is being developed to mine for Gypsum. Gypsum mining generally does not result in the mobilization of metals or other potentially harmful constituents (e.g., Arsenic, Aluminum, Cyanide etc.) in the same manner as other mining practices do. However, all mining operations have site-specific components to them and as such, all contact water from the PA will be conveyed to a settling pond prior to

discharge. Water quality monitoring will be completed to ensure the water quality remains consistent with baseline conditions with no additional treatment being required outside of passive TSS settling.

### 4.1.3 Pumping Systems and Pipelines

A series of pumps and pipeline systems will be required to convey collected water from specific collection points (e.g., the North Settling Pond, South Settling Pond) to the areas of concern to mitigate flow impacts or bypass mine infrastructure and ensure continuity of flow (e.g., black ash locations, bypass pumping of watercourses around the open pit). These pumps will be sized to convey the calculated flow rates required to mitigate flow impacts to black ash.

### 4.1.4 Erosion and Sediment Control Measures

Erosion control measures in the contact water ditches and settling ponds include placement of riprap, check dams, silt fence and straw waddle across the PA. These erosion control measures are to be maintained during operations including replacement of riprap, restoration of check dams if damaged, and general visual inspection of the ditches and settling ponds on a regular basis. Sediment build-up could occur in the collection ditches, therefore contact water ditches should be inspected regularly and cleaned out as needed to ensure sediment does not build up within the ditches or travel directly into the settling pond, reducing the available storage volume of the settling pond itself.

The North Settling Pond outlet structure will be designed such that stormwater entering the pond sees a minimum of 24 hr detention time prior to discharge to aid in settling of suspended solids. The South Settling Pond will only discharge through a pump. As such, the intake for the pump will be placed in a clear stone well to aid in the filtering of suspended solids prior to pumping of water from the settling pond.

As discussed in Section 4.1.3, there are several pumps and pipeline structures. The pipelines will pump water from a collection point to a discharge point at which point the water will enter the natural water system. The design of the outlet structures for these pipelines will be completed during future design phases, however, the design of the outlet structure will be completed in a way to prevent erosion downstream of the outlet while mimicking the natural hydrology of the watershed. Several methods can be used to accomplish this (e.g., level spreaders, energy dissipation basin with overflow, treatment wetland with overflow to the natural environment) and the specific design for each discharge location will be determined based on the operating schedule of the pumps, micro-siting of the outlet location and any specific environmental concerns for the receiving watercourse.

### 4.1.5 Pit Dewatering

The progressive development of the open pit will result in water entering the open pit from precipitation and groundwater inflows. As the pit deepens and increases in footprint, it will be necessary to control water inflow through construction of in-pit dewatering systems such as sumps, pipelines, and pumps.

## 4.2 Conceptual Water Management Phases

This section will describe the CWMP for each phase of Project development.

### 4.2.1 Phase 1

During Phase 1 conditions, surface water will be managed as follows:

- Water will be directed northwest towards the North Settling Pond located north of the stockpile area
- Water from around the stockpiles will be collected via surface water ditches and will drain via gravity to the North Settling Pond
- Water from the administrative and processing areas will drain via overland flow to surface water ditches which drain via gravity to the North Settling Pond
- Water from the open pit will be pumped to the North Settling Pond through a pipeline

- Three (3) supplemental flow pumps will be required during Phase 1 to mitigate environmental concerns for the black ash. Two (2) pumps will take a portion of the surface water runoff from the North Settling Pond and discharge to Assessment Points (AP) 5 and 7 (as defined in the Water Balance Assessment (GHD, 2024)) to mitigate flow loss to watercourses/wetlands associated black ash. One (1) pump will take water from the open pit and pump it to AP 3 (as defined in the Water Balance Assessment (GHD, 2024)) to mitigate any potential flow losses to Annad Brook.
- Water in excess of the required supplemental flow volumes present in the North Settling Pond will be released to AP 12 (as defined the in the Water Balance Assessment (GHD, 2024)).

**Figure 4.1** below depicts the conceptual water management plan for Phase 1 of Project development.



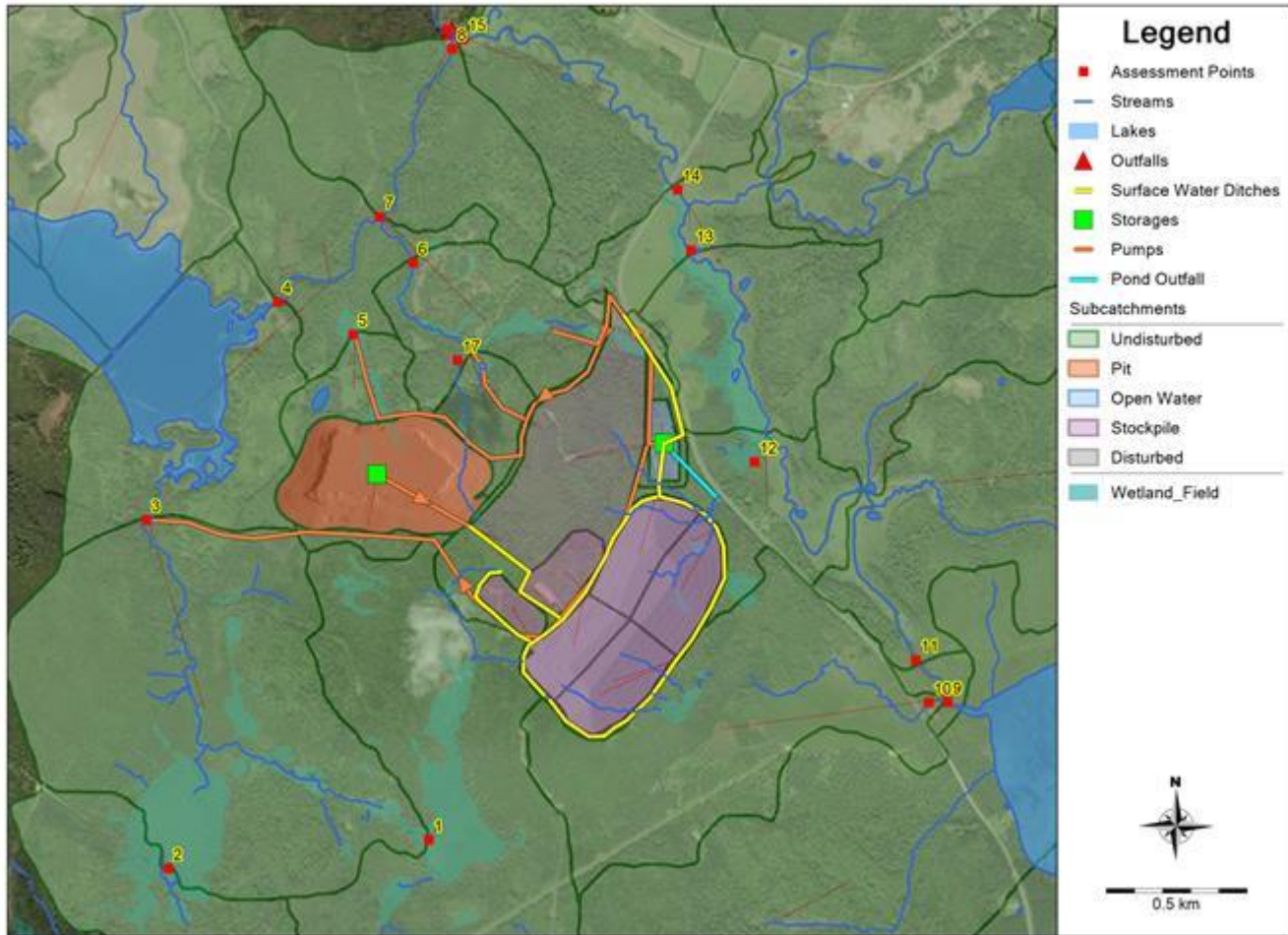


Figure 4.1 Conceptual Water Management Plan for Phase 1 of Mine Development

## 4.2.2 Phase 2

During Phase 2 conditions, surface water will be managed as follows:

- Water will be directed either to the North Settling Pond or to the South Settling Pond. The administrative and processing areas as well as the northern portions of the stockpiles will be directed via gravity to the North Settling Pond while the southern portion of the stockpiles will be directed towards the South Settling Pond
- The northern portion of the open pit is assumed to be backfilled to surface at this point in time. As such, all water collected within the open pit will be pumped from the open pit to South Settling Pond.
- The supplemental flow pumps established in Phase 1 from the North Settling Pond to AP 5 and AP 17 will be maintained during Phase 2. In addition, pumps will be required to pump water from the South Settling Pond as well as the intersection of the AP 2 watercourse with the pit, around the pit, to AP 3, downstream of the pit.

**Figure 4.2** below depicts the CWMP for Phase 2 of Project development.

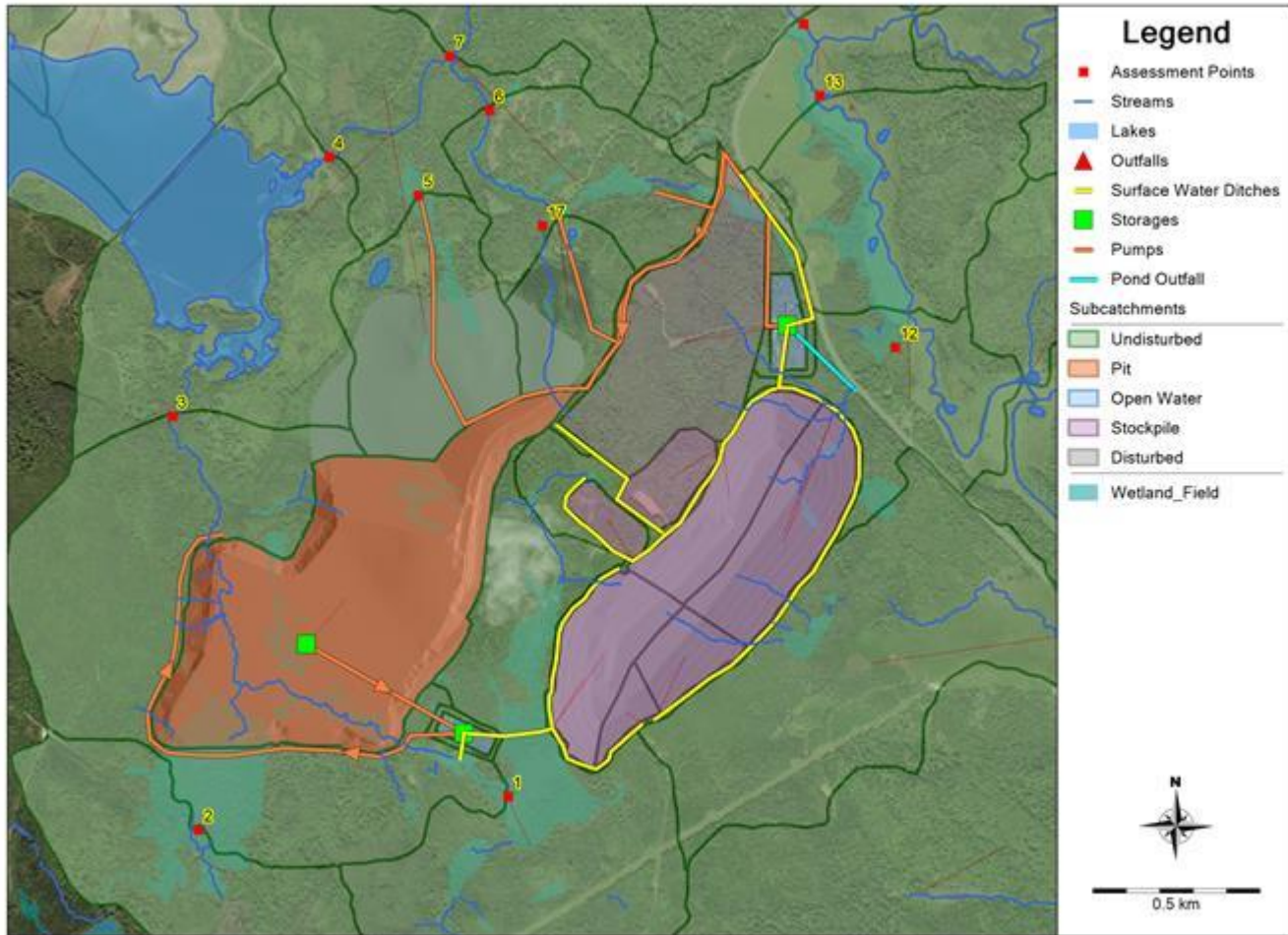


Figure 4.2 Conceptual Water Management Plan for Phase 2 of Mine Development

### 4.2.3 Pit Filling

During Pit Filling conditions, surface water will be managed as follows:

- All groundwater inflow and rainfall that enters the pit will remain in the pit to allow the pit to fill with water
- Water from AP 1 and AP 2 will be allowed to drain into the open pit to aid in filling of the pit
- The supplemental flow pumps established in Phase 1 from the North Settling Pond to AP 5 and AP 17 will be maintained during Pit Filling. In addition, a supplemental flow pump will be required to pump water from the open pit to AP 3 to mitigate potential flow reductions to Annad Brook south of the Scotia Mine polishing pond.
- Drainage to the North Settling Pond will be unaltered
- The South Settling Pond will be decommissioned

**Figure 4.3** below depicts the conceptual water management plan for Pit Filling conditions.



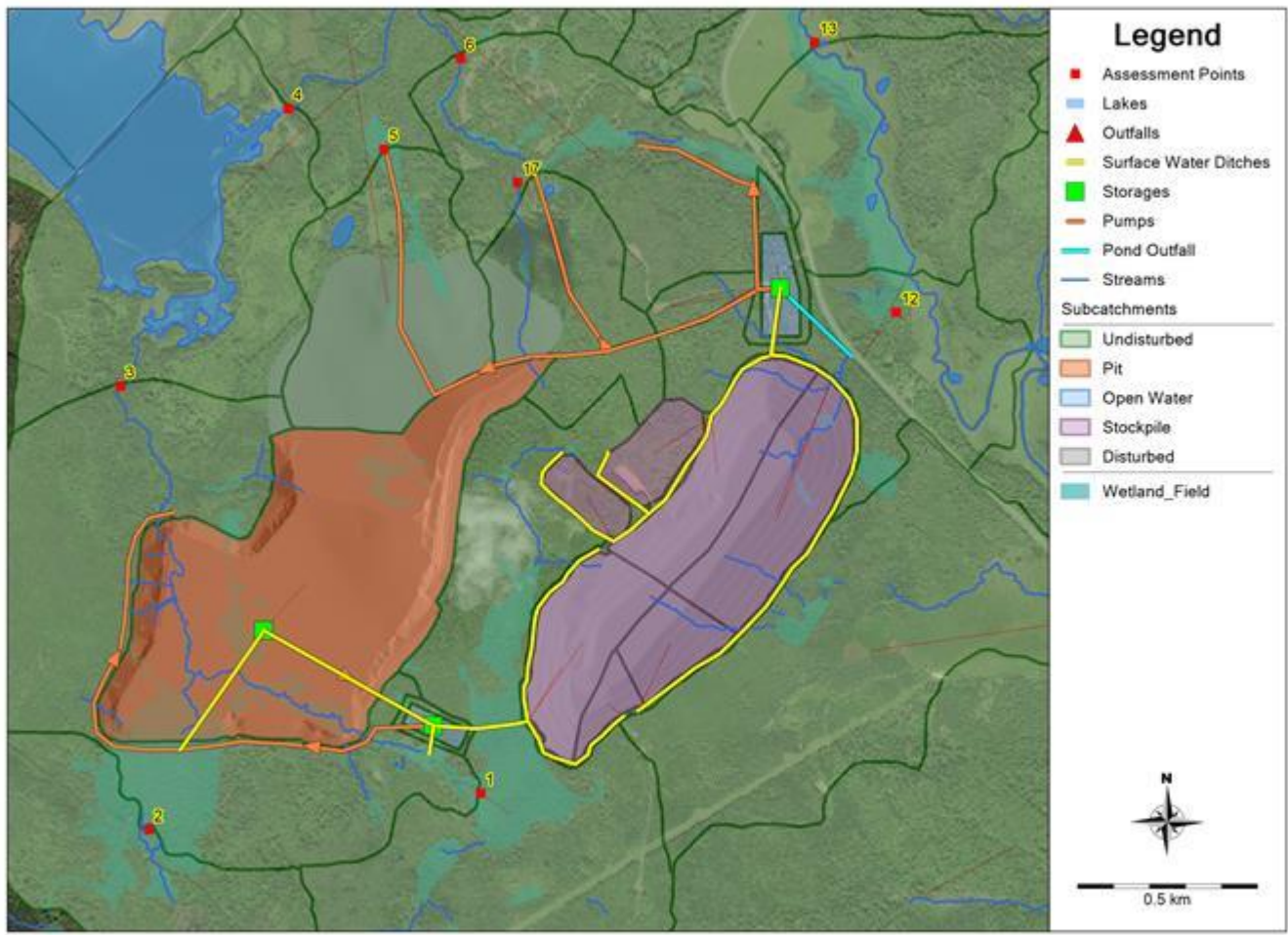


Figure 4.3 Conceptual Water Management Plan for Pit Filling

## 4.2.4 Closure

During Closure conditions, surface water will be managed as follows:

- All supplemental flow infrastructure will be removed
- Water north and west of the pit lake will continue to flow overland or use surface water ditches which were developed during previous phases of mine development
- The North Settling Pond will be decommissioned, and water will be directed towards AP 12

**Figure 4.4** below depicts the conceptual water management plan for Closure conditions.

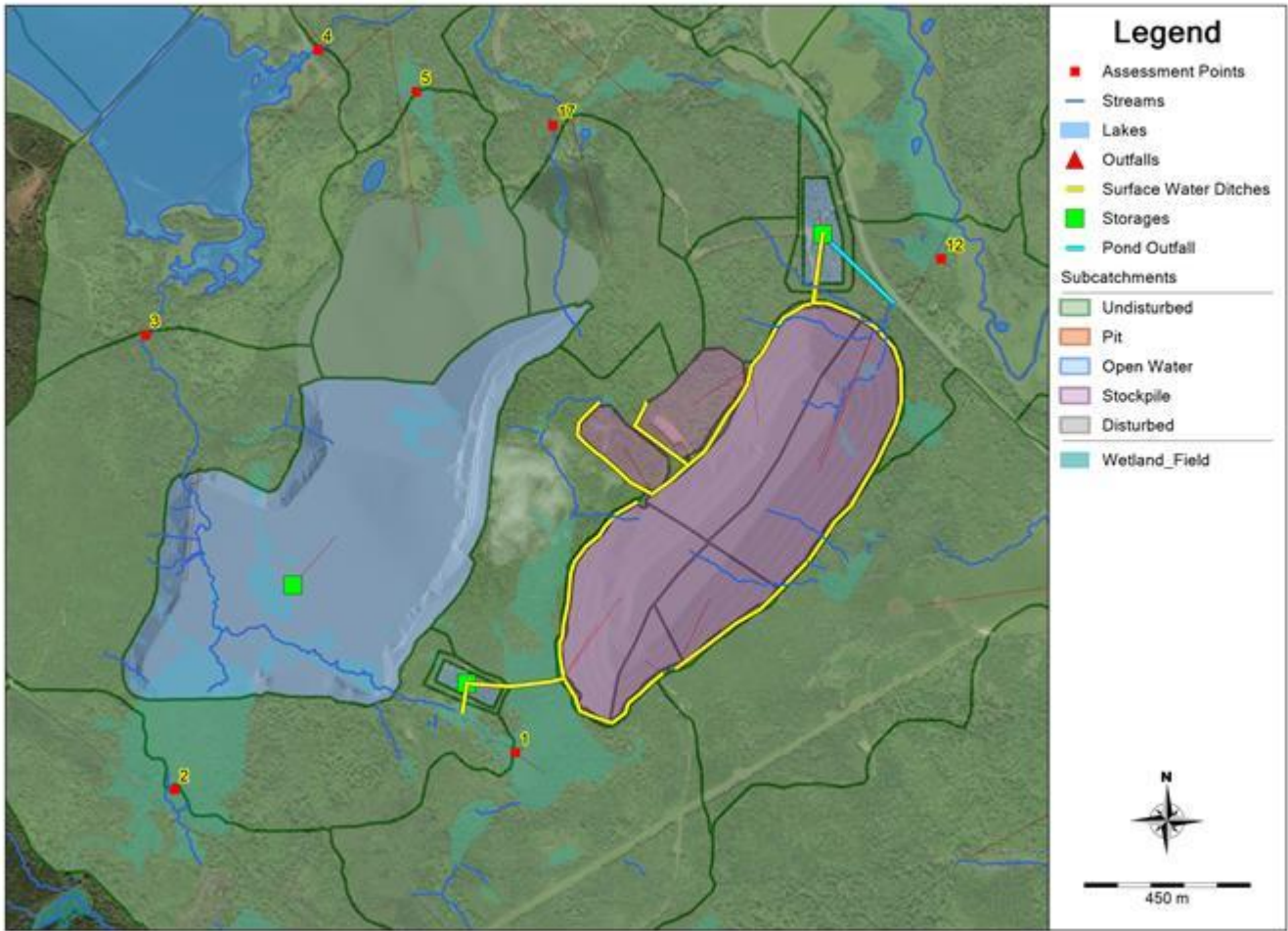


Figure 4.4 Conceptual Water Management Plan for Closure Conditions

## **5. Conclusions**

GHD has developed a CWMP for four (4) phases of Project development; Phase 1, Phase 2, Pit Filling and Closure. The CWMP will be developed in further detail during later design phases to ensure connectivity with operating procedures and mitigate any potential impacts of mine development on the adjacent environment.

## **6. References**

GHD, 2024, Water Balance Assessment Antrim Gypsum Project Nova Scotia





[ghd.com](http://ghd.com)

➔ **The Power of Commitment**