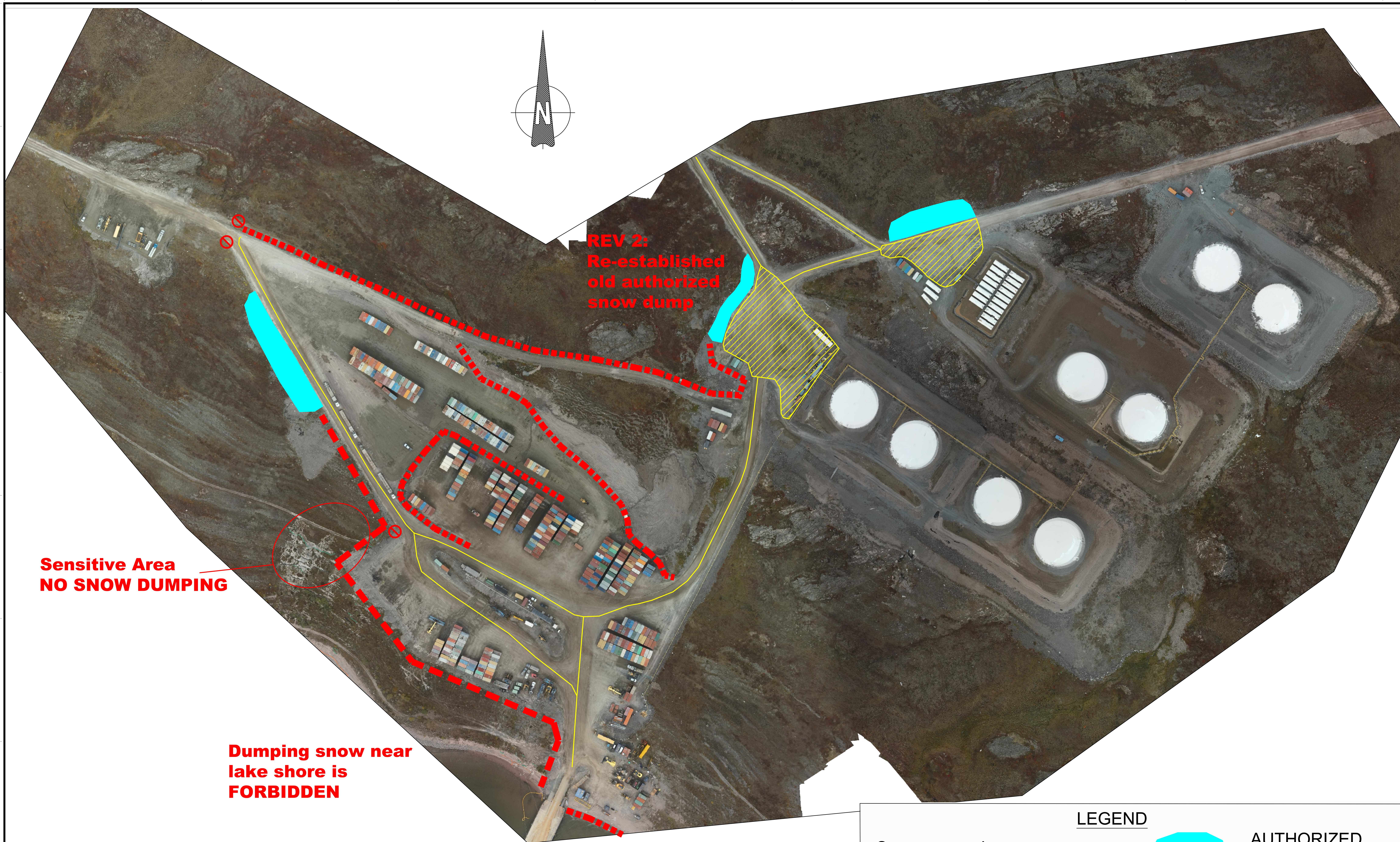
APPENDIX 3

2024-2025 Snow management

DRAWING NO.

FORMAT ARCHD–LANDSCAPE



LEGEND

Snow removal	AUTHORIZED SNOW DUMP
E & I	NO SNOW DUMP
	NO SNOW DUMP (CULVERT)

KEY PLAN

GENERAL NOTES

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
2	2025–01–17	Snow Clearing Map 2024 – Rev 2	MS		
1	2024–09–12	Snow Clearing Map 2024	CP		

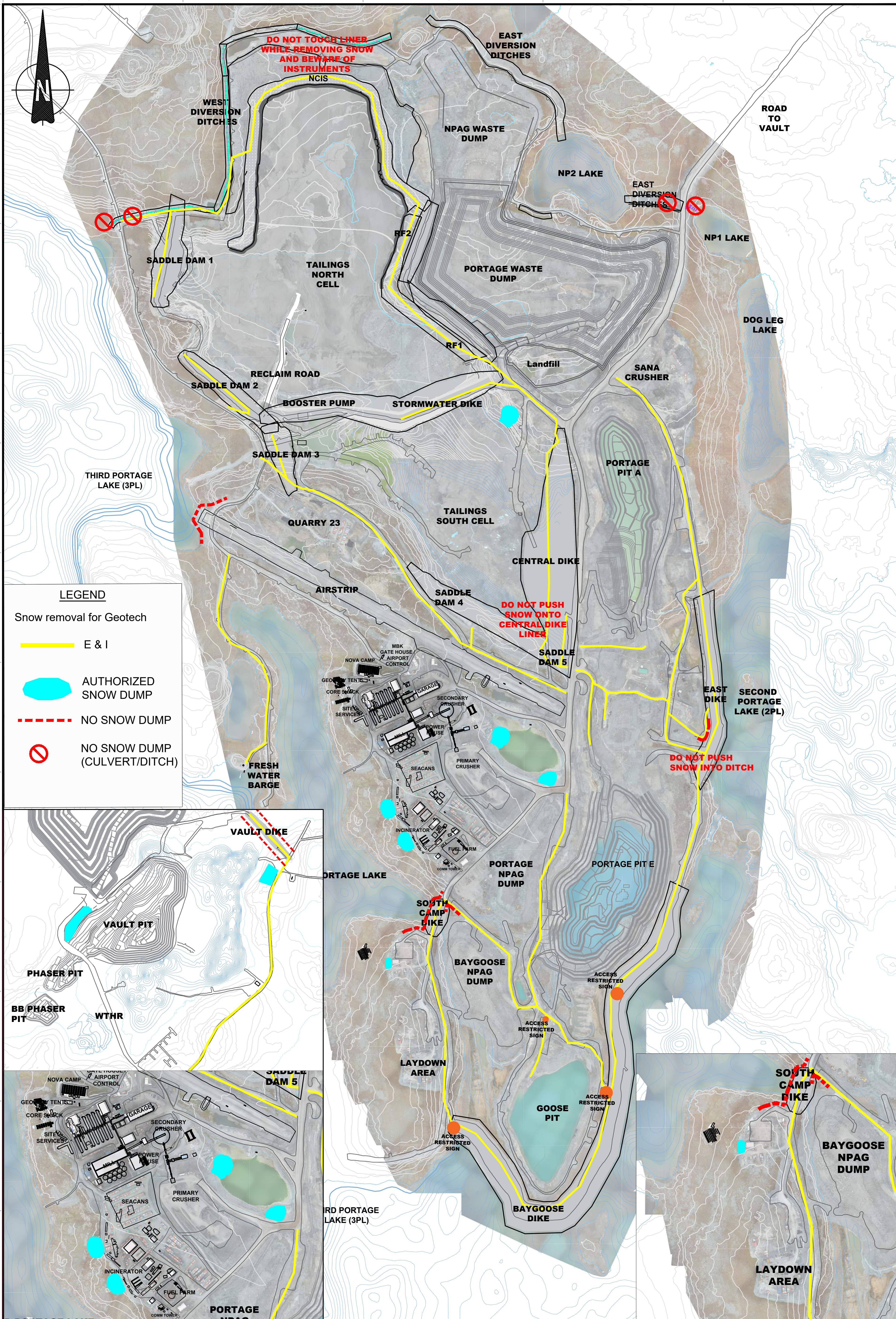
REVISIONS

AGNICO EAGLE
MEADOWBANK

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
SNOW CLEARING MAP
2024 – REV 2
BAKER LAKE

DRAWN BY: M. Sadler	DATE: 2025–01–17
CHECKED BY	
APPROVED BY	
SCALE: N.T.S.	DATE
DRAWING NO.	
PROJECT NO.	REVISION / SHEET: 1 / 1

FORMAT ANSI B-PORTRAIT



TECHNICAL SPECIFICATION

None

AGNICO EAGLE
MEADOWBANK

DRAWN BY	DATE	MODIFIED BY	DATE
SURVEY CHECK	DATE	C. Pelletier	2024-09-12
GEOLOGY CHECK	DATE		
ENGINEERING CHECK	DATE		

MEADOWBANK DIVISION

GEOTECH REQUIREMENTS

MBK SNOW CLEARING MAP

2024-2025

SCALE | DATE | FILE .DWG

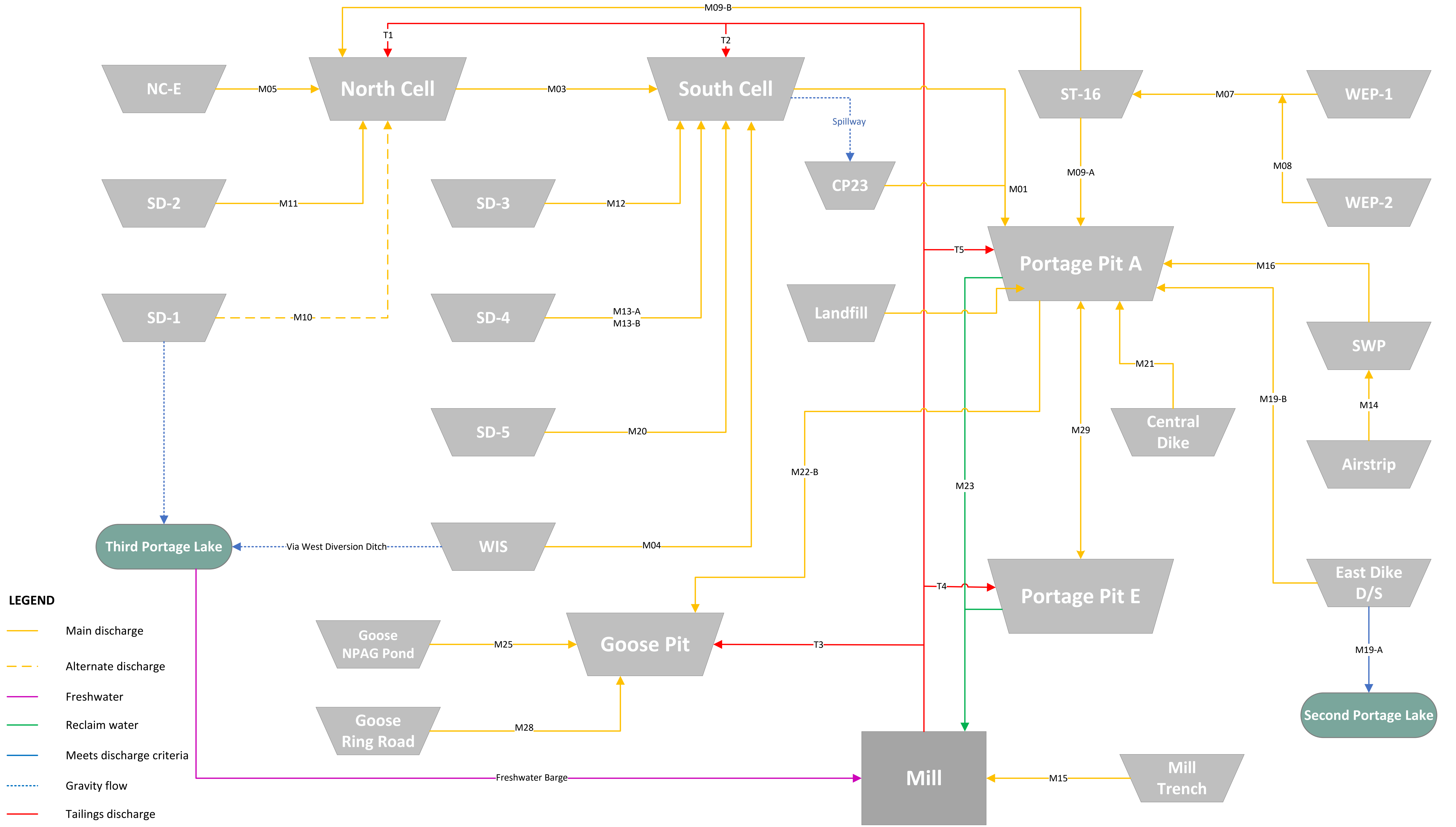
P:\Engineering\05-Geotechnic\05-WaterManagement\Snow Management\2024\MBK Snow Plowing Map for 2024.dwg, 12 Sep 2024

APPENDIX 4

2025 Freshet flowchart and plan view

Updated by : C. Pelletier
Date: 2025-01-03

Meadowbank Freshet Detailed Flowsheet - 2025



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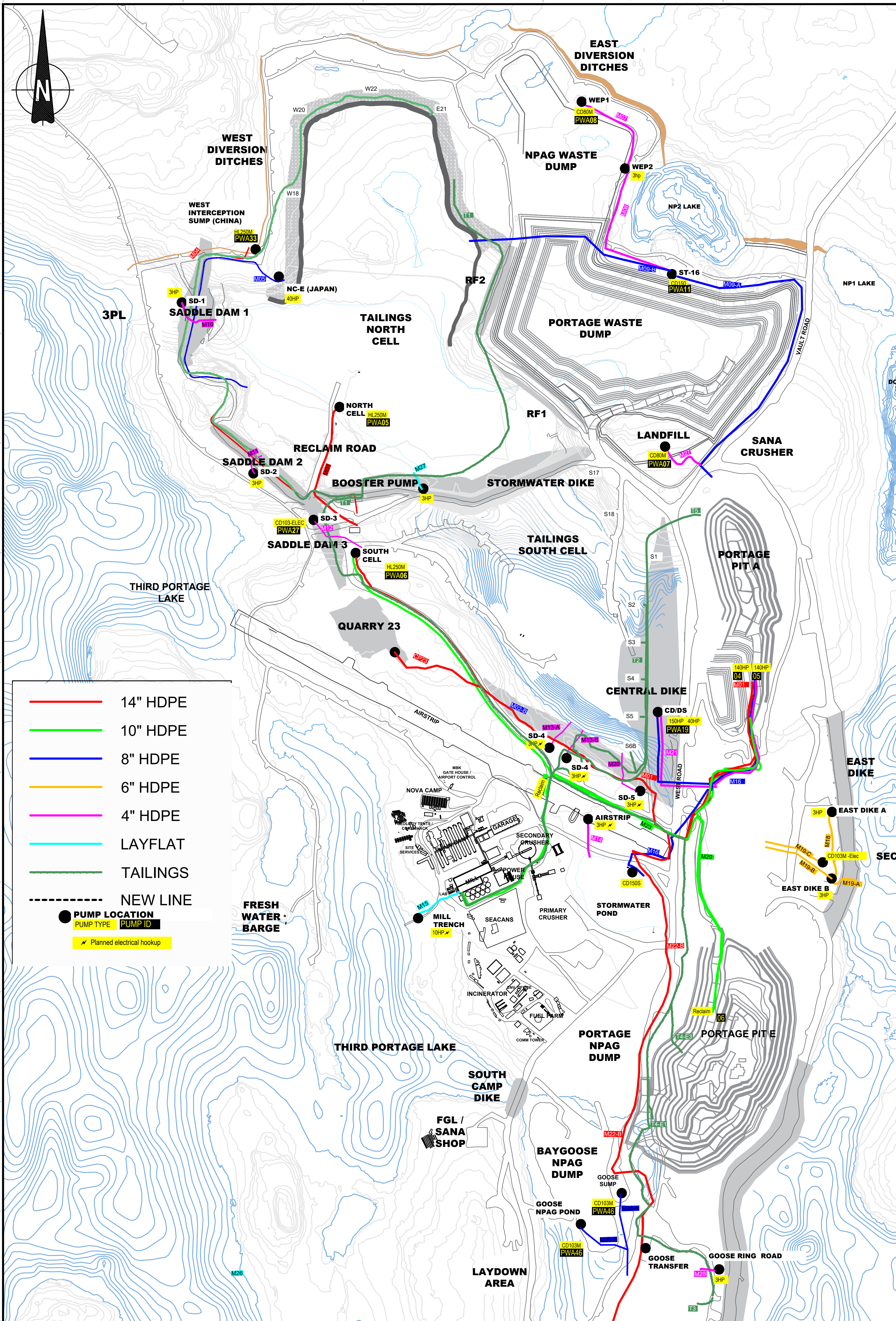

TECHNICAL SPECIFICATION

None

AGNICO EAGLE
MEADOWBANK

DRAWN BY	DATE
SURVEY CHECK	DATE
GEOLOGY CHECK	DATE
ENGINEERING CHECK	DATE

MODIFIED BY	DATE
OE	2025-02-26

MEADOWBANK DIVISION
ENGINEERING - GEOTECH
MBK DEWATERING MAPS
FRESHET 2025
Revision1

SCALE 1:12500 DATE FILE .DWG

P:\Engineering\05-Geotechnic\14- Amaruq\04- Water Management\3- Operation\11- Planning\4- Freshet\6 - Freshet 2025\2 - Technical\0 - Maps\Meadowbank\2025 MBK Freshet Map.dwg, 09 Mar 2025

APPENDIX E –AMMONIA MANAGEMENT PLAN

MEADOWBANK COMPLEX

AMMONIA MANAGEMENT PLAN

JANUARY 2024

VERSION 5

EXECUTIVE SUMMARY

In accordance with the Type A Water Licenses (2AM-MEA1530 & 2AM-WTP1830) Agnico Eagle is updating the Ammonia Management at the Meadowbank and Whale Tail sites (e.g., the Meadowbank Complex), which includes monitoring for ammonia in all mine pit sumps, storage pond, tailings storage facility, seeps, etc. Furthermore, Agnico Eagle has implemented a comprehensive, regular inspection program related to explosives management within the mine pits, conducts regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continues to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

This Ammonia Management Plan (AMP) is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the Water Licenses.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
00	SNC		February 2013	All	
01	Agnico Eagle	1	March 2016	13	Table 1 update
				16	Add section 6
				Appendix 1	Add Memorandum to address comments made during water license renewal process
WT	Agnico Eagle	WT	June 2016		Included Whale Tail Pit operations in the updated plan
02_NIRB	Agnico Eagle	2	Dec 2018		For WT Expansion permitting process
02_NWB	Agnico Eagle	2	April 2019		For WT Expansion permitting process
02	Agnico Eagle	2	April 2020	All	Comprehensive review of the plan + incorporates WT
03	Agnico Eagle	3	March 2021	All	Comprehensive update to reflect the current operation
04	Agnico Eagle	4	December 2021	Appendix 5, p.27	Update inspection sheet
				Section 2.1.1, p.9	Update to reflect WT emulsion plan construction
05	Agnico Eagle	5	January 2024	Section 2.1.1 and 2.1.2, p.9	Updated to reflect current operation
				Appendix 1, p.21	Updated Figures
				Appendix 3, p.25	Updated Emergency Response Plan
				Appendix 4, p.26	Updated MSDS

Prepared By: Environmental Department

Approved by: Eric Haley
Environment and Critical Infrastructures Superintendent

TABLE OF CONTENTS

List of Appendix

ACRONYMNS

AGNICO EAGLE	AGNICO EAGLE MINES LIMITED
AMP	AMMONIA MANAGEMENT PLAN
AN	AMMONIUM NITRATE
ANFO	AMMONIUM NITRATE – FUEL OIL
AWAR	ALL-WEATHER ACCESS ROAD
CCME	CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT
CIRNAC	CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA
CNO-	CYANATE
CREMP	CORE RECEIVING ENVIRONMENTAL MONITORING PROGRAM
KivIA	KIVALLIQ INUIT ASSOCIATION
MDMER	METAL AND DIAMOND MINING EFFLUENT REGULATIONS
NIRB	NUNAVUT IMPACT REVIEW BOARD
NWB	NUNAVUT WATER BOARD
TSF	TAILINGS STORAGE FACILITY
WMP	WATER MANAGEMENT PLAN
WRSF	WASTE ROCK STORAGE FACILITY
WTHR	WHALE TAIL HAUL ROAD

1 INTRODUCTION

The Meadowbank Mine Water Management Plan (WMP) was first prepared in 2009. This version was subsequently updated in preparation for the Type-A Water License Application for the Meadowbank Mine. The WMP was then updated in 2011. In 2015 WMP update, a technical note was added as an appendix, which was the first iteration of the Ammonia Management Plan (AMP) for the Meadowbank Mine. As an extension of the Meadowbank Mine, the 2016 update of the AMP includes measures to manage and monitor ammonia at the Whale Tail satellite open pit operations. Other facilities that are part of the Meadowbank Mine are the Baker Lake facility, the All-weather Access Road (AWAR) between Baker Lake and the Meadowbank Mine, the Meadowbank Mine Camp, the Meadowbank Tailings Storage Facility, the Whale Tail Haul Road (WTHR) between the Whale Tail and the Meadowbank Mine sites.

The Ammonia Management Plan (AMP) was updated in March 2016 in response to concerns raised during the Water License renewal process (January, 2015 – NWB Technical Meetings – Baker Lake) and was re-issued as part of the management plans update process. These concerns from interveners centered on ammonia loading resulting from mine infrastructure in particular from cyanidation in the Tailings Storage Facility (TSF), the use and management of explosives, and the management of treated sewage. In addition, there was a request for loading calculations of ammonia to the receiving environment. These comments are addressed in the Ammonia Management Plan Version 2 March 2016 and specifically in the SNC 2016 Technical Memorandum – WGFU, which was appended to the revised plan. It should be noted that there is no further planned discharge of mine contact water into Third Portage Lake from the Portage Attenuation Pond. The onsite Core Receiving Environmental Monitoring Program (CREMP), takes into account the overall ammonia levels in Third Portage Lake and to date Agnico Eagle has not reached any level of concern (no trigger levels have been reached for ammonia).

Ammonia management at Whale Tail site follows the same practices as outlined in this approved plan and similarly includes conducting routine monitoring in the receiving environment at the Whale Tail site under the CREMP.

This AMP is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the water license. This includes monitoring for ammonia in all mine pit sumps, attenuation ponds, TSF, seeps, etc. in accordance with the Type A Water Licenses. Furthermore, Agnico Eagle implemented a comprehensive, regular inspection program related to explosives management within the mine open pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continue to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are noted. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

Ammonia is a naturally occurring nitrogen compound found in the environment. However, there are two sources at the mine site that can contribute to the mobilization of ammonia in the groundwater or surface runoff:

1. Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations. AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff.

2. In gold mine operations using a cyanidation process to extract the gold from the ore, the cyanide in solution is oxidized to cyanate (CNO^-) using a sulfur dioxide (SO_2) air process before discharge to the TSF. The cyanate can then hydrolyze to ammonia in the TSF reclaim pond.

Ammonia dissolved in water exists in equilibrium of interchanging un-ionized (NH_3) and ionized (NH_4^+) forms. The equilibrium is influenced by pH, temperature, and ionic strength (salinity) where the amount of un-ionized ammonia is favored as the pH becomes more basic or as the water temperature or salinity increases. Un-ionized ammonia can readily pass across the gill surface and enter into the bloodstream of fish, while ionized ammonia passes with greater difficulty. Once inside the fish, both forms of ammonia can cause toxic effects (CCME, 2010). Furthermore, it should be noted that ammonia oxidizes to nitrite (NO_2) and nitrate (NO_3), the former being particularly toxic to fish and humans. Both nitrite and nitrate have CCME guidelines to ensure the Protection of Aquatic Life.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the AMP, as both water quality parameters are signature compounds of AN explosives. NO_3 has a discharge criteria threshold specified in the conditions applying to waste disposal and management in the Meadowbank and Whale Tail Water Licenses. This AMP proposes monitoring of blasting practices for the assessment of explosive quantity used and blast performance, as well as monitoring of water quality to determine ammonia levels in waters within the mine sites. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

2 EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

2.1 SITE DESCRIPTION

2.1.1 Explosive Storage

The primary storage area of explosive products is located at the Whale Tail emulsion plant areas (see Appendix 1). The explosive products arrive by barge at the Baker Lake marshalling area. They are then transported by ground to the Whale Tail emulsion plant. There is no explosive storage at Meadowbank since the beginning of 2022.

Explosive products at the plant facilities are packaged in supplier provided containers, which limit the possibility of spillage into the environment. The products are only removed from these containers prior to use at the emulsion plant areas. Surface areas are graded to collect water runoff within the storage facilities.

The emulsion plant area at Meadowbank is located north of the Meadowbank mill, pits, and camp site and approximately 76 km from Whale Tail Mine. The storage area is accessible from the AWAR. Some ammonium nitrate prill containers are temporary stored at the Meadowbank emulsion plant (no longer in operation) and brought to Whale Tail as needed due to the limited storage capacity on Whale Tail site. The Whale Tail Emulsion Plant is located in a remote area of Whale Tail Mine, southwest of the pits and the main camp. The plant was commissioned in January 2022. The infrastructure presently consists of an emulsion plant for the preparation of bulk emulsion explosives, two buildings for the storage of AN, a nitrate pad and seven explosive magazines along the access road to the plant.

Similar to the previous Meadowbank operations, the emulsion is trucked to Whale Tail Pit, IVR Pit and Underground operation. The current plan for emulsion delivery is to directly deliver to the open pits and underground however, emulsion is also stored in a remote emulsion storage building located where the Whale Tail mine explosives magazines are stored. In the case of road closures, inclement weather or other operational constraints, the remote emulsion storage will supply emulsion to the Whale Tail Pit, IVR Pit and underground.

2.1.2 Roads

The AWAR and the WTHR are use to transport explosive products from the Baker Lake site facilities to Whale Tail Mine.

Agnico Eagle will continue to enforce restricted access from km 85 north to the Meadowbank Mine and will enforce the same restrictions along the WTHR (refer to the Whale Tail Haul Road Management Plan).

Spillage control protocols, procedures and handling of spilled material, and explosive management for both storage and transport have been established by Dyno Nobel Inc. (Dyno) and are provided in Appendix 2. Explosive products and spills on the AWAR/WTHR are referenced in the Spill Contingency Plan.

2.1.3 Pits and Underground Operations

The development sequence of the mine site is provided in the Meadowbank Mine Waste Rock and Tailings Management Plan and the Whale Tail Waste Rock Management Plan. Explosives are used for the excavation of waste rock and mining of the ore at the Portage, Goose and Vault pits at Meadowbank before depletion, and at the Whale Tail Pit, IVR Pit, and underground mines.

2.2 AMMONIA PATHWAYS

Emulsion not fully detonated in pit blasting operations provides several pathways for ammonia mobilization. Water from drainage runoff is the primary mechanism of mobilization for ammonia residuals remaining within open pits. This water, being at Meadowbank or Whale Tail, is collected at pit sumps and then is pumped to the associated Attenuation Ponds.

Blasting residuals are also expected to be attached to waste rock and ore materials, which are transported from the open pits to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to the attenuation ponds. Residuals from the ore may be carried in the tailings to the TSF. All these pathways (mine sumps, attenuation ponds, TSF) are monitored in accordance with the Water License.

At Whale Tail operations, if blasting residues on waste rock are mobilized, they will collect in the Waste Rock Storage Facility (WRSF) pond, which is downslope of the WRSF, or the IVR WRSF contact water collection system. For ore stored within the dewatered portion of Whale Tail Lake, drainage would flow to the attenuation pond. The locations of the WSRF and the storage ponds are shown in the figure for Whale Tail site in Appendix 1.

To avoid any case of poor or incomplete detonation, Agnico Eagle employs the following measures:

- inspection of drilling depth to ensure it is in accordance with blast design;
- inspection of quantity of explosives in each drillhole to ensure it is in accordance with blast design;
- inspection of blast tie-in execution; and
- reporting of any anomalies during loading and priming of explosives to correct situations prior to initiation.

These measures will be reviewed should ongoing cases of poor or incomplete detonation be encountered. This will be included in the next revision of the AMP.

2.3 EXPLOSIVES AND BLASTING

Based on experience at Meadowbank and at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia released from AN are explosives flowing into cracks and fissures in the rock and not detonating or leading to an incomplete detonation of the explosive column and misfired blastholes. An ammonium-nitrate based emulsion is used as a blasting agent at the Meadowbank and Whale Tail sites. This material is designed to repel water thus minimizing the potential for ammonia to impact mine water.

Blasting operations on site include monitoring of explosive quantities, blast design, procedures, and practices. The results of this assessment are used to adjust blasting practices as needed to:

a) Optimize the use of explosives; and

b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

2.3.1 Explosive Products

Explosive products used at the mine site include bulk explosives (bulk emulsion), packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. The material safety data sheets (MSDS) for these products are provided in Appendix 4. Of these products, the greatest potential for water contamination comes from the bulk explosives. Meadowbank and Whale Tail use emulsion as the primary bulk explosive for blasting operations.

Bulk emulsions typically contain some or all of the following components:

- Ammonium, sodium and/or calcium nitrate;
- Fuel and/or mineral oil;
- Methylamine nitrate;
- Emulsifiers; and
- Ethylene glycol.

Although bulk emulsions are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods of time. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the emulsion remains in the blasthole after it has been loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the bulk emulsion for extended periods of time.

2.3.2 Procedures and Practices

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the emulsion occur at the plant and density tests are done at the blast site (on the trucks). Loading procedures specify that blastholes be loaded with emulsion from the bottom of the blastholes to provide a continuous explosive column. Details on the explosive quality control and loading procedures have been established by Dyno Nobel and are provided in Appendix 2.

The primary factors that may reduce the amount of ammonia available for mobilization in mine water are:

- Explosives handling; and
- Completeness of detonation

Bulk emulsion spillage during blasthole loading could (as bulk emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the pits. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, as well as the emergency response plan, have been established by Dyno and are provided in Appendix 2 and 3.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muck pile. Muck piles are routinely inspected by Meadowbank and Whale Tail staff for signs of incomplete detonation.

3 MONITORING

Monitoring of explosive handling and blasting is as follows:

a) Explosive quantities: Records of explosive quantities used for in-pit blasting are kept for each blasting event and will be conserved throughout the mine life. Furthermore, a record of blast location (i.e., pit and elevation), blast date, and bulk explosive type and name used (emulsion, with the corresponding ratio of AN over emulsion) is kept for all events.

b) Design parameters: Blast design parameters, as well as changes in the blast design parameters from the standard are recorded and dated.

c) Loading instructions: Loading instruction forms are completed for each blast event and provide a record of the as-loaded parameters for all blastholes in the blast pattern including:
   - Hole depth
   - Collar height
   - Priming (single or double)
   - Other observations made by the blast crew (e.g., wetness of holes, use of liners, collapsing holes or difficulty loading)

d) Video footage: Videos are taken of each blast. This practice provides a visual, qualitative record of the results of each blast and provides insight into potential problems such as incomplete detonation (e.g., orange fumes) and misfires, as well as areas of poor muck pile heave and forward movement.

e) Blast audits: Blast audits are conducted on a monthly basis to ensure that best practices are being followed in the field (audits may be adjusted to a lesser frequency if low ammonia levels are consistently observed, or conversely may be adjusted to a higher frequency if high ammonia levels are consistently observed).

An additional monitoring technique commonly used is the measurement of the Velocity of Detonation (VOD), which has been shown to be directly related to the volumetric fraction of the explosive that has been consumed. This technique will be implemented if poor or incomplete detonation is consistently suspected.

4 MILL EFFLUENT

4.1 SITE DESCRIPTION

The mill effluent consists of tailings produced at the mill that is pumped as slurry and deposited in the TSF/in-pit disposal where the tailings particles can settle and consolidate. The reclaim water is pumped back to the mill for re-use. Prior to discharge of the mill effluent to the TSF, the effluent is sent to the cyanide destruction process. The cyanide destruction process at Meadowbank uses the sulfur dioxide (SO_2) and air process to oxidize weak acid dissociable cyanide (CN-WAD) to a less toxic form: cyanate (CNO^-) based on the following reactions:

$$SO_2 + O_2 + H_2O + \text{CN-WAD} \rightarrow CNO^- + H_2SO_4$$

The process can also use sodium metabisulfite ($Na_2S_2O_5$) instead of sulfur dioxide in case there are operating issues with the dosing of sulfur dioxide gas in the process. This ensures that chemicals required for the cyanide destruction process (either SO_2 or $Na_2S_2O_5$) are always available.

4.2 AMMONIA PATHWAY

Cyanate produced from the oxidation of CN-WAD can readily hydrolyze to ammonia (NH_3) and carbon dioxide (CO_2) based on the following reaction:

$$CNO^- + H^+ + H_2O \rightarrow NH_3 + CO_2$$

Thus, the mill effluent provides an ammonia loading to the TSF reclaim water.

During the operation of the TSF, the reclaim water will be pumped to the mill for re-use in a closed loop system. Consequently, there will be no discharge of reclaim water to the environment during this period. Furthermore, it is expected that the ammonia concentration will gradually increase in the TSF/in-pit reclaim pond over time, even though (1) there may be some slight attenuation of ammonia due to microbial/algae activity in the summer and (2) ammonia may oxidize to nitrite and nitrate, particularly near the top of the pond where oxygen is most present.

Annual Water Quality Forecasting provides a forecast of the concentration for ammonia in the TSF reclaim pond during the life of the mine. Furthermore, the report provides a forecast of the ammonia concentration in the Portage and Goose Pit flooding activities This modeling has been updated for Whale Tail operations to include predictions for Portage and Goose Pit end pit water quality and will be updated according to the Type A Water License requirements.

4.3 MONITORING

Concentrations of ammonia, nitrate and nitrite are parameters that are monitored on a monthly basis as part of this sampling campaign of the TSF/in-pit reclaim water.

In the Water Quality Forecasting, a maximum ammonia concentration in the TSF reclaim water is evaluated in order to meet the Type A Water License criteria which for benchmarking are compared to CCME guidelines for the Protection of Aquatic Life in the Portage and Goose Pits once in-pit disposal and flooding activities are completed. If this concentration is exceeded before the end of the flooding operation, measures could be undertaken to lower the ammonia concentration, as well as nitrate and nitrite if required, in the TSF reclaim pond prior to the transfer of TSF reclaim water to the pits.

Ammonia treatment technologies that could be further investigated, if the need arises, include:

i) Biological nitrification / denitrification during the summer months.

ii) In-situ volatilization of ammonia during the summer months.

iii) Ammonia removal by snow making.

5 WATER MANAGEMENT

For details on the site wide water management, please refer to the Meadowbank Water Management Report and Plan and the Whale Tail Water Management Plan.

In addition to controlling contact water through design, the Meadowbank Water Quality and Flow Monitoring Plans and Type A Water License requires monitoring stations that are used for the monitoring of ammonia loadings around the mine site and waste rock storage areas from explosive residuals, as well as ammonia concentration found in the reclaim pond. These monitoring requirements ensure contact water that may contain elevated ammonia, nitrates or nitrites are managed, treated if necessary and do not impact the receiving environment. Monitoring at Whale Tail site is presented in the Whale Tail Water Quality and Flow Monitoring Plan and in the Type A Water License.

In addition to the monitoring listed in the Water Quality and Flow Monitoring Plan, the following actions are undertaken at Meadowbank and Whale Tail as part of the AMP:

- If runoff or seepage is detected at the rock storage facility, water samples collected at the Portage, Vault, Whale Tail, or IVR WRSFs during late operations will also be analyzed for nitrate and nitrite to complete the suite of signature compounds found in explosive residuals.
- Tailings slurry volumes and density from the mill pumping facility to the TSF are recorded on a monthly basis.
- The records of water volumes pumped from the Meadowbank and Whale Tail sumps or WRSF pond to the attenuation ponds are recorded on a monthly basis.
- The records of water volumes pumped from the attenuation or storage ponds to the receiving environment will be recorded on a monthly basis.

Sampling frequency at the pit sump will also be increased if high variability is identified in observed constituent concentrations as a result of the blasting schedule.

The WRSF ponds at Whale Tail will collect all drainage from the WRSFs. Any drainage from the ore storage area will collect in the Whale Tail/IVR Attenuation Ponds. The open pit, water storage ponds and the Attenuation Ponds at Whale Tail and IVR Pits are shown in Appendix 1.

6 REPORTING

Reporting of ammonia concentrations at the Type A sampling stations listed is included as part of the requirement of the Water License. The reporting frequency is prescribed by the Nunavut Impact Review Board (NIRB) Kivalliq Inuit Association (KivIA), and Nunavut Water Board (NWB) and include, but may not be limited to:

- Brief monthly reports of the compiled water quality monitoring results, sent to the NWB, the CIRNAC Water License Inspector and to the KivIA; and
- An annual report submitted to the NWB, KivIA, CIRNAC, NIRB, Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, annual groundwater monitoring results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation personnel reviews on a monthly basis the data gathered from the sampling stations in the Type A Water License and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, Agnico Eagle will notify the NWB and KivIA as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the NWB for review.

7 INSPECTION

On a weekly basis, the environment department will conduct inspection in the blasting area to ensure that the Dyno Nobel loading procedures are being implemented (this will minimize blasting residues). In addition, inspections will be undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up action will be undertaken, and corrective measures will be put in place. See Appendix 5 for copy of the Emulsion plant inspection form.

8 REVIEW OF AMMONIA MANAGEMENT PLAN

Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the NWB for review.

9 REFERENCES

Agnico Eagle (2020), Meadowbank Water Quality and Flow Monitoring Plan. July 2020.

Agnico Eagle (2016), Whale Tail Pit Project FEIS and Type A application documents. Volume 8 – Monitoring and Mitigation and Management Plans. June 2016.

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SLI (2012). Water Management Plan 2012. Agnico-Eagle Mines. Document No. 610756- 0000-40ER-0001, Rev. 02. March 2013.

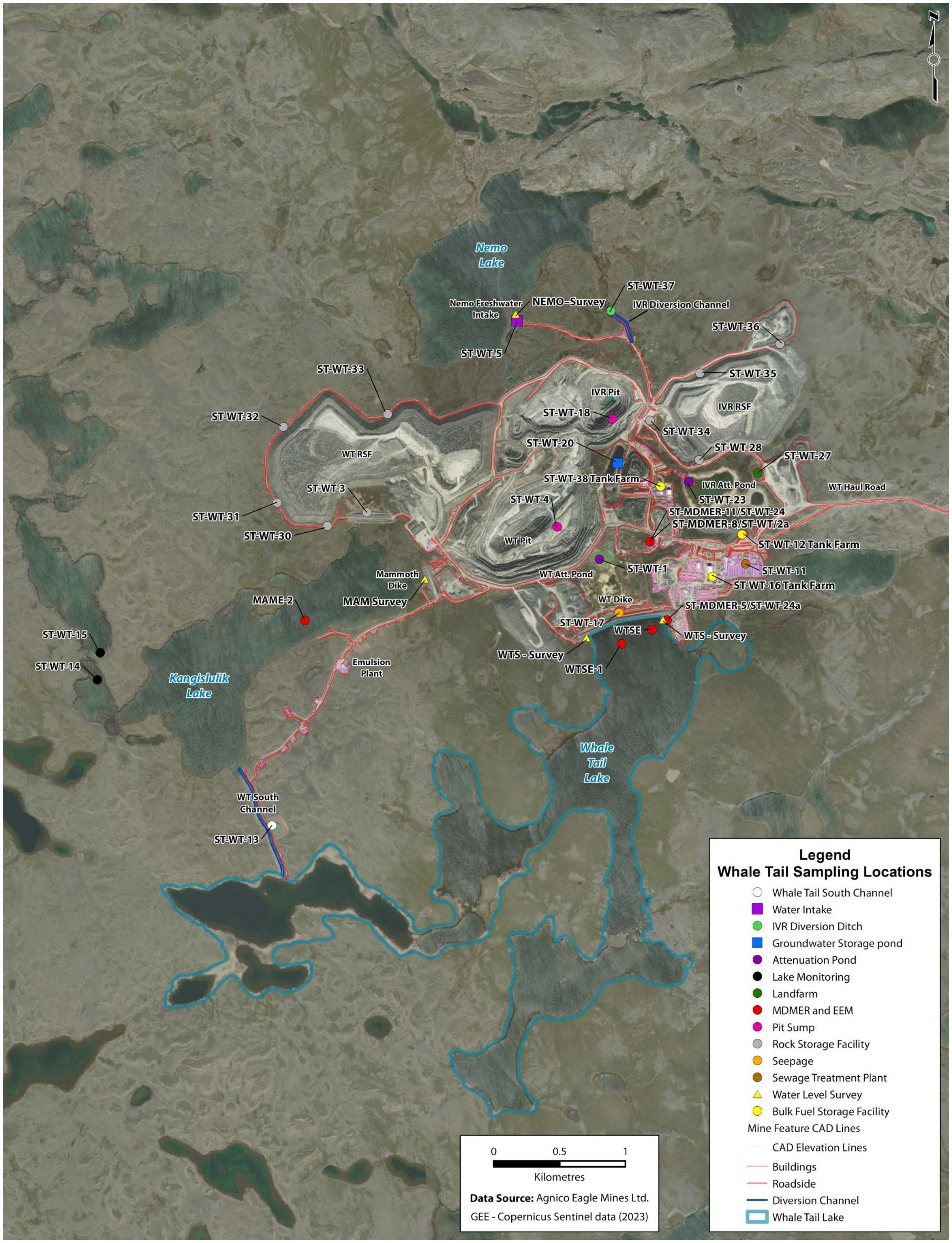
SLI (2012). Water Quality Forecasting for the Portage Area 2012-2025. Agnico-Eagle Mines. Document No. 610756-0000-40ER-0002, Rev. 01. March 2013

APPENDIX 1

ENVIRONMENT FIELD STATIONS – MINE SITE VIEW

Meadowbank Mine Site Layout Area

Whale Tail Mine Site Layout Area



APPENDIX 2

SPILL CONTROL AND LOADING PROCEDURE PLAN

Dyno Spill Control and Loading Procedure Plan

1) All trucks are washed inside shop to contain any residue that may have contacted trucks. The water from the washing of the trucks and or the shop floors themselves is then picked up by the AEM e vacuum and disposed of in the onsite Stormwater Management Pond.

2) A.N. Prill is brought to the Emulsion Plant site in 20 ft Seacans and is stored in the Seacans on the A.N. Pad for the site till it is needed. It is then taken out of the Seacan /s and brought into the Plant for use. Sometimes enough product for the next batch is stored outside to speed up Batching time when it is necessary. A.N. Prill is not left outside if weather looks like it is going to be damp or raining to prevent the leaching of Prill through the Tote bags and on to the ground surface.

3) Any A.N. spills that occur are promptly cleaned up and disposed of in 1 of 2 ways:
    i. Any contaminated prill is put into containment barrels or buckets inside Plant, depending on amount, and put into the next Ansol batch to be made.
    ii. Any contaminated Prill is put in Barrels or Buckets (depending on amount) and then transferred from barrels to buckets for the Emulsion Truck Operators to take to the Blast Pattern and placed into the boreholes after they have been loaded (disposal via blast).

   Any spills that are too difficult (some of our drummed Products) to take care of in this manner are placed in Metal Drums or HAZMAT bins etc. with absorbing materials, sealed and sent to AEM HAZMAT AREA (for shipment south).

4) Emulsion waste (with contaminants) is also either contained in drums or bins until it can be transferred into buckets and taken to Blast patterns and placed into boreholes for disposal (disposal via blasting).
   Any non contaminated Emulsion is put back through the system and on to Trucks.
   When Trucks need to be de-contaminated or process lines of trucks or plant need to be cleaned out, the excess water is strained through a Sack (this allows the water to go through, but contains the Emulsion) to minimize nitrites in our plant sump containment.

5) When an Emulsion Truck has completed loading on a blast pattern the remaining emulsion is flushed out of the loading hose by running water through the hose (water holding tank on trucks) until water discharges out the end of the hose into the borehole.
   This does not completely remove all of the Emulsion out of the Hose; there is still a residue amount left in the hose. Thus, when the Truck operator starts up on the next blast pattern, the hose is put into the borehole and the Operator primes the hose and all the residue Emulsion is contained in borehole and disposed of when hole/s are blasted.

APPENDIX 3

DYNO NOBEL EMERGENCY RESPONSE PLAN

DYNO NOBEL CANADA

EMERGENCY RESPONSE PLAN

AMARUQ NUNAVUT

REVISION STATUS

Revision #	Date	Revision Description	By	Checked by	Approved by	Revision Due
1.0	July 31, 2019	New Standard	P.St-Georges	D. Wall; P. Piprell	T. Medak	
1.1	October 26, 2020	Site Manager change		P.Piprell a& Shanno Ryan	T.Medak	
1.2	October 26, 2021	Review ERP	PSt-G.			October 2022
1.3	October 26, 2022	Review ERP Mod. In Blue*	P.St-G.			October 2023
1.4	October 17, 2023	Review ERP Mod. In Blue*	P.St-G.			October 2024

* Modification done in the site ERP are in blue

Approved for release by:

Signature: Patrick Piprell _______________ Date: October 17, 2023
Title: Site Supervisor

CONTENTS

External Reports

All incident involving the manufacturing, importation, exportation, sales or storage of explosives and restricted components, and the use of fireworks, must be reported to the Chief Inspector of Explosives as soon as circumstances permit. For accident involving fatality, serious injuries or major property damage, call 1-855-912-0012 as soon as possible. All other accident/incidents must be reported to 1-613-948-5200. The completed Explosive Incident Report form F07-01 should be sent by email to ERDmms@nrcan.gc.ca or by fax to 613-948-5195. The inspector of explosives responsible for your area should also be contacted.

1.0 SITE INFORMATION

The entrance to the site is south of AMARUQ mine site at the Explosive Manufacturing Road (EMR).
Latitude (North): 65° 23’43.45”N
Longitude (West): 96° 44’1.00”W
Office: +1 819 759-3555 ext 4606808

2.0 PURPOSE

The purpose of the ‘Emergency Response Plan’ is to provide guidelines for the protection of all employees and company property in the event of an emergency occurring on company premises. It outlines the setting up of emergency control within the site and the emergency procedures in place to ensure the safety and protection of people, property and the environment.

- Notifying all on-site personnel of emergencies.
- Organizing the site based emergency response, where applicable.
- Facilitating communications with Emergency Services.
- The plan provides procedures for:
  - ➢ Training of site personnel in emergency response.
  - ➢ Reviewing and updating emergency procedures.
  - ➢ Facilitating recovery operations.

To provide a management system for Dyno Nobel Canada and stakeholders, to deal with emergencies to protect people, property and the environment.

Objectives:

- To minimize adverse effects on people, property and the environment
- To control or limit the effects of an emergency
- To facilitate an emergency response and to provide appropriate assistance to the emergency services
- To communicate vital information to all relevant persons as soon as possible
- To provide for competency-based training so that a high level of preparedness can be continually maintained
- To provide a basis for updating and reviewing emergency procedures
- To provide a system to manage an emergency
- To link current site plans with the corporate plan
- To identify and utilize an effective communication system

3.0 SCOPE

This plan has been prepared for Dyno Nobel Canada Inc. The plan covers the emergency response requirements for Dyno Nobel's AMARUQ Operations.

SCOPE OF OPERATION

Bulk Explosives Factory Site includes;

Emulsion Manufacturing site
storage of emulsion, Ammonium Nitrate 182,500 NEQ
- 50,000 liters of diesel;

4.0 REFERENCES

- Site Emergency Response Plan (Template)
- Emergency Risk Assessment Worksheet
- IPL HSE MS Element 9.1, Emergency Response Planning
- CSA-Z731-03 Standard – Emergency Procedures
- Regulatory Agencies, Groups, Industry and Community
- Environmental Emergency Regulation – Environment Canada

The regulatory agencies administering explosives are:

- Transportation of Dangerous Goods (TDG)
- Natural Resource Canada (NRC)
- Explosives Regulatory Division (ERD)
- Environment Canada (EC)

5.0 EMERGENCIES COVERED UNDER THE PLAN

Based on a risk assessment conducted the following natural or man made disasters could impact our business:

On-site Emergencies

- White outs
- High Winds
- Explosion – equipment (boiler/fuel or other)
- Fire in plant
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Environmental contamination
- Spills
- Severe weather
- Product shortage
- Raw ingredient shortage
- Critical replacement parts unavailable
- NOX gas release possible.

Off-site Emergencies (including transportation)

- Transportation incident rollover or collision
- Blast pattern incident with drill
- Blast pattern incident near highwall
- Blast patten incident – lightning
- Fire –threat to vehicle
- Fire – toxic fumes
- Explosion – product detonation
- Security
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Spills
- Severe weather
- NOX gas release possible.

6.0 HAZARDOUS OPERATIONS

The following zones, activities and equipment are hazardous and may require an emergency response:
The following is a prioritized list of hazardous operations and storage areas.

	Operation	Comments / Instructions
1.	Manufacture Emulsion	Plant and emulsion storage with chemicals. Emulsion storage in ISO tank.
2.	Operating loader	Yard; site access road
3.	Fuel storage area (bulk)	Bulk tank in yard
4.	Product delivery to blast pattern	Plant; Site yard; Mine road; pit
5.	Driving on a pattern	Pit
6.	Transferring chemicals	Plant; Process vehicles
7.	PTW activities	Confined Space Entry; Working at Height; Hot Work; Loading and unloading (Emulsion, Traces, Fuel); Lockout/Tagout; Critical Lifts

7.0 HAZARD CHEMICALS AND MATERIALS

The following is a prioritized list of or hazardous chemicals, materials and intermediates of significant quanities on site or transported by site:

	Chemical / Material	Quanties	Location
1.	Fuel oil	50,000L	Outside plant
2.	Trace 1 (citric acid)	284 L	
3.	Trace 2 (sodium nitrite)	284 L	
4.	ANP	120,000 kg	Outside

8.0 EMERGENCY CONTACT INFORMATION

Dial 6-9-1-1 in an emergency or call CODE 1 – CODE 1 – CODE 1

Non-Emergency Police / Fire

- Baker Lake RCMP (867) 93-1111

Regulatory Contacts: (NRCan via H&S or Regulatory Compliance Manager)

- H&S: Seamus Kilcommons Cell: 403 815-4066
- Reg: Pierre St-Georges Cell: 613 677-1051

DN Title	Name	Cell Phone	Work Phone	Home Phone
Manager of the Site	Patrick Piprell & Shannon Ryan	NA	819 759-3555 EXT 4606608	
Operations Manager	Krisnar Cruz	587-839-0654	587-839-0654	
General Manager	Jim O'Brien	913-940-5170	913-940-5170	
HSEC Manager	Seamus Kilcommons	403-837-2685	403-723-7547	
Emergency Supervisor (ES)	Shannon Ryan Patrick Piprell		819-759-3555 EXT: 4606808	

Local Emergency Services may be required to take control of the emergency situation. Dyno Nobel personnel will assist the Local Emergency Services with information and advice and will ensure that the Emergency Services are briefed with all appropriate information when attempting to take control of the situation.

9.0 EMERGENCY FUNCTIONS AND RESPONSIBILITIES

The following people will participate in emergency planning and crisis management.

Name	Role / Responsibitlies
	Responsible for updating emergency response plan
Patrick Piprell & Shannon Ryan	Site Supervisors will be the EMERGENCY MANAGER, or in his/her absence the next most senior manager on site will assume this role. Responsibilities are to ensure ERP is site specific: Lead drills twice a year
Jim O'Brien	General Manager: Overall reviewer and sign off. General Manager; Media Liaison.
Krisnar Cruz	Operations Manager: responsible to review and ensure adequate: review of drills conducted; Bulk Site Operations Advisor
Seamus Kilcommons	HSEC Manager: responsible to review and ensure adequate: review of drills conducted; Liaison with regulatory authorities

Benoit Choquette	Environment Manager; Liaison with relevant regulatory authorities
Pierre St Georges	Regulatory Compliance Manager; Liaison with all relevant regulatory authorities

Emergency response responsibilities for all personnel on site are describe as follows:

Roles	Responsibilities
Emergency Manager (EM)	This position will usually be filled by the Site Supervisor / Acting Site Supervisor and will be responsible for: • Overall responsibility for management of the emergency. • Contact with other external organizations (e.g. Police) • Contact with employees and relatives • Declaration of "All clear" to approve re-entry • Implementation of the DNA Crisis Communication Plan
Emergency Supervisor (ES)	This position will usually be filled by the one of the operators or designate and will be responsible for: • Liaison with the EM. • Arrange the removal of equipment (e.g. truck explosives). • On-site security. • Collect visitors book during evacuation (if safe to do so) • Conducting head count of all personnel on site In the event that there is only 1 person on site then that person will assume responsibilities of both the EM & ES.
Other personnel on site	This position will usually be filled by any other employee on site. • If safe to do so, personnel holding appropriate licenses will attempt to remove all explosive trucks from the vicinity of the fire and shut down all equipment. • Follow the direction by EM to control the situation (e.g. extinguish fire) if directed • Make their way to the nearest designated evacuation point. • Visitors and contractors must proceed directly to the evacuation / muster point: The scale house.

10.0 ALARM COMMUNICATION SYSTEM

- Type of warning/alarm system (including back-up): Alarms tied into AMARUQ mine site Notified system to security / ERT
- The communication system used: Two way radios and phone
- Location of Alarms: Emulsion plant and office – Internal and external alarms

- We will communicate an on-site in an emergency situation to employees by:
- Alarm System Bell. In the event of a disaster we will communicate with employees by: Two way radio
- In case of an emergency the triggered alarm communicate with the bitshop, crusher pad, magazines pads. The employees will gather at the muster point where a head count will be performed.
- In event no one is on site, the alarm system will activate by: Automatic alarm: sensored for smoke and heat??
- We will test the warning system and record results at least __1___ time per year. Results are recorded by the mine. Mine owns the Dyno Nobel building

11.0 EMERGENCY RESPONSE EQUIPMENT

The following emergency response equipment is located on site:

Location	Equipment
Emulsion plant	**Spill Kits; Fire extinguishers; First Aid Kits**
Process Vehicles	**Spill Kits; Fire extinguishers; First Aid Kits**
Pickup trucks	**Fire extinguishers; First Aid Kits**

EMERGENCY RESPONSE KITS & MATERIAL

All DNCI worksites will maintain the following emergency response equipment, that is appropriately packaged, stored and easily loaded onto a pick-up truck and / or aircraft for immediate transfer to an accident scene:

VERIFY WHAT IS READILY AVAILABLE IN SPILL KITS AS PER LIST BELOW

I - Spill Recovery Material
1000 ft. of 3 inch fluorescent yellow security tape
3 explosion-proof lanterns / flashlights
1 roll (200 ft.) of 10 mil. clear plastic for ground or product cover
3 "explosives" signs plus assorted 1.1 / 1.5 "placards and labels"
4 polyethylene / non-ferrous 45 gal. drums with removable lids
1 doz. large heavy duty garbage bags (to line drums and for trash)
3 non-ferrous shovels
1 spill kit containing 1 - 25 lb. bag of granular absorbent material
30 ft. of 5 in. sorbent booms
10 ft of 3 in. sorbent socks

1 case of sorbent pads
1 - 3 ft. x 3 ft. neoprene sheet (drain seal)
6 heavy-duty cardboard boxes for repackaging broken boxes
2 rolls of 3" duct tape
2 rolls of 3" packing tape
1 push broom
6 blank (TDG) shipping documents

II – Personal Protective Equipment
6 reflective safety vests
6 safety "goggles"
6 particulate respirators (dust masks)
1 doz. disposable ear plugs
6 pr. nitrile gloves
6 pr. cotton gloves
Industrial First Aid Kit

(Note: all DNCI Emergency Responders must wear CSA approved protective footwear and Type II (lateral protection) hard hats when on the job. As well, a camera should be readily available to photograph the scene of an accident and remedial measures for inclusion in the accident investigation report).

An inventory list of the emergency response kit/material will be kept with the cache, which must be inspected quarterly, to ensure the contents are present and in good working order (note: Emergency response kit cache may be witness/lock-wired closed, in which case only an annual verification that the contents are present and in good working order is necessary, so long as the witness/lock-wire is present and unbroken).

12.0 EMERGENCY CONTROL CENTER

The Site Manager or Supervisor will nominate the most appropriate location of the Site Emergency Control Centre when all site personnel, contractors and visitors have mustered at the designed evacuation area. The Site Emergency Control Centre will depend upon type and location of the emergency.

In the event of an emergency that requires all personnel to be evacuated from the site, the Site Emergency Control Center will be located at the main gate.

13.0 EMERGENCY INSTRUCTIONS

- Ring the alarm.
- Evacuation Procedure.
- Evacuation of people includes alarms, designation of staging areas and alternative routes/assembly points, and a system of head counts to determine if all individuals have been evacuated.

- Activating the emergency plan.
- Activating the emergency services.
- Terminating the emergency.
- Health and safety functions, such as roll call and search and rescue.
- To identify those responsible for conducting this work and detail procedure to clean and contain spills.

13.1 EXTREME TEMPERATURES

Working in cold environments can be not only hazardous to your health but also life threatening. It is critical that the body be able to preserve core body temperature steady at + 37°C (+ 98.6°F). This thermal balance must be maintained to preserve normal body functioning as well as provide energy for activity (or work!). The body's mechanisms for generating heat (its metabolism) has to meet the challenge presented by low temperature, wind and wetness - the three major challenges of cold environments.

Uncomfortably cold working conditions can lead to lower work efficiency and higher accident rates. Cold impairs the performance of complex mental tasks. Manual tasks are also impaired because the sensitivity and dexterity of fingers are reduced in the cold. At even lower temperatures, the cold affects the deeper muscles resulting in reduced muscular strength and stiffened joints. Mental alertness is reduced due to cold-related discomfort. For all these reasons accidents are more likely to occur in very cold working conditions.

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

13.2 INJURY/ILLNESS

Medical emergencies may arise due to serious injury caused by machinery, entrapment, heart stoke. Limited first aid is available on site and casualties would likely be transferred by ambulance to nearess Hospital for treatment. A transport vehicle is always readily available on site for transportation needs. The site is accesible to local emergency services at all time.

A means of communication is mandatory for all employees working on site at all time. For emergencies requiring immediate medical attention, quickly assess the scene then call for assistance. Qualified Site First Aiders will assess the casualty, and if required, **call 6911** or CODE 1 – CODE 1 – CODE 1 on Two Way radio

The site has several trained first aid attendants and these people will be the first to assist in an emergency.

FIRST AID ATTENDANTS	EXPIRY DATE
Chris Paul	
Patrick Piprell	
Shannon Ryan	
Aubrey Chaulk	
Billy Harrison	

*** Report incident details in SHAERS database when the Emergency is over.**

13.3 EXPLOSION / FIRE CONTROL PROCEDURE

EXPLOSION

All site personnel should be evacuated as soon as possible. In the event of an explosion the Emergency Services should be contacted immediately and the evacuated personnel assembled at the Muster area. No personnel should enter the site until at least one hour after the explosion or until the resultant fire has burnt out.

Dyno Nobel personnel should restrict access to the plant and nearby area until the Police and emergency services arrive at which time all access roads should be blocked off at a suitable distance. Emergency services should be advised not to enter the site but if they choose to do so they should be fully briefed before entering.

The Dyno Nobel Compliance Manager shall be notified of any explosion immediately so as to inform Government authorities of any incident that has occurred. There should be no attempt made at clean up or repair of the site until authorisation from the appropriate authorities has been received.

13.3 EXPLOSION / FIRE CONTROL PROCEDURE (Continued)

FIRE CONTROL PROCEDURES

Fires will vary in location and the materials involved. Each kind of fire shall have inherent risks associated with them. In general the following guidelines should be adhered to:

- Do not fight a fire that has become established which involves explosives or precursors used in the manufacture of explosives;
- Proceed with extreme caution when fighting fires involving Oxidizing agents as toxic fumes may be evolved;
- Never fight a fire unless you are comfortable to do so and have the correct equipment;
- Always leave an escape route when approaching or fighting a fire; and
- Always fight a fire from upwind.

IF YOU ARE UNABLE TO CONTAIN THE FIRE WITH A FIRE EXTINGUISHER THEN YOU MUST EVACUATE THE AREA.

13.4 SECURITY

The Site can be secured by a locked gate at the main entrance (main emergency exit and gathering point) of the site. Due to 24 hour operation the gate is not locked to allow access for DYNO personell and mine blasters. A sign in, sign out book is located at the main entrance for visitor and employee manlimits as per the site ERD Factory License. Only Dyno Employee's have keys to the locked gate.

'A' & 'B'. Sign includes ; Danger - Explosives, No Trespassing, Penalty-Section 18, Canada Explosives Act, $ 5,000.00 fine. Man Limit. No smoking. A match/lighter box. PPE requirements, and a 24 hour Emergency Contact Number.

13.5 BOMB THREAT

In the event of a "Bomb" threat the telephone operator or other person receiving the call should obtain as much information as possible. Where practicable the person receiving the call should have access to the "Bomb Threat Checklist".

Action if bomb or other explosive device is found:
If object or parcel, suspected of being a "bomb" or other type of explosive device is found by anyone, the following action should be taken:

- Do not touch, tilt or otherwise tamper with the object, whether it is a bomb, improvised explosive device (IED) or other suspect object.
- Immediately evacuate the area surrounding the object.

13.5 BOMB THREAT (Continued)

- Consider the consequential damage and effect - both on site and off site -if process equipment, storages or pipelines are involved.

Use the following guidelines:

- Evacuate the area concerned.
- The possibility of shrapnel must be considered.
- Evacuate all persons to the emergency evacuation area. Safety perimeters must be maintained until the device is rendered safe.
- Quick detailed observations should be taken of a suspected IED. Time spent near an IED must be kept to absolute minimum.

Observations should include:

- Exact location and proximity to hazards such as dangerous chemicals or substances.
- Size, shape and colour of object.
- Any writings or labels appended to the device.
- Any other peculiarities.
- Notify Police simultaneously with the commencement of evacuation.
- approach police upon their arrival to supply all details of information.
- Police will, upon their arrival, coordinate and control all necessary procedures.

13.6 CHEMICAL SPILL/RELEASE

Spills of materials on site are most likely to originate from damaged containers and drums whilst unloading raw materials. The action taken to deal with a spill is dependent on the type of material spilt and the associated hazards with that material.

Environmental considerations should be taken into account when cleaning up a spill. To ensure that the appropriate action is taken to clean up a spill the MSDS (Material Safety Data Sheet) should always be consulted before any clean up attempt is made.

Care should also be taken that the spill does not mix with other raw materials as violent reactions or the generation of toxic fumes may be possible. In the case of reactions or fume generation the emergency services should be called and the area evacuated.

The Ministry of Environment is to be notified. Contact Dyno Nobel Canada Environmental Manager.

13.7 TRESPASSING/VANDALISM

If there has been a breech of security or obvious signs of trespassers, notify the police. Do not disturb scene.

Determine if there has been any damage or theft. Follow instructions of the mine security or police. If there has been a theft of explosive materials proceed to the appropriate section of this Plan.

Take temporary actions to prevent recurrence until permanent actions can be implemented.

13.8 LOSS/THEFT OF EXPLOSIVES

LOSS

Determine the nature of the loss. **Implement** the appropriate sections of the Notification Plan. **Retrace** all routes of travel. **Verify** security and inventory level with personnel at the place of origin and destination. **If material cannot** be accounted for, the HSE Advisor and Site Manager shall notify ERD & the RCMP.

THEFT OF EXPLOSIVES

Immediately call the police. **Implement** the Emergency Notification Plan.

The Site Manager, HSE Advisor or Regional Operations Manager will call, as soon as possible and within 24 hours, the RCMP & ERD. **Determine** exactly what product, how much and code date(s) was stolen from the magazine(s). **Be careful** not to disturb the magazine or its contents so as not to destroy evidence such as fingerprints, shoe marks, etc. **Do not** handle tools or equipment that may have been used to break in. **Allow** Police personnel access but protect the scene from others that may disturb the evidence.

Do not permit news media personnel or any other non-company personnel (excluding Police) to enter the site. **Do not** make any statements to the media or non-company personnel. Refer the media to the Company Spokesperson. **The** Site Manager shall be the direct liaison between the company and the police and regulatory agencies. **Keep a log,** (documentation), of all activities regarding the break-in investigation for the company record. **The** Regional Operations Manager, HSE Advisor, and Site Manager will review all information and determine prevention measures to be taken to deter future break-ins.

13.9 PROCESS LOSS/INTERRUPTION

The possibility of a power outage on the site is very thin. The site has a generator.

13.11 TRANSPORTATION VEHICLE ACCIDENT

Ensure the accident scene is safe. Check if there are injuries. Whether the victim is conscious. Ask someone to call emergency assistance. Provide First aid and take control of the scene of an accident. Take care of the victims until help arrives.

13.12 TRANSPORTATION VEHICLE BREAKDOWN

Call **911** and contact
Regulatory Manager Pierre St-Georges at (613) 677-1051.
Environment manager Benoit Choquette at (514) 249-6285

13.13 BLAST SITE INCIDENT

If the emergency involves a blasting incident, the crew at the blast site shall follow the emergency instructions outlined in the Blasting Guidelines and Procedures. This site shall implement the appropriate sections of the Notification Plan as directed. The site shall support the blasting crew with personnel and equipment as needed.

13.14 TRANSPORTATION CHEMICAL SPILL

Initiate the ERAP by calling 1-800-367-4629 and call 911. The Emergency Response Advisor will contact the authorities.

Determine what material(s) has spilled or leaked and secure the area. Do not walk through the spilled material. **Put** on appropriate Personal Protective Equipment.

Protect the area from ignition sources. If a vehicle is involved, engage the battery disconnect switch. **Keep** unauthorized persons away.

Make every effort to confine and contain the spill, using spill kit and all available resources. **Determine** the source of the spill, and stop the leak if possible. **Make** every attempt to see that the material does not reach any waterway. **Prevent** rain or water from coming in contact with the product. Diking may be possible with gravel, soil or any ground material. **Use** what resources you have to begin cleaning up the product, outside equipment may be required. **Return** uncontaminated product to the original containers.

If the material has spilled into a waterway, an outside clean-up contractor will be called to assist with the clean-up operation. Call the main office as soon as possible. Seek corporate counsel as soon as the situation is stable.

13.15 TRANSPORTATION FIRE/EXPLOSION INCIDENT

Should there be explosive detonations, or the risk of detonations due to the presence of fire or other detonating factors, advise the First Responders (or anyone within the immediate vicinity if First Responders are not at the scene) of the risk of an explosion. Help organize perimeter guards to prevent people from entering the evacuation zone. The minimal distance to evacuate for a 20,000 kg tanker is 1.2 km or 4000 feet.

14.0 AMMONIUM NITRATE (E2 REGULATION)

14.1 Physical and chemical properties

Ammonium nitrate in solid form (prill) is of a light or off-light color and is commercially available in small beads of various sizes. It gives off a light ammonia smell. It is considered an oxidizer (risk class 5.1). Its density varies between 0.72 and 1.0 g/cc. Its solubility in water is high at 192 g/100 ml at 20°C. Its boiling point (decomposition) varies between 177 and 210 °C and its fusion point is 170°C.

Ammonium nitrate is stable in normal conditions. However, when involved in a fire, it will give off toxic compounds of nitrogen oxides and may emit ammonia vapors in the air. When confined or exposed at high temperatures, it can explode. It becomes more sensitive to explosion when contaminated by organic matters or other combustible materials.

14.2 Potential environmental impact

Ammonium nitrate is a fertilizer composed of nitrate ion (NO_3^-) and ammonium nitrogen ion (NH_4^+). Nitrate is essential to life. Most crop requires a large quantity of nitrates to support growth. In moderate quantities, nitrate is a harmless component of food and water. The nitrate ions are very soluble in water. They are easily solubilized and transported by surface and groundwater. Ammonium nitrogen is a reduced form of nitrogen which has the potential in water to release ammonia gas and be toxic to aquatic life. This ion is not very mobile in soils. This ion normally stays attached to clay or humus soil particles. Ammonium nitrogen will normally be converted in nitrates by soil bacteria in a few weeks.

A high level of nutrients (nitrates) combined with the presence of phosphorus in water support the rapid growth of algae and aquatic plants in water. It may reduce dissolved oxygen level in water. Insufficient oxygen levels may create dead zones where fish species requiring cold and well oxygenated water could no longer live in. Nitrates can therefore contribute to the eutrophication phenomena of lakes and rivers. The closest water bodies that can be impacted by a spill are located within a kilometer of the plant site and testing is completed by Meadowbank environment regularly. No potable water wells are present at the site.

14.3 What to do in case of a spill

In case of a spill, the product must be recovered rapidly to avoid exposure to water. Protect it with tarp and build berms around it if necessary to avoid exposure to surface water and rain. Avoid any contact with a flame. The product can be recovered manually using plastic shovels or brooms and put into plastic bags or containers. A HEPA filter can also be used if desired. In case of a very large spill, the product can be recovered using a mechanical shovel or loader and put in a sealed steel (20 cubic yards) bin equipped with a cover. The bin must be clean and not contaminated by any organic material.

In low concentrations in water, nitrates will be absorbed by surrounding vegetation and will support their growth. If there are water wells nearby, there is a potential to contaminate the potable water. The drinking water standards for nitrates is 10 mg/l (as N). Therefore, prevent contaminated water to enter sanitary and surface water drains. Recovered product can be re-used if clean, recycled as a fertilizer or disposed off-site as an oxidizer to an approved waste disposal company. Do not fight fires involving ammonium nitrate because of the risks of explosion.

14.4 Maximum quantity planned during the year:

10,000,000 kg.

14.5 Location of the subtance :

In seacans at plant site (EMR)

14.6 Training required for emergency responders

- First aid
- Transportation of Dangerous Goods
- WHMIS
- Emergency Response Plan (this plan)

Emergency Response equipment

- Danger tape
- Tote bags with internal plastic liner
- Plastic shovels
- Drain cover
- Brooms
- Polyethylene tarps

Note: equipment must be readily available at the Quaatuq location.

14.7 Personnel Protective Equipment

- Reflective vests
- Safety Glasses
- Dust masks
- Plastic gloves
- Safety boots
- First aid kit

Note: equipment must be readily available at the Quaatuq site location.

15.0 TRAFFIC CONTROL

In the event of an emergency it is essential that the traffic movements to the site be limited to essential vehicles only. The control of traffic will be achieved by posting sentries at the evacuation point. The sentry shall use the company vehicles onsite so that they can stay in contact via cell phone with the Emergency Manager or Emergency Services Coordinator.

During an emergency the only vehicles that will be allowed to enter the site will be:

- Emergency Services;
- Any equipment providers which have been requested to attend to the emergency; and
- Dyno Nobel personnel that are directly involved in the response effort.

Any other entry to site will require the permission of the Emergency Manager after consultation with the Emergency Services Coordinator.

If an employee or visitor is injured and can safely be transported to the mine without incurring additional harm to the employee/worker, or posing any additional risk to the safety of the person, Dyno vehilces can be used to transport.
Where specific stabilization of an injured person is required, or where moving an injured person may result more serious injury or life threatening concerns, the injured person is to be stabilized as per first aid training and AMARUQ emergency services dispatched to site.

In the event that there is a chance of an explosion or release of toxic fumes roadblocks should be at least **1200m** from the scene.

The Mine security or local Police are the only personnel authorised to close any public roads, as a result, the need to close the road should be established early. The road would need to be closed at a distance of no less than **1200m** from the facility in order to prevent damage to vehicles or people outside the site.

16.0 PROTECTION OF VITAL ASSETS / EMERGENCY SHUTDOWN

Under no circumstance are lives to be put at unacceptable risk in order to preserve material assets or intellectual property.

To avoid knock on effects of an emergency such as escalated destruction or business disruption, consideration should be given to preserve critical company assets by shutdown or removal of equipment such as:

- Mobile Processing Units (MPU's)
- Raw Materials/Handling equipment

Materials handling equipment and energy sources should be shutdown or isolated by activating emergency stop buttons or closing valves on the following systems:

- Electrical

Isolation are clearly identified by color coded labeling. All personnel must know location and operation of these devices.

- Switches

The decision to isolate energy sources or remove assets may be made at the time of evacuation notification or post evacuation by the Emergency Manager or Supervisor. Either way, this action must not be made if it is considered that it will not delay the evacuation process or put personnel at an unacceptable level of risk in terms personal injury or health.

Energy Source / Equipment	Type of Isolation	Location
Electrical Systems & Equipment	Switch	

17.0 SEARCH AND RESCUE

Search and rescue shall be the responsibility of emergency services only as Dyno Nobel are not equipped to carry out search and rescue operations in a safe manner.

Search and rescue operations should only be conducted if it is safe to do so and if there is no potential of an explosion occurring. Very careful consideration should be made to limiting casualties.

Before attempting search and rescue, personnel must be knowledgeable of the following:

- Site layout;
- Hazardous effects from hazardous substances;
- Fumes/poisoning;
- Explosion;
- Burns;
- Use of proper PPE;
- Breathing apparatus;
- Fire extinguishers;
- Recovery gear;
- Practiced search and rescue techniques; and
- Possible casualties.

18.0 RECOVERY PLAN

The Emergency Manager has the responsibility to declare the emergency over after consultation and agreement with Local Emergency Services:

- When the damage is localised to the extent that normal operations could resume in unaffected areas;
- Work in unaffected areas will not contaminate the emergency scene and destroy causal evidence;
- Affected areas are secure with actual or potential energy sources neutralized and controlled; and
- The all clear / re-entry approval should be communicated to all personnel in consideration of any special conditions.

19.0 CLEAN UP

Environmental aspects and impacts need to be considered when dealing with chemical waste and approval for disposal of chemicals must be obtained before disposal.

20.0 RESUMPTION OF BUSINESS

The EM will carry out the following:

- Arrange for appropriate personnel to complete a risk assessment of the area and assess the impact of the emergency; and
- Provide DNA appropriate personnel with an update as soon as practicable.

In conjunction with Dyno Nobel's VP of HSEQ and VP of Operations, the Emergency Manager shall develop an action plan to ensure that:

- The site is secure and safe for all personnel;
- Pollution due to leaking storages and firewater run-off is minimised;
- Production facilities are re-established; and
- Supply contingencies are activated.

Senior Management shall be informed of any loss and they will ensure that the underwriters are informed. It is essential that all costs of recovery and increased costs due to the incident be identified.

21.0 CRISIS COMMUNICATION PLAN

The Site Media plan is only activated if the media has arrived at your site and is asking questions.

If the media is contacting you by phone, fax or email, refer them to Diana Roising, Crisis Media Advisor in Salt Lake City, cell: 801- 321 5338 or office: 801 328 6536

IF THE MEDIA HAS ARRIVED AT YOUR SITE

The First Critical Statement may be made by a trained spokesperson (generally the Manager on Site) who has received permission from a member of the DNA Crisis Management Team. ***In most cases Media contact will be referred to the General Manager, Mike Soter, or his designate.***

If permission is granted, the Supervisor of the Site should fill in the information in the First Critical Statement template

After the statement is presented to the media on site, it is important not to attempt to answer additional questions. All other information will be done at the direction of the DNA Crisis Management Team, unless otherwise directed.

If additional personnel are available, have an assistant to this spokesperson remain behind to gather business cards and write down questions while the spokesperson leaves. This person must NOT answer any questions

Fax/email a copy of the Statement to DNA Crisis Management Team member and wait for further instructions

When the Media Arrives at Your Site Say ONLY the following:

Site Media Statement

At approximately _________ am/pm on ___________ we experienced

____

____

(Only obvious facts - No explanation - No elaboration)

This is all I can confirm at the present time. I am sure you understand that we are assessing the situation so we can provide the most accurate information.

Our company spokesperson will be in touch with you and other media representatives as soon as possible to provide more information. In the interim, we ask for your patience as we conduct our investigation.

(You are now free to turn and walk away.

(If you are asked additional questions, make the following statement:)

22.0 TRAINING

All Dyno Nobel employees will be trained to cope with an outbreak of fire in the site and MPU operation, at minimum all DNCI employees should be fully trained in the use of fire extinguishers.

All employees shall be trained in the roles they are expected to play during an emergency and/or an evacuation.

Regular evacuation and emergency drills shall be conducted in order to evaluate the effectiveness of the overall strategy and identify any deficiencies in the procedures. Emergency drills should be conducted every six months for DNCI internal drills with at least one of these involving local Emergency Service teams. Local Emergency Service providers shall be briefed on potential site emergencies by the Site Management team.

After conducting drills has a meeting shall be conducted to identify the gaps found during the emergency drill.

Training shall include:

- Fire extinguisher training;
- WHMIS;
- Transportation of Dangerous Goods,
- Emergency Response Training.

23.0 INFORMATION

Emergency procedures are posted on the Safety board. A copy of the Emergency Response Plan was provided to all employees during the Training.

Information on this Emergency Response Plan is recorded electronically on NEXUS.

APPENDIX I – BOMB THREAT

INITIAL INFORMATION:	
Date :	
Person receiving call:	
Exact time of call:	
Time of the call end:	
Exact words of caller :	
QUESTIONS TO ASK	
Where is the bomb?	
When is bomb going to explode?	
What does it look like?	
Did you place the bomb?	
Why?	
Where are you calling from?	
Are you an employee?	
Caller Gender : F / M	Age :

CALLER'S VOICE (circle)				
Calm	Fast	Distinct	Joker	Throat clearing
Angry	Soft	Lisp	Disguised	Deep breathing
Excited	Mocking	Nasal	Loud	Stuttering
Slow	Crying	Irregular	Deep	Mumble
LANGUAGE OF THE CALLER				
Articulate	Educated	Coarse	Irrational	Incoherent
Recorded	Message read by the author of the threat			

BACKGROUND NOISES					
Traffic	Telephone booth	House sound	Music	Motor	Dishes
Soft	Long Distance/Local call	Machinery	Static	None	Animal
Others :					

APPENDIX II – EMPLOYEE ACKNOWLEDGEMENT, REVIEW & TRAINING CERTIFICATION RECORD

Signature indicates that person has been given an opportunity to review and make comments regarding this safe work instruction and revisions. Signature indicates that person has received training about and understands the information contained in this document, related operating procedures, and requirements imposed by this program.

PRINT NAME	SIGNATURE	DATE

APPENDIX 4

MSDS FOR BULK EMULSION AND SENATEL

1. MSDS – Dyno Bulk Emulsion

2. MSDS – Senatel

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party
Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800   Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com   www.dynonobel.com

SDS #: 1052
Date: 10/02/2018
Supersedes: 06/10/2016

Product Identifier
Product Form: Mixture
Product Name: Bulk Emulsion

Other Means of Identification
Synonyms:

DYNO GOLD®	TITAN® 2000
DYNO GOLD® LITE	TITAN® 2000G
EXTRAMITE 1000	TITAN® PB 1000
RUG-1 (Canada Only)	TITAN® PB 2000
TITAN® 1000	TITAN® PB 2000 HF
TITAN® 1000 GREEN	TITAN® SME 1000
TITAN® 1000G	TITAN® SME 1000 GREEN
TITAN® 1000G GREEN	TITAN® XL1000 GREEN
TITAN® XL1000	TITAN® HD
SMS 1116, 1116A, 1126P, 1136P, 1146P	TITAN® SME 2000
DX5037	TITAN® 5000
	TITAN® 5000 G

Intended Use of the Product
Industrial blasting applications as emulsion explosive precursor

Emergency Telephone Number

FOR 24 HOUR EMERGENCY, CALL	**CHEMTREC (USA)**	**800-424-9300**
	CANUTEC (CANADA)	**613-996-6666**

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Ox. Liq. 2	H272
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304
Eye Irrit. 2B	H320

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS03   GHS07   GHS08

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H304 – May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H320 – Causes eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P220 - Keep/Store away from clothing, combustible materials, combustibles
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles
P233 - Keep container tightly closed
P260 - Do not breathe dust, fume, mist, spray, vapors
P264 - Wash exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P308+P313 - If exposed or concerned: Get medical advice/attention
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P370+P378 - In case of fire: Use appropriate media to extinguish
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards
Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	45 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272

			Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Methylamine nitrate	(CAS No) 22113-87-7	0.1 – 3	Expl. 1.5, H205 Skin Corr. 1A, H314 Eye Dam. 1 – H318
**Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 10	Flam. Liq. 4, H227 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304

* This ingredient is not used in most products, including in GREEN-named products.
** This ingredient is not used in GREEN-named products.
Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).
Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything orally to an unconscious person. If you feel unwell, seek medical advice (provide this Safety Data Sheet to medical personnel).

Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing for at least 15 minutes. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

Most Important Symptoms and Effects Both Acute and Delayed

General: May be harmful if swallowed. May cause eye or skin irritation.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause eye irritation.

Ingestion: Likely to be harmful if swallowed.

Chronic Symptoms: Contains an ingredient which may cause cancer. Causes damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.

Unusual Fire and Explosion Hazards: May explode or detonate under fire conditions. Burning material may produce toxic vapors.

Unsuitable Extinguishing Media: Not available

Special Hazards Arising from the Substance or Mixture

In large, intense fires the emulsion can behave more like an explosive and detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if a largeamount of emulsion is involved in a large fire.

Fire Hazard: May intensify fire; oxidizer. Will burn if exposed to heat, and in addition, will accelerate the burning of other combustibles, resulting in more rapid spread of fire.
Explosion Hazard: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials.
Advice for Firefighters
Precautionary Measures Fire: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.
Protection During Firefighting: When controlling fire before involvement of explosives or explosive precursors, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.
Hazardous Combustion Products: Nitrogen oxides. Carbon oxides (CO, CO_2). Ammonia.
Other information: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.
Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
General Measures: Avoid all contact with skin, eyes, or clothing. Avoid breathing dust, mist, or spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition. Evacuate danger area.
For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.
For Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
For Containment: Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.
Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate state, federal and local regulations.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Do not puncture or incinerate containers.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.
Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep /store away from combustible materials, extremely high or low temperatures, direct sunlight, ignition sources, incompatible materials.
Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Calcium nitrate	(CAS No) 10124-37-5	None	None
Methylamine nitrate	(CAS No) 22113-87-7	None	None
Fuels, diesel, no. 2	(CAS No) 68476-34-6	100 ppm	None
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	5 mg/m^3 (mist)	None

Exposure Controls
Under normal conditions of use, over-exposure is not expected to occur.
Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas. Keep containers tightly sealed.
Personal Protective Equipment: Protective goggles. Gloves. Protective clothing.

Materials for Protective Clothing: Chemically resistant materials and fabrics.
Hand Protection: Wear chemically resistant protective gloves.
Eye Protection: Chemical goggles or face shield.
Skin and Body Protection: Not available.
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits. Under normal conditions of use and handling there is minimal likelihood for the this exposure limit to be reached.
Other Information: When using or handling, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Translucent to opaque viscous liquid.
Odor	:	Fuel
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butylacetate=1)	:	< 1
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available

Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	0.8 - 1.5 g/cc
Solubility	:	Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire. May accelerate the burning of other combustible materials.

Chemical Stability: May intensify fire. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

Hazardous Decomposition Products: Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Under normal conditions of use, over-exposure is not expected to occur. Minor skin exposure is most likely.

Information on Toxicological Effects - Product

Acute Toxicity: Harmful if swallowed.

LD50 and LC50 Data: ATE Oral 1,510 (mg/kg)

Skin Corrosion/Irritation: Causes skin irritation.

Serious Eye Damage/Irritation: May cause eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Contains a substance which has been shown to cause cancer in laboratory animals. IARC Group 2A Probably carcinogenic to humans.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: May be fatal if swallowed and enters airways.
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause eye irritation.
Symptoms/Injuries After Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.
Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.
Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg (REACH dossier 2950 mg/kg)
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight

Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg (REACH dossier 3430 mg/kg)
ATE CLP (oral)	1267.000 mg/kg body weight

Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/l/4h

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Harmful to aquatic life with long lasting effects.

Ammonium nitrate (6484-52-2)	
LC50 Fish 1	95-102 mg/l (Exposure time: 48 h - Cyprinus carpio (Common carp))
EC 50 Aquatic Invertebrates	490 mg/l (Exposure time 48 h - Daphnia magna)

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Calcium nitrate (10124-37-5)	
LC50 Fish 1	10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

Persistence and Degradability

Bulk Emulsion	
Persistence and Degradability	Not established.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential	
Bulk Emulsion	
Bioaccumulative Potential	Not established.
Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Contact manufacturer for advice on proper disposal methods.

Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Label Codes : 5.1

Packing Group : II
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Packing Group : II
Label Codes : 5.1
EmS-No. (Fire) : F-H
EmS-No. (Spillage) : S-Q

14.3 In Accordance with IATA

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Identification Number : UN3375
Hazard Class : 5
Label Codes : 5.1

ERG Code (IATA) : 5L

14.4 In Accordance with TDG

No UN number exists for blasting intermediates for Transport Canada (use the following for Canadian shipments)

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332

Label Codes	: 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Bulk Emulsion

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Reactive hazard Delayed (chronic) health hazard Fire hazard

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)

U.S. – California – Air Toxics “Hot Spots” (A-I)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. – Rhode Island – RTK (Right to Know) List

Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. – Rhode Island – RTK (Right to Know) List

Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Bulk Emulsion

WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date	: 10/02/2018
Other Information	: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
Ox. Liq. 2	Oxidizing liquids Category 2
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H227	Combustible liquid
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H318	Causes serious eye damage
H319	Causes serious eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure
H373	May cause damage to organs (Thymus, Liver, bone marrow) through prolonged or repeated exposure

Party Responsible for the Preparation of This Document

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800

Disclaimer

Dyno Nobel SDS

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
6440 S. Millrock Drive, Suite 150
Salt Lake City, Utah 84121
Phone: 801-364-4800   Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com   www.dynonobel.com

SDS #: 1062
Date: 07/20/2020
Supersedes: 11/01/2018

Product Identifier
Product Form: Mixture
Product Name: Bulk Emulsion Explosive

Other Means of Identification
Synonyms:

DYNO® RU	TITAN® 2000 LD
DYNO® RU Alaska	TITAN® 2000 SD
DYNO® RU SX	TITAN® PB 2000 LD
DYNO® RU Uphole	TITAN® PB 2000 SD
EXTRAMITE 2000	TITAN® 7000 RU
FRAGMITE	TITAN® 7000 RU-A
TITAN® 1000 LD-E2	TITAN® 7000 RU-SX
TITAN® 1000 LD	TITAN® 5000 LD
TITAN® 1000 LD GREEN	TITAN® 7000
TITAN® 1000 SD	TITAN® 7000 A
TITAN® 1000 SD GREEN	TITAN® 7000 SX
TITAN® PB 1000 LD	DX5103
TITAN® PB 1000 SD	DX5108

Intended Use of the Product
Industrial applications

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL   CHEMTREC (USA)   800-424-9300
CANUTEC (CANADA)   613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Expl. 1.5	H205
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Eye Irrit. 2B	H320
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS07   GHS08

Signal Word (GHS-US) : Danger
Hazard Statements (GHS-US) : H205 - May mass explode in fire
H302 - Harmful if swallowed

H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H320 - Causes eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P220 - Keep/Store away from clothing, combustible materials, combustibles
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles
P233 - Keep container tightly closed
P260 - Do not breathe dust, fume, mist, spray, vapors
P264 - Wash exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P370+P380 - In case of fire: Evacuate area
P372 - Explosion risk in case of fire
P373 - DO NOT fight fire when fire reaches explosives
P401 - Store local, regional, national, and international regulations
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards
Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	30 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 8	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation), H332

			Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304

* This ingredient is not used in GREEN-named products.
Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures
General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.
Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.
Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.
Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.
Most Important Symptoms and Effects Both Acute and Delayed
General: May be harmful if swallowed. Causes serious eye damage. Skin irritation.
Inhalation: May cause respiratory irritation.
Skin Contact: May cause skin irritation.
Eye Contact: Causes eye irritation.
Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways.
Chronic Symptoms: Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.
Indication of Any Immediate Medical Attention and Special Treatment Needed
If symptoms occur, seek medical attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media
Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.
Unsuitable Extinguishing Media: Not available
Special Hazards Arising from the Substance or Mixture
Fire Hazard: In case of fire involving explosives: Evacuate area. DO NOT fight fires involving explosives. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information. Extreme risk of explosion from shock, friction, fire or other sources of ignition.
Explosion Hazard: Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.
Reactivity: Accelerates the rate of burning materials.
Advice for Firefighters
Precautionary Measures Fire: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Hazardous Combustion Products: Nitrogen oxides. Carbon oxides (CO, CO_2). Ammonia.
Other information: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up

For Containment: Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.

Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate State, Federal and local regulations.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Do not puncture or incinerate container.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from combustible materials, extremely high temperatures, direct sunlight, ignition sources, incompatible materials.

Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Fuels, diesel, no. 2 (68476-34-6)		
USA ACGIH	ACGIH TWA (mg/m³)	100 mg/m³
Alberta	OEL TWA (mg/m³)	100 mg/m³
British Columbia	OEL TWA (mg/m³)	100 mg/m³
Manitoba	OEL TWA (mg/m³)	100 mg/m³
Newfoundland & Labrador	OEL TWA (mg/m³)	100 mg/m³
Nova Scotia	OEL TWA (mg/m³)	100 mg/m³
Ontario	OEL TWA (mg/m³)	100 mg/m³
Prince Edward Island	OEL TWA (mg/m³)	100 mg/m³
Saskatchewan	OEL STEL (mg/m³)	150 mg/m³
Saskatchewan	OEL TWA (mg/m³)	100 mg/m³

Exposure Controls

Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment: Protective goggles. Gloves. Insufficient ventilation: wear respiratory protection. Protective clothing.

Materials for Protective Clothing: Chemically resistant materials and fabrics.

Hand Protection: Wear chemically resistant protective gloves.

Eye Protection: Chemical goggles or face shield.

Skin and Body Protection: Not available

Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.

Other Information: When using, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Appearance	: White, yellow or pink opaque viscous liquid.
Odor	: Slight fuel oil odor.
Odor Threshold	: Not available
pH	: Not available
Relative Evaporation Rate (butylacetate=1)	: < 1
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not available
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available
Upper Flammable Limit	: Not available
Vapor Pressure	: Not available
Relative Vapor Density at 20 °C	: Not available
Relative Density	: Not available
Specific Gravity	: 1.00 - 1.45 g/cc
Solubility	: Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	: Not available
Viscosity	: Not available
Explosion Data – Sensitivity to Mechanical Impact	: Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	: Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: Accelerates the rate of burning materials. Oxidizer. May react violently with strong acids, strong oxidizing and reducing agents.

Chemical Stability: May intensify fire; oxidizer. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

Hazardous Decomposition Products: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity: Harmful if swallowed.

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Contains an ingredient suspected of causing cancer.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: May be fatal if swallowed and enters airways.

Symptoms/Injuries After Inhalation: May cause respiratory irritation.

Symptoms/Injuries After Skin Contact: May cause skin irritation.

Symptoms/Injuries After Eye Contact: Causes eye irritation.

Symptoms/Injuries After Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

Chronic Symptoms: Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight
Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg
ATE CLP (oral)	1267.000 mg/kg body weight
Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/l/4h
Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Calcium nitrate (10124-37-5)	
LC50 Fish 1	10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Persistence and Degradability

Bulk Emulsion	
Persistence and Degradability	Not established.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential

Bulk Emulsion	
Bioaccumulative Potential	Not established.

Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Contact manufacturer for advice on proper disposal methods.
Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.
Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE Eor Agent blasting, Type E
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D

Packing Group : II
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

Safety Data Sheet

14.3 In Accordance with IATA

Proper Shipping Name	:	AGENT, BLASTING TYPE E
Identification Number	:	UN0332
Hazard Class	:	1
Label Codes	:	1.5D
ERG Code (IATA)	:	1L

14.4 In Accordance with TDG

Proper Shipping Name	:	EXPLOSIVE, BLASTING, TYPE E
Packing Group	:	II
Hazard Class	:	1.5D
Identification Number	:	UN0332
Label Codes	:	1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Bulk Emulsion

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Reactive hazard Delayed (chronic) health hazard Fire hazard

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List

Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

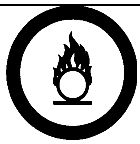
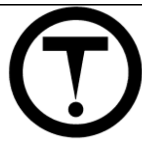
Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Bulk Emulsion

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Ammonium nitrate (6484-52-2)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Sodium nitrate (7631-99-4)	
Listed on the Canadian DSL (Domestic Substances List) inventory. Listed on the Canadian Ingredient Disclosure List	
WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
Calcium nitrate (10124-37-5)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
Fuels, diesel, no. 2 (68476-34-6)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
Listed on the Canadian DSL (Domestic Substances List) inventory.	
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.	

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 07/20/2020

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Expl. 1.5	Explosive Category 1.5
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Corr. 1A	Skin corrosion/irritation Category 1A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H320	Causes eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure

Party Responsible for the Preparation of This Document
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Dyno Nobel SDS

Senatel Powersplit

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision Date: 02/08/2017 Date of Issue: 06/15/2011 Supersedes Date: 11/12/2013 Version: 2.0

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: Senatel Powersplit

Product Code: 3020

Synonyms: Magnum Powersplit

Intended Use of the Product

A detonator sensitive emulsion explosive. For professional use only.

Name, Address, and Telephone of the Responsible Party

USA:
Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For SDS Requests: 1-855-26-ORICA (1-855-266-7422)
sds.na@orica.com

Canada:
Orica Canada Inc.
301 Rue Hotel-de-Ville
Brownsburg-Chatham, QC
J8G 3B5
For SDS Requests:
1-855-26-ORICA (1-855-266-7422)
sds.na@orica.com
www.oricaminingservices.com

Emergency Telephone Number

Emergency Number : **Canada:** 1-877-561-3636 (Orica Transportation Emergency Response)
USA: 1-800-424-9300 (CHEMTREC)

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

GHS-US/CA Classification

The explosive classification below only applies to US 29 CFR 1910.1200 (HCS/HazCom 2012). The explosive classification is excluded from Canada Hazardous Products Regulations (HPR, SOR/2015-17), it is regulated under the Canada Explosives Act (R.S.C., 1985, c. E-17).

Explosives, Division 1.1	H201
Ox. Liq. 3	H272
Acute Tox. 4 (Oral)	H302
Eye Irrit. 2A	H319
Carc. 1B	H350
STOT RE 2	H373
Aquatic Acute 3	H402
Aquatic Chronic 3	H412

Full text of hazard classes and H-statements : see section 16

Label Elements

GHS-US/CA Labeling

Any labeling elements (pictograms, signal word, hazard, and precautionary statements) related to explosive classifications apply to the OSHA Hazard Communication Standard (HCS, 29 CFR 1910.1200) only and are excluded from Canada's Hazardous Products Regulations (HPR, SOR/2015-17).

Hazard Pictograms (GHS-US/CA) :

GHS01 GHS03 GHS07 GHS08

Signal Word (GHS-US/CA) : Danger

Hazard Statements (GHS-US/CA) : H201 - Explosive; mass explosion hazard.
H272 - May intensify fire; oxidizer.
H302 - Harmful if swallowed.
H319 - Causes serious eye irritation.
H350 - May cause cancer.
H373 - May cause damage to organs through prolonged or repeated exposure.
H402 - Harmful to aquatic life.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary Statements (GHS-US/CA) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P220 - Keep away from clothing and other combustible materials.
P260 - Do not breathe fumes, vapors, mist, or spray.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, and eye protection.
P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313 - If exposed or concerned: Get medical advice/attention.
P314 - Get medical advice/attention if you feel unwell.
P330 - Rinse mouth.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.
P240 - Ground/bond container and receiving equipment.
P250 - Do not subject to friction, grinding, shock.
P370+P380 - In case of fire: Evacuate area.
P372 - Explosion risk in case of fire.
P373 - DO NOT fight fire when fire reaches explosives.
P401 - Store in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.

Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions. Overexposure may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia.

Unknown Acute Toxicity (GHS-US/CA)

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	% *
Ammonium nitrate	(CAS No) 6484-52-2	70 - 80

Sodium nitrate	(CAS No) 7631-99-4	7 - 13
Sodium perchlorate	(CAS No) 7601-89-0	5 - 10
Petroleum	(CAS No) 8002-05-9	3 - 7
Pentaerythrite tetranitrate	(CAS No) 78-11-5	0.5 - 2

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

SECTION 4: FIRST AID MEASURES

Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Causes serious eye irritation. Harmful if swallowed. There are potential chronic health effects to consider. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.

Inhalation: Prolonged exposure may cause irritation.

Skin Contact: Prolonged exposure may cause skin irritation.

Eye Contact: Contact causes severe irritation with redness and swelling of the conjunctiva.

Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts.

Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable Extinguishing Media: DO NOT fight fires involving explosives.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Explosive, could cause fire and secondary explosions. May intensify fire; oxidizer.

Explosion Hazard: Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously). Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Reactivity: Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire. This product is an explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO_2), hydrocarbons, nitrogen oxides. At temperatures above 210 °C (410 °F), decomposition may be explosive, especially if confined.

Other Information: Do not allow run-off from fire fighting to enter drains or water courses.

Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Keep away from heat, sparks, open flames, hot surfaces. – No smoking. Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray. Evacuate danger area. Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking. Keep away from combustible material. Avoid all contact with skin, eyes, or clothing.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel. Evacuate danger area.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area. Eliminate ignition sources.

Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up

For Containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Absorb and contain with inert material. Place contents in suitable container for disposal. Use only non-sparking tools.

Methods for Cleaning Up: Use only non-sparking tools. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Absorb and/or contain spill with inert material, then place in suitable container. Do not take up in combustible material such as: saw dust or cellulosic material.

Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: May cause or intensify fire; oxidizer.

Precautions for Safe Handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Keep away from sources of ignition - No smoking. Keep away from extremely high or low temperatures, ignition sources, and incompatible materials. - No smoking. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing. Do not handle until all safety precautions have been read and understood. Do not breathe fumes, vapors, mist, spray. Avoid contact with skin, eyes and clothing.

Hygiene Measures: This product is an explosive and should only be used under the supervision of trained and licensed personnel. Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations. Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment.

Storage Conditions: Store under moderate temperatures recommended by competent authority. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Isolate from incompatibles. . Keep/Store away from combustible materials, organic material, ignition sources, incompatible materials. Keep in fireproof place.

Incompatible Materials: Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Special Rules on Packaging: Keep only in the original container.

Specific End Use(s)

A detonator sensitive emulsion explosive. For professional use only.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

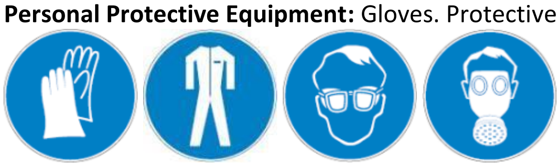
For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Petroleum (8002-05-9)		
USA OSHA	OSHA PEL (TWA) (mg/m³)	2000 mg/m³
USA OSHA	OSHA PEL (TWA) (ppm)	500 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m³)	350 mg/m³
USA NIOSH	NIOSH REL (ceiling) (mg/m³)	1800 mg/m³ (15 min)
USA IDLH	US IDLH (ppm)	1100 ppm (10% LEL)

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. Proper grounding procedures to avoid static electricity should be followed. Product to be handled in a closed system and under strictly controlled conditions. Use explosion-proof equipment. Gas detectors should be used when flammable gases or vapors may be released.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



Materials for Protective Clothing: Chemically resistant materials and fabrics. Wear fire/flame resistant/retardant clothing.

Hand Protection: Wear protective gloves.

Eye Protection: Chemical safety goggles.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink or smoke

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Viscous. String of plastic wrapped material traced internally with detonating cord. If the outer plastic is perforated, the exposed product appears putty-like.
Odor	:	Odorless
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Detonating Cord 70 °C (158 °F) / Ammonium Nitrate 210 °C (410 °F)
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available

Upper Flammable Limit	:	Not available
Vapor Pressure	:	0 mm Hg @ 20 °C (68 °F)
Relative Vapor Density at 20°C	:	Not available
Relative Density	:	1.2 - 1.3
Density	:	1.2 - 1.3 g/cc
Specific Gravity	:	1.2 - 1.3
Solubility	:	Slightly soluble in standard organic solvents. Insoluble in water.
Partition Coefficient: N-Octanol/Water	:	Not available
Viscosity	:	Not available
Explosive Properties	:	Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously)

SECTION 10: STABILITY AND REACTIVITY

Reactivity: Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

Chemical Stability: Extreme risk of explosion by shock, friction, fire or other sources of ignition. May intensify fire; oxidizer.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Keep away from open flames, hot surfaces and sources of ignition. Incompatible materials. Direct sunlight, extremely high or low temperatures, ignition sources, combustible materials, incompatible materials.

Incompatible Materials: Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous Decomposition Products: None expected under normal conditions of use.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity (Oral): Oral: Harmful if swallowed.
Acute Toxicity (Dermal): Not classified
Acute Toxicity (Inhalation): Not classified
LD50 and LC50 Data:

Senatel Powersplit	
ATE US/CA (oral)	1,733.41 mg/kg body weight

Skin Corrosion/Irritation: Not classified

Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: May cause cancer.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Prolonged exposure may cause irritation.
Symptoms/Injuries After Skin Contact: Prolonged exposure may cause skin irritation.
Symptoms/Injuries After Eye Contact: Contact causes severe irritation with redness and swelling of the conjunctiva.
Symptoms/Injuries After Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts.
Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg

LC50 Inhalation Rat	> 88.8 mg/l/4h

Petroleum (8002-05-9)	
LD50 Oral Rat	> 4300 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg
LC50 Inhalation Rat	2.18 mg/l/4h

Sodium nitrate (7631-99-4)	
LD50 Oral Rat	> 2000 mg/kg

Sodium perchlorate (7601-89-0)	
LD50 Oral Rat	2100 mg/kg
ATE US/CA (oral)	500.00 mg/kg body weight

Pentaerythrite tetranitrate (78-11-5)	
LD50 Oral Rat	1660 mg/kg

Petroleum (8002-05-9)	
IARC Group	3

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Ecology - General: Harmful to aquatic life with long lasting effects.

Ammonium nitrate (6484-52-2)	
LC50 Fish 1	542 mg/l
EC50 Daphnia 1	555 mg/l

Petroleum (8002-05-9)	
LC50 Fish 1	< 7.1 mg/l (Species: Pimephales promelas, Exposure time 96 h)
LC50 Other Aquatic Organisms 1	2.7 mg/l LL50 96 hr (Kelp forest mysid shrimp)
EC50 Daphnia 1	6.9 mg/l (Exposure time: 48 h)

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Persistence and Degradability

Senatel Powersplit	
Persistence and Degradability	May cause long-term adverse effects in the environment.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	Readily biodegradable in water.

Bioaccumulative Potential

Senatel Powersplit	
Bioaccumulative Potential	Not established.

Ammonium nitrate (6484-52-2)	
BCF Fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil

Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment. This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

Packing Group : II
ERG Number : 112

In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-X
MFAG Number : 112

In Accordance with IATA

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Identification Number : 1.1D
Hazard Class : UN0241
ERG Code (IATA) : 1L

In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Hazard Class : 1.1D
Identification Number : UN0241
Label Codes : 1.1D

Packing Group : II

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Senatel Powersplit	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard Fire hazard Immediate (acute) health hazard Delayed (chronic) health hazard

Ammonium nitrate (6484-52-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Petroleum (8002-05-9)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium perchlorate (7601-89-0)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Pentaerythrite tetranitrate (78-11-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA

US State Regulations

Ammonium nitrate (6484-52-2)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Petroleum (8002-05-9)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium nitrate (7631-99-4)
U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List

Sodium perchlorate (7601-89-0)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Pentaerythrite tetranitrate (78-11-5)
U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Ammonium nitrate (6484-52-2)
Listed on the Canadian DSL (Domestic Substances List)

Petroleum (8002-05-9)
Listed on the Canadian DSL (Domestic Substances List)

Sodium nitrate (7631-99-4)
Listed on the Canadian DSL (Domestic Substances List)

Sodium perchlorate (7601-89-0)
Listed on the Canadian DSL (Domestic Substances List)

Pentaerythrite tetranitrate (78-11-5)
Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision Date : 02/08/2017

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR).

GHS Full Text Phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Carc. 1B	Carcinogenicity Category 1B
Expl. 1.1	Explosive Category 1.1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Ox. Liq. 3	Oxidizing liquids Category 3
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H201	Explosive; mass explosion hazard
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H319	Causes serious eye irritation

H350	May cause cancer
H373	May cause damage to organs through prolonged or repeated exposure
H402	Harmful to aquatic life
H412	Harmful to aquatic life with long lasting effects

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NA GHS SDS 2015 (Can, US)

APPENDIX 5

EMULSION PLAN / BLAST AREA INSPECTION SHEET

Environmental Inspection Report for the Emulsion Plant Area and the Loading of Blast Holes

Date:
Time:
Location: Emulsion Plant

Inspected By:

Weekly Inspection

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part B Item 10	Sign posted to inform of a waste disposal facility				
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills?				
NWB Part F Item 10	All Hazardous Waste disposal is located 30m from the ordinary high water mark.				
NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided.				
NWB Part I Item 7	Monitoring signs are posted in English, French, and Inuktitut.				
MBK SCP	Spill Kits Present				
MBK NIRB Condition 26	Ensure that spills, if any, are cleaned up immediately and that the site is kept clean of debris, including wind-blown debris.				
MBK NIRB Condition 25	Management and control waste in a manner that reduces or eliminates the attraction to carnivores and/or raptors.				

MBK NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				
Hazardous Management Plan	Are storage containers clearly labelled to identify Hazardous substance?				
Ammonia Management Plan	Are storage containers in good condition? Is there any visible damage or leaks? Can the doors be sealed shut?				
Ammonia Management Plan	Where necessary – Are containers with product stored in an upright position?				
Ammonia Management Plan	Do you see any potential environmental hazards posed by these HAZARDOUS containers/materials?				
BMP	Are there any additional environmental hazards/potential impacts that require attention?				
MINE ACT	Are there any Health and Safety issues that should be addressed to prevent injury to workers?				

Pit Location: **Blast Pattern:**

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills, including emulsion?				
Ammonia Management Plan	Is there presence of Emulsion outside of the holes that are being loaded?				
NWB Part F Item 10	All Hazardous Waste disposals are located 30m from the ordinary high water mark.				

NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided?				
MBK NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				

Comments/Recommendations:

Environmental Personnel Name:

Actions Corrected: None

____

____

____

____

____

Dyno Nobel Supervisor Name: ____________________________________

Signature: ____________________________________

APPENDIX F – TDS-SITE-SPECIFIC WATER QUALITY PROGRAM TECHNICAL MEMORANDUM

TECHNICAL MEMORANDUM

DATE February 20, 2025 **Reference No.** CA0031499.3639-MBK2024_020-TM-Rev2

TO Lisa Ramilo, Permitting Lead Water & Waste
Agnico Eagle Mines Limited

CC Sarah Crabbe

FROM Chelsea Grimard; Connor Pettem; Gary Lawrence **EMAIL chelsea.grimard@wsp.com**

SITE SPECIFIC BENCHMARKS FOR TOTAL DISSOLVED SOLIDS IN SUPPORT OF WATER LICENSE SUBMISSION AND FINAL CLOSURE AND RECLAMATION PLAN FOR MEADOWBANK MINE COMPLEX

1.0 INTRODUCTION

This technical memorandum presents the proposed benchmark for total dissolved solids (TDS) for application to future discharge conditions at Meadowbank Mine Complex (the Mine) located in the Kivalliq Region of Nunavut. The benchmark was derived to support the Human Health and Ecological Risk Assessment under the Final Closure and Reclamation Plan (FCRP) for the Mine and to support a Water License amendment.

TDS was identified as both an acute and chronic constituent of concern for benchmark[1] development under:

- Meadowbank Mine Type A Water License 2AMMEA1530 per Items 7[2] and 9[3].
- Human Health and Ecological Risk Assessment, in the absence of a promulgated water quality guideline for screening of TDS.

Within this document, two types of site-specific benchmarks for TDS were developed:

- Acute Toxicity Effluent Quality Criterion (EQC)—to apply at the end-of-pipe at the point of discharge for treated effluent, as a mitigation against acute toxicity of TDS.
- Site-Specific Water Quality Objective (SSWQO)—to apply at the edge of the mixing zone in the receiving environment, as a mitigation against chronic toxicity of TDS.

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[1] The term benchmark is used in this document as a general term for science-based numerical values for water quality screening, including effluent quality criteria and site-specific water quality objectives; benchmarks are intended to support water management, are candidate values for regulatory consideration for both Water License approvals, and are recommended for use in initial screening of water quality predictions.

[2] The Licensee shall submit a Water Management Plan on an annual basis to the Board for review following the commencement of Operations. The Plan must include an updated Water Balance. The Water Management Plan shall include an action plan to be implemented if predicted re-flooded pit water quality indicates that treatment is necessary. The Licensee shall not breach dikes until the water quality in the re flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives. Subject to the Board approval, if water quality parameters are above CCME Guidelines, a site-specific risk assessment must be conducted to identify water quality objectives that are protective of the aquatic environment.

[3] The Licensee shall, on an annual basis during Operations and Closure, compare the predicted water quantity and quality within the pits to the measured water quantity and quality. Should the difference between the predicted and measured values be 20% or greater, then the cause(s) of the difference(s) shall be identified, and the implications of the difference shall be assessed and reported to the Board.

The acute toxicity EQC and SSWQO collectively satisfy the Type A Water License requirement that a site-specific risk assessment must be conducted to identify water quality objectives that are protective of the aquatic environment. The guiding principles for developing benchmarks are that they should be developed to be protective of the environment, satisfy regulatory requirements, be based on science (rather than strictly on considerations of policy or precedent), and be customized to the site-specific conditions of water quality and quantity. Adoption of fixed numerical benchmarks across sites or for all water compositions, either as static effluent limits or generic water quality guidelines, is unlikely to satisfy some parts of the guiding principle. Site-specific benchmarks can, however, be developed using a toxicity-based approach that satisfies all the above conditions.

The development of site-specific benchmarks has three main components for acceptability as stipulated in the Water License (Part F, Item 6):

- no acute toxicity at the point of discharge
- no unacceptable chronic toxicity at the edge of the mixing zone
- suitable assimilation capacity in the receiving environment

Rather than rely on uncertain generic numerical values for TDS, site-specific benchmarks were developed to manage TDS in the effluent and receiving environment (to apply at the edge of the mixing zone) that meet the above conditions through incorporation of site-specific exposure conditions and confirmation through site-specific toxicity testing. Evaluation of assimilative capacity in the receiving environment resulted in a proposed maximum average concentrations (MAC) EQC and maximum grab concentrations (MGC) EQC for Wally Lake of 1,608 and 3,217 mg/L, respectively (Appendix A, Assimilative Capacity Report, WSP 2025). A potential range for the acute toxicity EQC is presented herein and incorporates consideration of both the site-specific benchmarks and the mixing and assimilation properties of the effluent in the receiving environment.

This memo presents a summary of the methods (Section 2.0, results (Section 3.0), and conclusions (Section 4.0) for the proposed TDS benchmarks for acute (EQC) and chronic (SSWQO) toxicity. Supplementary desktop-based literature and site-specific information are presented in Attachment 1, and site-specific toxicological study methodology and results are presented in Attachment 2.

2.0 METHODS

Literature and site-specific toxicity data were compiled, evaluated, and used to derive proposed benchmarks for effluent at the end-of-pipe (acute toxicity EQC) and at the edge of the mixing zone within the receiving environment (SSWQO). Detailed methods and results are provided for the desktop-based supplementary information (including literature reviews of TDS toxicity) in Attachment 1 and technical findings of the site-specific toxicity testing are provided in Attachment 2. The literature and site-specific data were considered as complementary lines of evidence in deriving proposed benchmarks, using the following steps:

1) Characterization of the TDS composition in effluent and in the receiving environment under future effluent discharge conditions. The ionic composition has relevance to toxic potency and was evaluated based on water quality characteristics for modelled and measured pit chemistry and draft modelled effluent chemistry (Attachment 1, Section 1-2).

2) Compilation of acute and chronic thresholds for TDS toxicity to sensitive, site-relevant aquatic test species using endpoint responses obtained from the literature; test results were screened for relevance to exposure conditions (e.g., balance of ions, sulphate proportion, hardness) reflective of Meadowbank Mine (Attachment 1, Sections 1-3 and 1-4).

3) Compilation of TDS acute toxicity EQC and SSWQO values derived for other northern mines sites that have a similar TDS composition to Meadowbank Mine (Attachment 1, Sections 1-3 and 1-4).

4) Evaluation of site-specific toxicity of TDS for controlled studies in the laboratory using samples prepared to simulate future exposure conditions specific to Meadowbank Mine conditions. Toxicological studies to support development of the proposed benchmarks were undertaken to validate literature-based data (Table 1 Attachment 2). The objectives of the site-specific toxicological studies were to:

    a. Evaluate the acute toxicity of synthesized site effluent blends of TDS to the acute regulatory test species *Daphnia magna* (48-hr exposure) and Rainbow Trout (*Oncorhynchus mykiss*; 96-hr exposure). These test species provide data consistent with Metal and Diamond Mining Effluent Regulations (MDMER) used routinely to regulate the deposit of effluent from metal and diamond mines into water frequented by fish under subsection 36(3) of the *Fisheries Act*.

    b. Evaluate the chronic toxicity of TDS, under future exposure conditions simulating the edge of the mixing zone during effluent discharge, using a battery of sensitive, surrogate laboratory test species: the water flea *Ceriodaphnia dubia*, an algae *Raphidocelis subcapitata*, and early life stage *Pimephales promelas* (Fathead Minnow). These species were identified to be reliable, relevant, and sensitive indicators of chronic toxicity from TDS to freshwater aquatic species.

Table 1: Overview of Toxicity Testing Programs for Total Dissolved Solids

Toxicity Testing Program	Dilution Water	Laboratory Toxicity Test				
		Daphnia magna **Survival Test (48-h)**	**Rainbow Trout Survival Test (96-h)**	***Raphidocelis subcapitata*** **Growth (72-h)**	***Ceriodaphnia dubia*** **Survival and Reproduction (7 to 8-d)**	**Fathead Minnow Survival, Development, and Growth (32-d)**
Acute TDS	Pit E cryo-concentrated water	☑	☑	—	—	—
Chronic TDS	Site-collected water	—	—	☑	☑	—
	Synthetic laboratory water	—	—	—	—	☑

Notes: TDS = total dissolved solids; ☑ = toxicity test performed; — = not tested or not applicable.

The information gathered from the site-specific toxicity program was integrated with literature data for comparable TDS mixtures to establish proposed benchmarks that are protective of aquatic life under acute (EQC) and chronic (SSWQO) exposure conditions. Site-specific data were used as the primary line of evidence to establish the benchmarks, with supplementary literature data providing additional evidence to evaluate concurrence or divergence in toxicity benchmarks for TDS under comparable exposure scenarios.

3.0 RESULTS

3.1 Proposed Acute Toxicity Effluent Quality Criteria Range

The proposed acute toxicity EQC for TDS at Meadowbank Mine ranges from 4,000 to ~10,293 mg/L (as calculated TDS[4]). Evaluation of assimilative capacity in the receiving environment resulted in a proposed MAC EQC and MGC EQC for Wally Lake of 1,608 and 3,217 mg/L, respectively (Appendix A, Assimilative Capacity Report, WSP 2025). The lines of evidence presented below collectively provide high confidence that no acute lethality is expected at the point of discharge at TDS concentrations below 4,000 mg/L. Given the conservatism of the assessment, the results could support an extension of the proposed acute toxicity EQC above 4,000 mg/L, providing assimilative capacity conditions are met. However, at this stage, the lower end of the proposed range has been advanced as the proposed benchmark, providing a margin of safety for management. The evidence in support of a confident determination of no acute toxicity comes from the following sources:

- Information from other mine sites with comparable TDS mixtures indicated no acute toxicity (i.e., 100% survival) at maximum evaluated TDS concentrations of ~4,000 mg/L.
  - At Faro Mine site, no acute toxicity to *D. magna* and Rainbow Trout was observed with maximum tested calculated TDS ranging from 3,870 to 3,960 mg/L for calcium-sulphate dominant TDS mixtures (Attachment 1, Section 1-3).
  - At Meliadine Mine site, no acute toxicity to the cladoceran *Ceriodaphnia dubia* was observed (LC_{50} >4,250 mg/L TDS) with exposure to a sodium-sulphate-chloride dominant TDS mixture (Attachment 1, Section 1-3). The *C. dubia* survival endpoint is not routinely applied as a measure of acute toxicity under effluent discharge regulations, as it is a chronic test and more sensitive than the standard tests used to evaluate acute toxicity in undiluted effluent (i.e., Rainbow Trout and *D. magna*). As such, confirmation of an LC_{50} for *C. dubia* for a TDS mixture broadly comparable to Meadowbank Mine, and for a sensitive aquatic species, provides an additional line of evidence indicating that no acute toxicity is expected at calculated TDS concentrations of ~4,000 mg/L.
- Site-specific acute toxicity data indicated no acute lethality[5] to regulatory test species *D. magna* and Rainbow Trout at calculated TDS concentrations ranging from 2,382 up to 4,050 mg/L (measured TDS of 2,480 to 4,000 mg/L), with exposure to Pit E water collected from Meadowbank Mine. These findings have been validated over eight rounds of testing. Pit E water is predicted to have the highest TDS concentrations on average relative to the other pits (Attachment 1; Section 1-3).
- Acute toxicity data from the site-specific toxicological study indicated no acute lethality to *D. magna* and Rainbow Trout exposed to cryo-concentrated Pit E waters (sodium-sulphate dominant) with calculated TDS concentrations ranging from 4,577 to 10,293 mg/L (measured TDS of 4,590 to 10,100 mg/L). Minor immobility effects (12% to 20% immobility) were observed in the *D. magna* tests with calculated TDS >8,836 mg/L (measured TDS of >8,710 mg/L), but this response did not reach the threshold of a 50% effect level (Attachment 2).

[4] TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 × nitrate as N; APHA 2012).

[5] Acute lethality is defined as more than 50% mortality in a test population during exposure over a defined period (e.g., 48 hours for *D. magna* and 96 hours for Rainbow Trout).

3.2 Chronic Site-Specific Water Quality Objectives

3.2.1 Literature Data Compilation

The detailed literature review is presented in Attachment 1 (Section 1-4), and a summary of key findings is as follows:

- There are no federal, provincial, and territorial water quality guidelines for TDS in Canada. However, several other sites have developed chronic benchmarks applicable for Meadowbank (i.e., sulphate-dominant TDS mixtures); these benchmarks range from 500 mg/L to 1,500 mg/L calculated TDS.
- Effect concentrations for sensitive, aquatic receptors (phytoplankton, benthic invertebrates and zooplankton, and fish) from the literature for comparable TDS mixtures (sulphate-dominant) were generally above 1,000 mg/L as calculated TDS.

3.2.2 Site-Specific Chronic Toxicity Testing

The detailed methods and results of the site-specific chronic TDS toxicity test program are presented in Attachment 2, and a summary of key findings is as follows:

- Overall, the magnitude of effect to the tested species observed was negligible (*R. subcapitata*) or small in magnitude (*C. dubia* and Fathead Minnow) across a wide range of tested concentrations (i.e., exceeding 2,000 mg/L calculated TDS for all three test species).
- No statistically significant reduction in *R. subcapitata* growth was observed with exposure to calculated TDS concentrations up to 2,217 mg/L (unbounded no observable effect concentration; NOEC).
- No statistically significant reduction in *C. dubia* survival was observed with exposure to calculated TDS concentrations up to 2,226 mg/L (unbounded NOEC). A statistically significant reduction in *C. dubia* reproduction was observed in the 2,296 mg/L calculated TDS treatments, with a NOEC of 1,745 mg/L calculated TDS and LOEC of 1,745 mg/L calculated TDS. The IC_{10} estimate was 976 mg/L calculated TDS and the IC_{20} estimate was 1,354 mg/L calculated TDS, which aligns with expectations based on the review of literature data (i.e., negligible chronic toxicity at concentrations ≤1,000 mg/L calculated TDS; Section 3.2.1).
- No statistically significant reduction in Fathead Minnow overall and post-hatch survival, proportion normal, hatch rate, and length was observed with exposure to calculated TDS concentrations up to 2,211 mg/L (unbounded NOEC). A low-level statistically significant reduction in Fathead Minnow dry weight was observed in the 600 to 2,211 mg/L calculated TDS treatments, with a NOEC of 487 mg/L calculated TDS and LOEC of 600 mg/L calculated TDS for the dry weight endpoint. However, a concentration-response model could not be fit to the dry weight data and the effect sizes for dry weight in these treatments were small (equal to or less than 10%). The concentration-response pattern was also considered atypical as there was no apparent trend to the reductions, indicating the reduction in dry weight may be (in part) driven by a factor other than TDS. As such, the NOEC for dry weight is not suitable for choice of the "most appropriate EC_X/IC_X representing a no-effects threshold" per CCME (2007) guidance.

3.2.3 Species Sensitivity Distribution

A species sensitivity distribution (SSD) for chronic TDS toxicity was derived using CCME (2007) guidance. The detailed SSD is presented in Attachment 1 (Section 1-5), and a summary of key findings is as follows:

- Chronic toxicity data for 11 species were retained for an SSD: three fish, three non-insect invertebrates, three freshwater bivalves, one aquatic insect, and one alga. The minimum dataset requirements were satisfied for the derivation of a Type A SSD derivation for freshwater environments as defined by CCME (2007).
- Following CCME (2007) guidance, the resulting hazardous concentration to 5% of the tested species (HC_5) for TDS was 979 mg/L. The HC_5 is just below the proposed SSWQO for TDS of 1,000 mg/L (as calculated TDS) with confidence limits overlapping 1,000 mg/L TDS (752 to 1,297 mg/L TDS). The HC_5 value and is driven by a site-specific IC_{10} of 976 mg/L calculated TDS for *C. dubia*, followed by a conservatively derived site-specific NOEC geomean of 1,038 mg/L calculated TDS for Fathead Minnow. These values are highly conservative and have moderate uncertainty regarding their relevance for TDS toxicity (Attachment 2). As discussed above, site-specific testing for these species generally indicates negligible chronic toxicity at concentrations ≤1,000 mg/L calculated TDS.
- A bounding analysis was conducted to investigate the implications the uncertainty in the *C. dubia* and Fathead Minnow effect concentrations have on the HC_5 where the *C. dubia* reproduction IC_{10} was replaced with the IC_{20} of 1,354 mg/L calculated TDS and the Fathead Minnow dry weight NOEC was replaced with the length NOEC[6] of >2,211 mg/L calculated TDS. The resulting HC_5 for TDS was 1,220 mg/L with confidence limits above 1,000 mg/L TDS (1,038 to 1,462 mg/L TDS).

3.2.4 Proposed Chronic Site-Specific Water Quality Objective

A proposed SSWQO for TDS of 1,000 mg/L (as calculated TDS) to apply in the receiving environment of Third Portage Lake (North Basin) or Wally Lake at the edge of the mixing zone[7] is proposed for protection against chronic toxicity to representative aquatic species.

The proposed SSWQO of 1,000 mg/L is supported by the following considerations:

- Favourable ionic balance— Effect concentrations reported in the compiled dataset were derived from exposures using a balanced TDS mixture; the later has been demonstrated to be favourable for preventing aquatic toxicity relative to mixtures dominated by a single ion. Meadowbank Mine TDS during treated effluent discharge is expected to contain primarily calcium and sodium cations; these dominant ions are among the least toxic according to Mount et al. (1997) and have been identified as key components of TDS that ameliorate toxicity of other ions (Mount et al. 2016; Mount et al. 2019). The information from the ionic composition analysis and comparison to the TDS toxicity dataset for comparable mixtures (Attachment 1; Section 1-2) suggests that the Meadowbank Mine TDS mixture would not exhibit chronic toxicity from TDS components at concentrations of TDS below approximately 1,000 mg/L.

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[6] No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, and hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

[7] The mixing zones for Third Portage Lake and Wally Lake were as defined in WSP (2023a,b).

- Comparability to validated benchmarks at other sites and the literature—Effect concentrations derived from validation of site-specific benchmarks at other mine sites and reported in the literature generally indicate negligible chronic effects to surrogate species at TDS concentrations below 1,000 mg/L for comparable mixtures (Attachment 1; Section 1-4). Meadowbank Mine TDS ionic composition broadly resembles the ionic composition evaluated during the validation of site-specific TDS/sulphate benchmarks for these comparable sites; the latter have been assigned TDS limits of ~1,000 mg/L (or benchmarks for sulphate with corresponding TDS of ~1,000 mg/L).

- Site-specific toxicity study with negligible chronic toxicity—Effect concentrations for *R. subcapitata*, *C. dubia,* and Fathead Minnow (sensitive algae, invertebrate, and fish species) from the site-specific chronic TDS study (Attachment 2) were generally similar to, or higher, than the chronic benchmarks from other sites that are applicable for Meadowbank Mine. The effect concentrations were also higher than the corresponding effect concentrations reported in the literature for phytoplankton. This provides site-specific validation that the Meadowbank mixtures are not more toxicity than other mixtures used to support assigned TDS limits of ~1,000 mg/L.

- Conservatism of test endpoints—Effect concentrations for *C. dubia* (sensitive invertebrate) tend to be among the lowest (i.e., most sensitive) chronic benchmark values from standardized testing of TDS exposures to freshwater aquatic life. Mount et al. (2019) have used this species and endpoint as a model species for the evaluation of chronic toxicity to mixtures of ions in chronic exposures, and Teck Coal Ltd. (2014) has based environmental effects concentrations for sulphate (in a similar mine-related ionic composition) on *C. dubia* reproduction.

- Species sensitivity distribution—The proposed TDS SSWQO of 1,000 mg/L (as calculated TDS) is between the conservatively-derived HC_5 of 979 mg/L TDS following CCME (2007) protocol and the HC_5 of 1,220 mg/L TDS derived using the bounding analysis (Attachment 1, Section 1-5). The HC_5 of 979 mg/L TDS derived following the CCME (2007) protocol is just below the proposed TDS SSWQO. However, all effect concentrations for species used in the SSD are above the HC_5 of 979 mg/L TDS, except the IC_{10} (976 mg/L calculated TDS) for *C. dubia*, which is approximately equal to the HC_5. Site-specific toxicity testing with *C. dubia* indicated that meaningful chronic toxicity does not occur until much higher concentrations of calculated TDS are reached (IC_{20} = 1,354 mg/L calculated TDS).

The proposed TDS SSWQO relies on the following assumption:

- Ionic composition will reflect the composition estimated based on current modelling and measured chemistry data available at the time of this review; it is further assumed the composition will remain relatively stable over time. The benchmark was derived from the anticipated ionic composition for Meadowbank Mine based on monitoring data in the receiving environment and a conservative (upper bound) modelling scenario for effluent. Modelling data are subject to change pending revisions to the mine management plan, requiring confirmation that ionic mixtures will remain consistent in terms of proportions of major ions. If future effluent quality with respect to TDS constituents is markedly different, then re-evaluation of the dataset underlying the proposed TDS benchmark may be warranted.

4.0 CONCLUSION

The review completed herein provides an indication of the proposed ranges of benchmarks for TDS, including the acute toxicity EQC (4,000 to 10,293 mg/L; calculated) and SSWQO (1,000 mg/L; calculated). We trust the information provided in this report is sufficient for your present needs. Should you have any questions regarding this report or require additional information, please do not hesitate to contact the undersigned.

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ATTACHMENT 1

Supplementary Information to Support Proposed Total Dissolved Solids Site-Specific Water Quality Objectives

This attachment presents the supporting technical information for derivations of proposed benchmarks for total dissolved solids (TDS), including for the effluent at the end-of-pipe (acute toxicity EQC; Section 3.1 of the main report) and at the edge of the mixing zone (SSWQO; Section 3.2 of the main report).

1-1.0 CHARACTERISTICS OF TDS

1-1.1 Definition

The TDS parameter is defined as the sum of the concentrations of all common dissolved ions in freshwaters (e.g., sodium [Na^+], calcium [Ca^{2+}], magnesium [Mg^+], potassium [K^+], sulphate [SO_4^{2-}], bicarbonate [HCO^{3-}], chloride [Cl^-], nitrate [NO^{3-}], fluoride [F^-], and silicate [SiO_3^{2-}]), and is essentially an expression of salinity. TDS can be calculated using the following equation (APHA 2005):

$$TDS_{calculated\ (mg/L)} = \sum[Na^+, K^+, Ca^{2+}, Mg^{2+}, Cl^-, F^-, SO_4^{2-}, SiO_3^{2-}, 4.42 \times NO_3^-\ (as\ N), 0.6\ \times\ total\ alkalinity\ (as\ CaCO_3)]$$

Concentrations of TDS may also be measured gravimetrically by analytical laboratories (i.e., measured TDS). However, calculated TDS is used herein as the primary basis for derivation of targets for TDS and screening because:

- Laboratory interference can reduce the accuracy of measured TDS (Evaristo-Cordero 2011). In particular, waters with high calcium, magnesium, and chloride concentrations can form hydroscopic residues that absorb water under normal laboratory conditions, potentially biasing the measured TDS higher than actual concentrations (APHA 2005; Evaristo-Cordero 2011). In contrast, calculated TDS is based on the major ions that can measurably contribute to TDS and is therefore not influenced by any changes that may occur from those ions being taken out of solution.
- Calculated TDS incorporates explicit consideration of the ionic composition, which is important for evaluating the toxicity of the TDS mixture (as discussed below).

1-1.2 General Fate and Effects

Dissolved solids occur naturally in water, with the composition and concentration of individual ion constituents varying by location based on natural factors, such as the geology and soil in the watershed, atmospheric precipitation, and the water balance (evaporation-precipitation) (Weber-Scannell and Duffy 2007). Anthropogenic activities can alter the concentration of TDS in the aquatic environment, with effluent from mining or industrial treatment of water identified as common sources of elevated TDS (Soucek 2007; Weber-Scannell and Duffy 2007). Differences in the ratios of calcium to magnesium (Ca:Mg) or relative contribution of sulphate or chloride to the total TDS concentration are common indicators of anthropogenic influence. A review of the literature indicates that when accounting for toxicity for TDS the following observations apply as summarized by Chapman and McPherson (2015):

- TDS toxicity is lower with the presence of more than one cation (i.e., balanced mixtures tend to be less toxic relative to individual ions in isolation).
- Hardness may ameliorate TDS toxicity and the toxicity of individual ions (e.g., chloride and sulphate).
- The relative ratios of ions within the TDS mixture may affect TDS toxicity (e.g., Ca^{2+}:Mg^{2+}).

More recent research by Mount et al. (2016) supports the conclusions by Chapman and McPherson (2015). Following extensive toxicity testing exposing *C. dubia* to different salt mixtures, Mount et al. (2016) concluded that inferring toxicity from individual ions is difficult due in part to interdependence among ions. Buchwalter (2013) concluded that TDS toxicity is complicated by the findings that:

- individual ions vary in toxicity
- some ions in solution can modify the toxicity of other ions
- relative toxicities of ions are not consistent across species

The results from Mount et al. (2016) also support the conclusion that toxicity of TDS mixtures varies by ionic composition, and that the characteristics of the TDS mixture influence the toxicity of other ions in the mixture.

1-2.0 SITE-SPECIFIC TDS COMPOSITION

The following general attributes are anticipated to influence toxicity of TDS for the site-specific mixture:

- **Balance of ions**—the predicted concentrations of ions of the TDS mixture were estimated using several datasets:
    - For treated effluent (at end-of-pipe) under a high TDS concentration[1], the composition of major ions was predicted to be dominated by sulphate (49%), chloride (16%), calcium (10%), sodium (10%), and potassium (4%), with a smaller relative proportion of alkalinity, nitrate, fluoride, and magnesium (Table 1-1; Figure 1-1). This composition represented the modelled “base waters” for the snapshot year 2040 during active closure and was selected as a conservative upper bound of modelled major ion conditions.
    - For treated effluent (at end-of-pipe) under a low TDS concentration[2], the composition of major ions was predicted to be dominated by alkalinity (35%), sulphate (26%), calcium (16%), chloride (7%), magnesium (5%), sodium (5%), nitrate (3%), and potassium (3%), with a smaller relative proportion of fluoride (Table 1-1; Figure 1-1). This composition represented the modelled “base waters” for 2038 to 2060 during periods of discharge (May to October) and was selected as a lower bound of modelled major ion conditions.
    - For receiving environment without discharge, measured chemistry in Wally Lake and TPL (Figure 1-2) was reviewed and the dominant cations were identified calcium and sodium with dominant anions of sulphate and total alkalinity. Total alkalinity is predominant under the baseline TDS composition in Wally Lake and TPL, but this applies under conditions of calculated TDS <40 mg/L; with treated mine effluent discharge, it is expected that the relative proportion of total alkalinity would decline with corresponding increases of calcium, sodium, and sulphate.

[1] Draft treated effluent predictions modelled by Lorax Environmental Services Ltd. for the Vault Pit (base waters; active closure, October 2040) were provided to WSP by Agnico on 30 March 2024 (V0.4.3).

[2] Draft treated effluent predictions modelled by Lorax Environmental Services Ltd. for the Vault Pit were provided to WSP by Agnico on 12 June 2024 (V0.4.5).

- For future conditions at the edge of the mixing zone, the concentrations of ions and ionic composition were estimated by applying a 0.75 dilution factor to the effluent predictions to target an upper bound for edge of mixing zone as a simulated scenario of 2,000 mg/L TDS (Table 1-1) with an ionic composition dominated by sulphate (49%), chloride (16%), sodium (10%), calcium (10%), nitrate (10%), and potassium (4%), with a smaller relative proportion of alkalinity, fluoride, and magnesium (Figure 1-1). It is expected that the edge of mixing zone conditions will be between the measured conditions for the receiving environments without effluent discharge and this simulated scenario.[3]
- The primary exposure and toxicity modifying factor (ETMF) for TDS is ionic composition, reflecting the fact that individual ionic components exhibit different potential to exert toxicity. In general, a balanced mixture of ions results in lower toxicity than strong dominance by an individual ion, particularly dominance by an individual ion with relatively high toxicity. Mount et al. (1997) reported that the relative ion toxicity to freshwater biota was generally potassium > carbonate ≈ magnesium > chloride > sulphate, with calcium and sodium exhibiting relatively low toxicity. Therefore, the toxicity of a TDS mixture depends largely on the composition of ions within the mixture, rather than the total TDS concentration, which on its own is not an accurate predictor of toxicity.

- **Sulphate proportion**—sulphate is one of the dominant individual ions, based on review of model predictions and measured pit chemistry. This is broadly similar to site water composition at several other northern mining projects in Canada, including effluent at Faro Mine and in the Elk Valley, which have sulphate-dominant TDS compositions.
- **Hardness**—Hardness may modify ion-specific toxicity, thereby ameliorating the toxicity of a mixture by reducing the toxicity of individual ions (Kennedy et al. 2005). For example, calcium has been identified as a specific component of hardness that ameliorates sulphate toxicity (Davies and Hall 2007; Mount et al. 2016). Hardness is not considered a ETMF in the case of TDS, because hardness is a component of the TDS mixture and is therefore not an independent factor distinct from ionic composition. However, hardness can be considered for the evaluation of ion-specific toxicity, given that some ions (e.g., sulphate, chloride) are less toxic in hard water. Water hardness was calculated as calcium carbonate ($CaCO_3$) using the following equation:

$$[CaCO_3] = 2.5 \times [Ca^{2+}] + 4.1 \times [Mg^{2+}]$$

[3] Edge of mixing zone predictions generated from assimilative capacity modelling results are anticipated to be available in summer or fall 2024.

Table 1-1: Simulated ion concentrations in effluent and estimated ion concentrations at the edge of the mixing zone

Constituent	Units	Effluent Predictions		Simulated Edge of Mixing Zone[c]
		Vault Pit Predictions Version 4.3[a]	Vault Pit Predictions Version 4.5[b]	
TDS (calculated)	mg/L	2,655	82	2,000
Sulphate	mg/L	1,303	21	982
Chloride	mg/L	415	5.7	313
Calcium	mg/L	260	13	196
Magnesium	mg/L	21	3.9	16
Sodium	mg/L	276	4.5	208
Total Alkalinity	mg/L as $CaCO_3$	27	29	20
Potassium	mg/L	107	2.3	81
Fluoride	mg/L	0.28	0.095	0.21
Nitrate (as N)	mg/L as N	58	0.53	43
Hardness	mg/L as $CaCO_3$	737	48	555

Notes: TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

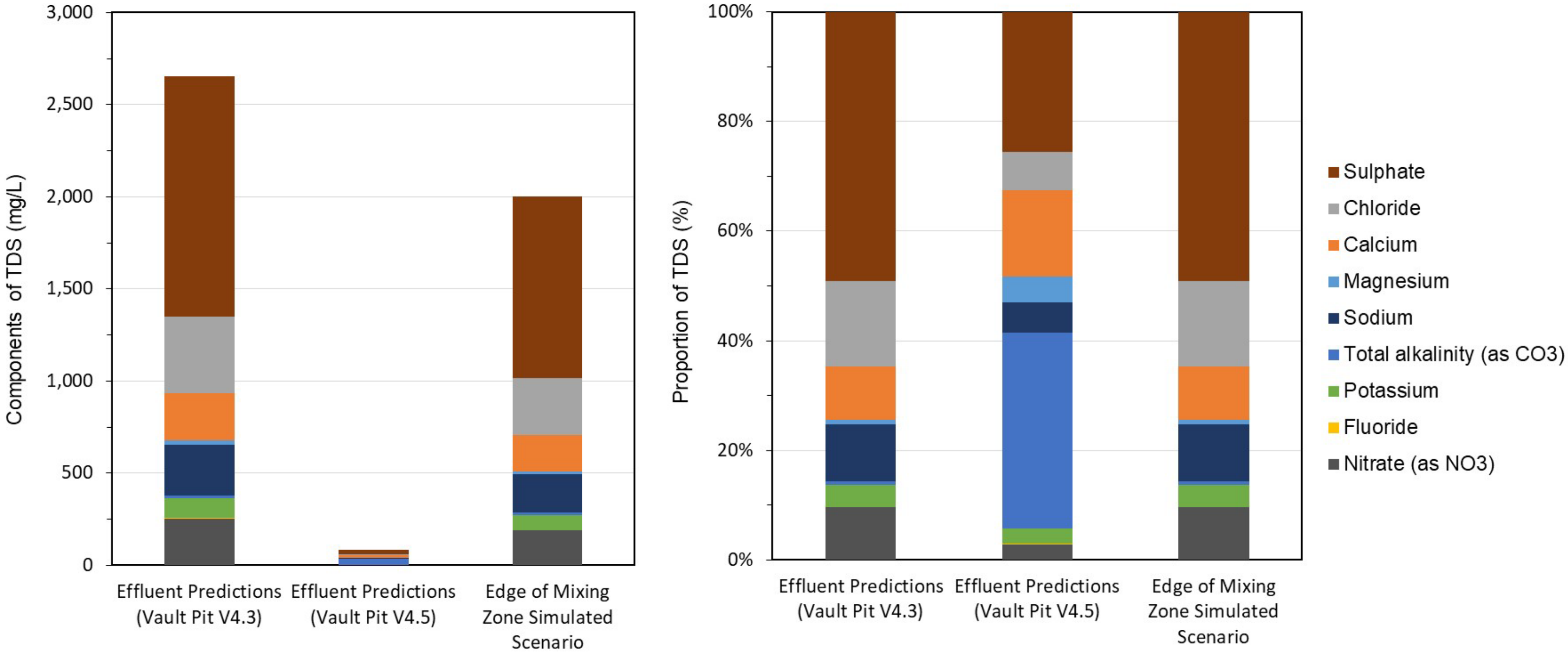
TDS = total dissolved solids; mg/L = milligrams per litre; N = nitrogen; $CaCO_3$ = calcium carbonate.

(a) Draft treated effluent predictions were provided by Lorax for the Vault Pit to WSP by Agnico on March 30 2024.

(b) Draft treated effluent predictions were provided by Lorax for the Vault Pit to WSP by Agnico on June 12 2024.

(c) The simulated edge of mixing zone scenario was generated by applying a dilution factor of 0.75 to the effluent predictions to reach TDS of 2,000 mg/L. The dilution factor of 0.75 (1.33:1) was chosen to be a “worst-case scenario” given that the predicted minimum dilution factor (as provided by Tetra Tech Canada Incorporated to Agnico Eagle) for Wally Lake is estimated to be closer to 0.5 (2:1), and 0.077 (13:1) for Third Portage Lake (see table below). For the 2024 investigations, a higher level of conservatism was taken and assumed a lower level of dilution than is expected (greater exposure concentrations).

Figure 1-1: Total dissolved solid concentration (left) and composition (right) in simulated effluent and estimated edge of the mixing zone

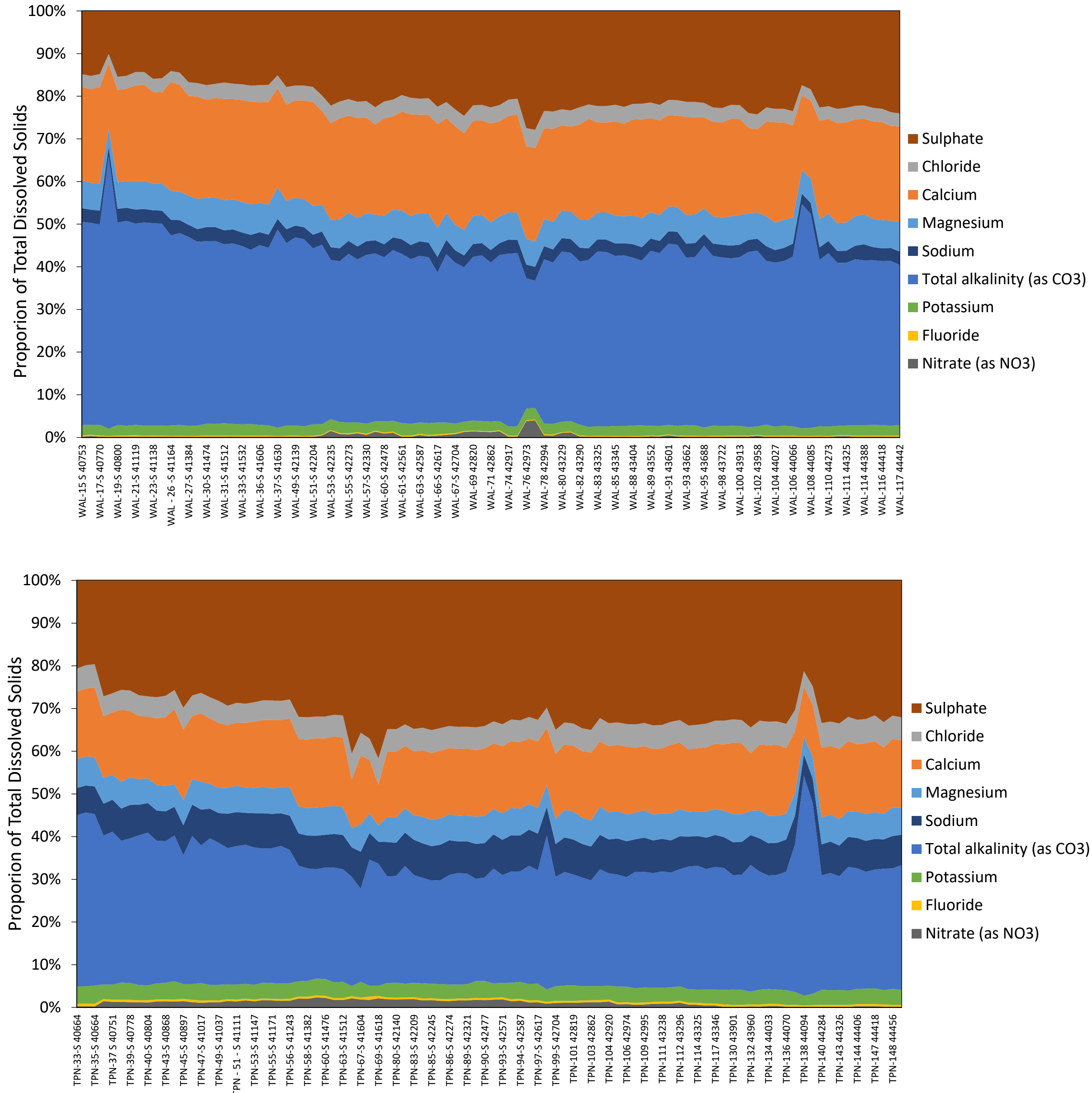


Notes: The simulated edge of mixing zone scenario was generated by applying a dilution factor of 0.75 to the V.3 effluent predictions to reach TDS of 2,000 mg/L.

TDS (mg/L) is calculated as the sum of calcium, chloride, fluoride, magnesium, potassium, sodium, sulphate, alkalinity as carbonate (calculated 0.6 × total alkalinity as $CaCO_3$), and nitrate as NO_3 (calculated 4.427 x nitrate as N; APHA 2012).

TDS = total dissolved solids; V = version; CO_3 = carbonate ion; NO_3 = nitrate ion; mg/L = milligrams per litre.

Figure 1-2: Measured total dissolved solid composition in Wally Lake (top) and Third Portage Lake (north basin; bottom), 2010 to 2021



Notes: Monitoring data was obtained from Azimuth (2022) CREMP environmental monitoring database. Data were included for all stations sampled within Wally Lake and Third Portage Lake (north basin) from 2010 to 2021. Data collected prior to 2010 either did not measure the full suite of major ions or had atypically high detection limits relative to the bulk of the dataset.

Data on the x-axis represent samples collected at each station within a year from 2010 to 2021.

1-3.0 ACUTE TOXICITY DATA FOR TDS

Acute toxicity testing data and corresponding water chemistry data were collected by Veolia (2022) and Agnico Eagle as part of a Mock Effluent evaluation of the treatment efficiency in ameliorating acute lethality in Pit E water (ST-19). Pit E water is predicted to have the highest TDS concentrations on average relative to the other pits. Acute toxicity tests performed were:

- Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to *Daphnia magna* (ECCC 2000a).
- Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout (ECCC 2000b).

Acute toxicity test species include the standard protocols (*D. magna* and Rainbow Trout) used to assess compliance for acute lethality under the Metal and Diamond Mining Effluent Regulations (MDMER; Government of Canada 2002). Acute toxicity test results and corresponding water chemistry data for TDS (measured and calculated) and sulphate are presented in Table 1-2, ionic composition are presented in Figure 1-3, and raw laboratory results are provided in Appendix A.

Acute toxicity testing conducted from 2022 to 2023 with treated Pit E water has indicated no acute toxicity per regulatory definition (i.e., LC_{50} >100% vol/vol) to *D. magna* or Rainbow Trout survival with measured TDS concentrations up to and including 4,000 mg/L (calculated TDS concentrations of 4,050 mg/L). Smaller magnitude responses, which did not trigger acute toxicity per the Metal and Diamond Mining Effluent Regulations definition, were occasionally observed:

- Reduced survival in D. magna (40% in full-strength sample) and Rainbow Trout (20% in full-strength sample) was observed in a sample collected November 7, 2022, at measured TDS concentrations of 2,900 mg/L (calculated TDS concentrations of 2,834 mg/L).
- Reduced survival in Rainbow Trout (20% in full-strength sample) was observed in a sample collected December 7, 2022, at measured TDS concentrations of 3,500 mg/L (calculated TDS concentrations of 2,382 mg/L).
- In both cases, mortality did not exceed 50%, and several other unamended samples have since been tested with measured TDS concentrations greater than 2,812 mg/L, all of which indicated no acutely toxic effects to Rainbow Trout and D. magna.

Collectively, this review of available acute toxicity data for Meadowbank Mine indicates that acute lethality to regulatory test species *D. magna* and Rainbow Trout is not expected at end-of-pipe with measured TDS concentrations of less than or equal to 4,000 mg/L. This conclusion is strengthened by results of testing of even higher concentrations of simulated effluent (achieved through cryo-concentration in the laboratory) which validated the expected of non-lethality to at least 4,000 mg/L, if not greater.

Table 1-2: Acute toxicity data for Mock Treated Effluent (Pit E, ST-19), Meadowbank Mine

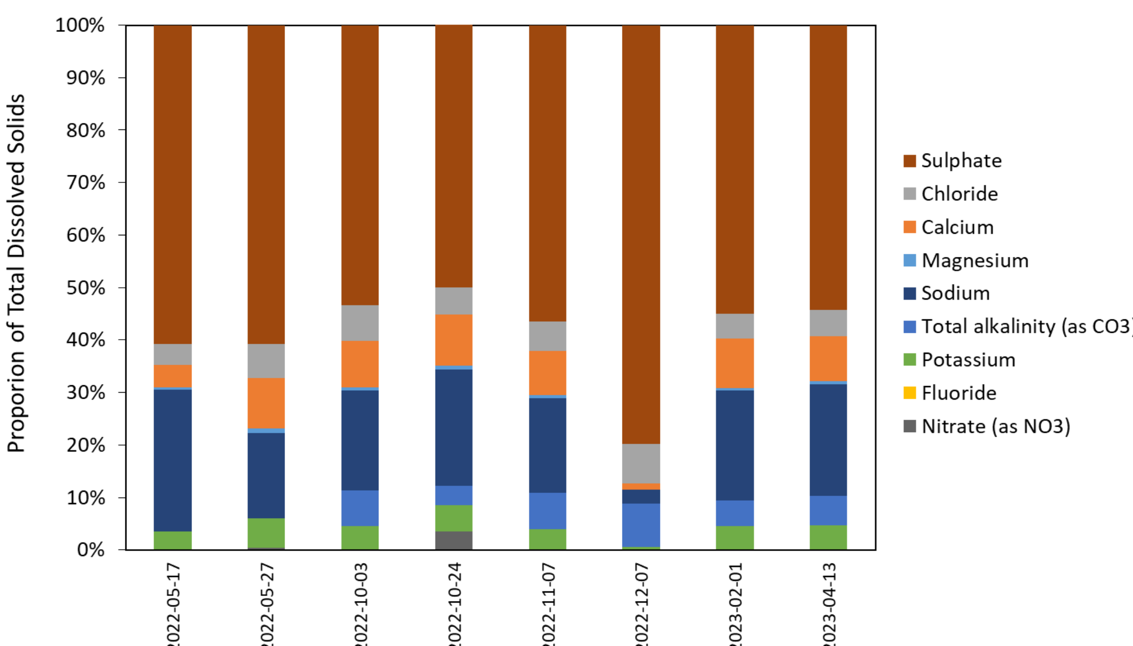
Sample Date	Acute Toxicity				Water Chemistry (mg/L)			
	Daphnia magna		Rainbow Trout *Oncorhynchus mykiss*					
	48-hour Survival in Full-Strength Sample (%)	48-hour Survival LC_{50} (% vol/vol)	96-hour Survival in Full-Strength Sample (%)	96-hour Survival LC_{50} (% vol/vol)	Measured TDS	Calculated TDS	Sulphate	Total Hardness
May 17 2022	100	>100	100	>100	2,490	3,079	1,870	395
May 27 2022	100	>100	100	>100	2,480	2,963[(a)]	1,800	819
October 3 2022	100	>100	100	>100	3,200	2,812	1,500	707
October 24 2022	100	>100	100	>100	3,500	3,606	1,800	992
November 7 2022	60	>100	80	>100	2,900	2,834	1,600	672
December 7 2022	100	>100	80	>100	3,500	2,382	1,900	75
February 1 2023	100	>100	100	>100	3,900	3,817	2,100	990
April 13 2023	100	>100	100	>100	4,000	4,050	2,200	970

Notes: Hardness is reported as calcium carbonate.

TDS = total dissolved solids; mg/L = milligrams per litre; LC_X = lethal concentration causing a lethal effect to x% of the test population; vol/vol = volume per volume.

(a) Dissolved calcium, magnesium, potassium, and sodium were not analyzed, therefore TDS was calculated using the total fraction of these constituents.

Figure 1-3: Measured total dissolved solid composition in Mock Treated Effluent Blends of Pit E water, 2022 to 2023



Notes: Total dissolved solid composition from treated Pit E water (ST-19) collected by Veoila (2022) and Agnico (T. Gentry) between 2022 to 2023 using benchtop-scale treatment.

Additional lines of evidence compiled from the literature to support evaluation of acute lethality to these test species for comparable TDS mixtures are:

- **Meliadine Mine (Golder 2021)**— a series of toxicity tests were conducted to support validation of the TDS acute toxicity EQC and SSWQO established for Meliadine Mine. As part of this work, toxicity identification evaluation (TIE) testing was conducted with the cladoceran *C. dubia* to evaluate if effects on the survival endpoint changed with a shift in the ionic composition while the TDS concentration was held constant. Meliadine Mine TDS composition is chloride-dominant, but one of the mixtures evaluated in the TIE involved reduction of the relative proportion of chloride by replacing with increased relative proportion of sulphate. The 7-d LC_{50} for *C. dubia* shifted from 3,581 mg/L TDS in the chloride-dominant TDS mixtures (~50% chloride as TDS; ~8% sulphate as TDS) to no effect (i.e., 100% survival) with an unbounded LC_{50} of >4,250 mg/L in a sulphate-dominant TDS mixture (~35% sulphate as TDS; ~23% chloride as TDS). The *C. dubia* survival endpoint is a highly sensitive indicator of short-term toxicity and is not routinely applied as a measure of acute toxicity under the MDMER or other effluent discharge regulations, as it is a classified as chronic test, and has been demonstrated to be more sensitive than the standard tests used to evaluate acute toxicity in undiluted effluent (i.e., Rainbow Trout and *D. magna*). Confirmation of an LC_{50} for *C. dubia* for a TDS mixture broadly comparable to Meadowbank Mine, for a highly sensitive aquatic species, and for a longer test duration relative to *D. magna*, provides an additional margin of safety confirming no expectation of acute toxicity at TDS concentrations ~4,000 mg/L.
- **Faro Mine (CIRNAC 2020)**— Site-specific testing programs were conducted using mock treated effluent waters for the Faro Mine Site to evaluate short-term sulphate effluent quality criteria (as a surrogate for TDS) developed for the site. The ionic composition of site waters used in testing was calcium-sulphate dominant. Acute toxicity testing was conducted with Rainbow Trout (96-hr exposure) and *D. magna* (48-hr exposure). Testing was conducted under high water hardness conditions (>250 mg/L as $CaCO_3$). No acute toxicity was observed to either test species at the highest tested sulphate concentration of 2,890 mg/L, corresponding to a calculated TDS concentration ranging from 3,870 to 3,960 mg/L.

1-4.0 CHRONIC TOXICITY DATA FOR TDS

This review of chronic toxicity data from the literature and other sites was drawn from recent work completed for other projects. The dataset was screened to reflect exposure conditions broadly representative of the expected TDS composition at Meadowbank as informed by the current modelled predictions and measured chemistry data:

- Ionic composition—as ionic composition is the most important factor for evaluating TDS toxicity, data were retained from the literature and other sites with a broadly comparable (i.e., sulphate-dominant) ionic composition to Meadowbank Mine. Based on review of calcium and magnesium concentrations in the pit lakes and receiving environment lakes for Meadowbank Mine, it is expected that the calcium to magnesium (Ca:Mg) ratio will be greater than 1.0. Therefore, only data from the literature and other sites evaluating a Ca:Mg ratio of >1.0 were retained herein. If the ionic composition was not reported or could not be discerned from the information provided by the authors, then the study was excluded.

- Hardness—although hardness is not the primary exposure toxicity modifying factor for TDS toxicity, it is important for evaluating individual ion toxicity for sulphate. Therefore, the dataset was also tailored based on hardness conditions. Data were retained where the nominal hardness levels were ≥100 mg/L as $CaCO_3$.

Currently, there are no federal, Provincial, or Territorial water quality guidelines for TDS in Canada. Several other sites have developed criteria/benchmarks/SSWQO that are applicable for Meadowbank (i.e., sulphate-dominant TDS mixtures):

- **Alaska Criteria (ADEC 2009; Brix et al. 2010)**—TDS criteria range from 500 to 1,500 mg/L (ADEC 2009), depending on the TDS composition and whether the receiving environment is potential salmon spawning habitat. Permits are required for discharges to receiving water that result in an increase in TDS concentration in the waterbody between 500 and 1,000 mg/L. Chapman et al. (2000) reported that studies conducted for Coeur Alaska's Kensington Mine site resulted in the first site-specific TDS permit in Alaska. The permit states that TDS may not exceed 1,000 mg/L in Sherman Creek, the receiving waterbody of Kensington Mine effluent (ADEC 2017). Alaska also granted a site-specific permit for Red Dog Mine effluent (ADEC 2013; Brix et al. 2010). Concentrations of TDS up to 1,500 mg/L are permitted during periods when salmonids are not spawning, provided calcium is greater than 50% by weight of the total cations (ADEC 2013; Brix et al. 2010). During spawning periods only, the limit was set at 500 mg/L (Brix et al. 2010). The studies used to establish the Alaskan TDS water quality criterion were based on ionic compositions dominated by calcium sulphate, which is relevant for Meadowbank Mine.
- **IDNR Criteria (IDNR 2009)**—In 2004, the Iowa Department of Natural Resources (IDNR) adopted an interim TDS standard of 1,000 mg/L in receiving streams; the standard was used as a screening value to determine whether site-specific toxicity testing was required (IDNR 2009). However, IDNR since recommended replacing the TDS standard with numerical sulphate and chloride criteria (IDNR 2009) under the assumption that the individual ions provide a more defensible basis for evaluating toxicity relative to the sum of the ions.
- **Faro Mine (CIRNAC 2020)**—Site-specific testing programs were conducted using waters from the Faro Mine Site in the Yukon, Canada to evaluate a long-term sulphate SSWQO (as a surrogate for TDS) developed for the site. The ionic composition of site waters used in testing was calcium-sulphate dominant. Chronic toxicity testing was conducted with early lifestage Fathead Minnow (*Pimephales promelas*; 7-d exposure), *C. dubia* neonates (<24-hr old, 3 brood exposure), and alga *Pseudokirchneriella subcapitata* (72-hr growth inhibition). Testing was conducted under high water hardness conditions (>250 mg/L as $CaCO_3$). No chronic toxicity to Fathead Minnow was observed with a NOEC of 2,106 mg/L TDS (1,480 mg/L sulphate). The most sensitive endpoint was *C. dubia* reproduction (EC_{20} = 1,744 mg/L TDS; 1,154 mg/L sulphate), followed by *P. subcapitata* growth (EC_{20} = 1,796 mg/L TDS; 1,211 mg/L sulphate). Based on this, Faro Mine established an SSWQO of sulphate of up to 800 mg/L at hardness of 432 mg/L (as $CaCO_3$), which corresponds to a TDS composition of ~1,143 to 1,212 mg/L (assuming 66% to 70% SO_4 as TDS).

- **Elk Valley Coal Mining Operations (Teck 2014)**—Site-specific testing programs were conducted using waters from the Elk Valley in southeastern British Columbia in support of the Elk Valley Water Quality Plan (Teck 2014). Testing programs evaluated the sensitivity of sulphate to crustaceans and other invertebrates, and to fish. Site-specific toxicity testing conducted in support of the Elk Valley Water Quality Plan consisted of two programs: the Phase 1 Mixture Toxicity Study (Golder and Nautilus 2013) and the Fall 2013 testing program (Teck 2014). The ionic composition of the exposure waters in all of these studies was calcium sulphate dominant.
  - The Phase 1 Mixture Toxicity Study evaluated sulphate toxicity under high hardness conditions (>500 mg/L as $CaCO_3$) to Rainbow Trout (*Oncorhynchus mykiss*) embryo-alevin (28-d exposure), *C. dubia* neonates (<24-hr old, 7-d exposure), and mayfly *Centroptilum triangulifer* (28-d exposure). The most sensitive endpoint was for Rainbow Trout development with an IC_{20} of 530 mg/L at a hardness concentration of 830 mg/L. The next most sensitive endpoint reported by Golder and Nautilus (2013) was for *C. dubia* reproduction with an IC_{20} of 595 mg/L at a hardness concentration of 910 mg/L. Based on the lowest reported chronic endpoints, Golder and Nautilus (2013) concluded that the benchmark for chronic toxic effects from sulphate in the very hard site-specific water was between 500 and 600 mg/L SO_4, with associated TDS concentrations approximately equal to or greater than 1,000 mg/L.
  - The Fall 2013 testing program evaluated sulphate toxicity under high hardness conditions (>100 mg/L as $CaCO_3$) to Rainbow Trout swim-up fry (28-d exposure), early life stage Fathead Minnow (7-d exposure), *C. dubia* neonates (<24-hr old, 3 brood exposure), and the amphipod *Hyalella azteca* (14-d exposure). Sulphate was not toxic to *C. dubia*, *H. azteca*, Fathead Minnow, or Rainbow Trout up to the maximum sulphate concentrations tested (approximately 1,100 to 1,200 mg/L) corresponding to TDS of >1,000 mg/L. Individual replicates for some tests exhibited performance for survival, growth, or reproduction that were below reference responses, but overall patterns indicated weak or non-existent concentration responses across the range of sulphate concentrations.

In addition to the derived benchmarks for other sites, literature data were compiled from studies that met the screening criteria presented earlier (Table 1-3). The following trends were identified for generic TDS mixture-based tests amended with multiple salts[4] conducted for other sites and reported in the literature data:

- Phytoplankton—effect concentrations for phytoplankton are generally higher than 1,000 mg/L. One study indicated lower tolerance of phytoplankton below 1,000 mg/L (LeBlond and Duffy 2001), but this was with a TDS composition of 70% sulphate as TDS. For TDS mixtures with composition closer to Meadowbank Mine, the TDS effect concentrations were higher than 1,000 mg/L.
- Benthic invertebrates and zooplankton—in general, adverse effect concentrations were above 1,000 mg/L, with the following exceptions. Kunz et al. (2013) reported lower (estimated) TDS effect concentrations for the amphipod *H. azteca* (MATC ~787 mg/L TDS) and the cladoceran *C. dubia* (MATC ~790 mg/L TDS) relative to the rest of the dataset. This study reported hypothesis-based endpoints from a limited number (n=4) of treatments; the significant reduction in the test endpoints occurred between two treatments with a more than four-fold difference in test concentrations. In the absence of regression-based endpoints, the maximum allowable toxicant concentration (MATC) was calculated as the geometric mean of the no observed effect concentration (NOEC)[5] and lowest observed effect concentration (LOEC)[6] reported in the study; the MATC is a more preferred endpoint for benchmark derivation than a NOEC or LOEC (CCME 2007). Because of the study design (i.e., wide concentration series), the MATC for these two species is highly uncertain. Data from two other studies for *H. azteca* and five other studies for *C. dubia* reported TDS effect concentration greater than 1,000 mg/L.
- Fish—Fish were similarly or less sensitive to TDS toxicity than zooplankton and plants, with effect concentrations for ranging from 1,116 mg/L to 2,039 mg/L TDS (geometric means).

[4] Lower effect concentrations have been reported for individual ions for select species (grey shaded rows of Table 1-3), but these tests reflect exposure conditions accounting for a single ion, and not a balanced TDS mixture representative of most field conditions. As discussed earlier, TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

[5] Highest test concentration with no significant difference in test endpoint relative to control.

[6] Lowest test concentration with a significant difference in test endpoint relative to control.

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[b]	Sulphate					
Fish	*Oncorhynchus tshawytscha*	Chinook salmon	eyed eggs to alevin	28 d	survival	LC_{10}	1,980	1,980	1,287	263	2.3	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	fry	7 d	mortality and growth	NOEC	>2,039	>1,999	>1,399	1,412	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	fry	7 d	mortality and growth	NOEC		>2,080	>1,040	1,256	14	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryos	7 d	viability	NOEC	>1,999	>1,999	>1,399	1,261	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}	>1,214	>1,113	>945	206	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,058	>905	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,430	>1,140	480	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	7 d	survival, growth, and biomass	EC_{10}		>1,289	>1,050	364	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	<24 h old gametes	29 d	survival	EC_{25}	1,437	2,316	1,621	54 to ~1,900	2.5	Calcium-sulphate dominant[c]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
Fish	*Oncorhynchus mykiss*	Rainbow Trout	<24 h old gametes	29 d	survival	EC_{25}		1,895	1,232	54 to ~1,900	2.5	Calcium-sulphate dominant[c]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	survival, growth, and biomass	IC_{20}		923	530	830	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	survival, growth, and biomass	IC_{20}		1,052	622	946	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	normal alevins	EC_{10}	1,802	1,802	1,187	1,559	5.1	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	55 d	survival, growth	LOEC	4,836	4,836	>3,240	103	3.1	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	21 d	survival	LC_{10}	512	371	162	104	4.9	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	21 d	survival	LC_{10}		707	191	257	4.9	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival and growth	EC_{10}	1,454	2,106	1,480	1,559	4.8	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,096	>947	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,440	>1,150	485	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{10}		>1,346	>1,100	378	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	7 d	survival	EC_{20}	>1,116	>1,116	>948	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	34 d	survival	IC_{10}	968	455	250	106	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	34 d	survival	IC_{10}		768	430	103	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	14 d	survival	IC_{10}		845	507	108	3.0	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[(a)]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[(b)]	Sulphate					
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	14 d	survival	IC_{10}		1,640	1,066	103	1.3	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		783	470	110	3.0	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,411	917	100	1.3	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,684	1,078	108	1.2	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<24 h embryos	7 d	survival	IC_{10}		1,661	1,063	109	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	<1 d embryos	34 d	biomass	IC_{10}		500	265	102	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Pimephales promelas*	fathead minnow	larvae (<24 hour post-hatch)	7 d	survival	LC_{10}	2,722	1,857	1,120	117	4.8	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Fish	*Pimephales promelas*	fathead minnow	larvae (<24 hour post-hatch)	7 d	biomass	LC_{10}		3,989	2,969	317	5.7	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	8 d	reproduction	EC_{25}	1,511	2,193	>1,535	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	8 d	reproduction	EC_{25}		2,286	>1,600	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h neonate	3-brood	reproduction	EC_{20}		1,744	1,154	1,481	4.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{20}		1,019	452	779	75	Calcium-chloride-sulphate dominant	Calcium sulphate and calcium chloride	Mount et al. 2019
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	IC_{20}		1,012	595	910	2.6	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	IC_{20}		1,322	840	1,189	2.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}	>1,222	>1,092	>894	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,100	>951	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,455	>1,165	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24h neonate	8 d	reproduction	EC_{10}		>1,276	>1,030	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction (mean offspring per female)	MATC[(e)]	790	790	411	235 to 1,461	1.7	Sodium-sulphate dominant	Multiple salts	Kunz et al. 2013
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{10}	1,409	1,327	849	106	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{10}		1,497	958	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	EC_{20}	853	853	546	607	58	Calcium-sulphate dominant	Calcium sulphate	Mount et al. 2019
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}	1,527	868	564	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}		2,685	>1,745	54 to ~1,900	2.5	Calcium-sulphate dominant[(c)]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[(d)]

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[(a)]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[(b)]	Sulphate					
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}	>1,250	>1,148	>950	245	3.3	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,096	>947	161	4.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,440	>1,150	485	2.1	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	-	14 d	survival, growth, and biomass	EC_{10}		>1,346	>1,100	378	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (Fall 2013)
Invertebrate	*Hyalella azteca*	amphipod	~7 d old	28 d	biomass (mean dry weight of survivors)	MATC[(e)]	787	787	346	193 to 1,495	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Hyalella azteca*	Amphipod	2 to 9 d old	28 d	biomass	LC_{10}	1,163	1,216	437	233	3.2	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Hyalella azteca*	Amphipod	2 to 9 d old	28 d	biomass	LC_{10}		1,113	682	117	3.4	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Centroptilum triangulifer*	mayfly	-	28 d	survival and biomass	IC_{20}	1,427	1,398	885	1,257	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		2,025	1,439	87 to 1,605	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[(d)]
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		1,168	841	55 to 1,574	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[(d)]
Invertebrate	*Centroptilum triangulifer*	mayfly	first instar; ≤48 hr old	~35 d	survival and biomass	NOEC[(e)(f)]		1,255	~>640	NR	NR	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Centroptilum triangulifer*	mayfly	larvae to subimago stage	life cycle	survival (as% emergence)	EC_{20}	1,300	1,300	145	95	3.6	Sodium-sulphate dominant	Sodium sulphate	Soucek and Dickinson 2015
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	mortality	MATC	1,499	1,461	~731	~1,145	17	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	growth	MATC		1,539	~1,077	~1,414	13	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Red Dog mine)
Invertebrate	*Chironomus dilutus*	midge	larvae	28 d	biomass	IC_{10}	1,676	1,367	875	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Chironomus dilutus*	midge	larvae	41 d	emergence time	IC_{10}		2,055	1,315	103	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	individual length	NOEC[(e)]	1,245	1,265	>645	217 to 1,461	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	biomass	IC_{10}	853	853	503	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Invertebrate	*Villosa iris*	rainbow mussel	juvenile (>3.5 months)	55 d	survival	NOEC	>645	>441[(g)]	>118	205	2.5	Bicarbonate-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Ciparis et al. 2015
Invertebrate	*Villosa iris*	rainbow mussel	juvenile (>3.5 months)	55 d	survival	NOEC		>944[(g)]	>434	381	1.7	Bicarbonate-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Ciparis et al. 2015
Invertebrate	*Villosa iris*	rainbow mussel	40 d juveniles	28 d	individual dry weight	IC_{10}	502	502	271	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2020
Invertebrate	*Elliptio complanata*	Mussel	juvenile	28 d	survival	LC_{10}	1,573	1,241	676	288	5.1	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Elliptio complanata*	Mussel	juvenile	28 d	survival	LC_{10}		1,995	1,125	250	5.2	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
Invertebrate	*Lampsilis abrupta*	pink mucket	40 d old juvenile	28 d	length, weight, biomass	MATC	1,871	1,871	1,197	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Plant	*Raphidocelis subcapitata*	green algae	-	96 h	growth	NOEC	>2,000	>2,000	~>1,000	—	—	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)

Table 1-3: Chronic toxicity test dataset for sulphate-dominant total dissolved solid mixtures

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Amendment Salt	Reference
								TDS[b]	Sulphate					
Plant	*Raphidocelis subcapitata*	green algae	-	72 h	growth	EC_{20}	995	551	~385	—	—	Calcium-sulphate dominant (70% SO_4 as TDS)	Calcium, magnesium, and potassium salts	LeBlond and Duffy 2001 (Red Dog Mine)
Plant	*Raphidocelis subcapitata*	green algae	-	72 h	growth	EC_{20}		1,796	1,211	1,461	4.5	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020

Notes: Grey-shaded rows indicate the tests were amended with a single salt. These effect concentrations should be interpreted for TDS toxicity with caution because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

(a) The geometric mean was calculated for each species for comparable biological endpoints and test statistics per Chapman (2015).

(b) Most studies reported effect concentrations in terms of sulphate. The effect concentration in terms of TDS was calculated herein if not reported by the author(s). Calculation used measured water chemistry reported during the test in the treatment corresponding to the test statistic to calculate TDS or estimate the percent sulphate as TDS in the treatments bounding the test statistic and then dividing the reported result as sulphate by percent sulphate as total dissolved solids to obtain the estimated test statistic as TDS.

(c) Ionic composition estimated from TDS composition figures for *Ceriodaphnia dubia*. The same mixture was evaluated across test species and therefore, the ionic composition for *C. dubia* was assumed to apply to the other test species.

(d) Regression based endpoints were not reported by Buchwalter et al. (2018) but were estimated from figures presented in Van Geest et al. (2018a).

(e) NOEC and LOEC values are reported by the authors as volumetric concentration (% v/v) of the dilution series used for the exposure. Therefore, NOEC and LOEC for sulphate were determined by cross-referencing volumetric exposure concentration for the NOEC and LOEC with measured sulphate concentrations presented in Table S4.

(f) The survival NOEC for *Centroptilum triangulifer* (now *Neocloeon triangulifer*) was extracted from discussion in Soucek and Dickinson (2015) paper.

(g) Survival at this unbounded NOEC was greater than 95%.

TDS = total dissolved solids; Ca;Mg = calcium to magnesium mass ratio; mg/L = milligrams per litre; $CaCO_3$ = calcium carbonate; NOEC = no observable effects concentration; LOEC = lowest observable effects concentration; IC_X = inhibitory concentration that results in x% reduction in sublethal endpoint; LC_X = lethal concentration that results in x% lethality to test population; EC_X = effects concentration that results in x% effect in test population; ~ = approximately.

1-5.0 CHRONIC SPECIES SENSITIVITY DISTRIBUTION FOR TDS

1-5.1 Methods

A species sensitivity distribution (SSD) for chronic TDS toxicity was derived using CCME (2007) guidance as outlined below.

Receptors

The minimum dataset requirements for the derivation of Type A SSD for long-term SSWQOs, as defined by CCME (2007), are provided in Table 1-4.

Table 1-4: Minimum Dataset Requirements for the Derivation of SSD-based (Type A) Guidelines

Receptor Group	Long-Term Site-Specific Water Quality Objective
Fish	Three fish species, including at least one salmonid and one non salmonid. Exposure periods involving juvenile or adult stages of at least 21 days in duration, or periods involving eggs and larvae of 7 days or more are considered long-term exposures.
Aquatic invertebrates	Three aquatic or semi aquatic invertebrates, at least one of which must be a planktonic crustacean. Long-term exposures are defined to include nonlethal endpoints from test durations of at least 96 hours for shorter-lived invertebrates (e.g., *Ceriodaphnia dubia*), nonlethal endpoints of at least 7 days in duration for longer-lived invertebrates (e.g., crayfish), or lethal endpoints from tests of at least 21 days in duration for longer-lived invertebrates.
Aquatic plants	At least one study on a freshwater vascular plant of freshwater algal species. Additional representation of macrophytes and algae are required for substances that have phytotoxicity as a dominant process. All tests for *Lemna* sp. following standard test protocols, as well as all tests with algae greater than 24 hours, are considered long-term exposures.
Amphibians	Toxicity data for amphibians are highly desirable, but not necessary. Exposure periods involving juvenile or adult stages of at least 21 days in duration, or periods involving eggs and larvae of at least 7 days are considered long-term exposures.

SSD = species sensitivity distribution.

Endpoint Selection

Chronic toxicity data from the literature and other sites were compiled per Section 1-4.0 and site-specific toxicity data were compiled from Attachment 2. Statistical endpoint selections were reviewed according to the CCME (2007) preference ranking for selecting endpoints for a Type A derivation, specifically in decreasing order of preference:

- EC_X (concentration causing X% effect) or IC_X (concentration causing X% inhibition) representing a no-effects threshold—this is the preferred approach where the value of X can be determined to be meaningful from a statistical and biological relevance perspective.
- EC_{10}/IC_{10}—the 10% magnitude of response is commonly applied as a no-effect benchmark, given that most toxicity endpoints cannot discriminate beyond this level of precision
- $EC_{11\text{-}25}/IC_{11\text{-}25}$—the adoption of magnitude of response greater than 10% is supported where the statistical power of the experiment cannot provide reliable EC10/IC10 and where the response can safely be accommodated at the local population level.
- Maximum Acceptable Toxicant Concentration (MATC)—the MATC is often calculated as the geometric mean between the No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC).

- NOEC—defined based on highest tested concentration for which there are no statistically significant difference of effect ($p<0.05$) when compared to the control group.
- LOEC—the lowest concentration where a statistically significant effect has been observed in chronic ecotoxicity studies.
- EC_{26-40}/IC_{26-49}—larger effect sizes with increase potential to affect populations are less preferred, although some toxicity endpoints (e.g., plant or algae growth or frond count) can adopted higher response sizes.
- nonlethal EC_{50}/IC_{50}—50% responses are the largest possible magnitude for non-lethal endpoints; for mortality, no more than 25% adverse effect size is acceptable.[7]

According to this protocol, "a threshold level for no negative effect is generally defined as an effect level of 10% or less of the exposed individuals of a species (i.e., EC_{10}), unless a more appropriate no effects threshold is defined for the test species in a generally accepted standardized test protocol" (CCME 2007). The determination of whether a 10% adverse response is the most appropriate effect size depends on considerations of statistical power, test reliability, and acceptable control response for a valid test.

Additionally, preference was given to endpoints derived using tests amended with multiple salts because TDS toxicity is dependent on the characteristics of the mixture and therefore, inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

Species Mean Values

Geometric means were used to calculate species mean chronic values (SMCVs) where multiple effect concentrations were available for a particular species, provided that the test endpoints are comparable in terms of endpoint type, magnitude, and exposure conditions. Following CCME (2007) guidance, it is appropriate to combine these effect concentrations using a geometric mean (i.e., effects concentrations are combined for comparable endpoint types and statistical endpoints). In some cases, professional judgment is required to distinguish comparable versus non-comparable endpoints. Guidance provided by Chapman (2015) was followed for cases where endpoint data were sufficiently similar in terms of endpoint type or magnitude to warrant aggregation using a geometric mean. It is not necessary that the endpoints be for identical biological and statistical endpoints and identical exposures to warrant combining with a geometric mean; rather, the endpoints should be for broadly comparable biological endpoints and effect sizes conducted on the same species and using similar protocols.

[7] EC_X = effective concentration causing X% reduction in sublethal endpoint with binomial outcomes for individual organisms, such as survival or normal development; IC_X = the concentration that results in a magnitude of effect of X% over a specified period of time; MATC = maximum acceptable toxicant concentration (calculated as the geometric mean of the no observed effect concentration and lowest observed effect concentration.

Species Sensitivity Distribution Model

The British Columbia Ministry of Environment and Parks (BC ENV) SSDtools package (Thorley and Schwarz 2018) in R (version 4.2.1; R Core Team 2022) was used to develop SSDs using the species mean chronic values. Per Schwarz and Tillman (2019), SSDs were fit using a maximum likelihood estimation with a model averaging approach, in which models with a corrected Akaike information criterion (AICC) score within 2 (indicated by the delta) of the lowest AICC score were retained for model averaging and weighted relative to their AICC scores. The predict function was used to generate a line of best fit and 95% confidence intervals, and the SSD hc function was used to derive the hazardous concentration to 5% of the tested species (HC_5). The 95% confidence intervals are generated using the bootstrap resampling method. As a result, confidence intervals will fluctuate between SSD model runs using the BC ENV SSD tool and may differ from what is presented in the SSD summary statistic table.

1-5.2 Results

Derivation using CCME (2007) Protocol

Chronic toxicity data for 11 species were retained for an SSD (Table 1-5): three fish (two salmonid and one non salmonid), three non-insect invertebrates (a crustacean, a chironomid, and an amphipod), three freshwater bi-valves, one aquatic insect, and one alga. The following species was excluded from the SSD:

- The unbounded NOEC (geomean >645 mg/L TDS) for *Villosa iris* (rainbow mussel) reported by Ciparis et al. 2015 was excluded because the unbounded concentration was not above identified effect concentrations for other sensitive organisms (e.g., *C. dubia*). Per CCME (2007) guidance, the toxic threshold for an unbounded concentration must be clearly above identified thresholds for other sensitive organisms to warrant inclusion in an SSD.

The bullets below provide rationale for the endpoints and effect concentrations selected for each species included in the SSD:

- Only one study that met data quality criteria was available for *Oncorhynchus tshawytscha* (Chinook Salmon), *Elliptio complanate* (mussel), and *Lampsilis abrupta* (pink mucket mussel). The tests in these studies were amended with a single salt (sodium sulphate) but were retained to meet the requirements of a Type A SSD derivation.
- For Rainbow Trout, *Hyalella azteca*, *Centroptilum triangulifer Chironomus dilutus*, and *Lampsilis siliquoidea*, the selected endpoints aligned with the CCME (2007) preference ranking for selecting endpoints for a Type A SSD derivation, as described in Section 1-5.1. Preference was given to studies that used multiple salts[8] and effect concentrations that were bounded[9].

[8] For example, for *C. dilutus*, the MATC reported by Chapman et al. 2000 calculated from tests amended with multiple salts (geomean = 1,499 mg/L TDS) was selected in preference to the IC_{10} reported by Wang et al. 2016 calculated from tests amended with only sodium sulphate (geomean = 1,676 mg/L TDS) because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

[9] For example, for *H. azteca,* the EC_{25} reported by Van Geest et al. 2018 (geomean = 1,527 mg/L TDS) was selected in preference to the unbounded EC_{10} reported by Teck 2014 (geomean >1,250 mg/L TDS).

- For *R. subcapitata*, *C. dubia*, and Fathead Minnow, effect concentrations from site-specific testing (Attachment 2) were used instead of literature data because the site-specific testing program used highly relevant synthetic waters that closely matched site-specific mixtures of water quality characteristics. As a result, effect concentrations from the site-specific program are most representative of conditions on site. The rationale for each site-specific endpoint is described in the bullets below.
  - For *R. subcapitata*, no statistically significant reduction in *R. subcapitata* growth was observed in the site-specific tests. The NOEC of >2,217 mg/L calculated TDS was retained as the most reliable and relevant endpoint.
  - For *C. dubia*, reproduction was significantly reduced in the 2,296 mg/L calculated TDS treatment in the site-specific tests. An IC_{10} of 976 mg/L calculated TDS and IC_{20} of 1,354 mg/L calculated TDS were derived from the concentration-response. However, there is elevated uncertainty in the IC_{10} and IC_{20} effects estimates because the estimated effects are below the NOEC (1,745 mg/L calculated TDS) and because the PMSD relative to the site-collected reference (34%) was greater than the estimated effect sizes (i.e., 10% and 20%; Attachment 2). Therefore, IC_{10} and IC_{20} estimates have low statistical reliability and should be used and interpreted with caution. The IC_{10} of 976 mg/L calculated TDS was conservatively retained for the SSD to increase confidence the HC_5 estimate would not be overestimated. However, in consideration of the uncertainty described above, the IC_{20} of 1,354 mg/L calculated TDS could be considered. Implications of including the alternative IC_{20} endpoint on the HC_5 is presented in a bounding analysis below.
  - For Fathead Minnow, no statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate, and length in the site-specific tests yielding a NOEC of >2,211 mg/L calculated TDS. However, dry weight was significantly reduced yielding a NOEC of 487 mg/L calculated TDS. There is elevated uncertainty in the dry weight NOEC because an atypical concentration response was observed for dry weight where an apparent low-magnitude response (9.7% effect on dry weight) was observed in the highest exposure treatment, but the effects were flat (i.e., not concentration-dependent) for the remaining dilutions. These results indicate the reduction in dry weight may be (in part) driven by a factor other than TDS. Additionally, low inter-replicate variances were observed for dry weight which resulted in low magnitude responses, and both the NOEC and LOEC calculations yield values below 10% magnitude of effect. Such small differences are unlikely to be biologically meaningful, especially in the absence of a clear concentration-response profile. The dry weight NOEC was conservatively retained for the SSD to increase confidence the HC_5 estimate would not be overestimated. However, in consideration of the uncertainty described above, the dry weight NOEC could be replaced with the NOEC for length of >2,211 mg/L TDS. Implications of replacing the dry weight NOEC on the HC_5 is presented in a bounding analysis below.

Table 1-5: Chronic toxicity test dataset for total dissolved solids species sensitivity distribution

Receptor	Test Species	Common Name	Life Stage	Test Duration	Endpoint	Test Statistic	Geomean TDS (mg/L)[a]	Result (mg/L)		Hardness (mg/L as $CaCO_3$)	Ca:Mg Ratio	TDS Composition	Salt Amendment	Reference
								TDS[b]	Sulphate					
Invertebrate	*Ceriodaphnia dubia*	water flea	<24 h old neonates	7 d	reproduction	IC_{10}	976	976	~390	~290	~6.4	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)
Fish	*Pimephales promelas*	Fathead Minnow	<24 h post-hatch	32 d	growth (length)[c]	NOEC	1,038	>2,211	1,020	840	10	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)
					growth (dry weight)			487	195	225	4.4			
Invertebrate	*Lampsilis siliquoidea*	fatmucket clam	~2 months old	28 d	individual length	NOEC[d]	1,265	1,265	>645	217 to 1,461	1.6	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Centroptilum triangulifer*	mayfly	-	28 d	survival and biomass	IC_{20}	1,427	1,398	885	1,257	2.5	Bicarbonate-calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Teck 2014 (PI MTS)
			larvae to subimago stage	life cycle	survival (as% emergence)	EC_{25}		2,025	1,439	87 to 1,605	2.7	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	Buchwalter et al. 2018[d]
								1,168	841	55 to 1,574			Calcium sulphate and magnesium sulphate	
			first instar; ≤48 hr old	~35 d	survival and biomass	NOEC[d][f]		1,255	~>640	NR	NR	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Kunz et al. 2013
Invertebrate	*Chironomus dilutus*	midge	larvae	10 d	mortality	MATC	1,499	1,461	~731	~1,145	17	Calcium-sulphate dominant (50% SO_4 as TDS)	Calcium, magnesium, and potassium salts	Chapman et al. 2000 (Kensington mine)
					growth			1,539	~1,077	~1,414	13	Calcium-sulphate dominant (70% SO_4 as TDS)		Chapman et al. 2000 (Red Dog mine)
Invertebrate	*Hyalella azteca*	amphipod	2 to 9 d old	14 d	growth (average dry weight)	EC_{25}	1,527	868	564	54 to ~1,900	2.5	Calcium-sulphate dominant[g]	Calcium sulphate and magnesium sulphate	Van Geest et al. 2018a[d]
								2,685	>1,745					
Invertebrate	*Elliptio complanata*	mussel	juvenile	28 d	survival	LC_{10}	1,573	1,241	676	288	5.1	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (Annex F, Appendix D, PESC in BC MOE 2013)
								1,995	1,125	250	5.2			
Fish	*Oncorhynchus mykiss*	Rainbow Trout	embryo-alevin	28 d	normal alevins	EC_{10}	1,802	1,802	1,187	1,559	5.1	Calcium-sulphate dominant	Calcium sulphate and magnesium sulphate	CIRNAC 2020
Invertebrate	*Lampsilis abrupta*	pink mucket mussel	40 d juvenile	28 d	length, weight, biomass	MATC	1,871	1,871	1,197	105	2.9	Sodium-sulphate dominant	Sodium sulphate	Wang et al. 2016
Fish	*Oncorhynchus tshawytscha*	Chinook Salmon	eyed eggs to alevin	28 d	survival	LC_{10}	1,980	1,980	1,287	263	2.3	Sodium-sulphate dominant	Sodium sulphate	Teck 2014 (PESC in BC MOE 2013)
Plant	*Raphidocelis subcapitata*	green algae	-	96 h	growth	NOEC	>2,217	>2,217	1,020	840	10	Sodium-sulphate dominant	Calcium, magnesium, potassium, and sodium salts	Site-specific testing (Attachment 2)

Notes: Grey shaded rows indicate the tests were amended with a single salt. These effect concentrations should be interpreted for TDS toxicity with caution because TDS toxicity is dependent on the characteristics of the mixture and therefore inferring TDS toxicity from individual ions is difficult due in part to interdependence among ions.

(a) The geometric mean was calculated for each species for comparable biological endpoints and test statistics per Chapman (2015).

(b) Most studies reported effect concentrations in terms of sulphate. The effect concentration in terms of TDS was calculated herein if not reported by the author(s). Calculation used measured water chemistry reported during the test in the treatment corresponding to the test statistic to calculate TDS or estimate the percent sulphate as TDS in the treatments bounding the test statistic and then dividing the reported result as sulphate by percent sulphate as total dissolved solids to obtain the estimated test statistic as TDS.

(c) No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

(d) NOEC and LOEC values are reported by the authors as volumetric concentration (% v/v) of the dilution series used for the exposure. Therefore, NOEC and LOEC for sulphate were determined by cross-referencing volumetric exposure concentration for the NOEC and LOEC with measured sulphate concentrations presented in Table S4.

(e) Regression based endpoints were not reported by Buchwalter et al. (2018) but were estimated from figures presented in Van Geest et al. (2018a).

(f) The survival NOEC for *Centroptilum triangulifer* (now *Neocloeon triangulifer*) was extracted from discussion in Soucek and Dickinson (2015) paper.

(g) Ionic composition estimated from TDS composition figures for *Ceriodaphnia dubia*. The same mixture was evaluated across test species and therefore, the ionic composition for *C. dubia* was assumed to apply to the other test species.

TDS = total dissolved solids; Ca;Mg = calcium to magnesium mass ratio; mg/L = milligrams per litre; $CaCO_3$ = calcium carbonate; NOEC = no observable effects concentration; LOEC = lowest observable effects concentration; IC_X = inhibitory concentration that results in x% reduction in sublethal endpoint; LC_X = lethal concentration that results in x% lethality to test population; EC_X = effects concentration that results in x% effect in test population; ~ = approximately.

The minimum dataset requirements were satisfied for the derivation of a Type A SSD derivation for freshwater environments as defined by CCME (2007). The chronic toxicity data in Table 1-5 were used to develop an SSD using the BC ENV SSDtools package (Thorley and Schwarz 2018) in R (version 4.2.1; R Core Team 2022) as described in Section 1-5.1. The resulting HC_5 for TDS was 979 mg/L (Table 1-6; Figure 1-4).

Table 1-6: Chronic total dissolved solids species sensitivity distribution summary statistics

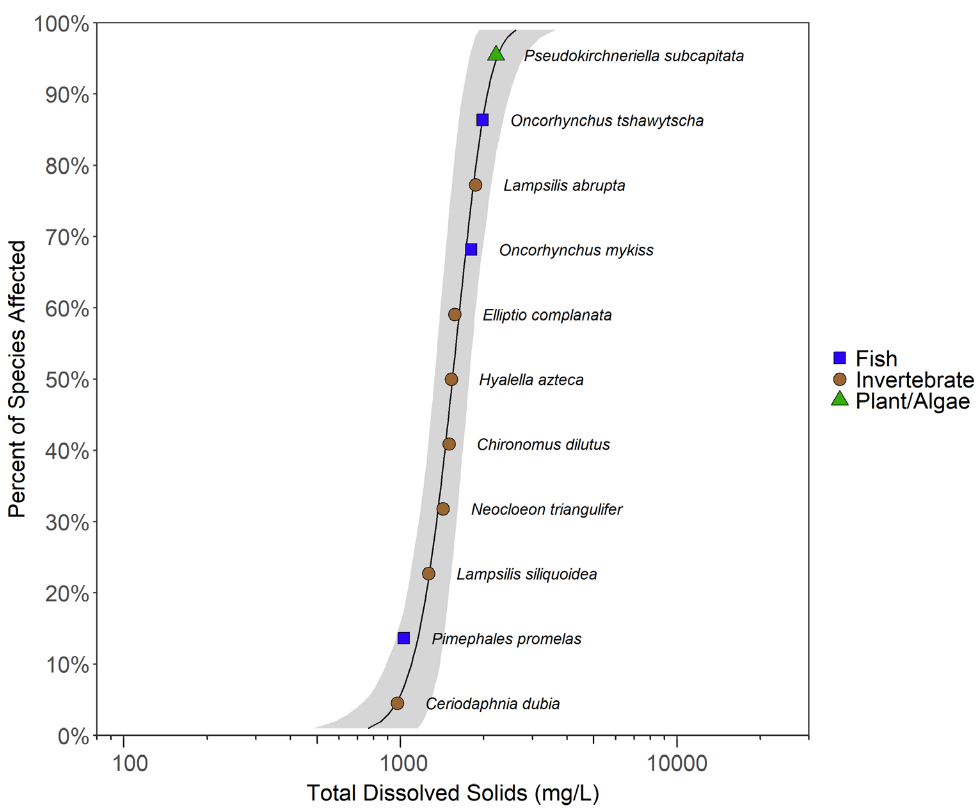
Distribution	Delta	Predicted HC_5 (mg/L)	95% LCL (mg/L)	95% UCL (mg/L)	Weight	Weighted HC_5 (mg/L)
Gamma	0.076	999	787	1,298	0.28	280
Log-logistic	0.94	1,005	758	1,288	0.18	183
Log-normal	0.33	1,012	822	1,300	0.25	249
Weibull	0	916	654	1,298	0.29	267
					Final HC_5[(a)] =	**979 (752–1,297)**

Notes:

(a) Final HC_5 is the sum of weight HC_5 for the individual models with lower and upper confidence intervals presented in brackets. The 95% confidence intervals are generated using the bootstrap resampling method and may fluctuate between SSD runs using the BC ENV SSD tool.

HC_5 = hazardous concentration to 5% of the tested species, or the concentration that protects 95% of the tested species; LCL = lower confidence interval; UCL = upper confidence interval; SSD = species sensitivity distribution; mg/L = milligram per litre.

Figure 1-4: Species sensitivity distribution curve for chronic total dissolved solids toxicty data



Notes: mg/L = milligrams per litre.

Derivation using Bounding Analysis

The HC_5 is dependent on the endpoints selected for the SSD. As discussed above, the *C. dubia* reproduction IC_{10} and Fathead Minnow dry weight NOEC from site-specific testing have moderate uncertainty regarding their relevance for TDS toxicity (Attachment 2). In the face of this uncertainty, highly conservative assumptions have been made for the selection of the preferred statistical endpoints for site-specific toxicity tests. To investigate the implications this uncertainty has on the HC_5, a bounding analysis was conducted where the C. *dubia* reproduction IC_{10} was replaced with the IC_{20} of 1,354 mg/L calculated TDS and the Fathead Minnow dry weight NOEC was replaced with the length NOEC[10] of >2,211 mg/L calculated TDS. For *C. dubia*, the IC_{20} was selected because site-specific testing does not show significantly reduced *C. dubia* reproduction until concentrations exceeding 1,000 mg/L calculated TDS (Attachment 2). For Fathead Minnow, the length NOEC was selected because, as discussed above, site-specific testing showed an atypical concentration response for dry weight yielding low magnitude responses (equal to or less than 10%) which are unlikely to be biologically meaningful. Therefore, the length NOEC was considered the more relevant and reliable endpoint for representing effects of TDS to Fathead Minnow (Attachment 2). The resulting HC_5 for TDS was 1,220 mg/L (Table 1-7; Figure 1-5).

Table 1-7: Chronic total dissolved solids species sensitivity distribution summary statistics using the bounding analysis

Distribution	Delta	Predicted HC_5 (mg/L)	95% LCL (mg/L)	95% UCL (mg/L)	Weight	Weighted HC_5 (mg/L)
Gamma	0.21	1,219	1,013	1,472	0.23	277
Log-gumbel	0	1,285	1,172	1,449	0.25	324
Log-logistic	1.1	1,192	957	1,453	0.14	172
Log-normal	0.067	1,235	1,071	1,475	0.24	301
Weibull	1.3	1,100	851	1,454	0.13	146
					Final HC_5[(a)] =	**1,220 (1,038–1,462)**

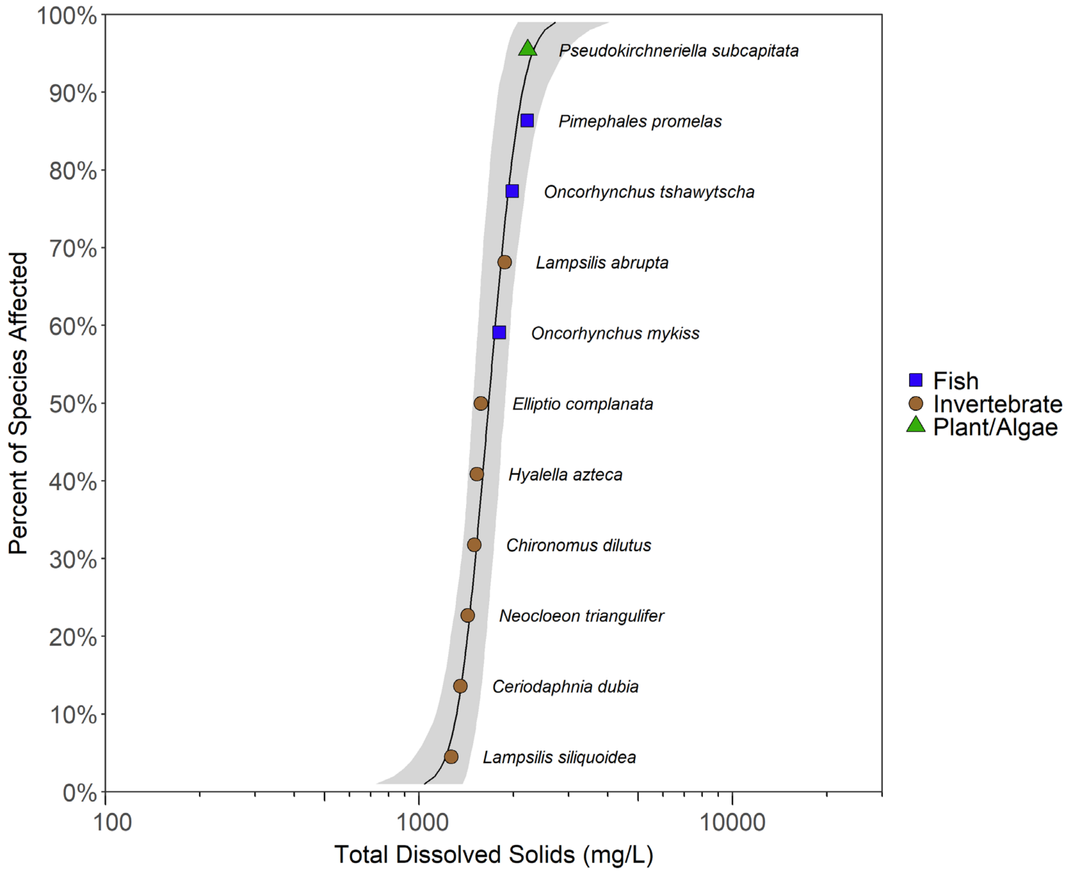
Notes:

(a) Final HC_5 is the sum of weight HC_5 for the individual models with lower and upper confidence intervals presented in brackets. The 95% confidence intervals are generated using the bootstrap resampling method and may fluctuate between SSD runs using the BC ENV SSD tool.

HC_5 = hazardous concentration to 5% of the tested species, or the concentration that protects 95% of the tested species; LCL = lower confidence interval; UCL = upper confidence interval; SSD = species sensitivity distribution; mg/L = milligram per litre.

[10] No statistically significant reduction in Fathead Minnow overall survival, post-hatch survival, proportion normal, hatch rate endpoints were also observed for the site-specific tests (Attachment 2).

Figure 1-5: Species sensitivity distribution curve for chronic total dissolved solids toxicty data using the bounding analysis



Notes: mg/L = milligrams per litre.

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APPENDIX A

Acute Mock Effluent Toxicity Testing Reports

AGNICO EAGLE LIMITED, MEADOWBANKS

Attention: Thomas Genty, Eng.
Environmental Engineer – Agnico Eagle

FINAL REPORT

TOTAL AMMONIA REMOVAL EMPLOYING MBBR TECHNOLOGY

DECEMBER 09, 2022, REVISION 1

PREPARED BY:
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TABLE OF CONTENTS

SECTION 1. INTRODUCTION

Veolia Water Technologies Canada Inc. (VEOLIA) has performed a laboratory bench scale trial on AEM Meadowbank Raw Water mine effluent where the contaminants of concern were metals and nitrogen species (cyanide containing compounds (thiocyanate, cyanate), ammonia, and nitrate). The trial has been performed at VEOLIA's laboratory, located in Montréal, QC.

The aim of the study was to validate the proposed treatment chain and confirm the chemical dosages required for metals precipitation. This study started with an ACTIFLO clarification stage to remove metals, followed by a biological treatment system to reduce nitrogen compounds, and ended with an ACTIFLO clarification step to remove suspended solids. A volume of 1000 liters of raw water sample from the mining site was received in February 2022 at VEOLIA's laboratory. The test stages are as follows:

- Step 1: Metals precipitation using the ACTIFLO process;

- Step 2: The MBBR biological process (Moving Bed Biofilm Reactor):
    - A cyanate and thiocyanate removal reactor;
    - A nitrification reactor;
    - A denitrification reactor;
    - A Re-oxygenation and removal of excess chemical organic demand (Re-Oxygenation) reactor.

- Step 3: A polishing step for total suspended solids removal.

Throughout the trial, the following nomenclature will be used for the samples appellation:

- Sample received from AEM: Raw Water
- Raw water after metal treatment: Clarified Raw Water
- Clarified Raw water after MBBR treatment: MBBR Effluent Water
- MBBR Effluent after clarification: Clarified MBBR Water.

The laboratory tests began in February, 2022. The received sample was completely treated by the ACTIFLO process in order to reduce the concentration of metals (Step 1) on a batch process. In order to demonstrate the effectiveness and stability of the step 2 treatment in different operating temperature, this step of the laboratory study was carried out in two phases. The first stabilization phase took place at room temperature. During the second phase, the temperature was gradually lowered to 7-8°C. The step two was based on a continuous operation. During the step 3, the MBBR Effluent Water was polished using another ACTIFLO stage that produced the Clarified MBBR Water in a batch process.

The non-toxicity of the Clarified MBBR Water was validated by acute toxicity tests on aquatic species including *Daphnia magna* and *Oncorhynchus mykiss* (rainbow trout). This report presents the Clarified MBBR Water qualities issued from the biological and metal removal treatment trial, and the following sections are included in this report:

- Objectives;
- Process Description;
- Material & Methods;
- Results and Discussion;
- Conclusion.

SECTION 2. OBJECTIVES

The laboratory test aimed to validate the performance of the proposed biological process as well as the ACTIFLO clarification steps necessary to achieve the treatment objectives presented in Table *1*. More specifically, the objectives were:

- Validate the metals upstream (especially copper) of the biological process by sulfide precipitation followed with ACTIFLO clarification (STEP 1);
- Validate the reduction of cyanate, thiocyanate, ammonia and nitrates through MBBR (STEP 2).
- Limit the suspended solids in the Clarified MBBR Water to 15 mg/L using the ACTIFLO clarification (STEP 3);
- Prove that the Clarified MBBR Water is non-toxic for the *Oncorhynchus mykiss* (rainbow trout) and *Daphnia magna* species at room temperature, as well as at lower temperature.

Table *1 Treatment objectives as provided by AEM*

Parameters	*Units*	*Maximum Monthly Average Concentrations*	*Maximum Allowable Grab Sample Concentration*
pH	--	6.0 – 9.0	6.0 to 9.0
Total Dissolved Solids	mg/L	1400	1400
Total Suspended Solids	mg/L	15	30
Turbidity	mg/L	15	15
Total Aluminum	mg/L	1.5	1.5
Dissolved Aluminum	mg/L	1.0	1.0
Total Arsenic	mg/L	0.3	0.6
Total Cadmium	mg/L	0.002	0.004
Total Cyanides	mg/L	0.5	1.0
Total Copper	mg/L	0.1	0.2
Total Mercury	mg/L	0.0004	0.008
Nitrogen ammonia	mg/L	16	32
Total Nickel	mg/L	0.2	0.4
Nitrates	mg/L	20	40
Total Lead	mg/L	0.1	0.2
Total Phosphorous	mg/L	1.0	2.0
Total Zinc	mg/L	0.4	0.8
Total Chlorides	mg/L	1000	2000
Acute lethality to rainbow trout	--	Non-lethal	
Acute lethality to *Daphnia magna*	--	Non-lethal	

In addition to the treatment objectives, Table 2 show some examples of toxicity level found in the literature for rainbow trout and *Daphnia magna.*

Table 2 Toxicity level for rainbow trout and *Daphnia magna*

Parameters	Units	Typical toxicity level for rainbow trout	Typical toxicity level for *Daphnia magna*
Total Aluminum	mg/L	6.6 to 8	3.9 to 7.6
Total Arsenic	mg/L	ND*	7.4
Total Cadmium	mg/L	0.0005 to 0.006	0.065
Total Cyanides	mg/L	ND	0.09
Total Copper	mg/L	0.02 to 0.09	0.01 to 0.02
Total Mercury	mg/L	ND	0.005
Unionized ammonia	mg NH3/L	0.158 to 1.09	0.5 to 4.9
Total Nickel	mg/L	20	0.51 to 1.4
Nitrates	mg N/L	1355	323 to 611
Nitrites	mg N/L	0.2 to 0.4	10
Total Zinc	mg/L	0.1 to 0.3	0.3
Total Chlorides	mg/L	6030	3100 to 3600
Cyanate	mg/L	10 to 100	18
Thiocyanate	mg/L	94 to 300	16 to 32

*No Data

SECTION 3. PROCESS DESCRIPTION

The proposed treatment is presented in Figure 1.

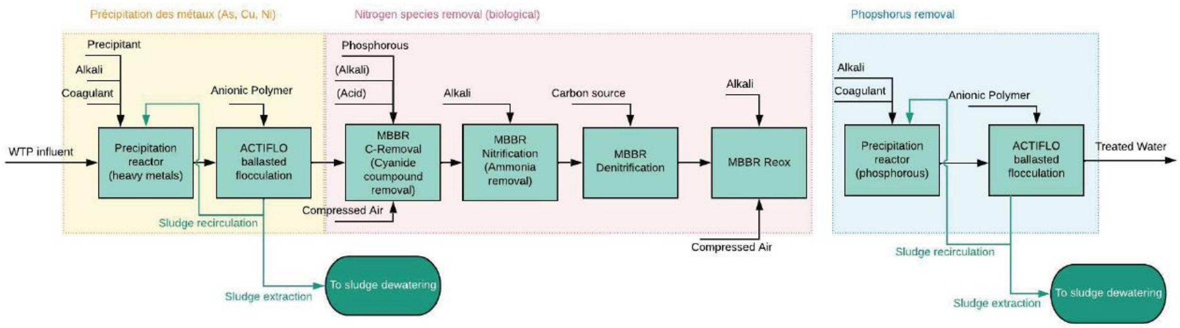

Figure 1 *Proposed treatment*

3.1 METAL PRECIPITATION REACTOR AND ACTIFLO BALLASTED SAND CLARIFIER

The metal precipitation reactor is designed to precipitate the dissolved metals in the Raw Water. This process includes pH adjustment and adding a sulfide based metal precipitant; the process also requires a ferric based coagulant for particle coagulation. The ACTIFLO process is a high rate settling process that combines the advantages of ballasted flocculation and lamella clarification. Coagulant and polymer are added to form flocs and microsand is added to increase the flocs weight for fast settling. In fact, the flocculation and settling process in the ACTIFLO are more efficient due to the density and the shape of the microsand particles. In rapid mixing tanks, the microsand significantly increases the probability of contact between particles. Therefore, it is faster and easier to create strong flocs, even when lighter and smaller solids are found in the Raw Water. Once the floc is formed and attached to microsand, the settling velocity of the floc-microsand aggregation becomes considerably higher allowing high rise rate. The process is very robust since it is not affected by the nature of the floc or water temperature variations.

3.2 MOVING BED BIOFILM REACTOR (MBBR)

VEOLIA's MBBR grows biomass on submerged carriers (see Figure 2). The MBBR's efficiency increases due to utilizing the specially designed carriers. These carriers are designed to have a protected interior for biofilm growth and remain in constant movement in the reactor. The constant movement of MBBR carriers is generated by an aeration system or mechanical mixers in the reactor. The mixing also supports the designed fill fraction of MBBR reactors.

The carriers constantly collide and subject to hydrodynamic shear forces. These processes act as a self-cleaning mechanism for the carriers and hence enable a consistent healthy biofilm. The self-cleaning mechanism eliminates the need for backwashing and all in-tank components (aeration grid and carrier retention sieves) are designed to be maintenance free. These attributes allow the MBBR to provide a significant increase in treatment capacity and maintain a simple and robust operation.

Figure 2: Seeded AnoxKaldnes K5™ carriers

In addition to its simple operation, the MBBR is significantly more resistant to acutely toxic events and changing water quality as compared to conventional suspended growth biological treatment. The robustness and stability are achieved through the inherently long biomass retention time (fixed film) and the natural benefits of diffusion based substrate transfers. These attributes collectively make the MBBR an ideal fit for mining applications; the bench scale tests will simulate the MBBR nitrification and the denitrification process to treat the Clarified Raw Water at room temperature (temperature to be lowered in the second phase).

3.1 ACTIFLO BALLASTED SAND CLARIFIER FOR P REMOVAL

Residual P and TSS from biological activity is removed with a coagulant (ferric salt based) and polymer within a reactor and a polishing ACTIFLO.

The ACTIFLO process is a high rate settling process that combines the advantages of ballasted flocculation and lamella clarification. Coagulant and polymer are added to form flocs and microsand is added to increase the flocs weight for fast settling. In fact, the flocculation and settling process in the ACTIFLO are more efficient due to the density and the shape of the microsand particles. In rapid mixing tanks, the microsand significantly increases the probability of contact between particles. Therefore, it is faster and easier to create strong flocs, even when lighter and smaller solids are found in the raw water. Once the floc is formed and attached to microsand, the settling velocity of the floc-microsand aggregation becomes considerably higher allowing high rise rate. The process is not affected by the nature of the floc or water temperature variations.

SECTION 4. METHODOLOGY

This section presents the methods used to carry out the trial and analyses as part of the laboratory test.

4.1 METAL PRECIPITATION AND ACTIFLO BALLASTED FLOCCULATION

4.1.1 Material used for metals and TSS removal

Several tests were completed in order to optimize chemical dosages and to test different products. Through many years of experience, VEOLIA has developed a laboratory procedure to accurately simulate the ACTIFLO process. The procedure uses a standard Phipps & Bird jar tester and 1 L cylindrical beakers as shown in Figure 3. The RPMs, time sequence of chemical / Actisand and settling time are optimized for the desired full-scale operation velocity.

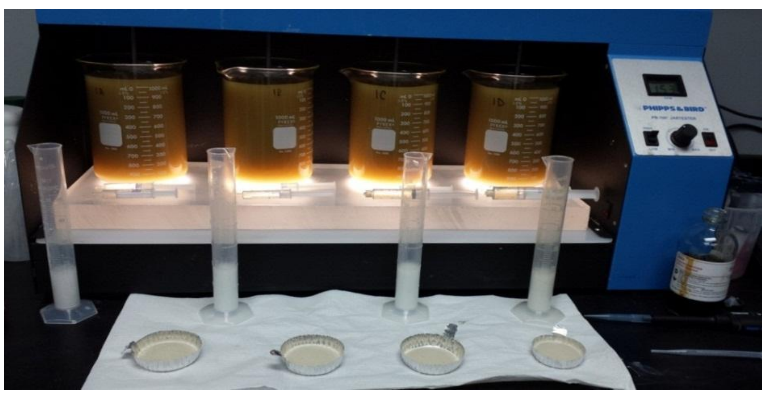

Figure 3: Bench scale jar tester

The jar test program is designed to reproduce the retention time expected in the selected ACTIFLO unit available. The test procedure used to simulate the actual ACTIFLO unit performance with the concentration process solution for copper removal was as follows:

1. Coagulants Hydrex 3253 and organo-sulfide based metal precipitant were added to the sample;
2. pH was adjusted with NaOH to the desired value if needed;
3. Polymer and microsand were added at the end of contact time for coagulation to start the ballasted flocculation process and to complete the suspended solids removal;
4. Sample is settles and Clarified Raw Water is collected.

Contact times for the ACTIFLO at 60 m/h including a contact time upstream the ACTIFLO for copper removal:

- Time 0 min: Coagulant, metal precipitant* and NaOH are added:
- Time 20:00 min: Sand and addition of 50% of the polymer dosage;
- Time 23:20 min: Addition of the remain 50% polymer dosage;
- Time 25:20 min: Mixing is stopped;
- Time 26:20 min: sampling of the supernatant.

*To be noted that both metals precipitants Hydrex 6909 and sodium sulfide were tested for metals precipitation during laboratory clarification tests; moreover, the sodium sulfide was used for the clarification of the 1000 liters sample (feed of the MBBR process).

4.1.2 Chemicals

The chemicals used during the clarification tests are shown in Table 3

Table 3 Chemicals used for the clarification

Chemicals	Formula	Type/Concentration	Description/Purpose
Iron-based Coagulant	Hydrex 3253	Liquid, 12.2 % Fe	Coagulation
Metal chelating agent*	Hydrex 6909	Liquid	Metals precipitation
Metal precipitant	Na_2S	Liquid, 10 g/L	Metals precipitation
Anionic Polymer	Hydrex 3543	Dry based, 1.0 g/L	Flocculation
Microsand	Actisand	--	Ballast settling

*The chelating power comes from a sulfur derivative functionality (dithiocarbamate) grafted onto an organic molecule.

4.2 MBBR TRIAL AT LABORATORY SCALE

The lab scale MBBR consists of a series of four connected reactors. Reactors 1, 2 and 4 were aerated, whereas reactor 2 had anoxic condition. The biological treatment is subdivided into 4 stages:

- Cyanate and thiocyanate removal (reactor 1);
- Nitrification (reactor 2);
- Denitrification (reactor 3);
- Re-oxygenation and removal of excess chemical organic demand (reactor 4).

The first-stage MBBR was dedicated to cyanate and thiocyanate removal. In this reactor, the media is colonized mainly by heterotrophic bacteria and the thiocyanate is oxidized into ammonia while the cyanate is hydrolysed into ammonia following these biochemical reactions:

$$SCN^- + 3H_2O + O_2 \rightarrow NH_4^+ + CO_2 + SO_4^{2-}$$
$$OCN^- + 3H_2O \rightarrow NH_4^+ + HCO_3^+ + OH^-$$

The second-stage MBBR was dedicated to ammonia nitrogen oxidation and was containing media colonized mainly by two types of autotrophic bacteria (*Nitrosomonas* and *Nitrobacter*). The nitrification reaction consumes oxygen and produces acidity by the process in the equations below:

$$NH_4^+ + 1.5O_2 \rightarrow NO_2^- + H_2O + 2H^+ \text{ (by Nitrosomonas)}$$
$$NO_2^- + 0.5O_2 \rightarrow NO_3^- \text{ (by Nitrobacter)}$$

The nitrification reaction uses inorganic ammonia and nitrite as an energy source (electron donor) corresponding to autotrophic bacterial growth. The nitrification reaction transforms ammonia to nitrite which is subsequently oxidized to nitrate.

In order to add oxygen to the systems, the first two MBBR reactors were aerated. Nitrification reaction generates hydrogen ions which decrease the pH in the reactor. Depending on water quality variation and state of the process (steady-state or transient state), all the reactions described can happen in either of the reactor. Thus, sodium hydroxide (NaOH) was dosed to reactors 1 and 2 to maintain an optimal pH level for the nitrifying biomass. The third MBBR reactor was mechanically mixed under anoxic conditions (low dissolved oxygen environment) for denitrification process. In this step, supplemental carbon (glucose) was added for heterotrophic bacteria growth to reduce nitrite and nitrate to nitrogen gas. The redox potential of the reactor was measured in order to validate that the proper environment was maintained.

The fourth MBBR reactor was used to re-oxygenate the effluent from reactor 3 and biologically oxidize any residual chemical organic demand Figure 4 illustrates the Meadowbank's laboratory MBBR set-up at VEOLIA's laboratory.

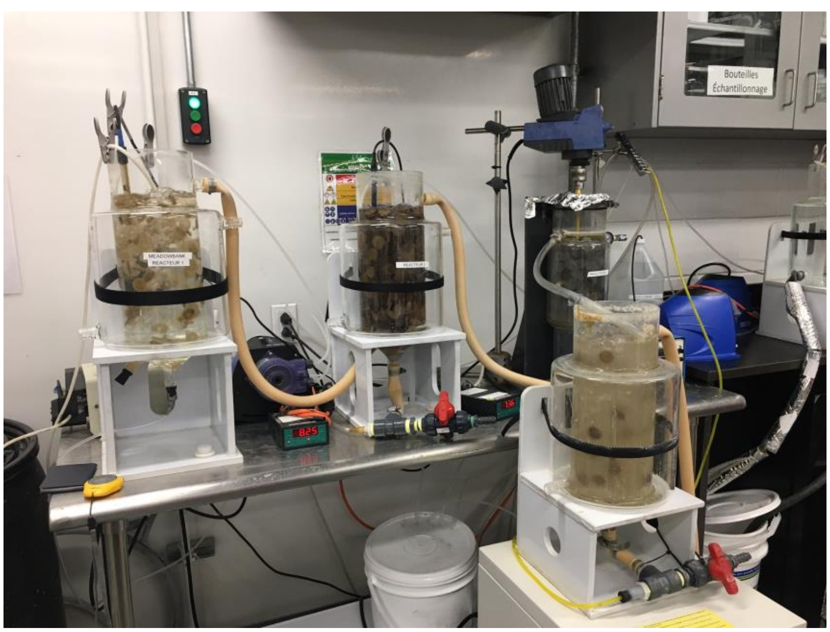

Figure 4 **: Laboratory MBBR set-up**

The laboratory set-up was composed of the following equipment:

- 1 double-walled 5 liters glass reactor for cyanates and thiocyanates removal;
- 1 double-walled 5 liters glass reactor for nitrification;
- 1 double-walled 3 liters reactor for denitrification;
- 1 double-walled 5 liters for Re-oxygenation and removal of excess chemical organic demand;
- 1 air pump with accessories;
- 1 mechanical laboratory stirrer;
- 1 drum and a Masterflex peristaltic pump for mine water supply (feed);
- 1 Chem-tech peristaltic pump for phosphorous source;
- 1 Chem-Tech peristaltic pump for carbon source;
- 1 pH online analyser with dosing setpoint for pH control in nitrification reactor;
- 1 Chem-Tech peristaltic pump for alkali (NaOH) dosing in nitrification reactor (controlled by the pH analyser);
- Tubing and connector;
- 1 industrial chiller for temperature control (not used during room temperature testing).

4.2.1 Chemicals

Table 4 shows chemicals used during the laboratory scale tests for the MBBR system where NaOH is used to maintain a pH value within nitrification range in Reactor 1 (in the vicinity of 7), and sodium hexametaphosphate (Reactor 1) as well as a carbon source (Reactor 3) are both used as nutrients for the bacteria.

Table 4 Chemicals used during the MBBR trial

Chemicals	Formula	Concentration	Description/Use	Consumption
Hydrex 9550	NaOH	Liquid, 0.1N	Alkali source	1.09 L/d
Sodium hexametaphosphate	$(NaPO_3)_6$	Liquid, 0.1 g/L	Phosphorous source	1.25 L/d
Carbon source	Glucose	Liquid, 9.10 g COD/L	Nutrient for the denitrification step	1.26 L/d

4.2.2 Operation parameters for MBBR system

Table 5 presents the MBBR trial operational parameters.

Table 5 Conditions applied to the bench scale MBBR to produce the desired pathway

Parameter	Units	Reactor 1: Cyanate and thiocyanate removal	Reactor 2: Nitrification	Reactor 3: Denitrification*	Reactor 4: Re-oxygenation
Target nitrogen species	-	CN, SCN, CNO	NH_4	NO_3^-	-
Type of carrier	-	K5™	K5™	K5™	K5™
Type of mixing	-	Aeration	Aeration	Mechanical*	Aeration
Dissolved Oxygen	mg O_2/L	> 4.0	> 4.0	< 1.0	> 4.0

The MBBRs were seeded with carriers from a previous trial (from another mine).The flow rate was slowly increased to promote efficient biomass growth. Once the process was stable at a reasonable flow, water from each reactor was collected for validation of the process performances.

4.3 P REMOVAL AND POLISHING

4.3.1 Material used for P and TSS removal

Several tests were completed in order to optimize chemical dosages and to test different products. The jar test program is designed to reproduce the retention time expected in the selected ACTIFLO unit available. The test procedure used to simulate the actual ACTIFLO unit performance with the concentration process solution was as follows:

1. Coagulants Hydrex 3253 was added to the sample;
2. pH was adjusted with NaOH to the desired value if needed;
3. Polymer and microsand were added at the end of contact time for coagulation to start the ballasted flocculation process and to complete the suspended solids removal;
4. Sample is settles and Clarified MBBR Water is collected.

Contact times for the ACTIFLO at 60 m/h including a contact time upstream the ACTIFLO for total suspended solids removal:

- Time 0 min: Coagulant addition;
- Time 1:20 min: Sand and addition of 50% of the polymer dosage;
- Time 4:40 min: Addition of the remain 50% polymer dosage;
- Time 6:40 min: Mixing is stopped;
- Time 8:40 min: sampling of the supernatant

The chemicals used during the clarification tests are shown in Table 6

Table 6 Chemicals used for the clarification

Chemicals	Formula	Concentration	Description/Purpose
Iron-based Coagulant	Hydrex 3253	Liquid, 12.2% Fe	Coagulation
Anionic Polymer	Hydrex 3543	Dry, 1.0 g/L	Flocculation
Microsand	Actisand	--	Ballast settling

4.4 ANALYTICAL MONITORING

4.4.1 Internal MBBR follow-up

The analytical monitoring performed on the MBBR set-up is shown in Table 7. This analytical monitoring is completed in VEOLIA's laboratory on a regular basis.

Table 7 Internal analysis program completed in VEOLIA's laboratory

Parameters	Units	Influent	Reactor 1 Cyanate and thiocyanate removal	Reactor 2 Nitrification	Reactor 3 De-nitrification	Reactor 4 Re-Ox
Flow	L/d	X	--	--	--	--
Dissolved oxygen, DO	mg O_2/L	--	X	X	--	X
Temperature	°C	--	X	X	X	X
pH	--	X	X	X	X	X
Thiocyanates (SCN-)	mg N/L	X	X	X	X	X
Chemical organic demand	mg/L	X	X	X	X	X
Ammonia(NH_4-N)	mg N/L	X	X	X	X	X
Nitrates (NO_3-N) *	mg N/L	X	X	--	X	X
Nitrites (NO_2-N)	mg N/L	X	X	X	X	X
Ortho-phosphates, O-PO_4	mg P/L	X	X	X	X	X

The complete analytical methods performed for the follow-up are detailed in Table 8.

Table 8 Analytical methods used by VEOLIA during the trials

Parameters	Units	Apparatus	Method
pH	--	HACH HQ-40	PHC10101
Dissolved Oxygen	mg/L	HACH HQ-40	LDO10101
Temperature	º C	HACH HQ-40	With pH probe
Ammonia	mg N/L	HACH DR5000	Hach 10031
Nitrite	mg N/L	HACH DR5000	Hach 8507
Nitrate	mg N/L	HACH DR5000	Hach 10020
Orthophosphate	mg P/L	HACH DR5000	Hach 8048

4.4.2 External Analyses and Sampling

Some parameters, such as metal concentrations, cannot be efficiently measured in VEOLIA's laboratory due to the stringent criteria and low detection limits required. For this reason, part of the analyses needs to be completed by an external laboratory. Samples were collected for these analyses and sent to an external accredited laboratory. All external laboratories were ISO/IEC 17025 accredited from the Standards Council of Canada.

Once the process was fully optimized, a complete characterization was done on the Clarified MBBR Water at both temperatures. The complete characterization includes the following parameters:

- Ammonia, Total;
- Cyanides compounds (CN, SCN, CNO)
- Total metals scan;
- Anions scan (NO_3, NO_2, Cl, SO_4);
- Acute lethality test on *Daphnia magna* and rainbow trout

All results from the external laboratory are presented in APPENDIX B.

SECTION 5. RESULTS AND DISCUSSION

5.1 RAW WATER CHARACTERISTICS

Upon reception of the 1 m^3 effluent from AEM-Meadowbank Raw Water, a sample was sent to an accredited laboratory for a full characterization. Table 9 presents the Meadowbank Raw Water parameters, as validated by an accredited external laboratory.

Table 9 AEM_Meadowbank Raw Rater

Parameters	Units	ST-19 Source (As received)	Maximum Monthly Average Concentration
pH	--	7.4	6.0 – 9.0
Total suspended solids	mg/L	23.8	15
Total dissolved solids	mg/L	2640	1400
Ammonia, Total (as N)	mg N/L	**41.3**	16
Bromide	mg/L	<0.50	
Chloride	mg/L	188	1000
Fluoride	mg/L	<0.10	
Nitrate (as N)	mg N/L	9.79	20
Nitrite (as N)	mg N/L	0.173	
Sulfate (as SO_4)	mg/L	1380	
Orthophosphates	mg/L	<0.0030	
Phosphorous, Total	mg/L	0.0113	1.0
Total organic carbon	mg/L	105	
Dissolved organic carbon	mg/L	98	
Cyanides, Total	mg/L	0.0312	0.5
Cyanate	mg/L	**115**	
Thiocyanates	mg/L	**147**	
Aluminium (Al)	mg/L	0.054	1.5
Antimony (Sb)	mg/L	0.0174	
Arsenic (As)	mg/L	0.0979	0.3
Barium (Ba)	mg/L	0.0561	
Beryllium (Be)	mg/L	<0.0010	
Bismuth (Bi)	mg/L	<0.00050	
Boron (B)	mg/L	0.26	
Cadmium (Cd)	mg/L	<0.000060	0.002
Calcium (Ca)	mg/L	285	
Cesium (Cs)	mg/L	<0.00010	
Chromium (Cr)	mg/L	<0.0050	
Cobalt (Co)	mg/L	0.464	
Copper (Cu)	mg/L	**0.811**	0.1
Iron (Fe)	mg/L	0.21	
Lead (Pb)	mg/L	0.00060	0.1
Lithium (Li)	mg/L	<0.010	

Parameters	Units	ST-19 Source (As received)	Maximum Monthly Average Concentration
Magnesium (Mg)	mg/L	23.5	
Manganese (Mn)	mg/L	0.0230	
Molybdenum (Mo)	mg/L	0.124	
Nickel (Ni)	mg/L	0.338	0.2
Phosphorous (as P)	mg/L	<0.50	
Potassium (K)	mg/L	173	
Rubidium (Rb)	mg/L	0.0502	
Selenium (Se)	mg/L	0.137	
Silicon (Si)	mg/L	3.0	
Silver (Ag)	mg/L	0.00057	
Sodium (Na)	mg/L	434	
Strontium (Sr)	mg/L	1.03	
Sulfur (S)	mg/L	619	
Tellurium	mg/L	<0.0020	
Thallium (Tl)	mg/L	<0.00010	
Thorium (Th)	mg/L	<0.0010	
Tin (Sn)	mg/L	<0.0010	
Titanium(Ti)	mg/L	<0.0030	
Tungsten (W)	mg/L	0.0072	
Uranium (U)	mg/L	0.0145	
Vanadium (V)	mg/L	<0.0050	
Zinc (Zn)	mg/L	<0.030	0.4
Zirconium	mg/L	<0.0020	

All external laboratory certificates of analyses are provided in APPENDIX A for reference.

Parameter of concerns are highlighted: TSS, TDS, ammonia, copper and nickel. Parameters in bold are likely to cause lethality to either freshwater control species.

This study aims to reduce all parameter of concern (from the regulation or that fails toxicity tests) except TDS that needs further treatment such as Reverse Osmosis or Evaporation to treat it.

5.1.1 METAL PRETREATMENT

The Raw Water was pre-treated with the ACTIFLO process to precipitate the metals present in it, especially the copper. The tote tank received from AEM-Meadowbank had to be treated with the ACTIFLO metal precipitation step in order to remove some metals, especially copper. Since copper concentration were at 0.811 mg/L and at this concentration, the copper is toxic for the biomass. The dosages applied for the clarification of the Raw Water were:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 465 mg/L;
- NaOH: 30 mg/L (liquid solution at 1N);
- Na_2S : 20 mg/L (10.0 g/L,dry based);
- Anionic polymer Hydrex 3543: 1.0 mg/L (dry based);
- Optimal pH in the vicinity of 7.0.

After the ACTIFLO clarification process, the Clarified Raw Water turbidity was in the vicinity of 0.5 NTU; as for the copper concentration, the result obtained for copper was 18 µg/L.

5.2 MBBR TESTING TIMELINE

Laboratory testing on MBBR technology for the treatment of the Clarified Raw Water was started on March 3, 2022.

Case history of the MBBR treatability testing:

- 2022-03-03: The MBBR system was started with a very low flow (2 L/d). It allows media to acclimate with the Clarified Raw Water which has low copper concentration (0.18 mg/L) and is rich with cyanates, thiocyanates and nitrogen compounds. The media put in the reactors 2, 3 and 4 was recovered from a previous trial. For the first reactor, municipal wastewater was used to seed the media.
- 2022-03-15: System was in control**:** nitrate, nitrite and total ammonia concentrations are below treatment objectives. The flow was slightly increased to 4.8 L/d.;
- 2022-03-23: The flow was again increased to 6.8 L/d since all the parameters were in control;
- 2022-03-25: For an unexplained reason, the pH dropped in the denitrification reactor, a pH loop was installed to prevent a low pH and inhibit the treatment;
- 2022-03-30 and 2022-03-31: One drop of phosphoric acid was added manually in the denitrification reactor, since on the previous days, there was a peak of nitrite and nitrate concentrations. Because the Ortho-phosphates were consumed by the biomass, and the lack of phosphorous content caused deficient denitrification process;
- 2022-04-01 to 2022-04-11: The addition of a phosphorous source had an immediate effect, and the system regained satisfying denitrification level, the nitrate and nitrite concentrations were within the discharge criteria. The flow was then gradually increased until it reached 8.64 L/d;
- 2022-04-11: A problem occurred during the week-end with the caustic pump that feeds the nitrification reactor resulting very low pH and the inhibition of the nitrifying bacteria; after the

correction and the replenishing of the caustic, the system was in control within 48 hours and the flow was increased to 9.1 L/d;

- 2022-04-15: The temperatures were lowered from 20 °C to 15 °C in order to proceed with the first toxicity analyses and full data analysis;
- 2022-04-20: On the week-end, the feed tube came out of the barrel, the system deprived for two days while the denitrification reactor was still fed with glucose. It caused vast development of biomass and massive quantity of total suspended solids in this reactor. Thus, TSS increased in the reoxygenation reactor;
- 2022-04-20 to 2022-04-25: Several manipulations were carried out in order to recover the treatment, including stopping the chiller, and cleaning of the reactors. At the end, reactor 4 was emptied to refill it with the effluent from R3. When the system regained its stability; the chiller was re-started;
- 2022-04-28: There was a clough in the outlet tube of reactor 1, causing the reactor to overflow;
- 2022-05-04: Temperatures were lowered to 15 °C;
- 2022-04-29 to 2022-05-10: It was difficult to keep the control of the system during this period, especially in denitrification reactor. Several adjustments such as addition of phosphoric acid, increase of the glucose dosage, reduction of the flow were carried out in order to regain control of the system;
- 2022-05-11: System was in control and at 15 °C, the MBBR Effluent Water was sampled and clarified with the ACTIFLO process to produce the Clarified MBBR Water and to do acute toxicity analyses as well as a full water characterization, the Clarified MBBR Water came back non-toxic and within all the targeted parameters (except TDS);
- 2022-05-13 to 2022-05-23: The flow was reduced and the temperatures were gradually lowered to achieve 8 °C, the system was in full control;
- 2022-05-24: A second sampling was carried out and, MBBR Effluent Water was clarified, and samples were sent for the same analyses performed on May 11th. Another time, all the parameters came back within objectives treatment (except TDS);
- 2022-05-25: Project was closed.

5.2.1 DISCUSSION ON MBBR OPERATION

The efficiency of the MBBR process is tributary from several operation parameters such as contaminants load (proportional to the flow rate), dissolved oxygen concentration and pH in each reactor. Each biological reactor has proper optimal parameters that should be monitored to promote optimal bacterial growth.

The biological process was started on March 3, 2022 with the Clarified Raw Water at a moderate flowrate with four reactors; one for cyanates and thiocyanates, the second one for nitrification, the third one for denitrification, and finally the fourth one for polishing the nitrates concentrations as well as oxidize the residual COD concentrations. When nitrification was well established, the flow rate was gradually increased while stabilizing the performance of the ammonia and nitrate removal at room temperature (in the vicinity of 20 °C). The temperature was lowered gradually to 15 °C for the first phase of the trial, and to 8 °C for the final phase.

The flowrate is equal in each reactor due to the hydraulic gravity profile of the MBBR bench scale unit set-up. The flowrate was gradually increased through the first phase of the laboratory testing and had reached up to 9.2 L/d. The flowrate evolution during the first phase of laboratory testing, held at room temperature, is illustrated in Figure 5.

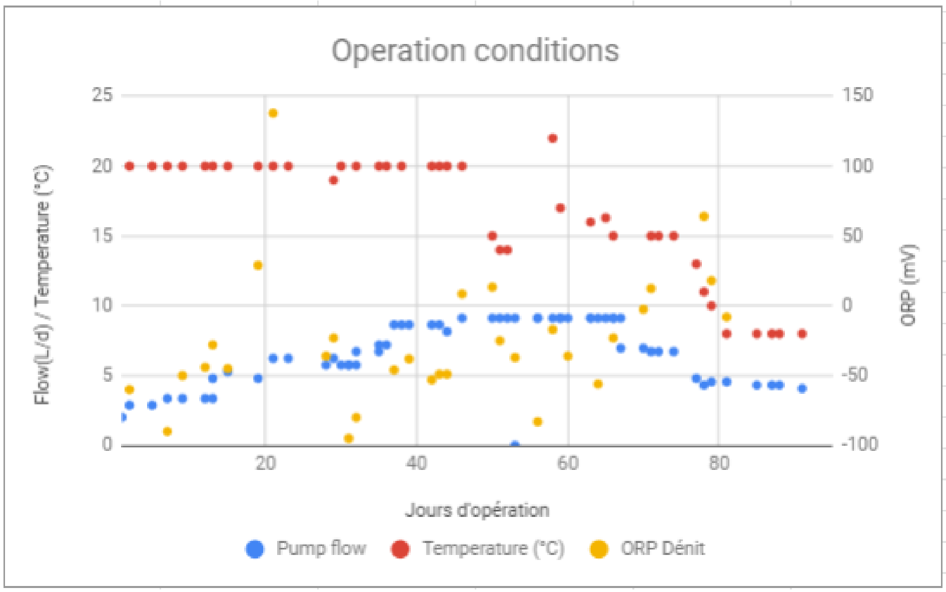

Figure 5 **: Flowrate and operation temperature for the MBBR set-up**

The reactor 1 efficiently removed thiocyanates in the Clarified Raw Water, even at low temperature such as 3 to 4 ºC. Figure 6 shows thiocyanates removal during trials.

As is seen in this Figure, thiocyanate removal is effective in reactor 1 under the given conditions. Throughout the trial, thiocyanate concentration in reactor 2 was closed to 0 mg/L as expected.

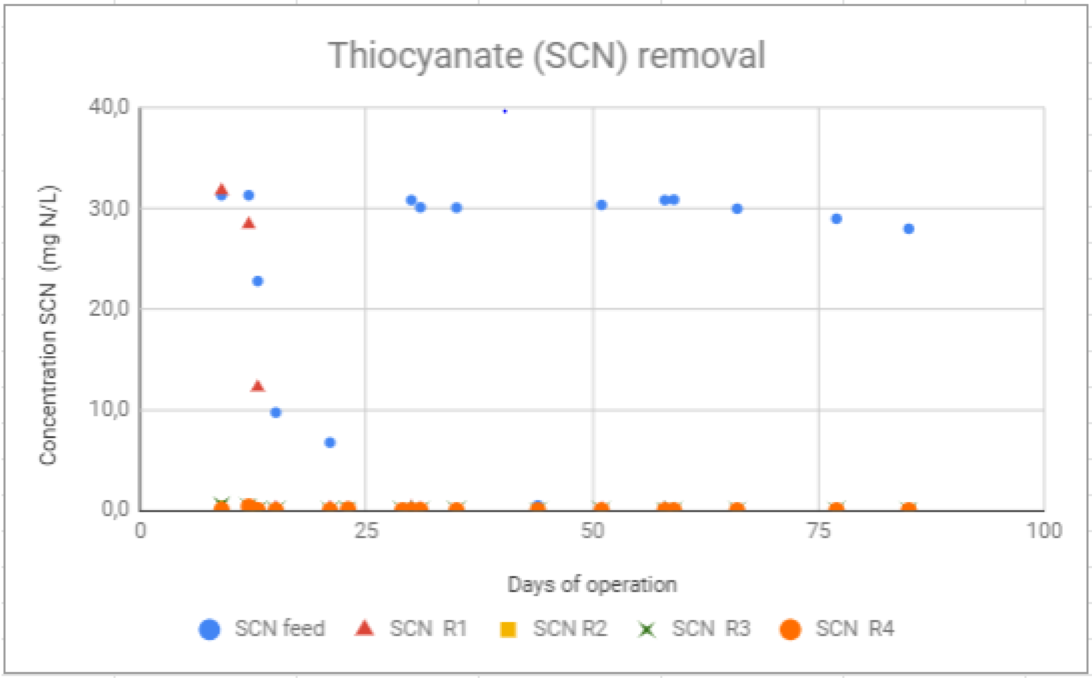

Figure 6 **: Thiocyanate removal by the MBBR process**

Low ammonia concentrations were recorded during most of the laboratory trial. The nitrification process was well established almost immediately after the beginning of the trial. The rare occasion of raising of NH_4 concentration occurred on April 11, 2022 (day 42) after malfunctioning of the caustic pump. The nitrification process is well recuperated after the correction of the issue.

Otherwise, the ammonia concentrations were totally in control in the system throughout the MBBR test, lowering the temperatures had no impact on the nitrification process. See Figure 7 for the ammonia concentrations profile in the MBBR system.

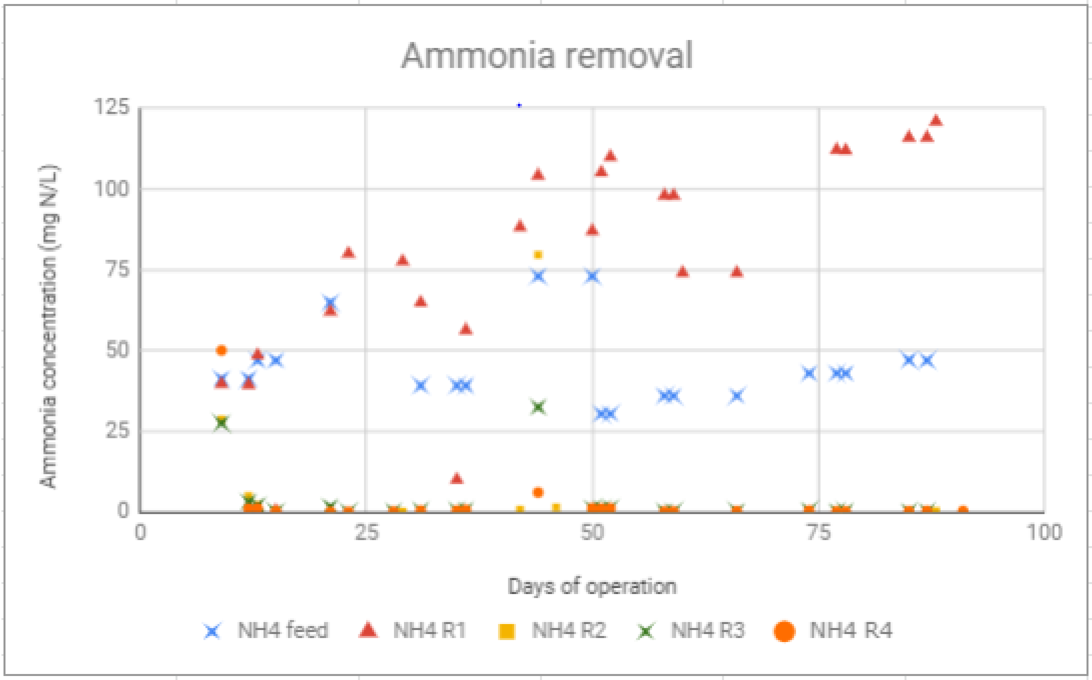

Figure 7: Total Ammonia profile across the MBBR system

Anoxic conditions in the third reactor allows nitrates reduction. Nitrates are produced in reactor 2 as the ammonia is oxidized to nitrite, and then nitrite to nitrate (final nitrification product). As for the nitrate and nitrite concentrations, the four MBBR and the MBBR Effluent Water shows values within discharge criteria most of the time. However, on day 23, it was noticed that the nitrate/nitrite concentrations started to increase in the denitrification reactor, resulting high values in the MBBR Effluent Water. It was determined that a phosphorus deficiency was the cause of this phenomenon. One drop of phosphoric acid was injected directly in the denitrification reactor to enhance the biological reaction and improve the denitrification process. A second episode of high concentrations occurred on days 56 to 66 due to mechanical issues, the system was back to normal in a few days after the correction of the issues.

Monitoring nitrite and nitrate validates that the nitrification and denitrification reactions were fulfilled. As shown in Figure 8 and Figure 9 , nitrate and nitrite were mostly produced in reactor 2 by ammonia-oxidizing bacteria that oxide total ammonia to nitrite; in a second stage nitrites are transformed to gaseous nitrogen. Nitrites concentrations were practically non-existing in Raw Water received from the mine while the nitrates concentrations were in the vicinity of 10 mg N/L. Nitrite and nitrate produced by reactor 2 were then eliminated in reactor 3 due to activity of the anoxic bacteria, which are practically not existing on reactor 4. Results showed that lowering the temperatures have no effect on the nitrate removal, the concentrations were below the toxicity range, even when 8° C was reached. Figure 8 and Figure 9 present nitrate and nitrite evolution on each reactor during trials.

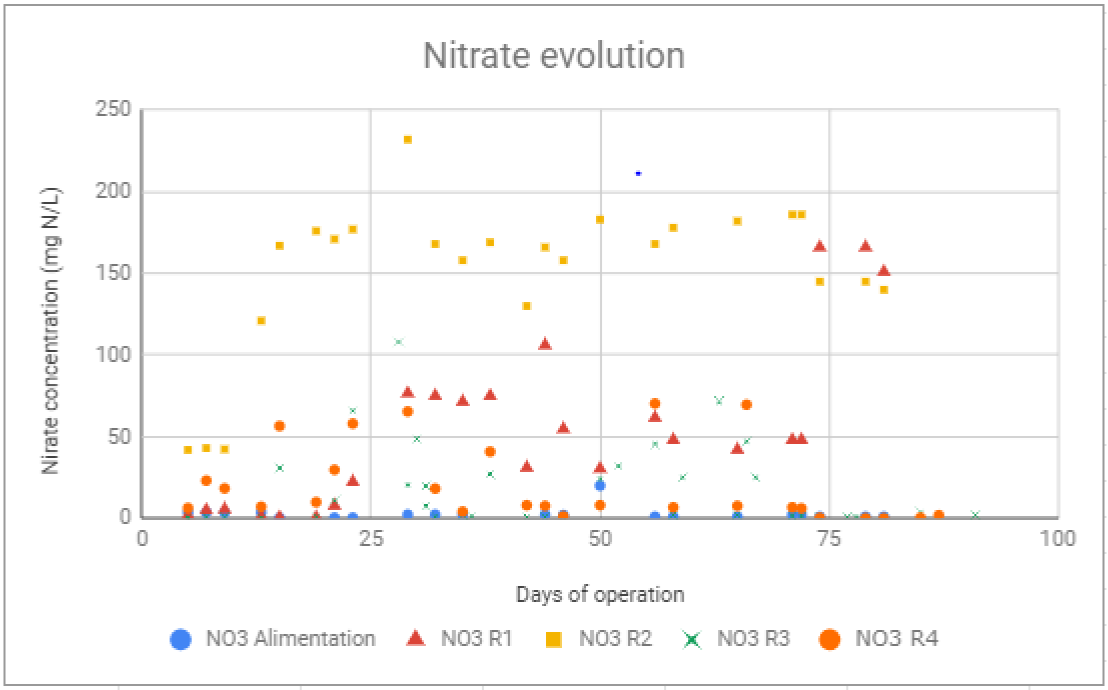

Figure 8 Nitrate evolution across the MBBR system

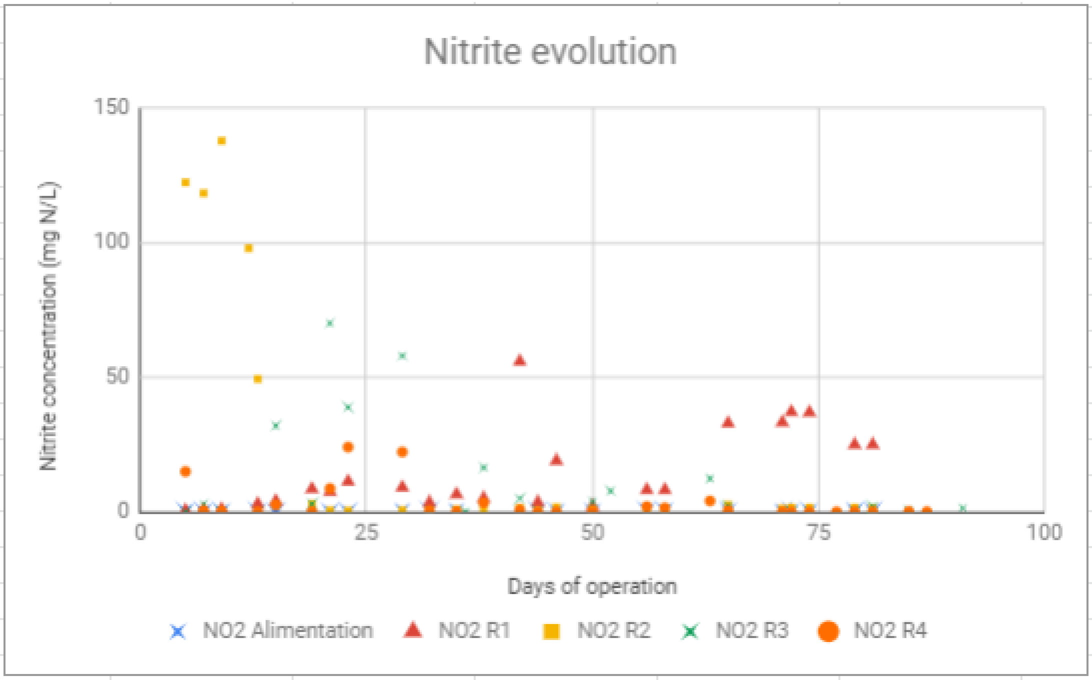

Figure 9 Nitrite evolution throughout the MBBR trial

Reduction of the ammonia and nitrate concentrations in the Clarified Raw Water results in total nitrogen reduction. The global nitrogen concentration evolution for each reactor is presented in Figure 10.

Complete nitrogen removal requires good efficiency of cyanides compounds (OCN, SNC), nitrification (occurring under aerobic conditions) and denitrification (occurring under anoxic conditions) to convert ammonium to nitrate and then nitrate to nitrogen gas. The data presented in Figure 10 is compatible with expected results; high concentrations of total nitrogen were observed in the Raw Water and reactor 1 (where nitrogen was converted but not removed). A significant reduction of the total nitrogen could be seen in reactor 3, as the denitrification process converts nitrates to nitrogen gas, thus removal of the total nitrogen load to the water phase. The offset presented in Figure 10 concerning the nitrates concentration at the end of the trial of the laboratory testing is also seen in the total nitrogen evolution as the denitrification reaction is the main key for total nitrogen removal in the Raw Water.

Therefore, the MBBR process allows significant nitrogen compounds removal during the second part of the laboratory testing, in which the water temperature was progressively decreased down to 8 °C.

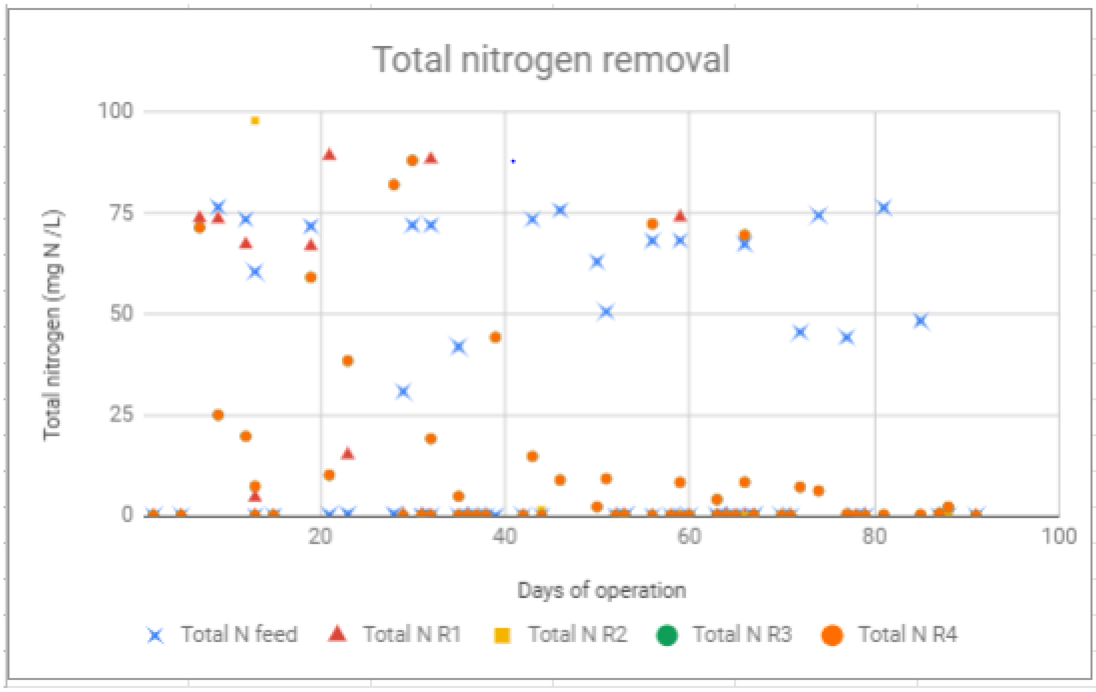

Figure 10 Total nitrogen ammonia removal

Evaluation of the performance of a MBBR process is based on its capacity to remove ammonia and nitrate on a known basis. For MBBR this is usually the media surface, and is typically expressed as g N/d/m2 of media. This allows for comparison of different media that may have different specific areas, expressed as m2 of surface area per m3 of media. The Surface Area Removal Rate (SARR) for ammonia was calculated for Meadowbanks MBBR bench test. However the maximum capacity of the system was not tested. Indeed, loading rates were kept on the safe side to promote nitrite oxidation and prevent further nitrite accumulation, which could have led to further nitrification inhibition by reducing the efficiency of ammonia oxidation to nitrite.

The ammonia and nitrate removal rates are expressed as SARR (Surface Area Removal Rate). Since removals were still complete at the highest loading rate achieved and that the system hasn't been pushed further during these tests, loading rate limitation is not known for this application and the observed SARR given are not to be used for design purpose. See Figures 11 and 12 for the removals during the trial. These figures shows the evolution of the SARR and the SALR (Surface Area Loading Rate) observed during the trial.

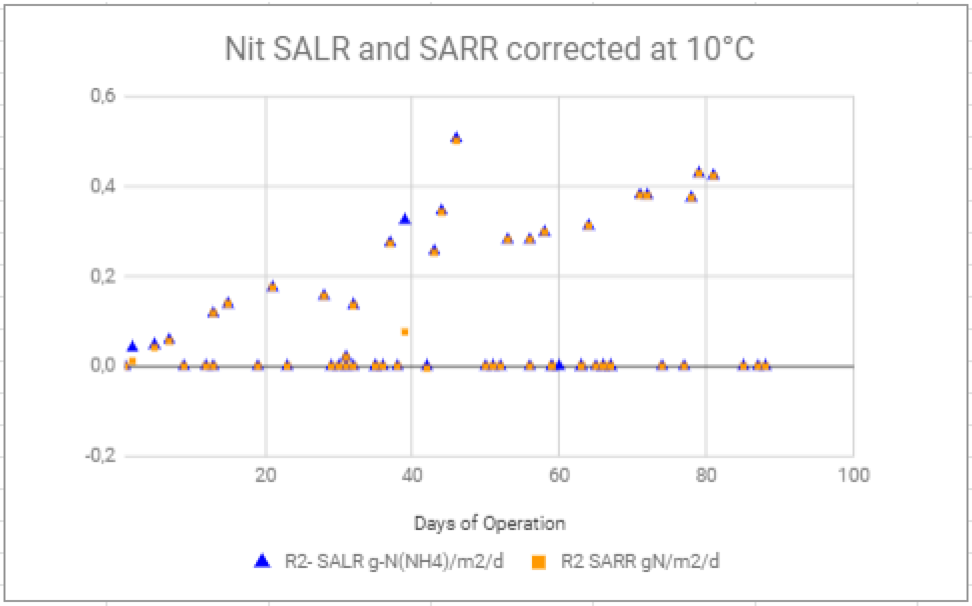

Figure 11 Nitrification SALR and SARR

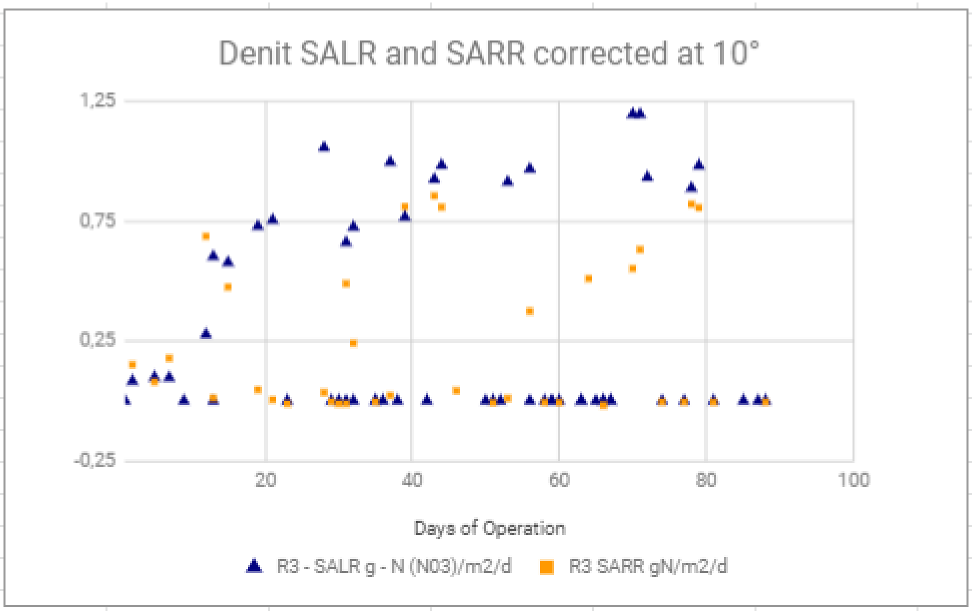

Figure 12 Denitrification SALR and SARR

5.2.2 SOLIDS CLARIFICATION AND P REMOVAL USING ACTIFLO TECHNOLOGY

During the MBBR trials at both temperature, MBBR Effluent Water samples were collected and clarified with the ACTIFLO process in order to determine the optimum chemical dosages necessary to reach optimal clarification. Thirty litres of MBBR Effluent Water were then collected and treated with the ACTIFLO process, using a ferric coagulant, caustic soda and an anionic polymer producing the Clarified MBBR Water. The optimum dosages for the Clarified MBBR Water, treated at 15 °C and 8 °C, were:

For the 15 °C sample:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 265 mg/L;
- NaOH : 240 mg/L (liquid solution at 1N);
- pH : in the vicinity of 7.0;
- Anionic polymer Hydrex 3543: 4.0 mg/L (dry based).

For the 8 °C sample:

- Coagulant Hydrex 3253 liquid coagulant (12.2% Fe): 300 mg/L;
- NaOH : 288 mg/L (liquid solution at 1N);
- pH : in the vicinity of 7.0;
- Anionic polymer Hydrex 3543: 4.0 mg/L (dry based).

Twenty litres of Clarified MBBR Water were sent to a specialized accredited external laboratory;

- One sample for acute lethality testing, single concentration, to both rainbow trout and *Daphnia magna*;
- One sample for a full characterization of the treated water.

Samples from the Clarified Raw Water were also sent for a final scan. The resulting characterization is presented in Table 10. Complete water characterization sent to the accredited external laboratories can be found in APPENDIX A.

Table 10 Clarified MBBR characterization of the laboratory testing at 15 °C

Parameters	Units	Criteria	Clarified Raw Water 15 °C	Clarified MBBR Water 15 °C
pH	--	6.0 – 9.0	7.59	7.15
Total Dissolved Solids*	mg/L	1400	2440	2490
Total Suspended Solids	mg/L	15	<3.0	6.3
Turbidity	mg/L	15	--	1.20
Total Aluminum	mg/L	1.5	<0.050	<0.050
Dissolved Aluminum	mg/L	1.0	<0.050	<0.050
Total Arsenic	mg/L	0.3	0.0015	<0.0010
Total Cadmium	mg/L	0.002	<0.000050	0.000058
Total Cyanide	mg/L	0.5	0.0403	0.0188
Cyanates	mg/L	--	17	<10
Total Copper	mg/L	0.1	0.0084	<0.0050
Total Mercury	mg/L	0.0004	--	--
Ammonia, Total	mg N/L	16	47.4	2.96
Total Nickel	mg/L	0.2	0.135	0.0454
Nitrates	mg N/L	20	9.37	<0.20
Nitrites	mg N/L	--	0.46	<10
Thiocyanate	mg N/L	--	138	<0.5
Total Lead	mg/L	0.1	<0.00050	<0.00050
Total Phosphorous	mg/L	1.0	<0.50	<0.50
Total Zinc	mg/L	0.4	<0.030	<0.030
Total Chlorides	mg/L	1000	188	121
Acute lethality to Rainbow trout	--	Pass/Fail	--	Non-lethal
Acute lethality to *Daphnia magna*	--	Pass/Fail	--	Non-lethal

***The MBBR treatment cannot reduce the TDS concentrations, the TDS treatment can be done through a membrane and evaporation chain.

On day 74, the temperatures were gradually lowered to 8 °C to proceed with the second toxicity analysis and complete characterization. The decrease of the temperatures in the four reactors had no impact on the treatment, all the targeted parameters were within objectives. On May 24th, 2022, the Raw Water as well as the Clarified MBBR Water treated with the ACTIFLO process were collected and sent to Bureau Veritas in Montréal, QC and Aquatox Quelph, ON. A sample of the MBBR Effluent Water (from R4) was tested for the same parameters. See Table 11 for the characterization of these three sources.

Table 11 Clarified MBBR Water characterization of the laboratory testing at 8 °C

Parameters	Units	Criteria	Clarified Raw Water 8 °C	MBBR Effluent Water 8 °C	Clarified MBBR Water 8 °C
pH	--	6.0 – 9.0	7.84	7.76	6.98
Total Dissolved Solids	mg/L	1400	6.3	<u>2110</u>	<u>2600</u>
Total Suspended Solids	mg/L	15	6.3	<u>346</u>	<3.8
Turbidity	mg/L	15	--	-	2.74
Total Aluminum	mg/L	1.5	0.0464	<0.03	<0.03
Total Arsenic	mg/L	0.3	0.00169	<0.001	<0.001
Total Cadmium	mg/L	0.002	<0.0005	<0.0006	<0.0005
Total Cyanides	mg/L	0.5	0.0617	0.0144	0.0282
Cyanate	mg/L	--	30	<2	<1
Total Copper	mg/L	0.1	0.00832	0.018	<0.005
Total Mercury	mg/L	0.0004	--	--	--
Ammonia, Total	mg N/L	16	<u>64.4</u>	0.0352	3.94
Total Nickel	mg/L	0.2	0.142	0.0647	0.0546
Nitrates	mg N/L	20	2.96	<0.1	<0.2
Nitrites	mg N/L	--	5.19	<0.05	<0.1
Thiocyanate	mg/L	--	**124**	<0.5	<0.5
Total Lead	mg/L	0.1	<0.0005	<0.0005	<0.0005
Total Phosphorous	mg/L	1.0	<0.5	8.95	<0.5
Total Zinc	mg/L	0.4	<0.03	<0.0316	<0.03
Total Chlorides	mg/L	1000	193	100	112
Acute lethality to Rainbow trout	--	Pass/Fail	--	--	Non-toxic
Acute lethality to *Daphnia magna*	--	Pass/Fail	--	--	Non-toxic

This table show that all the parameters are met on the Clarified MBBR Water, except for TDS.

SECTION 6. CONCLUSIONS

Raw Water was received from Meadowbank mine; the Raw Water was first treated for metals with the ACTIFLO process. The Clarified Raw Water was then treated with the MBBR process to produce the MBBR Effluent Water. The laboratory test was split into two distinct phases:

- Treatment at 15 °C;
- Treatment at 8 °C.

Testing results from both phases, at both temperature, have confirmed the efficiency of the biological treatment proposed (MBBR) for cyanates, thiocyanate, total ammonia and nitrate removal in four distinct reactors:

- Reactor 1: Cyanates and Thiocyanates removal;
- Reactor 2: Nitrification;
- Reactor 3: Denitrification;
- Reactor 4: Re-oxygenation and removal of excess chemical organic demand

The MBBR Effluent Water, the final effluents from reactor 4, were treated to remove phosphorus and TSS using a ballasted flocculation and clarification (ACTIFLO) process. The Clarified MBBR Water was meeting all objectives on Meadowbank effluent. All of the metal targets were met as well as the targeted pollutants.

The main conclusions for the bench scale MBBR trial performed at room and low temperature (8°) at VEOLIA laboratory are:

- Cyanates and thiocyanates were removed in the first reactor;
- The nitrification process was fulfilled and the treated water meets the objective of 16.0 mg N/L;
- The denitrification process reduced the nitrates present in the water as the results of the nitrification reaction. It also produced water with low nitrite concentration;
- The re-oxygenation and biological polishing reactor allowed for the elimination of the excess carbon left from denitrification step. It also increased the oxygen concentration in the water before its release into the environment to prevent toxicity in the Clarified MBBR Water;
- pH was maintained in the nitrification and denitrification reactors using sodium hydroxide, and a phosphorous source was needed in the feed (added at the beginning of the trial in the raw water source and later directly to the reactors);
- Following TSS removal, the Clarified MBBR Water, was not acutely lethal for both *Daphnia magna* and *Oncorhynchus mykiss* (rainbow trout);
- The TSS, phosphorous and all metals in the Clarified MBBR Water meet the discharge criteria.

APPENDIX A. MBBR FOLLOW-UP

MBBR Lab Study Results

Project: Meadowbank

Date	Hour	Days	Pump flow	Pump flow	pH					Temperature (°C)				Dissolved oxygen (mg O2/L)				ORP
			L/h	L/d	Feed	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4	ORP Denit
2022-03-03	13h30	1	0,08	2,02														
2022-03-04	11h00	2	0,12	2,88	7,40	7,75	7,65	7,24	8,63	20	20	20	20	8,75	8,36	0,45	8,23	
2022-03-07	9h00	5	0,12	2,88	8,38	7,60	7,10	7,50	8,02	20	20	20	20	8,51	6,42	0,45	7,56	-60
2022-03-09	9h00	7	0,14	3,36	8,30	8,14	6,93	7,88	8,20	20	20	20	20	8,48	8,01	0,43	8,02	
2022-03-11	9h00	9	0,14	3,36	8,12	8,02	7,21	7,65	8,52	20	20	20	20	8,42	6,80	0,39	7,98	-90
2022-03-14	10h00	12	0,14	3,36		8,21	7,64	7,59	8,67	20	20	20	20	8,74	6,60	0,41	8,07	-50
2022-03-15	9h00	13	0,14	3,36	8,12	8,16	7,24	7,55	8,60	20	20	20	20	8,74	6,55	0,35	8,23	-44
2022-03-15	16h00	13	0,20	4,80														
2022-03-17	9h00	15	0,22	5,28	8,03	8,1	7,38	7,11	8,46	20	20	20	20	8,5	5,57	0,35	8,12	-28
2022-03-21	9h00	19	0,20	4,80		7,99	7,28	7,29	8,36	20	20	20	20	8,67	6,67	0,37	8,24	-45
2022-03-23	9h00	21	0,26	6,24	8,25	7,94	7,34	6,80	8,38	20	20	20	20	8,69	4,97	0,37	8,16	29
2022-03-25	9h00	23	0,26	6,24		7,01	7,21	5,70	8,08	20	20	20	20	8,34	5,76	1,79	7,51	138
2022-03-28	9h00	28	0,24	5,76												0,56		
2022-03-29	9h00	29	0,26	6,24	8,20	7,17	7,28	7,43	8,02	19	19	19	19	7,26	7,93	0,72	8,16	-36
2022-03-30	9h00	30	0,24	5,76		6,97	7,28	7,25	8,22	20	20	20	20	7,08	6,87	0,55	8,22	-23
2022-03-31	9h00	31	0,24	5,76		7,00	7,48	7,29						6,78	6,72	0,50	8,01	
2022-03-31	15h30	31	0,24	5,76														
2022-04-01	9h00	32	0,24	5,76	8,20	7,07	7,58	7,15		20	20	20	20	6,48	6,70	0,38	7,51	-95
2022-04-01	11h00	32	0,28	6,72														
2022-04-04	9h00	35	0,28	6,72		7,06	7,26	7,05	8,41	20	20	20	20	6,56	6,98	0,33	8,09	-80
2022-04-04	16h20	35	0,30	7,20														
2022-04-05	16h00	36	0,30	7,20		7,01	7,37	7,35	8,31	20	20	20	20	6,51	6,81	0,40	8,03	
2022-04-06	16h00	37	0,36	8,64														
2022-04-07	9h00	38	0,36	8,64		7,19	7,38	7,15	8,15	20	20	20	20	6,28	6,67	0,41	8,01	-46
2022-04-08	9h00	39	0,36	8,64														
2022-04-11	9h00	42	0,36	8,64	7,24	7,46	7,21	7,04	8,06	20	20	20	20	6,13	5,30	0,34	6,77	-38
2022-04-12	9h00	43	0,36	8,64		6,91	7,12	7,14	8,32	20	20	20	20	5,80	5,76	0,36	7,31	-53
2022-04-13	9h00	44	0,34	8,16		7,11	7,99	7,18	8,43	20	20	20	20	5,82	6,50	0,35	7,53	-49
2022-04-15	9h00	46	0,38	9,12	8,18	7,20	7,39	7,11	8,20	20	20	20	20	5,38	6,17	0,34	7,63	-49
2022-04-19	9h00	50	0,38	9,12		7,19	7,49	7,02	8,24	15	15	15	15	6,36	7,17	0,38	8,38	8,5
2022-04-20	9h00	51	0,38	9,12		7,00	7,70	7,16	8,21	14	14	14	14	5,88	7,42	0,56	8,56	13,4
2022-04-21	9h00	52	0,38	9,12		7,08	7,64	7,14	8,19	14	14	14	14	6,53	7,35	1,25	8,72	-25
2022-04-22	8H00	53	0,38	9,12														
2022-04-22	12h00	53		0,00														
2022-04-25	8h00	56	0,38	9,12		7,04	7,29	7,03		22	22	22	22	5,50	6,95	0,37	8,44	-37
2022-04-25	10h00	56	0,38	9,12														
2022-04-27	9h00	58	0,38	9,12		7,26	7,47	7,2		22	22	22	22	4,86	6,22	0,32	7,35	-83,0
2022-04-28	9h00	59	0,38	9,12		7,03	7,43	8,22		17	17	17	17	6,69	6,97	0,6	6,92	-17
2022-04-28	17h00	59	0,38	9,12														
2022-04-29	10h00	60	0,38	9,12														
2022-05-02	9h00	63	0,38	9,12		7,2	7,52	7,12		16	16	16	16	7,30	6,58	0,69	8,42	-36
2022-05-02	13h00	63	0,38	9,12														
2022-05-03	9H00	64	0,38	9,12												0,43		
2022-05-04	9h00	65	0,38	9,12	7,80	7,3	7,39	7,09	8,62	16,2	16,3	16,3	16,3	7,71	7,07	0,41	8,53	-56
2022-05-05	9h00	66	0,38	9,12						15	15	15	15					
2022-05-05	10h00	66	0,38	9,12														
2022-05-06	9h00	67	0,38	9,12										8,08	7,35	0,45	8,70	-23
2022-05-06	11h00	67	0,29	6,96														
2022-05-09	9h00	70	0,29	6,96														
2022-05-10	9h00	71	0,28	6,72		7,49	7,60	7,03		15	15	15	15	8,26	8,16	0,42	8,67	-2,5
2022-05-11	9h00	72	0,28	6,72	7,59	7,59	7,48	7,21	8,48	15	15	15	15	8,17	7,95	0,34	8,38	12,4
2022-05-13	9h00	74	0,28	6,72						15	15	15	15					
2022-05-16	9h00	77	0,20	4,80						13	13	13	13					
2022-05-17	9h00	78	0,18	4,32						11	11	11	11					
2022-05-18	11h00	79	0,19	4,56	7,14	7,66	7,31	7,01	7,86	10	10	10	10	9,63	9,25	0,37	9,18	64
2022-05-20	9h00	81	0,19	4,56		7,84	8,07	7,03	7,76	8	8	8	8	9,80	9,44	0,36	9,31	18
2022-05-24	9h00	85	0,18	4,32		7,31	7,88	7,01	7,88	8	8	8	8	10,23	10,24	0,45	10,10	-8

Date	Hour	Ortho-Phosphate-P (mg PO4 - P/L)					DCO soluble (mg/L)					NH4 Feed	NH4 R1	NH4 R2	NH4 R3	NH4 R4	NO2 Feed	NO2 R1	NO2 R2	NO2 R3	NO2 R4	NO3 Feed	NO3 R1	NO3 R2	NO3 R3	NO3 R4	OCN Feed	OCN R1	OCN R2	OCN R3	OCN R4	SCN Feed	SCN R1	SCN R2	SCN R3	SCN R4
		Feed	R1	R2	R3	R4	Feed	R1	R2	R3	R4	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L	mg N/L
2022-03-03	13h30																																			
2022-03-04	11h00																																			
2022-03-07	9h00	0,4	7,1	6,1	2,1	3,1	376	376	202	161	62	41,3	39,7	28,7	27,5	50,1	0,26	0,48	122,5	0,00	15,0	3,6	1,8	41,9	0,4	6,3	30,0					31,3	31,8	0,6	0,5	0,0
2022-03-09	9h00									37	39	41,3	39,4	4,9	3,1	1,0	0,26	0,73	118,5	2,8	0,54	3,6	5,0	43,0	0,9	23,1						31,3	28,4	0,1	0,4	0,4
2022-03-11	9h00						376	241	183	42	43	47,0	48,6	2,2	2,0	1,1	0,10	0,91	138	0,13	0,32	3,6	5,5	42,3	0,4	18,3						22,8	12,3	0,0	0,0	0,0
2022-03-14	10h00									98									98,0																	
2022-03-15	9h00									40	46	47,0	0,3	0,3	0,1	0,1	0,10	2,93	49,5	0,016	0,12	3,6	1,1	121,0	0,3	7,1						9,7	0,2	0,1	0,0	0,0
2022-03-15	16h00																																			
2022-03-17	9h00						376	241	183	104	25	64,8	62,0	0,0	1,6	0,0	0,005	3,98	2,4	32,0	2,6	0,2	0,6	167	30,8	56,5						6,7	0,3	0,0	0,0	0,0
2022-03-21	9h00												80,0	0	0	0,0		8,52	3,0	2,98	0,13		0,6	176	0,9	9,9						0,2	0,2	0,1	0,1	0,1
2022-03-23	9h00						181	189	55	197	58			0,1	0,1	0,1	0,03	7,45	0,55	70,0	8,7	0,4	7,7	171	10,8	29,7										
2022-03-25	9h00		1,69	1,12	0,62	0,16				847	74		77,6	0,1			0,03	11,3	0,45	39,0	24,1	0,4	22,3	177	66,1	58						0,0	0,0	0,0	0,0	0,0
2022-03-28	9h00									761															108,0							30,9	0,2	0,0	0,0	0,0
2022-03-29	9h00									148	94	39,2	64,8	0,3	0,4	0,4	0,43	9,1	0,6	58,0	22,30	2,3	76,6	232	20,4	65,4						30,1	0,2	0,1	0,0	0,0
2022-03-30	9h00				0,0					236															48,7											
2022-03-31	9h00				0,13					93															19,8											
2022-03-31	15h30				3,0																				7,4											
2022-04-01	9h00						275	55	21	75	66	39,2	10,0	0,4	0,4	0,4	0,43	3,4	0,5	0,25	0,5	2,3	75,0	168	1,0	18,2						30,1	0,0	0,0	0,0	0,0
2022-04-01	11h00																																			
2022-04-04	9h00				0,04					236	55	39,2	56,2	0,6	0,6	0,6	0,43	6,52	1,00	0,23	0,14	2,3	71,4	158	2,2	4,1										
2022-04-04	16h20																																			
2022-04-05	16h00									200										0,07					1,1											
2022-04-06	16h00									132																										
2022-04-07	9h00				0,02					163	37		88,2	0,7				5	1,12	16,5	3,4		75	169	27	40,8										
2022-04-08	9h00																																			
2022-04-11	9h00	0,63	0,95	2,12	0,04	0,04				648	67	73,0	104,2	79,6	32,5	6		56	1,50	5,00	0,75		31	130	0,7	8				0,0		0,5	0,0	0,0	0,0	0,0
2022-04-12	9h00									53				1,4																						
2022-04-13	9h00									90	50	73,0	87,0	1,1	1,1	1,1	0,43	3,5	0,55	0,23	0,17	2,3	106	166	0,8	7,6										
2022-04-15	9h00									180	36	30,4	105,2	1,0	1,0	1,0	0,18	19,0	1,74	0,01	0,04	2,0	54,7	158	0,9	1,2						30,4	0,1	0,0	0,0	0,0
2022-04-19	9h00		0,42	0,66	0,04	0,02				681	197	30,4	110,0	1,1	1,2	1,1	0,18	2,02	1	3,8	0,12	20	30,4	183,0	24,1	8,0										
2022-04-20	9h00									421																										
2022-04-21	9h00									532										7,69					32,1											
2022-04-22	8H00																																			
2022-04-22	12h00																																			
2022-04-25	8h00									46	40	36,0	98,0	0,1	0,1	0,1	0,34	8,15	1,44	4,4	1,98	1,0	61,6	168	45,6	70,3				0,0		30,9	0,1	0,0	0,0	0,0
2022-04-25	10h00																																			
2022-04-27	9h00											36,0	98,0	0,06	0,1	0,1	0,34	8,15	1,40	0,69	1,50	1,0	48	178	1,9	6,7						30,9	0,0	0,0	0,0	0,0
2022-04-28	9h00									1000	248		74												24,9											
2022-04-28	17h00																																			
2022-04-29	10h00																																			
2022-05-02	9h00				0,02					70	29			ND						12,4	4,05				71,4											
2022-05-02	13h00																																			
2022-05-03	9H00																																			
2022-05-04	9h00				0,10					66	55	36,0	74,0	0,1	0,1	0,23	0,34	33,0	2,61	2,25	0,52	1,0	42,0	182	2,1	7,6						30,0	0,0	0,0	0,0	0,0
2022-05-05	9h00				2,77					39															>70	69,6										
2022-05-05	10h00																								47											
2022-05-06	9h00				0,64					60															25											
2022-05-06	11h00																																			
2022-05-09	9h00																																			
2022-05-10	9h00									130	46	43,0	>70	0,37	0,40	0,40	0,18	33,3	1,22	0,32	0,045	2,3	48,0	186	1,6	6,7										
2022-05-11	9h00				0,80					184	46	43,0	112,2	0,30	0,16	0,10	0,18	37,2	1,62	0,00	0,01	2,3	48,0	186	1,4	6,1						29,0	0,0	0,0	0,0	0,0
2022-05-13	9h00									310	40	43	112	0,3	0,2	0,1	0,20	37,0	1,6	0,05	0,00	1,0	166	145	0,5	0,3										
2022-05-16	9h00									276	47									0,00	0,00				0,8											
2022-05-17	9h00									432															0,8											
2022-05-18	11h00				0,9					503	53	*47,1*	116,0	0,2	*0,2*	*0,2*	*0,30*	25,0	1,60	0,30	0,10	*1,0*	166	145	0,8	0,0						28,0	0,0	0,0	0,0	0,0
2022-05-20	9h00									449	67	47,0	116	0,1	0,2	0,3	0,3	25,0	1,4	1,90	0,02	1,0	151	140	0,9	0										
2022-05-24	9h00				0,0					577	163		121	0,28						0,67	0,17				3,40	0,40										

APPENDIX B. CERTIFICATE OF ANALYSIS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WT2204627**	Page	: 1 of 4
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Date Analysis Commenced	: 30-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:19
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Metals, Waterloo, Ontario
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
CNI	*Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	196035-RW-8.C	----	----	----	----
				Client sampling date / time	27-May-2022	----	----	----	----
					WT2204627-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
solids, total dissolved [TDS]	----	E162	10	mg/L	2480 [DLDS]	----	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	6.3	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	64.4 [DLHC]	----	----	----	----
bromide	24959-67-9	E235.Br	0.10	mg/L	<1.00 [DLDS]	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	193 [DLDS]	----	----	----	----
cyanate	88402-73-7	E343	0.20	mg/L	30.0 [DLHC, DLM]	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.200 [DLDS]	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	2.96 [DLDS]	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	5.19 [DLDS]	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	1800 [DLDS]	----	----	----	----
Cyanides									
thiocyanate	302-04-5	E344	0.50	mg/L	124 [DLM]	----	----	----	----
cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	0.0617 [CNI]	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	80.5	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	92.0	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0464 [DLHC]	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00746 [DLHC]	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00169 [DLHC]	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0290 [DLHC]	----	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000200 [DLHC]	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000500 [DLHC]	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.263 [DLHC]	----	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000500 [DLHC]	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	286 [DLHC]	----	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000100 [DLHC]	----	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00500 [DLHC]	----	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.447 [DLHC]	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	196035-RW-8.C	----	----	----	----
				Client sampling date / time	27-May-2022	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	WT2204627-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
copper, total	7440-50-8	E420	0.00050	mg/L	0.00832 DLHC	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.190 DLHC	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000500 DLHC	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0100 DLHC	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	23.1 DLHC	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0238 DLHC	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0906 DLHC	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.142 DLHC	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.500 DLHC	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	166 DLHC	----	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0448 DLHC	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.123 DLHC	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	1.57 DLHC	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000100 DLHC	----	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	482 DLHC	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	1.04 DLHC	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	649 DLHC	----	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00200 DLHC	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000100 DLHC	----	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00300 DLHC	----	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00100 DLHC	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00869 DLHC	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00500 DLHC	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0300 DLHC	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00200 DLHC	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2204627**	Page	: 1 of 9
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Issue Date	: 09-Jun-2022 16:19
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Extraction / Preparation: Holding Times Rec	Extraction / Preparation: Holding Times Actual	Extraction / Preparation: Eval	Analysis: Analysis Date	Analysis: Holding Times Rec	Analysis: Holding Times Actual	Analysis: Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) 196035-RW-8.C	E298	27-May-2022	30-May-2022	----	----		31-May-2022	28 days	5 days	✓
Anions and Nutrients : Bromide in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.Br	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.Cl	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Cyanate by Ion Selective Electrode										
HDPE [ON MECP] 196035-RW-8.C	E343	27-May-2022	----	----	----		03-Jun-2022	----	----	
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (0.003 mg/L)										
HDPE [ON MECP] 196035-RW-8.C	E378-T	27-May-2022	----	----	----		31-May-2022	7 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.F	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.NO3	27-May-2022	----	----	----		02-Jun-2022	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.NO2	27-May-2022	----	----	----		02-Jun-2022	7 days	7 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] 196035-RW-8.C	E235.SO4	27-May-2022	----	----	----		02-Jun-2022	28 days	7 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) 196035-RW-8.C	E344	27-May-2022	----	----	----		06-Jun-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
HDPE - total (sodium hydroxide) 196035-RW-8.C	E333	27-May-2022	----	----	----		07-Jun-2022	14 days	12 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
HDPE [ON MECP] 196035-RW-8.C	E358-L	27-May-2022	30-May-2022	3 days	4 days	✓	01-Jun-2022	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 196035-RW-8.C	E355-L	27-May-2022	30-May-2022	----	----		31-May-2022	28 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP] 196035-RW-8.C	E162	27-May-2022	----	----	----		01-Jun-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] 196035-RW-8.C	E160	27-May-2022	----	----	----		02-Jun-2022	7 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) 196035-RW-8.C	E420	27-May-2022	----	----	----		31-May-2022	180 days	5 days	✓

Legend & Qualifier Definitions

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
TDS by Gravimetry	E162	507016	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓
TSS by Gravimetry	E160	508156	1	19	5.2	4.7	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	504433	1	18	5.5	5.0	✓
Bromide in Water by IC	E235.Br	506135	1	2	50.0	5.0	✓
Chloride in Water by IC	E235.Cl	506137	1	6	16.6	5.0	✓
Cyanate by Ion Selective Electrode	E343	510689	1	1	100.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	504389	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T	505218	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	506136	1	2	50.0	5.0	✓
Nitrate in Water by IC	E235.NO3	506133	1	18	5.5	5.0	✓
Nitrite in Water by IC	E235.NO2	506134	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	506132	1	3	33.3	5.0	✓
Thiocyanate by Colourimetry	E344	513209	1	7	14.2	5.0	✓
Total Cyanide	E333	513898	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	504833	1	12	8.3	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	504434	1	2	50.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
TSS by Gravimetry	E160 Waterloo - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Waterloo - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC	E235.Br Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Waterloo - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence	E298 Waterloo - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Cyanide	E333 Waterloo - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
Cyanate by Ion Selective Electrode	E343 Waterloo - Environmental	Water	APHA 4500-CN L (mod)	This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Waterloo - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Dissolved Orthophosphate by Colourimetry (0.003 mg/L)	E378-T Waterloo - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Waterloo - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Waterloo - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Total Organic Carbon by Combustion	EP355 Waterloo - Environmental	Water		Preparation for Total Organic Carbon by Combustion

Preparation Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
Preparation for Dissolved Organic Carbon for Combustion	EP358 Waterloo - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon

QUALITY CONTROL REPORT

Work Order	: **WT2204627**		
Client	: Veolia Water Technologies Canada	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: ----	Date Samples Received	: 30-May-2022 09:30
PO	: 5000196035.606300.21030003	Date Analysis Commenced	: 30-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:19
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 1		
No. of samples analysed	: 1		

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia

General Comments

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

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 507016)											
WT2204562-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	313	371	17.0%	20%	----
Physical Tests (QC Lot: 508156)											
WT2204615-023	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	8.3	7.7	0.6	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504433)											
WT2204564-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0941	0.0937	0.426%	20%	----
Anions and Nutrients (QC Lot: 505218)											
WT2204586-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	0.0033	<0.0030	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506132)											
WT2204645-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	249	249	0.136%	20%	----
Anions and Nutrients (QC Lot: 506133)											
WT2204645-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506134)											
WT2204645-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506135)											
WT2204645-004	Anonymous	bromide	24959-67-9	E235.Br	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506136)											
WT2204645-004	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.673	0.677	0.004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 506137)											
WT2204645-004	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	388	389	0.177%	20%	----
Anions and Nutrients (QC Lot: 510689)											
WT2204627-001	196035-RW-8.C	cyanate	88402-73-7	E343	10.0	mg/L	30.0	28.5	1.50	Diff <2x LOR	----
Cyanides (QC Lot: 513209)											
WR2200492-010	Anonymous	thiocyanate	302-04-5	E344	10.0	mg/L	<10.0	<10.0	0	Diff <2x LOR	----
Cyanides (QC Lot: 513898)											
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 504389)											
WT2204557-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	2.50	mg/L	57.6	64.5	11.3%	20%	----
Organic / Inorganic Carbon (QC Lot: 504434)											
WT2204627-001	196035-RW-8.C	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	92.0	87.2	5.28%	20%	----
Total Metals (QC Lot: 504833)											
WT2204620-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0093	0.0084	0.0009	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
					Laboratory Duplicate (DUP) Report						
Total Metals (QC Lot: 504833) - continued											
WT2204620-001	Anonymous	antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0421	0.0421	0.0269%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.071	0.073	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000087	0.0000107	0.0000020	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	52.2	51.7	0.980%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00020	0.00022	0.00001	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00087	0.00085	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.502	0.502	0.183%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000329	0.000328	0.0000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0057	0.0057	0.00006	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	7.72	7.52	2.64%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.220	0.219	0.866%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000572	0.000565	1.23%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00067	0.00069	0.00002	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.04	1.03	0.245%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00131	0.00136	0.00005	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	7.50	7.45	0.650%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	20.9	21.0	0.144%	20%	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	2.38	2.42	1.92%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	18.2	18.0	1.15%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	0.00031	0.00033	0.00002	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00043	0.00045	0.00002	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00038	0.00039	0.000007	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000201	0.000204	1.28%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 504833) - continued											
WT2204620-001	Anonymous	vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0070	0.0066	0.0004	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 507016)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 508156)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 504433)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 505218)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 506132)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 506133)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 506134)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 506135)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 506136)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 506137)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 510689)						
cyanate	88402-73-7	E343	0.2	mg/L	<0.20	----
Cyanides (QCLot: 513209)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 513898)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 504389)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 504434)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 504833)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 504833) - continued						
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 507016)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	115	85.0	115	----
Physical Tests (QCLot: 508156)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	93.2	85.0	115	----
Anions and Nutrients (QCLot: 504433)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 505218)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0196 mg/L	110	80.0	120	----
Anions and Nutrients (QCLot: 506132)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 506133)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 506134)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	97.6	90.0	110	----
Anions and Nutrients (QCLot: 506135)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 506136)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100.0	90.0	110	----
Anions and Nutrients (QCLot: 506137)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 510689)									
cyanate	88402-73-7	E343	0.2	mg/L	1 mg/L	86.4	85.0	115	----
Cyanides (QCLot: 513209)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	101	85.0	115	----
Cyanides (QCLot: 513898)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	98.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504389)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504434)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	111	80.0	120	----
Total Metals (QCLot: 504833)									

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 504833) - continued									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	101	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	99.6	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	100	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	99.7	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	98.9	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	91.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	97.5	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	95.4	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	96.5	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	97.1	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	98.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	99.3	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	93.0	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	106	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	96.2	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	95.0	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.4	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	99.0	70.0	130	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	95.4	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	94.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	108	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	101	60.0	140	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	89.2	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	96.9	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	99.7	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	101	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	97.6	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	97.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	96.4	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	95.6	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	95.0	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	102	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 504833) - continued									
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	93.9	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 504433)										
WT2204564-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0973 mg/L	0.1 mg/L	97.3	75.0	125	----
Anions and Nutrients (QCLot: 505218)										
WT2204586-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0173 mg/L	0.0196 mg/L	88.5	70.0	130	----
Anions and Nutrients (QCLot: 506132)										
WT2204645-004	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	519 mg/L	500 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 506133)										
WT2204645-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	12.3 mg/L	12.5 mg/L	98.7	75.0	125	----
Anions and Nutrients (QCLot: 506134)										
WT2204645-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	2.54 mg/L	2.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 506135)										
WT2204645-004	Anonymous	bromide	24959-67-9	E235.Br	5.06 mg/L	5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 506136)										
WT2204645-004	Anonymous	fluoride	16984-48-8	E235.F	5.02 mg/L	5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 506137)										
WT2204645-004	Anonymous	chloride	16887-00-6	E235.Cl	518 mg/L	500 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 510689)										
WT2204627-001	196035-RW-8.C	cyanate	88402-73-7	E343	ND mg/L	2 mg/L	ND	70.0	130	----
Cyanides (QCLot: 513209)										
WR2200492-011	Anonymous	thiocyanate	302-04-5	E344	9.46 mg/L	10 mg/L	94.6	75.0	125	----
Cyanides (QCLot: 513898)										
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.247 mg/L	0.25 mg/L	98.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504389)										
WT2204557-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504434)										
WT2204627-001	196035-RW-8.C	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 504833)										
WT2204620-002	Anonymous	aluminum, total	7429-90-5	E420	0.0890 mg/L	0.1 mg/L	89.0	70.0	130	----
		antimony, total	7440-36-0	E420	0.0471 mg/L	0.05 mg/L	94.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 504833) - continued										
WT2204620-002	Anonymous	arsenic, total	7440-38-2	E420	0.0479 mg/L	0.05 mg/L	95.9	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00455 mg/L	0.005 mg/L	90.9	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0457 mg/L	0.05 mg/L	91.5	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00479 mg/L	0.005 mg/L	95.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00234 mg/L	0.0025 mg/L	93.7	70.0	130	----
		chromium, total	7440-47-3	E420	0.0122 mg/L	0.0125 mg/L	97.8	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0116 mg/L	0.0125 mg/L	92.5	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0223 mg/L	0.025 mg/L	89.2	70.0	130	----
		lithium, total	7439-93-2	E420	0.0103 mg/L	0.0125 mg/L	82.3	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0118 mg/L	0.0125 mg/L	94.4	70.0	130	----
		nickel, total	7440-02-0	E420	0.0232 mg/L	0.025 mg/L	92.9	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.481 mg/L	0.5 mg/L	96.2	70.0	130	----
		potassium, total	7440-09-7	E420	2.24 mg/L	2.5 mg/L	89.6	70.0	130	----
		rubidium, total	7440-17-7	E420	0.00456 mg/L	0.005 mg/L	91.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0481 mg/L	0.05 mg/L	96.2	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00423 mg/L	0.005 mg/L	84.7	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00448 mg/L	0.005 mg/L	89.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.0447 mg/L	0.05 mg/L	89.5	70.0	130	----
		thorium, total	7440-29-1	E420	0.00476 mg/L	0.005 mg/L	95.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0236 mg/L	0.025 mg/L	94.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0114 mg/L	0.0125 mg/L	91.4	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00451 mg/L	0.005 mg/L	90.2	70.0	130	----
		uranium, total	7440-61-1	E420	0.000236 mg/L	0.00025 mg/L	94.4	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0243 mg/L	0.025 mg/L	97.2	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	0.00464 mg/L	0.005 mg/L	92.8	70.0	130	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - -

Page of

Report To — Contact and company name below will appear on the final report

Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To

Same as Report To ☑ YES ☐ NO

Copy of Invoice with Report ☐ YES ☐ NO

Company:

Contact:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Project Information

ALS Account # / Quote #:

Job #:

PO / AFE: 5000196035.606300.21030003

LSD:

ALS Lab Work Order # (lab use only): WT2204627

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	metal scan	TDS	TSS	NH4	TOC	DOC	COD soluble	Anion scan	cyanates	cyanides	thiocyanate	Anion scan	No2 + No3	O-PO4	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-RW-8°C	20220527		WW	8	X	X	X	X	X	X	X	X	X	X	X	X	X	X		

Environmental Division
Waterloo
Work Order Reference
WT2204627
Telephone : +1 519 886 6910

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C: 18.9

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022-05-27	Time:	Received by:	Date:	Time:	Received by:	Date: 05/30/22	Time: 930

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

NOV 2018 FRONT

CERTIFICATE OF ANALYSIS

Work Order	: **WT2204557**	Page	: 1 of 5
Client	: **Veolia Water Technologies Canada**	Laboratory	: Waterloo - Environmental
Contact	: Josee Lalonde	Account Manager	: Peter Stastny
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 514 334 7230	Telephone	: +1 519 886 6910
Project	: 196035_MD	Date Samples Received	: 27-May-2022 11:00
PO	: 5000196035.606300.21030001	Date Analysis Commenced	: 27-May-2022
C-O-C number	: ----	Issue Date	: 09-Jun-2022 16:12
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Inorganics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
DLIS	*Detection Limit Adjusted due to insufficient sample.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
SFT	*Sample was filtered due to turbidity interference. Result reflects soluble analyte concentration.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	196035_MD_R4_8C	196035_MD_CW_8C	----	----	----
				Client sampling date / time	26-May-2022	26-May-2022	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	WT2204557-001	WT2204557-002	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
solids, total dissolved [TDS]	----	E162	10	mg/L	2110 DLM	2600 DLM	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	346 DLHC	<3.8	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0352	3.94 DLHC	----	----	----
bromide	24959-67-9	E235.Br	0.10	mg/L	<0.50 DLDS	<1.00 DLDS	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	100 DLDS	112 DLDS	----	----	----
cyanate	88402-73-7	E343	0.20	mg/L	<2.00 DLIS	<1.00 DLIS	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.100 DLDS	<0.200 DLDS	----	----	----
nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	<0.100 DLDS	<0.200 DLDS	----	----	----
nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.050 DLDS	<0.100 DLDS	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	2.76 DLHC	<0.0030	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	6.45 DLM	0.0038	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	944 DLDS	1790 DLDS	----	----	----
Cyanides									
thiocyanate	302-04-5	E344	0.50	mg/L	<0.50 SFT	<0.50	----	----	----
cyanide, strong acid dissociable (total)	----	E333	0.0020	mg/L	0.0144	0.0282	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	57.6 DLM	41.0 DLM	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	143 DLM	43.5 DLM	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0300 DLHC	<0.0300 DLHC	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00313 DLHC	<0.00100 DLHC	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0169 DLHC	0.00840 DLHC	----	----	----
beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000200 DLHC	<0.000200 DLHC	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000500 DLHC	<0.000500 DLHC	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.143 DLHC	0.144 DLHC	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.000600 DLHC, DLM	<0.0000500 DLHC	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	150 DLHC	84.2 DLHC	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00500 DLHC	<0.00500 DLHC	----	----	----

Analytical Results

Sub-Matrix: Water

(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	196035_MD_R4_8C	196035_MD_CW_8C	----	----	----
				Client sampling date / time	26-May-2022	26-May-2022	----	----	----
					WT2204557-001	WT2204557-002	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.249 DLHC	0.255 DLHC	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.0108 DLHC	<0.00500 DLHC	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.180 DLHC	2.02 DLHC	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000500 DLHC	<0.000500 DLHC	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0100 DLHC	<0.0100 DLHC	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	12.2 DLHC	13.3 DLHC	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0159 DLHC	0.142 DLHC	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0481 DLHC	0.000792 DLHC	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.0647 DLHC	0.0546 DLHC	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	8.95 DLHC	<0.500 DLHC	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	96.9 DLHC	97.7 DLHC	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0263 DLHC	0.0261 DLHC	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.0396 DLHC	0.0155 DLHC	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	<1.00 DLHC	<1.00 DLHC	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	607 DLHC	795 DLHC	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.572 DLHC	0.469 DLHC	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	337 DLHC	596 DLHC	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00200 DLHC	<0.00200 DLHC	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000100 DLHC	<0.000100 DLHC	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00300 DLHC	<0.00300 DLHC	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00100 DLHC	<0.00100 DLHC	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00330 DLHC	<0.000100 DLHC	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00500 DLHC	<0.00500 DLHC	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0316 DLHC	<0.0300 DLHC	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00200 DLHC	<0.00200 DLHC	----	----	----
Aggregate Organics									
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	161	112	----	----	----

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

QUALITY CONTROL REPORT

Work Order	: **WT2204557**	Laboratory	: Waterloo - Environmental
Client	: Veolia Water Technologies Canada	Account Manager	: Peter Stastny
Contact	: Josee Lalonde	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Address	: 4105 Sartelon Ville St-Laurent QC Canada H4S 2B3	Telephone	: +1 519 886 6910
Telephone	: 514 334 7230	Date Samples Received	: 27-May-2022 11:00
Project	: 196035_MD	Date Analysis Commenced	: 27-May-2022
PO	: 5000196035.606300.21030001	Issue Date	: 09-Jun-2022 16:12
C-O-C number	: ----		
Sampler	: CLIENT		
Site	: ----		
Quote number	: Veolia, Quebec Standing Offer 2022		
No. of samples received	: 2		
No. of samples analysed	: 2		

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Jon Fisher	Department Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia

General Comments

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

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 505807)											
WT2204471-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	212	215	1.22%	20%	----
Physical Tests (QC Lot: 505814)											
WT2204471-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	342	334	2.22%	20%	----
Anions and Nutrients (QC Lot: 502949)											
WT2204540-030	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502950)											
WT2204540-030	Anonymous	bromide	24959-67-9	E235.Br	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502951)											
WT2204540-030	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	3.45	3.45	0.0332%	20%	----
Anions and Nutrients (QC Lot: 502952)											
WT2204540-030	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502953)											
WT2204540-030	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	0.020	mg/L	0.061	0.061	0.00006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502954)											
WT2204540-030	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.036	0.036	0.0007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504229)											
WT2204549-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 504430)											
WT2204551-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.409	0.414	1.16%	20%	----
Anions and Nutrients (QC Lot: 504432)											
WT2204559-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0100	mg/L	0.734	0.753	2.58%	20%	----
Anions and Nutrients (QC Lot: 509275)											
WT2204632-005	Anonymous	cyanate	88402-73-7	E343	0.20	mg/L	0.81	0.75	0.06	Diff <2x LOR	----
Cyanides (QC Lot: 506457)											
VA22B1539-001	Anonymous	thiocyanate	302-04-5	E344	2.50	mg/L	<2.50	<2.50	0	Diff <2x LOR	----
Cyanides (QC Lot: 513898)											
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 504389)											
WT2204557-001	196035_MD_R4_8C	carbon, dissolved organic [DOC]	----	E358-L	2.50	mg/L	57.6	64.5	11.3%	20%	----
Organic / Inorganic Carbon (QC Lot: 504431)											
WT2204557-002	196035_MD_CW_8C	carbon, total organic [TOC]	----	E355-L	2.50	mg/L	43.5	45.7	5.08%	20%	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 503812)											
WT2204557-001	196035_MD_R4_8C	aluminum, total	7429-90-5	E420	0.0300	mg/L	<0.0300	<0.0300	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00100	mg/L	0.00313	0.00320	0.00007	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00100	mg/L	0.0169	0.0166	1.39%	20%	----
		beryllium, total	7440-41-7	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.100	mg/L	0.143	0.141	0.003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.000600	mg/L	<0.000600	<0.000600	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.500	mg/L	150	151	0.105%	20%	----
		cesium, total	7440-46-2	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00100	mg/L	0.249	0.249	0.223%	20%	----
		copper, total	7440-50-8	E420	0.00500	mg/L	0.0108	0.0114	0.00062	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.100	mg/L	0.180	0.186	0.006	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0500	mg/L	12.2	12.3	0.474%	20%	----
		manganese, total	7439-96-5	E420	0.00100	mg/L	0.0159	0.0153	3.82%	20%	----
		molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.0481	0.0497	3.12%	20%	----
		nickel, total	7440-02-0	E420	0.00500	mg/L	0.0647	0.0647	0.118%	20%	----
		phosphorus, total	7723-14-0	E420	0.500	mg/L	8.95	9.01	0.620%	20%	----
		potassium, total	7440-09-7	E420	0.500	mg/L	96.9	97.4	0.610%	20%	----
		rubidium, total	7440-17-7	E420	0.00200	mg/L	0.0263	0.0259	1.22%	20%	----
		selenium, total	7782-49-2	E420	0.000500	mg/L	0.0396	0.0406	2.66%	20%	----
		silicon, total	7440-21-3	E420	1.00	mg/L	<1.00	<1.00	0	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.500	mg/L	607	604	0.592%	20%	----
		strontium, total	7440-24-6	E420	0.00200	mg/L	0.572	0.604	5.40%	20%	----
		sulfur, total	7704-34-9	E420	5.00	mg/L	337	342	1.50%	20%	----
		tellurium, total	13494-80-9	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00300	mg/L	<0.00300	<0.00300	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----

Sub-Matrix: **Water**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Laboratory Duplicate (DUP) Report						
					LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lot: 503812) - continued											
WT2204557-001	196035_MD_R4_8C	uranium, total	7440-61-1	E420	0.000100	mg/L	0.00330	0.00329	0.279%	20%	----
		vanadium, total	7440-62-2	E420	0.00500	mg/L	<0.00500	<0.00500	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0300	mg/L	0.0316	0.0342	0.0026	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 502107)											
WT2204557-001	196035_MD_R4_8C	chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	161	160	0.685%	20%	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 505807)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 505814)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 502949)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 502950)						
bromide	24959-67-9	E235.Br	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 502951)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 502952)						
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 502953)						
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 502954)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 504229)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	<0.0030	----
Anions and Nutrients (QCLot: 504430)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 504432)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 509275)						
cyanate	88402-73-7	E343	0.2	mg/L	<0.20	----
Cyanides (QCLot: 506457)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 513898)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 504389)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 504431)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 503812)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 503812) - continued						
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 503812) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Aggregate Organics (QCLot: 502107)						
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	<10	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 505807)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	94.0	85.0	115	----
Physical Tests (QCLot: 505814)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	105	85.0	115	----
Anions and Nutrients (QCLot: 502949)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 502950)									
bromide	24959-67-9	E235.Br	0.1	mg/L	0.5 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 502951)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.7	90.0	110	----
Anions and Nutrients (QCLot: 502952)									
nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	99.4	90.0	110	----
Anions and Nutrients (QCLot: 502953)									
nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	99.0	90.0	110	----
Anions and Nutrients (QCLot: 502954)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 504229)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.003	mg/L	0.0196 mg/L	109	80.0	120	----
Anions and Nutrients (QCLot: 504430)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.431 mg/L	99.8	80.0	120	----
Anions and Nutrients (QCLot: 504432)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 509275)									
cyanate	88402-73-7	E343	0.2	mg/L	1 mg/L	93.2	85.0	115	----
Cyanides (QCLot: 506457)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	99.7	85.0	115	----
Cyanides (QCLot: 513898)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	98.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504389)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 504431)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	113	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Total Metals (QCLot: 503812)									
aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	98.9	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	101	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	98.3	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.0125 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	91.9	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	98.3	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	86.9	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	99.5	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	95.4	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.0025 mg/L	97.2	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	98.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	95.8	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	96.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	98.7	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	98.5	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.0125 mg/L	85.7	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	2.5 mg/L	103	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	98.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	97.3	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	97.0	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	95.6	70.0	130	----
potassium, total	7440-09-7	E420	0.05	mg/L	2.5 mg/L	94.6	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.005 mg/L	98.4	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	97.5	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	0.5 mg/L	98.9	60.0	140	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	90.4	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.0125 mg/L	97.9	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	2.5 mg/L	92.5	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.005 mg/L	96.4	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	97.0	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.005 mg/L	99.9	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	98.7	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	95.7	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	95.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.00025 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	99.3	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 503812) - continued									
zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	99.2	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	96.5	80.0	120	----
Aggregate Organics (QCLot: 502107)									
chemical oxygen demand [COD], soluble	----	E560-L	10	mg/L	100 mg/L	107	85.0	115	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 502949)										
WT2204540-030	Anonymous	chloride	16887-00-6	E235.Cl	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 502950)										
WT2204540-030	Anonymous	bromide	24959-67-9	E235.Br	0.50 mg/L	0.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 502951)										
WT2204540-030	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 502952)										
WT2204540-030	Anonymous	nitrite (as N)	14797-65-0	E235.NO2	0.508 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 502953)										
WT2204540-030	Anonymous	nitrate (as N)	14797-55-8	E235.NO3	2.49 mg/L	2.5 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 502954)										
WT2204540-030	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 504229)										
WT2204549-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-T	0.0185 mg/L	0.0196 mg/L	94.4	70.0	130	----
Anions and Nutrients (QCLot: 504430)										
WT2204551-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 504432)										
WT2204559-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 509275)										
WT2204632-005	Anonymous	cyanate	88402-73-7	E343	1.56 mg/L	2 mg/L	78.0	70.0	130	----
Cyanides (QCLot: 506457)										
VA22B1539-002	Anonymous	thiocyanate	302-04-5	E344	196 mg/L	200 mg/L	98.1	75.0	125	----
Cyanides (QCLot: 513898)										
CG2206592-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.247 mg/L	0.25 mg/L	98.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504389)										
WT2204557-001	196035_MD_R4_8C	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 504431)										
WT2204557-002	196035_MD_CW_8C	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 503812)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*Concentration*	*Target*	*MS*	*Low*	*High*	*Qualifier*
Total Metals (QCLot: 503812) - continued										
WT2204557-002	196035_MD_CW_8C	aluminum, total	7429-90-5	E420	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		antimony, total	7440-36-0	E420	0.0504 mg/L	0.05 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0508 mg/L	0.05 mg/L	102	70.0	130	----
		barium, total	7440-39-3	E420	0.0115 mg/L	0.0125 mg/L	92.0	70.0	130	----
		beryllium, total	7440-41-7	E420	0.00473 mg/L	0.005 mg/L	94.5	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0490 mg/L	0.05 mg/L	98.0	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00499 mg/L	0.005 mg/L	99.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00251 mg/L	0.0025 mg/L	100	70.0	130	----
		chromium, total	7440-47-3	E420	0.0126 mg/L	0.0125 mg/L	101	70.0	130	----
		cobalt, total	7440-48-4	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	0.0118 mg/L	0.0125 mg/L	94.5	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	0.05 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0239 mg/L	0.025 mg/L	95.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0119 mg/L	0.0125 mg/L	95.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0132 mg/L	0.0125 mg/L	105	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.025 mg/L	ND	70.0	130	----
		phosphorus, total	7723-14-0	E420	0.509 mg/L	0.5 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	ND mg/L	0.005 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0485 mg/L	0.05 mg/L	97.0	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	0.5 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00446 mg/L	0.005 mg/L	89.2	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.0125 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	2.5 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.00472 mg/L	0.005 mg/L	94.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.0466 mg/L	0.05 mg/L	93.2	70.0	130	----
		thorium, total	7440-29-1	E420	0.00463 mg/L	0.005 mg/L	92.5	70.0	130	----
		tin, total	7440-31-5	E420	0.0255 mg/L	0.025 mg/L	102	70.0	130	----
		titanium, total	7440-32-6	E420	0.0114 mg/L	0.0125 mg/L	91.1	70.0	130	----
		tungsten, total	7440-33-7	E420	0.00493 mg/L	0.005 mg/L	98.7	70.0	130	----
		uranium, total	7440-61-1	E420	0.000248 mg/L	0.00025 mg/L	99.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0264 mg/L	0.025 mg/L	105	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 503812) - continued										
WT2204557-002	196035_MD_CW_8C	zinc, total	7440-66-6	E420	0.0252 mg/L	0.025 mg/L	101	70.0	130	----
		zirconium, total	7440-67-7	E420	0.00487 mg/L	0.005 mg/L	97.5	70.0	130	----
Aggregate Organics (QCLot: 502107)										
WT2204557-001	196035_MD_R4_8C	chemical oxygen demand [COD], soluble	----	E560-L	ND mg/L	100 mg/L	ND	75.0	125	----

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - -

Page of

A

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ · 3 day [P3-25%] ☐ · 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ · Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 196635_MD

PO / AFE: 500 0196035.606300.21030001

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: · PO#

Major/Minor Code: · Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only): WT2204557

ALS Contact: · Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metals scan (Low Limits)	CND, CN, SCN	Anions scan	ortho-phosphates	PT	TOC, DOC	COD soluble	TSS, TDS	NO2	NO3	NH4	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035_MD R4 8°C	2022-05-26			8	X	X	X	X	X	X	X	X	X	X	X		
	196035_MD-CW_8°C	~			8	X	X	X	X	X	X	X	X	X	X	X		

Environmental Division
Waterloo
Work Order Reference
WT2204557

Telephone : +1 519 886 6910

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria ... below

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ · SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ · Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C · FINAL COOLER TEMPERATURES °C: 17.7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022.05.26	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 27/22	Time: 11:10

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2706977

Project P.O. #: 5000196035_606300.21030001
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW							
Sampled By: CLIENT on 16-MAY-22							
Matrix: WATER							
Physical Tests							
Total Suspended Solids	<3.0		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2440	DLM	40	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	47.4	DLHC	1.0	mg/L		20-MAY-22	R5786193
Bromide (Br)	1.1	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	188	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	9.37	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0055		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1670	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0403		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	17	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	138		5.0	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Organic Carbon	86.5	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	85	DLM	10	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	0.0074	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	0.0015	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0301	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.25	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	280	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.425	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	0.0084	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	0.17	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	21.7	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.0242	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.0887	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	165	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0452	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.128	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	416	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	1.00	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	635	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00924	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					24-MAY-22	R5786219
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Antimony (Sb)-Dissolved	0.0079	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Arsenic (As)-Dissolved	0.0015	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Barium (Ba)-Dissolved	0.0327	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Boron (B)-Dissolved	0.26	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	24-MAY-22	24-MAY-22	R5786474
Calcium (Ca)-Dissolved	306	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Cobalt (Co)-Dissolved	0.435	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Copper (Cu)-Dissolved	0.0060	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Magnesium (Mg)-Dissolved	22.1	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Manganese (Mn)-Dissolved	0.0234	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Molybdenum (Mo)-Dissolved	0.0937	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Nickel (Ni)-Dissolved	0.138	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Potassium (K)-Dissolved	165	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Rubidium (Rb)-Dissolved	0.0484	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Selenium (Se)-Dissolved	0.129	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Silicon (Si)-Dissolved	1.57	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Sodium (Na)-Dissolved	429	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Strontium (Sr)-Dissolved	1.05	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Sulfur (S)-Dissolved	688	DLHC	5.0	mg/L	24-MAY-22	24-MAY-22	R5786474
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	24-MAY-22	24-MAY-22	R5786474
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Uranium (U)-Dissolved	0.00892	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
L2706977-2 196035_MD_R1 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	133	DLHC	5.0	mg/L		24-MAY-22	R5786193
Bromide (Br)	1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	181	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	32.0	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	48.2	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	1.90	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1830	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0352	CNI	0.0020	mg/L		19-MAY-22	R5785001
Thiocyanate (SCN)	1.22		0.50	mg/L		22-MAY-26	R5788598
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.967	DLHC	0.050	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	145	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	174	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	2.42	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1470	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0205		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-4 196035_MD_R3 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.096		0.010	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	127	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	0.99	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	0.0220		0.0030	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1080	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0164		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	6.3		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2490	DLM	80	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	4.17	DLHC	0.10	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	121	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0309		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1870	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0188		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	<10	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Organic Carbon	12.3	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	15.6	DLM	2.5	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0072	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.16	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	0.000058	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	134	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.281	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	3.12	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	13.4	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.00749	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.0454	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	103	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0284	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.0257	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	<1.0	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	729	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	0.530	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	605	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00055	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					19-MAY-22	R5785349
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Barium (Ba)-Dissolved	0.0067	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Boron (B)-Dissolved	0.17	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	19-MAY-22	20-MAY-22	R5786123
Calcium (Ca)-Dissolved	133	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Cobalt (Co)-Dissolved	0.302	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Iron (Fe)-Dissolved	0.76	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Magnesium (Mg)-Dissolved	14.6	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Manganese (Mn)-Dissolved	0.147	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Molybdenum (Mo)-Dissolved	0.00681	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Nickel (Ni)-Dissolved	0.0480	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Potassium (K)-Dissolved	107	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Rubidium (Rb)-Dissolved	0.0298	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Selenium (Se)-Dissolved	0.0242	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Silicon (Si)-Dissolved	0.56	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Sodium (Na)-Dissolved	832	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Strontium (Sr)-Dissolved	0.533	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Sulfur (S)-Dissolved	652	DLHC	5.0	mg/L	19-MAY-22	20-MAY-22	R5786123
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	19-MAY-22	20-MAY-22	R5786123
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Uranium (U)-Dissolved	0.00047	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Thiocyanate (SCN)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2706977-1, -5
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2706977-5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2706977-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2706977-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2706977-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2706977-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2706977-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2706977-1, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2706977-1, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L2706977-1, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2706977-1, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2706977-1, -5
Matrix Spike	Silicon (Si)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2706977-1, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sulfur (S)-Total	MS-B	L2706977-1, -5
Matrix Spike	Uranium (U)-Total	MS-B	L2706977-1, -5
Matrix Spike	Total Organic Carbon	MS-B	L2706977-1, -5

Sample Parameter Qualifier key listed:

Qualifier	Description
CNI	Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

ALS Test Code	Matrix	Test Description	Method Reference**
CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

ALS Test Code	Matrix	Test Description	Method Reference**
CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

Reference Information

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Bromide (Br)			102.8		%		85-115	19-MAY-22
WG3729578-11 MB								
Bromide (Br)			<0.10		mg/L		0.1	19-MAY-22
CL-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Chloride (Cl)			102.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-MAY-22
CN-CNO-WT	**Water**							
Batch R5785873								
WG3730231-2 LCS								
Cyanate			92.0		%		85-115	20-MAY-22
WG3730231-1 MB								
Cyanate			<0.20		mg/L		0.2	20-MAY-22
CN-SCN-VA	**Water**							
Batch R5788598								
WG3732009-2 LCS								
Thiocyanate (SCN)			98.9		%		85-115	22-MAY-26
WG3732009-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	22-MAY-26
CN-TOT-WT	**Water**							
Batch R5785001								
WG3729075-12 LCS								
Cyanide, Total			105.4		%		80-120	18-MAY-22
WG3729075-7 LCS								
Cyanide, Total			104.2		%		80-120	18-MAY-22
WG3729075-11 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
WG3729075-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
DOC-WT	**Water**							
Batch R5786276								
WG3730305-2 LCS								
Dissolved Organic Carbon			116.2		%		80-120	24-MAY-22
WG3730305-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5786276								
WG3730305-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	24-MAY-22
F-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Fluoride (F)			101.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	19-MAY-22
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Aluminum (Al)-Dissolved			99.1		%		80-120	20-MAY-22
Antimony (Sb)-Dissolved			95.7		%		80-120	20-MAY-22
Arsenic (As)-Dissolved			99.4		%		80-120	20-MAY-22
Barium (Ba)-Dissolved			104.5		%		80-120	20-MAY-22
Beryllium (Be)-Dissolved			92.3		%		80-120	20-MAY-22
Bismuth (Bi)-Dissolved			100.8		%		80-120	20-MAY-22
Boron (B)-Dissolved			89.7		%		80-120	20-MAY-22
Cadmium (Cd)-Dissolved			101.5		%		80-120	20-MAY-22
Calcium (Ca)-Dissolved			99.7		%		80-120	20-MAY-22
Cesium (Cs)-Dissolved			102.5		%		80-120	20-MAY-22
Chromium (Cr)-Dissolved			96.0		%		80-120	20-MAY-22
Cobalt (Co)-Dissolved			94.8		%		80-120	20-MAY-22
Copper (Cu)-Dissolved			94.3		%		80-120	20-MAY-22
Iron (Fe)-Dissolved			96.5		%		80-120	20-MAY-22
Lead (Pb)-Dissolved			100.5		%		80-120	20-MAY-22
Lithium (Li)-Dissolved			92.5		%		80-120	20-MAY-22
Magnesium (Mg)-Dissolved			102.0		%		80-120	20-MAY-22
Manganese (Mn)-Dissolved			96.3		%		80-120	20-MAY-22
Molybdenum (Mo)-Dissolved			92.0		%		80-120	20-MAY-22
Nickel (Ni)-Dissolved			95.4		%		80-120	20-MAY-22
Phosphorus (P)-Dissolved			98.4		%		80-120	20-MAY-22
Potassium (K)-Dissolved			96.0		%		80-120	20-MAY-22
Rubidium (Rb)-Dissolved			106.8		%		80-120	20-MAY-22
Selenium (Se)-Dissolved			96.5		%		80-120	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Silicon (Si)-Dissolved			96.1		%		60-140	20-MAY-22
Silver (Ag)-Dissolved			89.9		%		80-120	20-MAY-22
Sodium (Na)-Dissolved			101.5		%		80-120	20-MAY-22
Strontium (Sr)-Dissolved			99.3		%		80-120	20-MAY-22
Sulfur (S)-Dissolved			90.8		%		80-120	20-MAY-22
Tellurium (Te)-Dissolved			99.3		%		80-120	20-MAY-22
Thallium (Tl)-Dissolved			103.5		%		80-120	20-MAY-22
Thorium (Th)-Dissolved			98.4		%		80-120	20-MAY-22
Tin (Sn)-Dissolved			97.8		%		80-120	20-MAY-22
Titanium (Ti)-Dissolved			94.3		%		80-120	20-MAY-22
Tungsten (W)-Dissolved			97.9		%		80-120	20-MAY-22
Uranium (U)-Dissolved			101.2		%		80-120	20-MAY-22
Vanadium (V)-Dissolved			98.1		%		80-120	20-MAY-22
Zinc (Zn)-Dissolved			97.3		%		80-120	20-MAY-22
Zirconium (Zr)-Dissolved			93.9		%		80-120	20-MAY-22
WG3729634-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-1 MB								
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Batch R5786474								
WG3730658-2 LCS								
Aluminum (Al)-Dissolved			107.5		%		80-120	24-MAY-22
Antimony (Sb)-Dissolved			104.4		%		80-120	24-MAY-22
Arsenic (As)-Dissolved			102.9		%		80-120	24-MAY-22
Barium (Ba)-Dissolved			109.0		%		80-120	24-MAY-22
Beryllium (Be)-Dissolved			106.2		%		80-120	24-MAY-22
Bismuth (Bi)-Dissolved			101.2		%		80-120	24-MAY-22
Boron (B)-Dissolved			97.9		%		80-120	24-MAY-22
Cadmium (Cd)-Dissolved			104.6		%		80-120	24-MAY-22
Calcium (Ca)-Dissolved			104.9		%		80-120	24-MAY-22
Cesium (Cs)-Dissolved			110.9		%		80-120	24-MAY-22
Chromium (Cr)-Dissolved			99.2		%		80-120	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-2 LCS								
Cobalt (Co)-Dissolved			98.5		%		80-120	24-MAY-22
Copper (Cu)-Dissolved			97.4		%		80-120	24-MAY-22
Iron (Fe)-Dissolved			102.4		%		80-120	24-MAY-22
Lead (Pb)-Dissolved			103.7		%		80-120	24-MAY-22
Lithium (Li)-Dissolved			105.8		%		80-120	24-MAY-22
Magnesium (Mg)-Dissolved			105.3		%		80-120	24-MAY-22
Manganese (Mn)-Dissolved			102.7		%		80-120	24-MAY-22
Molybdenum (Mo)-Dissolved			103.1		%		80-120	24-MAY-22
Nickel (Ni)-Dissolved			97.8		%		80-120	24-MAY-22
Phosphorus (P)-Dissolved			103.3		%		80-120	24-MAY-22
Potassium (K)-Dissolved			103.2		%		80-120	24-MAY-22
Rubidium (Rb)-Dissolved			109.9		%		80-120	24-MAY-22
Selenium (Se)-Dissolved			97.5		%		80-120	24-MAY-22
Silicon (Si)-Dissolved			103.8		%		60-140	24-MAY-22
Silver (Ag)-Dissolved			97.3		%		80-120	24-MAY-22
Sodium (Na)-Dissolved			101.2		%		80-120	24-MAY-22
Strontium (Sr)-Dissolved			108.9		%		80-120	24-MAY-22
Sulfur (S)-Dissolved			104.9		%		80-120	24-MAY-22
Tellurium (Te)-Dissolved			101.2		%		80-120	24-MAY-22
Thallium (Tl)-Dissolved			102.3		%		80-120	24-MAY-22
Thorium (Th)-Dissolved			105.1		%		80-120	24-MAY-22
Tin (Sn)-Dissolved			104.4		%		80-120	24-MAY-22
Titanium (Ti)-Dissolved			102.2		%		80-120	24-MAY-22
Tungsten (W)-Dissolved			103.5		%		80-120	24-MAY-22
Uranium (U)-Dissolved			106.9		%		80-120	24-MAY-22
Vanadium (V)-Dissolved			102.4		%		80-120	24-MAY-22
Zinc (Zn)-Dissolved			102.0		%		80-120	24-MAY-22
Zirconium (Zr)-Dissolved			105.5		%		80-120	24-MAY-22
WG3730658-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-1 MB								
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	24-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	24-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Aluminum (Al)-Total			98.0		%		80-120	18-MAY-22
Antimony (Sb)-Total			103.7		%		80-120	18-MAY-22
Arsenic (As)-Total			97.6		%		80-120	18-MAY-22
Barium (Ba)-Total			99.7		%		80-120	18-MAY-22
Beryllium (Be)-Total			93.7		%		80-120	18-MAY-22
Bismuth (Bi)-Total			98.4		%		80-120	18-MAY-22
Boron (B)-Total			93.5		%		80-120	18-MAY-22
Cadmium (Cd)-Total			100.2		%		80-120	18-MAY-22
Calcium (Ca)-Total			93.0		%		80-120	18-MAY-22
Chromium (Cr)-Total			97.4		%		80-120	18-MAY-22
Cesium (Cs)-Total			103.9		%		80-120	18-MAY-22
Cobalt (Co)-Total			96.6		%		80-120	18-MAY-22
Copper (Cu)-Total			96.2		%		80-120	18-MAY-22
Iron (Fe)-Total			100.0		%		80-120	18-MAY-22
Lead (Pb)-Total			103.9		%		80-120	18-MAY-22
Lithium (Li)-Total			90.4		%		80-120	18-MAY-22
Magnesium (Mg)-Total			99.6		%		80-120	18-MAY-22
Manganese (Mn)-Total			96.3		%		80-120	18-MAY-22
Molybdenum (Mo)-Total			97.0		%		80-120	18-MAY-22
Nickel (Ni)-Total			96.7		%		80-120	18-MAY-22
Phosphorus (P)-Total			97.8		%		70-130	18-MAY-22
Potassium (K)-Total			97.7		%		80-120	18-MAY-22
Rubidium (Rb)-Total			100.8		%		80-120	18-MAY-22
Selenium (Se)-Total			100.8		%		80-120	18-MAY-22
Silicon (Si)-Total			95.5		%		60-140	18-MAY-22
Silver (Ag)-Total			92.4		%		80-120	18-MAY-22
Sodium (Na)-Total			97.5		%		80-120	18-MAY-22
Strontium (Sr)-Total			97.9		%		80-120	18-MAY-22
Sulfur (S)-Total			95.5		%		80-120	18-MAY-22
Thallium (Tl)-Total			103.3		%		80-120	18-MAY-22
Tellurium (Te)-Total			101.4		%		80-120	18-MAY-22
Thorium (Th)-Total			103.7		%		80-120	18-MAY-22
Tin (Sn)-Total			97.0		%		80-120	18-MAY-22
Titanium (Ti)-Total			90.8		%		80-120	18-MAY-22

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Tungsten (W)-Total			100.1		%		80-120	18-MAY-22
Uranium (U)-Total			107.0		%		80-120	18-MAY-22
Vanadium (V)-Total			97.5		%		80-120	18-MAY-22
Zinc (Zn)-Total			96.0		%		80-120	18-MAY-22
Zirconium (Zr)-Total			94.4		%		80-120	18-MAY-22
WG3728545-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	18-MAY-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Boron (B)-Total			<0.010		mg/L		0.01	18-MAY-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	18-MAY-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-MAY-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Iron (Fe)-Total			<0.010		mg/L		0.01	18-MAY-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	18-MAY-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	18-MAY-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	18-MAY-22
Potassium (K)-Total			<0.050		mg/L		0.05	18-MAY-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Silicon (Si)-Total			<0.10		mg/L		0.1	18-MAY-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Sodium (Na)-Total			<0.050		mg/L		0.05	18-MAY-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	18-MAY-22

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	18-MAY-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	18-MAY-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	18-MAY-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	18-MAY-22
NH3-F-WT	**Water**							
Batch R5786193								
WG3729971-2 LCS								
Ammonia, Total (as N)			104.6		%		85-115	20-MAY-22
WG3729971-1 MB								
Ammonia, Total (as N)			<0.010		mg/L		0.01	20-MAY-22
NO2-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrite (as N)			102.4		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	19-MAY-22
NO3-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrate (as N)			100.8		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	19-MAY-22
P-T-COL-WT	**Water**							
Batch R5785119								
WG3729112-2 LCS								
Phosphorus, Total			98.9		%		80-120	19-MAY-22
WG3729112-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	19-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-WT	**Water**							
Batch R5784431								
WG3728910-2 LCS								
Orthophosphate-Dissolved (as P)			100.6		%		80-120	18-MAY-22
WG3728910-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	18-MAY-22
SO4-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Sulfate (SO4)			102.6		%		90-110	19-MAY-22
WG3729578-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-MAY-22
SOLIDS-TDS-WT	**Water**							
Batch R5786369								
WG3729480-2 LCS								
Total Dissolved Solids			87.2		%		85-115	20-MAY-22
WG3729480-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-MAY-22
SOLIDS-TSS-WT	**Water**							
Batch R5785735								
WG3729472-2 LCS								
Total Suspended Solids			96.0		%		85-115	20-MAY-22
WG3729472-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAY-22
TOC-WT	**Water**							
Batch R5786669								
WG3730139-2 LCS								
Total Organic Carbon			92.3		%		80-120	24-MAY-22
WG3730139-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-MAY-22

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Cyanides							
Thiocyanate by Colour							
	1	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	2	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	3	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	4	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	5	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT

Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR: Exceeded ALS recommended hold time prior to sample receipt.
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT: Exceeded ALS recommended hold time prior to analysis.
Rec. HT: ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2706977 were received on 17-MAY-22 10:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2706977-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Contact your AM to confirm all E&P TATs (surcharges may apply)

TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To

Same as Report To ☑ YES ☐ NO

Copy of Invoice with Report ☐ YES ☐ NO

Company:

Contact:

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Project Information

ALS Account # / Quote #:

Job #: 196035 - MD

PO / AFE: 5000196035-606300.21030001

LSD:

ALS Lab Work Order # (lab use only): L2706977

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Contact: Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metal Scan	CNO	CN	SCN	Anions Scan	o-PO4	P	TOC	DOC soluble	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW	20220516		WW	8	X	X	X	X	X	X	X	X	X	X	X		
	196035-MD-R1	↓		↓	4		X		X	X	X	X						
	196035-MD-R2	↓		↓	4		X		X	X	X	X						
	196035-MD-R3	↓		↓	4		X		X	X	X	X						
	196035-MD-CW 15°C	↓		↓	8	X	X	X	X	X	X	X	X	X	X	X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 16.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: JL	Date: 22-5-13	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 17/22	Time: 11AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2016 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-MAY-22
Report Date: 27-MAY-22 14:57 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2706977

Project P.O. #: 5000196035_606300.21030001
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	<3.0		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2440	DLM	40	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	47.4	DLHC	1.0	mg/L		20-MAY-22	R5786193
Bromide (Br)	1.1	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	188	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	9.37	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0055		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1670	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0403		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	17	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	138		5.0	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Organic Carbon	86.5	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	85	DLM	10	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	0.0074	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	0.0015	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0301	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.25	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	280	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.425	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	0.0084	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	0.17	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	21.7	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.0242	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.0887	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	165	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0452	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.128	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	1.5	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	416	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	1.00	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	635	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00924	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					24-MAY-22	R5786219
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Antimony (Sb)-Dissolved	0.0079	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Arsenic (As)-Dissolved	0.0015	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Barium (Ba)-Dissolved	0.0327	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Boron (B)-Dissolved	0.26	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	24-MAY-22	24-MAY-22	R5786474
Calcium (Ca)-Dissolved	306	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Cobalt (Co)-Dissolved	0.435	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Copper (Cu)-Dissolved	0.0060	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	24-MAY-22	24-MAY-22	R5786474
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Magnesium (Mg)-Dissolved	22.1	DLHC	0.050	mg/L	24-MAY-22	24-MAY-22	R5786474
Manganese (Mn)-Dissolved	0.0234	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Molybdenum (Mo)-Dissolved	0.0937	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Nickel (Ni)-Dissolved	0.138	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-1 196035_MD_RW Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Potassium (K)-Dissolved	165	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Rubidium (Rb)-Dissolved	0.0484	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Selenium (Se)-Dissolved	0.129	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Silicon (Si)-Dissolved	1.57	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	24-MAY-22	24-MAY-22	R5786474
Sodium (Na)-Dissolved	429	DLHC	0.50	mg/L	24-MAY-22	24-MAY-22	R5786474
Strontium (Sr)-Dissolved	1.05	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Sulfur (S)-Dissolved	688	DLHC	5.0	mg/L	24-MAY-22	24-MAY-22	R5786474
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	24-MAY-22	24-MAY-22	R5786474
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	24-MAY-22	24-MAY-22	R5786474
Uranium (U)-Dissolved	0.00892	DLHC	0.00010	mg/L	24-MAY-22	24-MAY-22	R5786474
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	24-MAY-22	24-MAY-22	R5786474
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	24-MAY-22	24-MAY-22	R5786474
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	24-MAY-22	24-MAY-22	R5786474
L2706977-2 196035_MD_R1 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	133	DLHC	5.0	mg/L		24-MAY-22	R5786193
Bromide (Br)	1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	181	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	32.0	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	48.2	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	1.90	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1830	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0352	CNI	0.0020	mg/L		19-MAY-22	R5785001
Thiocyanate (SCN)	1.22		0.50	mg/L		22-MAY-26	R5788598
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.967	DLHC	0.050	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	145	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-3 196035_MD_R2 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Nitrate (as N)	174	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	0.46	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	2.42	DLHC	0.30	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1470	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0205		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-4 196035_MD_R3 Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Anions and Nutrients							
Ammonia, Total (as N)	0.096		0.010	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	127	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	0.99	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	0.0220		0.0030	mg/L		18-MAY-22	R5784431
Sulfate (SO4)	1080	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0164		0.0020	mg/L		18-MAY-22	R5785001
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	6.3		3.0	mg/L	19-MAY-22	20-MAY-22	R5785735
Total Dissolved Solids	2490	DLM	80	mg/L		20-MAY-22	R5786369
Anions and Nutrients							
Ammonia, Total (as N)	4.17	DLHC	0.10	mg/L		24-MAY-22	R5786193
Bromide (Br)	<1.0	DLDS	1.0	mg/L		19-MAY-22	R5785583
Chloride (Cl)	121	DLDS	5.0	mg/L		19-MAY-22	R5785583
Fluoride (F)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrate (as N)	<0.20	DLDS	0.20	mg/L		19-MAY-22	R5785583
Nitrite (as N)	<0.10	DLDS	0.10	mg/L		19-MAY-22	R5785583
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		18-MAY-22	R5784431
Phosphorus, Total	0.0309		0.0030	mg/L	19-MAY-22	19-MAY-22	R5785119
Sulfate (SO4)	1870	DLDS	3.0	mg/L		19-MAY-22	R5785583
Cyanides							
Cyanide, Total	0.0188		0.0020	mg/L		18-MAY-22	R5785001
Cyanate	<10	DLIS	10	mg/L		20-MAY-22	R5785873
Thiocyanate (SCN)	<0.50		0.50	mg/L		22-MAY-26	R5788598
Organic / Inorganic Carbon							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	lab	PEHT				21-MAY-22	R5785945
Dissolved Carbon Filtration Location	FIELD					18-MAY-22	R5783638
Dissolved Organic Carbon	12.3	DLM	2.5	mg/L	21-MAY-22	24-MAY-22	R5786276
Total Organic Carbon	15.6	DLM	2.5	mg/L		24-MAY-22	R5786669
Total Metals							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Antimony (Sb)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Arsenic (As)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Barium (Ba)-Total	0.0072	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Boron (B)-Total	0.16	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Cadmium (Cd)-Total	0.000058	DLHC	0.000050	mg/L	18-MAY-22	18-MAY-22	R5784424
Calcium (Ca)-Total	134	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Cobalt (Co)-Total	0.281	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Iron (Fe)-Total	3.12	DLHC	0.10	mg/L	18-MAY-22	18-MAY-22	R5784424
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Magnesium (Mg)-Total	13.4	DLHC	0.050	mg/L	18-MAY-22	18-MAY-22	R5784424
Manganese (Mn)-Total	0.135	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Molybdenum (Mo)-Total	0.00749	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Nickel (Ni)-Total	0.0454	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Potassium (K)-Total	103	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Rubidium (Rb)-Total	0.0284	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Selenium (Se)-Total	0.0257	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Silicon (Si)-Total	<1.0	DLHC	1.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	18-MAY-22	18-MAY-22	R5784424
Sodium (Na)-Total	729	DLHC	0.50	mg/L	18-MAY-22	18-MAY-22	R5784424
Strontium (Sr)-Total	0.530	DLHC	0.010	mg/L	18-MAY-22	18-MAY-22	R5784424
Sulfur (S)-Total	605	DLHC	5.0	mg/L	18-MAY-22	18-MAY-22	R5784424
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	18-MAY-22	18-MAY-22	R5784424
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	18-MAY-22	18-MAY-22	R5784424
Uranium (U)-Total	0.00055	DLHC	0.00010	mg/L	18-MAY-22	18-MAY-22	R5784424

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Total Metals							
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	18-MAY-22	18-MAY-22	R5784424
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	18-MAY-22	18-MAY-22	R5784424
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	18-MAY-22	18-MAY-22	R5784424
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					19-MAY-22	R5785349
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Antimony (Sb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Barium (Ba)-Dissolved	0.0067	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Boron (B)-Dissolved	0.17	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	19-MAY-22	20-MAY-22	R5786123
Calcium (Ca)-Dissolved	133	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Cobalt (Co)-Dissolved	0.302	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Copper (Cu)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Iron (Fe)-Dissolved	0.76	DLHC	0.10	mg/L	19-MAY-22	20-MAY-22	R5786123
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Magnesium (Mg)-Dissolved	14.6	DLHC	0.050	mg/L	19-MAY-22	20-MAY-22	R5786123
Manganese (Mn)-Dissolved	0.147	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Molybdenum (Mo)-Dissolved	0.00681	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Nickel (Ni)-Dissolved	0.0480	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Potassium (K)-Dissolved	107	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Rubidium (Rb)-Dissolved	0.0298	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Selenium (Se)-Dissolved	0.0242	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Silicon (Si)-Dissolved	0.56	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	19-MAY-22	20-MAY-22	R5786123
Sodium (Na)-Dissolved	832	DLHC	0.50	mg/L	19-MAY-22	20-MAY-22	R5786123
Strontium (Sr)-Dissolved	0.533	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Sulfur (S)-Dissolved	652	DLHC	5.0	mg/L	19-MAY-22	20-MAY-22	R5786123
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	19-MAY-22	20-MAY-22	R5786123
Tungsten (W)-Dissolved	<0.0010	DLHC	0.0010	mg/L	19-MAY-22	20-MAY-22	R5786123
Uranium (U)-Dissolved	0.00047	DLHC	0.00010	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2706977-5 196035_MD_CW15°C Sampled By: CLIENT on 16-MAY-22 Matrix: WATER							
Dissolved Metals							
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	19-MAY-22	20-MAY-22	R5786123
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	19-MAY-22	20-MAY-22	R5786123
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	19-MAY-22	20-MAY-22	R5786123

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Chloride (Cl)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Thiocyanate (SCN)	MS-B	L2706977-1, -2, -3, -4, -5
Matrix Spike	Dissolved Organic Carbon	MS-B	L2706977-1, -5
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L2706977-5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2706977-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2706977-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2706977-5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2706977-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-5
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2706977-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2706977-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2706977-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2706977-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2706977-1, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2706977-1, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L2706977-1, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2706977-1, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2706977-1, -5
Matrix Spike	Silicon (Si)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2706977-1, -5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2706977-1, -5
Matrix Spike	Sulfur (S)-Total	MS-B	L2706977-1, -5
Matrix Spike	Uranium (U)-Total	MS-B	L2706977-1, -5
Matrix Spike	Total Organic Carbon	MS-B	L2706977-1, -5

Sample Parameter Qualifier key listed:

Qualifier	Description
CNI	Test result for Total Cyanide may be biased high due to interference from high nitrite in this sample. Nitrite can cause false positives for T-CN at up to ~ 0.8% of the nitrite concentration. Interpret result as a maximum possible value.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLIS	Detection Limit Adjusted: Insufficient Sample
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

Reference Information

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NH3-F-WT	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

Reference Information

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2706977 Report Date: 27-MAY-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Bromide (Br)			102.8		%		85-115	19-MAY-22
WG3729578-11 MB								
Bromide (Br)			<0.10		mg/L		0.1	19-MAY-22
CL-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Chloride (Cl)			102.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-MAY-22
CN-CNO-WT	**Water**							
Batch R5785873								
WG3730231-2 LCS								
Cyanate			92.0		%		85-115	20-MAY-22
WG3730231-1 MB								
Cyanate			<0.20		mg/L		0.2	20-MAY-22
CN-SCN-VA	**Water**							
Batch R5788598								
WG3732009-2 LCS								
Thiocyanate (SCN)			98.9		%		85-115	22-MAY-26
WG3732009-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	22-MAY-26
CN-TOT-WT	**Water**							
Batch R5785001								
WG3729075-12 LCS								
Cyanide, Total			105.4		%		80-120	18-MAY-22
WG3729075-7 LCS								
Cyanide, Total			104.2		%		80-120	18-MAY-22
WG3729075-11 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
WG3729075-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	18-MAY-22
DOC-WT	**Water**							
Batch R5786276								
WG3730305-2 LCS								
Dissolved Organic Carbon			116.2		%		80-120	24-MAY-22
WG3730305-1 MB								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5786276								
WG3730305-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	24-MAY-22
F-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Fluoride (F)			101.1		%		90-110	19-MAY-22
WG3729578-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	19-MAY-22
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Aluminum (Al)-Dissolved			99.1		%		80-120	20-MAY-22
Antimony (Sb)-Dissolved			95.7		%		80-120	20-MAY-22
Arsenic (As)-Dissolved			99.4		%		80-120	20-MAY-22
Barium (Ba)-Dissolved			104.5		%		80-120	20-MAY-22
Beryllium (Be)-Dissolved			92.3		%		80-120	20-MAY-22
Bismuth (Bi)-Dissolved			100.8		%		80-120	20-MAY-22
Boron (B)-Dissolved			89.7		%		80-120	20-MAY-22
Cadmium (Cd)-Dissolved			101.5		%		80-120	20-MAY-22
Calcium (Ca)-Dissolved			99.7		%		80-120	20-MAY-22
Cesium (Cs)-Dissolved			102.5		%		80-120	20-MAY-22
Chromium (Cr)-Dissolved			96.0		%		80-120	20-MAY-22
Cobalt (Co)-Dissolved			94.8		%		80-120	20-MAY-22
Copper (Cu)-Dissolved			94.3		%		80-120	20-MAY-22
Iron (Fe)-Dissolved			96.5		%		80-120	20-MAY-22
Lead (Pb)-Dissolved			100.5		%		80-120	20-MAY-22
Lithium (Li)-Dissolved			92.5		%		80-120	20-MAY-22
Magnesium (Mg)-Dissolved			102.0		%		80-120	20-MAY-22
Manganese (Mn)-Dissolved			96.3		%		80-120	20-MAY-22
Molybdenum (Mo)-Dissolved			92.0		%		80-120	20-MAY-22
Nickel (Ni)-Dissolved			95.4		%		80-120	20-MAY-22
Phosphorus (P)-Dissolved			98.4		%		80-120	20-MAY-22
Potassium (K)-Dissolved			96.0		%		80-120	20-MAY-22
Rubidium (Rb)-Dissolved			106.8		%		80-120	20-MAY-22
Selenium (Se)-Dissolved			96.5		%		80-120	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-2 LCS								
Silicon (Si)-Dissolved			96.1		%		60-140	20-MAY-22
Silver (Ag)-Dissolved			89.9		%		80-120	20-MAY-22
Sodium (Na)-Dissolved			101.5		%		80-120	20-MAY-22
Strontium (Sr)-Dissolved			99.3		%		80-120	20-MAY-22
Sulfur (S)-Dissolved			90.8		%		80-120	20-MAY-22
Tellurium (Te)-Dissolved			99.3		%		80-120	20-MAY-22
Thallium (Tl)-Dissolved			103.5		%		80-120	20-MAY-22
Thorium (Th)-Dissolved			98.4		%		80-120	20-MAY-22
Tin (Sn)-Dissolved			97.8		%		80-120	20-MAY-22
Titanium (Ti)-Dissolved			94.3		%		80-120	20-MAY-22
Tungsten (W)-Dissolved			97.9		%		80-120	20-MAY-22
Uranium (U)-Dissolved			101.2		%		80-120	20-MAY-22
Vanadium (V)-Dissolved			98.1		%		80-120	20-MAY-22
Zinc (Zn)-Dissolved			97.3		%		80-120	20-MAY-22
Zirconium (Zr)-Dissolved			93.9		%		80-120	20-MAY-22
WG3729634-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	20-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786123								
WG3729634-1 MB								
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	20-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	20-MAY-22
Batch R5786474								
WG3730658-2 LCS								
Aluminum (Al)-Dissolved			107.5		%		80-120	24-MAY-22
Antimony (Sb)-Dissolved			104.4		%		80-120	24-MAY-22
Arsenic (As)-Dissolved			102.9		%		80-120	24-MAY-22
Barium (Ba)-Dissolved			109.0		%		80-120	24-MAY-22
Beryllium (Be)-Dissolved			106.2		%		80-120	24-MAY-22
Bismuth (Bi)-Dissolved			101.2		%		80-120	24-MAY-22
Boron (B)-Dissolved			97.9		%		80-120	24-MAY-22
Cadmium (Cd)-Dissolved			104.6		%		80-120	24-MAY-22
Calcium (Ca)-Dissolved			104.9		%		80-120	24-MAY-22
Cesium (Cs)-Dissolved			110.9		%		80-120	24-MAY-22
Chromium (Cr)-Dissolved			99.2		%		80-120	24-MAY-22

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-2 LCS								
Cobalt (Co)-Dissolved			98.5		%		80-120	24-MAY-22
Copper (Cu)-Dissolved			97.4		%		80-120	24-MAY-22
Iron (Fe)-Dissolved			102.4		%		80-120	24-MAY-22
Lead (Pb)-Dissolved			103.7		%		80-120	24-MAY-22
Lithium (Li)-Dissolved			105.8		%		80-120	24-MAY-22
Magnesium (Mg)-Dissolved			105.3		%		80-120	24-MAY-22
Manganese (Mn)-Dissolved			102.7		%		80-120	24-MAY-22
Molybdenum (Mo)-Dissolved			103.1		%		80-120	24-MAY-22
Nickel (Ni)-Dissolved			97.8		%		80-120	24-MAY-22
Phosphorus (P)-Dissolved			103.3		%		80-120	24-MAY-22
Potassium (K)-Dissolved			103.2		%		80-120	24-MAY-22
Rubidium (Rb)-Dissolved			109.9		%		80-120	24-MAY-22
Selenium (Se)-Dissolved			97.5		%		80-120	24-MAY-22
Silicon (Si)-Dissolved			103.8		%		60-140	24-MAY-22
Silver (Ag)-Dissolved			97.3		%		80-120	24-MAY-22
Sodium (Na)-Dissolved			101.2		%		80-120	24-MAY-22
Strontium (Sr)-Dissolved			108.9		%		80-120	24-MAY-22
Sulfur (S)-Dissolved			104.9		%		80-120	24-MAY-22
Tellurium (Te)-Dissolved			101.2		%		80-120	24-MAY-22
Thallium (Tl)-Dissolved			102.3		%		80-120	24-MAY-22
Thorium (Th)-Dissolved			105.1		%		80-120	24-MAY-22
Tin (Sn)-Dissolved			104.4		%		80-120	24-MAY-22
Titanium (Ti)-Dissolved			102.2		%		80-120	24-MAY-22
Tungsten (W)-Dissolved			103.5		%		80-120	24-MAY-22
Uranium (U)-Dissolved			106.9		%		80-120	24-MAY-22
Vanadium (V)-Dissolved			102.4		%		80-120	24-MAY-22
Zinc (Zn)-Dissolved			102.0		%		80-120	24-MAY-22
Zirconium (Zr)-Dissolved			105.5		%		80-120	24-MAY-22
WG3730658-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5786474								
WG3730658-1 MB								
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	24-MAY-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	24-MAY-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	24-MAY-22
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	24-MAY-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	24-MAY-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	24-MAY-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	24-MAY-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	24-MAY-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	24-MAY-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	24-MAY-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	24-MAY-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	24-MAY-22

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Aluminum (Al)-Total			98.0		%		80-120	18-MAY-22
Antimony (Sb)-Total			103.7		%		80-120	18-MAY-22
Arsenic (As)-Total			97.6		%		80-120	18-MAY-22
Barium (Ba)-Total			99.7		%		80-120	18-MAY-22
Beryllium (Be)-Total			93.7		%		80-120	18-MAY-22
Bismuth (Bi)-Total			98.4		%		80-120	18-MAY-22
Boron (B)-Total			93.5		%		80-120	18-MAY-22
Cadmium (Cd)-Total			100.2		%		80-120	18-MAY-22
Calcium (Ca)-Total			93.0		%		80-120	18-MAY-22
Chromium (Cr)-Total			97.4		%		80-120	18-MAY-22
Cesium (Cs)-Total			103.9		%		80-120	18-MAY-22
Cobalt (Co)-Total			96.6		%		80-120	18-MAY-22
Copper (Cu)-Total			96.2		%		80-120	18-MAY-22
Iron (Fe)-Total			100.0		%		80-120	18-MAY-22
Lead (Pb)-Total			103.9		%		80-120	18-MAY-22
Lithium (Li)-Total			90.4		%		80-120	18-MAY-22
Magnesium (Mg)-Total			99.6		%		80-120	18-MAY-22
Manganese (Mn)-Total			96.3		%		80-120	18-MAY-22
Molybdenum (Mo)-Total			97.0		%		80-120	18-MAY-22
Nickel (Ni)-Total			96.7		%		80-120	18-MAY-22
Phosphorus (P)-Total			97.8		%		70-130	18-MAY-22
Potassium (K)-Total			97.7		%		80-120	18-MAY-22
Rubidium (Rb)-Total			100.8		%		80-120	18-MAY-22
Selenium (Se)-Total			100.8		%		80-120	18-MAY-22
Silicon (Si)-Total			95.5		%		60-140	18-MAY-22
Silver (Ag)-Total			92.4		%		80-120	18-MAY-22
Sodium (Na)-Total			97.5		%		80-120	18-MAY-22
Strontium (Sr)-Total			97.9		%		80-120	18-MAY-22
Sulfur (S)-Total			95.5		%		80-120	18-MAY-22
Thallium (Tl)-Total			103.3		%		80-120	18-MAY-22
Tellurium (Te)-Total			101.4		%		80-120	18-MAY-22
Thorium (Th)-Total			103.7		%		80-120	18-MAY-22
Tin (Sn)-Total			97.0		%		80-120	18-MAY-22
Titanium (Ti)-Total			90.8		%		80-120	18-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-2 LCS								
Tungsten (W)-Total			100.1		%		80-120	18-MAY-22
Uranium (U)-Total			107.0		%		80-120	18-MAY-22
Vanadium (V)-Total			97.5		%		80-120	18-MAY-22
Zinc (Zn)-Total			96.0		%		80-120	18-MAY-22
Zirconium (Zr)-Total			94.4		%		80-120	18-MAY-22
WG3728545-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	18-MAY-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Boron (B)-Total			<0.010		mg/L		0.01	18-MAY-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	18-MAY-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	18-MAY-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Iron (Fe)-Total			<0.010		mg/L		0.01	18-MAY-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	18-MAY-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	18-MAY-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	18-MAY-22
Potassium (K)-Total			<0.050		mg/L		0.05	18-MAY-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Silicon (Si)-Total			<0.10		mg/L		0.1	18-MAY-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	18-MAY-22
Sodium (Na)-Total			<0.050		mg/L		0.05	18-MAY-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	18-MAY-22

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5784424								
WG3728545-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	18-MAY-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	18-MAY-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	18-MAY-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	18-MAY-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	18-MAY-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	18-MAY-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	18-MAY-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	18-MAY-22
NH3-F-WT	**Water**							
Batch R5786193								
WG3729971-2 LCS								
Ammonia, Total (as N)			104.6		%		85-115	20-MAY-22
WG3729971-1 MB								
Ammonia, Total (as N)			<0.010		mg/L		0.01	20-MAY-22
NO2-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrite (as N)			102.4		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	19-MAY-22
NO3-IC-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Nitrate (as N)			100.8		%		90-110	19-MAY-22
WG3729578-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	19-MAY-22
P-T-COL-WT	**Water**							
Batch R5785119								
WG3729112-2 LCS								
Phosphorus, Total			98.9		%		80-120	19-MAY-22
WG3729112-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	19-MAY-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PO4-DO-COL-WT	**Water**							
Batch R5784431								
WG3728910-2 LCS								
Orthophosphate-Dissolved (as P)			100.6		%		80-120	18-MAY-22
WG3728910-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	18-MAY-22
SO4-IC-N-WT	**Water**							
Batch R5785583								
WG3729578-12 LCS								
Sulfate (SO4)			102.6		%		90-110	19-MAY-22
WG3729578-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-MAY-22
SOLIDS-TDS-WT	**Water**							
Batch R5786369								
WG3729480-2 LCS								
Total Dissolved Solids			87.2		%		85-115	20-MAY-22
WG3729480-1 MB								
Total Dissolved Solids			<10		mg/L		10	20-MAY-22
SOLIDS-TSS-WT	**Water**							
Batch R5785735								
WG3729472-2 LCS								
Total Suspended Solids			96.0		%		85-115	20-MAY-22
WG3729472-1 MB								
Total Suspended Solids			<3.0		mg/L		3	20-MAY-22
TOC-WT	**Water**							
Batch R5786669								
WG3730139-2 LCS								
Total Organic Carbon			92.3		%		80-120	24-MAY-22
WG3730139-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-MAY-22

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Cyanides							
Thiocyanate by Colour							
	1	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	2	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	3	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	4	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT
	5	16-MAY-22	22-MAY-26 23:25	14	1467	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2706977 were received on 17-MAY-22 10:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2706977-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Contact your AM to confirm all E&P TATs (surcharges may apply)

TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4-20%] ☐		1 Business day [E - 100%] ☐	
3 day [P3-25%] ☐		Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐	
2 day [P2-50%] ☐			

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 196035 - MD

PO / AFE: 5000196035-606300.21030001

LSD:

ALS Lab Work Order # (lab use only): L2706977

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Metal Scan	CNO	CN	SCN	Anions Scan	O-PO4	P	TOC	DOC Soluble	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW	20220516		WW	8	X	X	X	X	X	X	X	X	X	X	X		
	196035-MD-R1	↓		↓	4		X		X	X	X	X						
	196035-MD-R2	↓		↓	4		X		X	X	X	X						
	196035-MD-R3	↓		↓	4		X		X	X	X	X						
	196035-MD-CW 15°C	↓		↓	8	X	X	X	X	X	X	X	X	X	X	X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?

☐ YES ☐ NO

Are samples for human consumption/ use?

☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	16.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: JL	Date: 22-5-13	Time:	Received by:	Date:	Time:	Received by: BB	Date: May 17 /22	Time: 11AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 17-FEB-22
Report Date: 17-FEB-22 14:59 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2686613

Project P.O. #: 5000196035.606300.21030003
Job Reference: 196035_MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2686613-1 196035_MD_RW_SPIKED AS Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	1.00	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.357	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.316	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-2 196035_MD_RW_1A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0055	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0221	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0704	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-3 196035_MD_RW_1B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0051	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0078	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0291	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-4 196035_MD_RW_1C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0038	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0105	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-5 196035_MD_RW_2A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0060	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0168	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0938	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-6 196035_MD_RW_2B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0065	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.0131	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-7 196035_MD_RW_2C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0058	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2686613-7 196035_MD_RW_2C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Nickel (Ni)-Total	0.0066	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-8 196035_MD_RW_3A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0053	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0117	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.133	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-9 196035_MD_RW_3B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0050	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	0.0053	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.138	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-10 196035_MD_RW_3C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0049	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.128	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-11 196035_MD_RW_4A Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0072	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.202	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-12 196035_MD_RW_4B Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0077	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.217	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
L2686613-13 196035_MD_RW_4C Sampled By: CLIENT on 15-FEB-22 Matrix: WATER							
Total Metals							
Arsenic (As)-Total	0.0079	DLHC	0.0010	mg/L	17-FEB-22	17-FEB-22	R5726857
Copper (Cu)-Total	<0.0050	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857
Nickel (Ni)-Total	0.204	DLHC	0.0050	mg/L	17-FEB-22	17-FEB-22	R5726857

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2686613 Report Date: 17-FEB-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5726857								
WG3697307-2 LCS								
Arsenic (As)-Total			101.1		%		80-120	17-FEB-22
Copper (Cu)-Total			97.9		%		80-120	17-FEB-22
Nickel (Ni)-Total			98.1		%		80-120	17-FEB-22
WG3697307-1 MB								
Arsenic (As)-Total			<0.00010		mg/L		0.0001	17-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	17-FEB-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	17-FEB-22

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2686613-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☒ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 196035-MD

PO / AFE: 5000196035.606300.21030003

LSD:

ALS Lab Work Order # (lab use only): L2686613

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	AS	Cu	Zn	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035_MD_RW_Spiked AS	2022-02-15			1	X	X	X		
	196035_MD_1A									
	196035_MD_1B									
	196035_MD_1C									
	196035_MD_2A									
	196035_MD_2B									
	196035_MD_2C									
	196035_MD_3A									
	196035_MD_3B									
	196035_MD_3C									
	196035_MD_4A									
	196035_MD_4B									
	196035_MD_4C									

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C | FINAL COOLER TEMPERATURES °C: 13.5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: EHT	Date: 2022-02-16	Time:	Received by:	Date:	Time:	Received by: AP	Date: 17 Feb 22	Time: 10:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION   WHITE - LABORATORY COPY   YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

NOV 2018 FRONT

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Date Received: 14-FEB-22
Report Date: 24-FEB-22 08:15 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2685466

Project P.O. #: 5000196035.606300.21030003
Job Reference: 196035-MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Physical Tests							
Total Suspended Solids	23.8		3.0	mg/L	14-FEB-22	15-FEB-22	R5723306
Total Dissolved Solids	2640	DLDS	20	mg/L		14-FEB-22	R5724121
Anions and Nutrients							
Bromide (Br)	<0.50	DLDS	0.50	mg/L		15-FEB-22	R5725167
Chloride (Cl)	188	DLDS	2.5	mg/L		15-FEB-22	R5725167
Fluoride (F)	<0.10	DLDS	0.10	mg/L		15-FEB-22	R5725167
Nitrate (as N)	9.79	DLDS	0.10	mg/L		15-FEB-22	R5725167
Nitrite (as N)	0.173	DLDS	0.050	mg/L		15-FEB-22	R5725167
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L		15-FEB-22	R5723310
Phosphorus, Total	0.0113		0.0030	mg/L	16-FEB-22	17-FEB-22	R5726921
Sulfate (SO4)	1380	DLDS	1.5	mg/L		15-FEB-22	R5725167
Cyanides							
Cyanide, Total	0.0312		0.0020	mg/L		15-FEB-22	R5725716
Cyanate	115	SP	2.0	mg/L		16-FEB-22	R5725719
Thiocyanate (SCN)	147		5.0	mg/L		23-FEB-22	R5728813
Organic / Inorganic Carbon							
Dissolved Carbon Filtration Location	LAB	PEHT				16-FEB-22	R5724856
Dissolved Organic Carbon	98	DLM	10	mg/L	16-FEB-22	16-FEB-22	R5726517
Total Organic Carbon	105	DLM	10	mg/L		16-FEB-22	R5726319
Total Metals							
Aluminum (Al)-Total	0.054	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5722282
Antimony (Sb)-Total	0.0174	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Arsenic (As)-Total	0.0979	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Barium (Ba)-Total	0.0561	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Boron (B)-Total	0.26	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5722282
Cadmium (Cd)-Total	<0.000060	DLM	0.000060	mg/L	14-FEB-22	14-FEB-22	R5722282
Calcium (Ca)-Total	285	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Cobalt (Co)-Total	0.464	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Copper (Cu)-Total	0.811	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Iron (Fe)-Total	0.21	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5722282
Lead (Pb)-Total	0.00060	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5722282
Magnesium (Mg)-Total	23.5	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5722282
Manganese (Mn)-Total	0.0230	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Molybdenum (Mo)-Total	0.124	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Nickel (Ni)-Total	0.338	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Potassium (K)-Total	173	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Total Metals							
Rubidium (Rb)-Total	0.0502	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Selenium (Se)-Total	0.137	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Silicon (Si)-Total	3.0	DLHC	1.0	mg/L	14-FEB-22	14-FEB-22	R5722282
Silver (Ag)-Total	0.00057	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5722282
Sodium (Na)-Total	434	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5722282
Strontium (Sr)-Total	1.03	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5722282
Sulfur (S)-Total	619	DLHC	5.0	mg/L	14-FEB-22	14-FEB-22	R5722282
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	14-FEB-22	14-FEB-22	R5722282
Tungsten (W)-Total	0.0072	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5722282
Uranium (U)-Total	0.0145	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5722282
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5722282
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	14-FEB-22	14-FEB-22	R5722282
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5722282
Dissolved Metals							
Dissolved Metals Filtration Location	LAB					14-FEB-22	R5723063
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5723036
Antimony (Sb)-Dissolved	0.0119	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Arsenic (As)-Dissolved	0.0595	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Barium (Ba)-Dissolved	0.0255	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Bismuth (Bi)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Boron (B)-Dissolved	0.19	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5723036
Cadmium (Cd)-Dissolved	<0.000050	DLHC	0.000050	mg/L	14-FEB-22	14-FEB-22	R5723036
Calcium (Ca)-Dissolved	141	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Cesium (Cs)-Dissolved	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Cobalt (Co)-Dissolved	0.327	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Copper (Cu)-Dissolved	0.144	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	14-FEB-22	14-FEB-22	R5723036
Lead (Pb)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Lithium (Li)-Dissolved	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Magnesium (Mg)-Dissolved	16.3	DLHC	0.050	mg/L	14-FEB-22	14-FEB-22	R5723036
Manganese (Mn)-Dissolved	0.0099	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Molybdenum (Mo)-Dissolved	0.0852	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Nickel (Ni)-Dissolved	0.223	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Potassium (K)-Dissolved	132	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2685466-1 196035-MD-RW Sampled By: CLIENT on 11-FEB-22 Matrix: WATER							
Dissolved Metals							
Rubidium (Rb)-Dissolved	0.0373	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Selenium (Se)-Dissolved	0.0953	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Silicon (Si)-Dissolved	1.96	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	14-FEB-22	14-FEB-22	R5723036
Sodium (Na)-Dissolved	318	DLHC	0.50	mg/L	14-FEB-22	14-FEB-22	R5723036
Strontium (Sr)-Dissolved	0.540	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Sulfur (S)-Dissolved	373	DLHC	5.0	mg/L	14-FEB-22	14-FEB-22	R5723036
Tellurium (Te)-Dissolved	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036
Thallium (Tl)-Dissolved	<0.00010	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Thorium (Th)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	14-FEB-22	14-FEB-22	R5723036
Tungsten (W)-Dissolved	0.0050	DLHC	0.0010	mg/L	14-FEB-22	14-FEB-22	R5723036
Uranium (U)-Dissolved	0.00944	DLHC	0.00010	mg/L	14-FEB-22	14-FEB-22	R5723036
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	14-FEB-22	14-FEB-22	R5723036
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	14-FEB-22	14-FEB-22	R5723036
Zirconium (Zr)-Dissolved	<0.0020	DLHC	0.0020	mg/L	14-FEB-22	14-FEB-22	R5723036

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Phosphorus (P)-Total	MES	L2685466-1
Matrix Spike	Cyanate	MS-B	L2685466-1
Matrix Spike	Dissolved Organic Carbon	MS-B	L2685466-1
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L2685466-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2685466-1
Matrix Spike	Boron (B)-Dissolved	MS-B	L2685466-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2685466-1
Matrix Spike	Cobalt (Co)-Dissolved	MS-B	L2685466-1
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L2685466-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2685466-1
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2685466-1
Matrix Spike	Nickel (Ni)-Dissolved	MS-B	L2685466-1
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2685466-1
Matrix Spike	Rubidium (Rb)-Dissolved	MS-B	L2685466-1
Matrix Spike	Selenium (Se)-Dissolved	MS-B	L2685466-1
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L2685466-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2685466-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2685466-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2685466-1
Matrix Spike	Tungsten (W)-Dissolved	MS-B	L2685466-1
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2685466-1
Matrix Spike	Arsenic (As)-Total	MS-B	L2685466-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2685466-1
Matrix Spike	Boron (B)-Total	MS-B	L2685466-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2685466-1
Matrix Spike	Cobalt (Co)-Total	MS-B	L2685466-1
Matrix Spike	Copper (Cu)-Total	MS-B	L2685466-1
Matrix Spike	Iron (Fe)-Total	MS-B	L2685466-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2685466-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L2685466-1
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L2685466-1
Matrix Spike	Nickel (Ni)-Total	MS-B	L2685466-1
Matrix Spike	Potassium (K)-Total	MS-B	L2685466-1
Matrix Spike	Rubidium (Rb)-Total	MS-B	L2685466-1
Matrix Spike	Selenium (Se)-Total	MS-B	L2685466-1
Matrix Spike	Silicon (Si)-Total	MS-B	L2685466-1
Matrix Spike	Sodium (Na)-Total	MS-B	L2685466-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2685466-1
Matrix Spike	Sulfur (S)-Total	MS-B	L2685466-1
Matrix Spike	Tungsten (W)-Total	MS-B	L2685466-1
Matrix Spike	Uranium (U)-Total	MS-B	L2685466-1
Matrix Spike	Total Organic Carbon	MS-B	L2685466-1

Qualifiers for Sample Submission Listed:

Qualifier	Description
SRPF	Sample received partially frozen

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Reference Information

PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
SP	Sample was Preserved at the laboratory

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-IC-N-WT	Water	Bromide in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L

This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode

CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.
Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method. Contact ALS for additional information if required.

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

DOC-WT	Water	Dissolved Organic Carbon	APHA 5310B

Sample is filtered through a 0.45um filter, then injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic carbon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Reference Information

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric

A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.

TOC-WT	Water	Total Organic Carbon	APHA 5310B

Sample is injected into a heated reaction chamber which is packed with an oxidative catalyst. The water is vaporized and the organic cabon is oxidized to carbon dioxide. The carbon dioxide is transported in a carrier gas and is measured by a non-dispersive infrared detector.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid weight of sample
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2685466 Report Date: 24-FEB-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Ville St-Laurent QC H2S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Bromide (Br)			103.3		%		85-115	15-FEB-22
WG3696311-6 MB								
Bromide (Br)			<0.10		mg/L		0.1	15-FEB-22
CL-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Chloride (Cl)			101.8		%		90-110	15-FEB-22
WG3696311-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	15-FEB-22
CN-CNO-WT	**Water**							
Batch R5725719								
WG3696986-3 DUP		**L2685466-1**						
Cyanate		115	3.5		mg/L	0.4	20	16-FEB-22
WG3696986-2 LCS								
Cyanate			96.1		%		85-115	16-FEB-22
WG3696986-1 MB								
Cyanate			<0.20		mg/L		0.2	16-FEB-22
WG3696986-4 MS		**L2685466-1**						
Cyanate			N/A	MS-B	%		-	16-FEB-22
CN-SCN-VA	**Water**							
Batch R5728813								
WG3699275-3 DUP		**L2685466-1**						
Thiocyanate (SCN)		147	147		mg/L	0.0	20	23-FEB-22
WG3699275-2 LCS								
Thiocyanate (SCN)			102.3		%		85-115	23-FEB-22
WG3699275-1 MB								
Thiocyanate (SCN)			<0.50		mg/L		0.5	23-FEB-22
CN-TOT-WT	**Water**							
Batch R5725716								
WG3696431-2 LCS								
Cyanide, Total			96.3		%		80-120	15-FEB-22
WG3696431-1 MB								
Cyanide, Total			<0.0020		mg/L		0.002	15-FEB-22
DOC-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DOC-WT	**Water**							
Batch R5726517								
WG3696667-2 LCS								
Dissolved Organic Carbon			104.5		%		80-120	16-FEB-22
WG3696667-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	16-FEB-22
F-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Fluoride (F)			101.3		%		90-110	15-FEB-22
WG3696311-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	15-FEB-22
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-2 LCS								
Aluminum (Al)-Dissolved			104.0		%		80-120	14-FEB-22
Antimony (Sb)-Dissolved			101.2		%		80-120	14-FEB-22
Arsenic (As)-Dissolved			102.6		%		80-120	14-FEB-22
Barium (Ba)-Dissolved			103.7		%		80-120	14-FEB-22
Beryllium (Be)-Dissolved			100.9		%		80-120	14-FEB-22
Bismuth (Bi)-Dissolved			104.1		%		80-120	14-FEB-22
Boron (B)-Dissolved			95.7		%		80-120	14-FEB-22
Cadmium (Cd)-Dissolved			102.7		%		80-120	14-FEB-22
Calcium (Ca)-Dissolved			100.9		%		80-120	14-FEB-22
Cesium (Cs)-Dissolved			106.3		%		80-120	14-FEB-22
Chromium (Cr)-Dissolved			102.7		%		80-120	14-FEB-22
Cobalt (Co)-Dissolved			104.3		%		80-120	14-FEB-22
Copper (Cu)-Dissolved			101.9		%		80-120	14-FEB-22
Iron (Fe)-Dissolved			103.2		%		80-120	14-FEB-22
Lead (Pb)-Dissolved			104.2		%		80-120	14-FEB-22
Lithium (Li)-Dissolved			104.2		%		80-120	14-FEB-22
Magnesium (Mg)-Dissolved			103.0		%		80-120	14-FEB-22
Manganese (Mn)-Dissolved			102.3		%		80-120	14-FEB-22
Molybdenum (Mo)-Dissolved			99.0		%		80-120	14-FEB-22
Nickel (Ni)-Dissolved			103.1		%		80-120	14-FEB-22
Phosphorus (P)-Dissolved			108.2		%		80-120	14-FEB-22
Potassium (K)-Dissolved			103.4		%		80-120	14-FEB-22
Rubidium (Rb)-Dissolved			107.4		%		80-120	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-2 LCS								
Selenium (Se)-Dissolved			100.2		%		80-120	14-FEB-22
Silicon (Si)-Dissolved			102.9		%		60-140	14-FEB-22
Silver (Ag)-Dissolved			105.0		%		80-120	14-FEB-22
Sodium (Na)-Dissolved			104.7		%		80-120	14-FEB-22
Strontium (Sr)-Dissolved			104.1		%		80-120	14-FEB-22
Sulfur (S)-Dissolved			101.0		%		80-120	14-FEB-22
Tellurium (Te)-Dissolved			101.8		%		80-120	14-FEB-22
Thallium (Tl)-Dissolved			103.8		%		80-120	14-FEB-22
Thorium (Th)-Dissolved			103.4		%		80-120	14-FEB-22
Tin (Sn)-Dissolved			102.4		%		80-120	14-FEB-22
Titanium (Ti)-Dissolved			98.5		%		80-120	14-FEB-22
Tungsten (W)-Dissolved			101.5		%		80-120	14-FEB-22
Uranium (U)-Dissolved			105.7		%		80-120	14-FEB-22
Vanadium (V)-Dissolved			103.2		%		80-120	14-FEB-22
Zinc (Zn)-Dissolved			101.1		%		80-120	14-FEB-22
Zirconium (Zr)-Dissolved			101.0		%		80-120	14-FEB-22
WG3696019-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	14-FEB-22
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Boron (B)-Dissolved			<0.010		mg/L		0.01	14-FEB-22
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	14-FEB-22
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	14-FEB-22
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	14-FEB-22

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R5723036								
WG3696019-1 MB								
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Potassium (K)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	14-FEB-22
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	14-FEB-22
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	14-FEB-22
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	14-FEB-22
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	14-FEB-22
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	14-FEB-22
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	14-FEB-22
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	14-FEB-22
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	14-FEB-22
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-2 LCS								
Aluminum (Al)-Total			105.6		%		80-120	14-FEB-22
Antimony (Sb)-Total			106.4		%		80-120	14-FEB-22
Arsenic (As)-Total			106.4		%		80-120	14-FEB-22
Barium (Ba)-Total			108.2		%		80-120	14-FEB-22
Beryllium (Be)-Total			101.1		%		80-120	14-FEB-22
Bismuth (Bi)-Total			107.0		%		80-120	14-FEB-22
Boron (B)-Total			95.7		%		80-120	14-FEB-22
Cadmium (Cd)-Total			105.8		%		80-120	14-FEB-22
Calcium (Ca)-Total			102.2		%		80-120	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-2 LCS								
Chromium (Cr)-Total			105.4		%		80-120	14-FEB-22
Cesium (Cs)-Total			110.8		%		80-120	14-FEB-22
Cobalt (Co)-Total			107.3		%		80-120	14-FEB-22
Copper (Cu)-Total			106.6		%		80-120	14-FEB-22
Iron (Fe)-Total			106.4		%		80-120	14-FEB-22
Lead (Pb)-Total			107.4		%		80-120	14-FEB-22
Lithium (Li)-Total			102.3		%		80-120	14-FEB-22
Magnesium (Mg)-Total			104.6		%		80-120	14-FEB-22
Manganese (Mn)-Total			104.1		%		80-120	14-FEB-22
Molybdenum (Mo)-Total			103.9		%		80-120	14-FEB-22
Nickel (Ni)-Total			106.1		%		80-120	14-FEB-22
Phosphorus (P)-Total			107.4		%		70-130	14-FEB-22
Potassium (K)-Total			105.1		%		80-120	14-FEB-22
Rubidium (Rb)-Total			109.6		%		80-120	14-FEB-22
Selenium (Se)-Total			102.9		%		80-120	14-FEB-22
Silicon (Si)-Total			102.4		%		60-140	14-FEB-22
Silver (Ag)-Total			108.1		%		80-120	14-FEB-22
Sodium (Na)-Total			107.1		%		80-120	14-FEB-22
Strontium (Sr)-Total			105.5		%		80-120	14-FEB-22
Sulfur (S)-Total			102.6		%		80-120	14-FEB-22
Thallium (Tl)-Total			107.2		%		80-120	14-FEB-22
Tellurium (Te)-Total			104.0		%		80-120	14-FEB-22
Thorium (Th)-Total			109.0		%		80-120	14-FEB-22
Tin (Sn)-Total			106.4		%		80-120	14-FEB-22
Titanium (Ti)-Total			99.7		%		80-120	14-FEB-22
Tungsten (W)-Total			105.6		%		80-120	14-FEB-22
Uranium (U)-Total			109.2		%		80-120	14-FEB-22
Vanadium (V)-Total			106.2		%		80-120	14-FEB-22
Zinc (Zn)-Total			104.7		%		80-120	14-FEB-22
Zirconium (Zr)-Total			104.8		%		80-120	14-FEB-22
WG3695996-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	14-FEB-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	14-FEB-22

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-1 MB								
Barium (Ba)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Boron (B)-Total			<0.010		mg/L		0.01	14-FEB-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	14-FEB-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	14-FEB-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Iron (Fe)-Total			<0.010		mg/L		0.01	14-FEB-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	14-FEB-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	14-FEB-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	14-FEB-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	14-FEB-22
Potassium (K)-Total			<0.050		mg/L		0.05	14-FEB-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	14-FEB-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Silicon (Si)-Total			<0.10		mg/L		0.1	14-FEB-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	14-FEB-22
Sodium (Na)-Total			<0.050		mg/L		0.05	14-FEB-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	14-FEB-22
Sulfur (S)-Total			<0.50		mg/L		0.5	14-FEB-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	14-FEB-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	14-FEB-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	14-FEB-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	14-FEB-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	14-FEB-22

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5722282								
WG3695996-1 MB								
Zinc (Zn)-Total			<0.0030		mg/L		0.003	14-FEB-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	14-FEB-22
NO2-IC-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Nitrite (as N)			101.0		%		90-110	15-FEB-22
WG3696311-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	15-FEB-22
NO3-IC-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Nitrate (as N)			101.7		%		90-110	15-FEB-22
WG3696311-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	15-FEB-22
P-T-COL-WT	**Water**							
Batch R5726921								
WG3696623-2 LCS								
Phosphorus, Total			100.5		%		80-120	17-FEB-22
WG3696623-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	17-FEB-22
PO4-DO-COL-WT	**Water**							
Batch R5723310								
WG3696141-2 LCS								
Orthophosphate-Dissolved (as P)			105.6		%		80-120	15-FEB-22
WG3696141-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	15-FEB-22
SO4-IC-N-WT	**Water**							
Batch R5725167								
WG3696311-7 LCS								
Sulfate (SO4)			103.7		%		90-110	15-FEB-22
WG3696311-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	15-FEB-22
SOLIDS-TDS-WT	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R5724121								
WG3695613-6 LCS								
Total Dissolved Solids			95.5		%		85-115	14-FEB-22
WG3695613-5 MB								
Total Dissolved Solids			<10		mg/L		10	14-FEB-22
SOLIDS-TSS-WT	**Water**							
Batch R5723306								
WG3695881-2 LCS								
Total Suspended Solids			95.3		%		85-115	15-FEB-22
WG3695881-1 MB								
Total Suspended Solids			<3.0		mg/L		3	15-FEB-22
TOC-WT	**Water**							
Batch R5726319								
WG3696266-2 LCS								
Total Organic Carbon			98.7		%		80-120	16-FEB-22
WG3696266-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	16-FEB-22

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Organic / Inorganic Carbon							
Dissolved Organic Carbon							
	1	11-FEB-22	16-FEB-22 00:00	3	5	days	EHTL

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2685466 were received on 14-FEB-22 09:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain of Custody (COC) / Analyt--- Request Form

Canada Toll Free: 1 800 668 9878

L2685466-COFC

COC Number: 17 - -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sarteion
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	
Contact:	

Repor[t Distribution]	
Select Report Format:	
Quality Control (QC) Report with Report ☐ YES ☐ NO	
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Email 1 or Fax	josee.lalonde@veolia.com
Email 2	
Email 3	

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Email 1 or Fax	vwtcanada_payables@veolia.com
Email 2	

...el Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4-20%]	☐	1 Business day [E - 100%]	☐
3 day [P3-25%]	☐	Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	☐
2 day [P2-50%]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:	
Job #:	196035- MD
PO / AFE:	5000196035.606300.21030003
LSD:	
ALS Lab Work Order # (lab use only):	L2685466 AP

Oil and Gas Required Fields (client use)

AFE/Cost Center:		PO#	
Major/Minor Code:		Routing Code:	
Requisitioner:			
Location:			
ALS Contact:		Sampler:	

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	metals total *	metals dissolved	CNO	CN	SCN	Anions scan	P total + O-PO4	TOC	DOC	TSS	TDS	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	196035-MD-RW				8	X	X	X	X	X	X	X	X	X	X	X		

* 24hrs for total metals only

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☑	SIF Observations	Yes ☐	No ☐	
Ice Packs ☐ Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐	
Cooling Initiated ☐				

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	-1.6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: AP	Date: 14-Feb-22	Time: 9:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY NOV 2018 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Veolia Water Technologies Canada (Saint-Laurent)
ATTN: Josee Lalonde
4105 Sartelon
Saint-Laurent QC H4S 2B3

Date Received: 23-FEB-22
Report Date: 24-FEB-22 08:17 (MT)
Version: FINAL

Client Phone: 514-334-7230

Certificate of Analysis

Lab Work Order #: L2687682

Project P.O. #: 500019035.606300.24030003
Job Reference: 196035-MD
C of C Numbers:
Legal Site Desc:

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2687682-1 CW-TOTE							
Sampled By: CLIENT on 22-FEB-22							
Matrix: WATER							
Total Metals in Water by CRC ICPMS							
Aluminum (Al)-Total	<0.050	DLHC	0.050	mg/L	23-FEB-22	23-FEB-22	R5728523
Antimony (Sb)-Total	0.0078	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Arsenic (As)-Total	0.0019	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Barium (Ba)-Total	0.0316	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Beryllium (Be)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Bismuth (Bi)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Boron (B)-Total	0.26	DLHC	0.10	mg/L	23-FEB-22	23-FEB-22	R5728523
Cadmium (Cd)-Total	<0.000050	DLHC	0.000050	mg/L	23-FEB-22	23-FEB-22	R5728523
Calcium (Ca)-Total	303	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Chromium (Cr)-Total	<0.0050	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Cesium (Cs)-Total	<0.00010	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Cobalt (Co)-Total	0.463	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Copper (Cu)-Total	0.0068	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Iron (Fe)-Total	0.37	DLHC	0.10	mg/L	23-FEB-22	23-FEB-22	R5728523
Lead (Pb)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Lithium (Li)-Total	<0.010	DLHC	0.010	mg/L	23-FEB-22	23-FEB-22	R5728523
Magnesium (Mg)-Total	23.6	DLHC	0.050	mg/L	23-FEB-22	23-FEB-22	R5728523
Manganese (Mn)-Total	0.0264	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Molybdenum (Mo)-Total	0.0928	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Nickel (Ni)-Total	0.151	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Phosphorus (P)-Total	<0.50	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Potassium (K)-Total	173	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Rubidium (Rb)-Total	0.0478	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523
Selenium (Se)-Total	0.131	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Silicon (Si)-Total	1.7	DLHC	1.0	mg/L	23-FEB-22	23-FEB-22	R5728523
Silver (Ag)-Total	<0.00050	DLHC	0.00050	mg/L	23-FEB-22	23-FEB-22	R5728523
Sodium (Na)-Total	477	DLHC	0.50	mg/L	23-FEB-22	23-FEB-22	R5728523
Strontium (Sr)-Total	1.07	DLHC	0.010	mg/L	23-FEB-22	23-FEB-22	R5728523
Sulfur (S)-Total	664	DLHC	5.0	mg/L	23-FEB-22	23-FEB-22	R5728523
Thallium (Tl)-Total	<0.00010	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Tellurium (Te)-Total	<0.0020	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523
Thorium (Th)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Tin (Sn)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Titanium (Ti)-Total	<0.0030	DLHC	0.0030	mg/L	23-FEB-22	23-FEB-22	R5728523
Tungsten (W)-Total	<0.0010	DLHC	0.0010	mg/L	23-FEB-22	23-FEB-22	R5728523
Uranium (U)-Total	0.00894	DLHC	0.00010	mg/L	23-FEB-22	23-FEB-22	R5728523
Vanadium (V)-Total	<0.0050	DLHC	0.0050	mg/L	23-FEB-22	23-FEB-22	R5728523
Zinc (Zn)-Total	<0.030	DLHC	0.030	mg/L	23-FEB-22	23-FEB-22	R5728523
Zirconium (Zr)-Total	<0.0020	DLHC	0.0020	mg/L	23-FEB-22	23-FEB-22	R5728523

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-4 DUP		**WG3699165-3**						
Aluminum (Al)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	23-FEB-22
Antimony (Sb)-Total		0.0078	0.0080		mg/L	1.7	20	23-FEB-22
Arsenic (As)-Total		0.0019	0.0021		mg/L	8.6	20	23-FEB-22
Barium (Ba)-Total		0.0316	0.0318		mg/L	0.5	20	23-FEB-22
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Bismuth (Bi)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Boron (B)-Total		0.26	0.26		mg/L	1.5	20	23-FEB-22
Cadmium (Cd)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-FEB-22
Calcium (Ca)-Total		303	308		mg/L	1.7	20	23-FEB-22
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-FEB-22
Cesium (Cs)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-FEB-22
Cobalt (Co)-Total		0.463	0.460		mg/L	0.7	20	23-FEB-22
Copper (Cu)-Total		0.0068	0.0076		mg/L	11	20	23-FEB-22
Iron (Fe)-Total		0.37	0.36		mg/L	1.9	20	23-FEB-22
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Lithium (Li)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	23-FEB-22
Magnesium (Mg)-Total		23.6	23.5		mg/L	0.1	20	23-FEB-22
Manganese (Mn)-Total		0.0264	0.0271		mg/L	2.5	20	23-FEB-22
Molybdenum (Mo)-Total		0.0928	0.0943		mg/L	1.7	20	23-FEB-22
Nickel (Ni)-Total		0.151	0.151		mg/L	0.1	20	23-FEB-22
Phosphorus (P)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	23-FEB-22
Potassium (K)-Total		173	173		mg/L	0.0	20	23-FEB-22
Rubidium (Rb)-Total		0.0478	0.0479		mg/L	0.1	20	23-FEB-22
Selenium (Se)-Total		0.131	0.132		mg/L	0.4	20	23-FEB-22
Silicon (Si)-Total		1.7	1.6		mg/L	3.5	20	23-FEB-22
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-FEB-22
Sodium (Na)-Total		477	476		mg/L	0.2	20	23-FEB-22
Strontium (Sr)-Total		1.07	1.09		mg/L	2.2	20	23-FEB-22
Sulfur (S)-Total		664	665		mg/L	0.1	20	23-FEB-22
Thallium (Tl)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	23-FEB-22
Tellurium (Te)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	23-FEB-22
Thorium (Th)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Tin (Sn)-Total		<0.0010	<0.0010		mg/L			23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-4 DUP		**WG3699165-3**						
Tin (Sn)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Titanium (Ti)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	23-FEB-22
Tungsten (W)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-FEB-22
Uranium (U)-Total		0.00894	0.00908		mg/L	1.6	20	23-FEB-22
Vanadium (V)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	23-FEB-22
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	23-FEB-22
Zirconium (Zr)-Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	23-FEB-22
WG3699165-2 LCS								
Aluminum (Al)-Total			103.7		%		80-120	23-FEB-22
Antimony (Sb)-Total			104.6		%		80-120	23-FEB-22
Arsenic (As)-Total			104.3		%		80-120	23-FEB-22
Barium (Ba)-Total			105.4		%		80-120	23-FEB-22
Beryllium (Be)-Total			101.8		%		80-120	23-FEB-22
Bismuth (Bi)-Total			99.2		%		80-120	23-FEB-22
Boron (B)-Total			94.7		%		80-120	23-FEB-22
Cadmium (Cd)-Total			105.7		%		80-120	23-FEB-22
Calcium (Ca)-Total			101.3		%		80-120	23-FEB-22
Chromium (Cr)-Total			104.3		%		80-120	23-FEB-22
Cesium (Cs)-Total			106.8		%		80-120	23-FEB-22
Cobalt (Co)-Total			102.5		%		80-120	23-FEB-22
Copper (Cu)-Total			103.3		%		80-120	23-FEB-22
Iron (Fe)-Total			104.3		%		80-120	23-FEB-22
Lead (Pb)-Total			103.0		%		80-120	23-FEB-22
Lithium (Li)-Total			98.9		%		80-120	23-FEB-22
Magnesium (Mg)-Total			103.3		%		80-120	23-FEB-22
Manganese (Mn)-Total			102.3		%		80-120	23-FEB-22
Molybdenum (Mo)-Total			102.2		%		80-120	23-FEB-22
Nickel (Ni)-Total			102.5		%		80-120	23-FEB-22
Phosphorus (P)-Total			104.5		%		70-130	23-FEB-22
Potassium (K)-Total			104.6		%		80-120	23-FEB-22
Rubidium (Rb)-Total			105.5		%		80-120	23-FEB-22
Selenium (Se)-Total			101.4		%		80-120	23-FEB-22
Silicon (Si)-Total			101.6		%		60-140	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-2 LCS								
Silver (Ag)-Total			98.5		%		80-120	23-FEB-22
Sodium (Na)-Total			104.0		%		80-120	23-FEB-22
Strontium (Sr)-Total			103.9		%		80-120	23-FEB-22
Sulfur (S)-Total			93.1		%		80-120	23-FEB-22
Thallium (Tl)-Total			102.8		%		80-120	23-FEB-22
Tellurium (Te)-Total			99.7		%		80-120	23-FEB-22
Thorium (Th)-Total			101.8		%		80-120	23-FEB-22
Tin (Sn)-Total			103.9		%		80-120	23-FEB-22
Titanium (Ti)-Total			100.9		%		80-120	23-FEB-22
Tungsten (W)-Total			103.4		%		80-120	23-FEB-22
Uranium (U)-Total			104.2		%		80-120	23-FEB-22
Vanadium (V)-Total			105.1		%		80-120	23-FEB-22
Zinc (Zn)-Total			104.7		%		80-120	23-FEB-22
Zirconium (Zr)-Total			101.6		%		80-120	23-FEB-22
WG3699165-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	23-FEB-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Barium (Ba)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Boron (B)-Total			<0.010		mg/L		0.01	23-FEB-22
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	23-FEB-22
Calcium (Ca)-Total			<0.050		mg/L		0.05	23-FEB-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Iron (Fe)-Total			<0.010		mg/L		0.01	23-FEB-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Lithium (Li)-Total			<0.0010		mg/L		0.001	23-FEB-22
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	23-FEB-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3
Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-1 MB								
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Phosphorus (P)-Total			<0.050		mg/L		0.05	23-FEB-22
Potassium (K)-Total			<0.050		mg/L		0.05	23-FEB-22
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	23-FEB-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Silicon (Si)-Total			<0.10		mg/L		0.1	23-FEB-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	23-FEB-22
Sodium (Na)-Total			<0.050		mg/L		0.05	23-FEB-22
Strontium (Sr)-Total			<0.0010		mg/L		0.001	23-FEB-22
Sulfur (S)-Total			<0.50		mg/L		0.5	23-FEB-22
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	23-FEB-22
Thorium (Th)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	23-FEB-22
Tungsten (W)-Total			<0.00010		mg/L		0.0001	23-FEB-22
Uranium (U)-Total			<0.000010		mg/L		0.00001	23-FEB-22
Vanadium (V)-Total			<0.00050		mg/L		0.0005	23-FEB-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	23-FEB-22
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	23-FEB-22
WG3699165-5 MS		**WG3699165-3**						
Aluminum (Al)-Total			125.9		%		70-130	23-FEB-22
Antimony (Sb)-Total			109.4		%		70-130	23-FEB-22
Arsenic (As)-Total			109.3		%		70-130	23-FEB-22
Barium (Ba)-Total			N/A	MS-B	%		-	23-FEB-22
Beryllium (Be)-Total			105.9		%		70-130	23-FEB-22
Bismuth (Bi)-Total			100.4		%		70-130	23-FEB-22
Boron (B)-Total			N/A	MS-B	%		-	23-FEB-22
Cadmium (Cd)-Total			104.6		%		70-130	23-FEB-22
Calcium (Ca)-Total			N/A	MS-B	%		-	23-FEB-22
Chromium (Cr)-Total			106.2		%		70-130	23-FEB-22
Cesium (Cs)-Total			107.6		%		70-130	23-FEB-22
Cobalt (Co)-Total			N/A	MS-B	%		-	23-FEB-22
Copper (Cu)-Total			104.0		%		70-130	23-FEB-22

Quality Control Report

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3

Contact: Josee Lalonde

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5728523								
WG3699165-5 MS		**WG3699165-3**						
Iron (Fe)-Total			N/A	MS-B	%		-	23-FEB-22
Lead (Pb)-Total			103.3		%		70-130	23-FEB-22
Lithium (Li)-Total			101.8		%		70-130	23-FEB-22
Magnesium (Mg)-Total			N/A	MS-B	%		-	23-FEB-22
Manganese (Mn)-Total			N/A	MS-B	%		-	23-FEB-22
Molybdenum (Mo)-Total			N/A	MS-B	%		-	23-FEB-22
Nickel (Ni)-Total			N/A	MS-B	%		-	23-FEB-22
Phosphorus (P)-Total			127.4		%		70-130	23-FEB-22
Potassium (K)-Total			N/A	MS-B	%		-	23-FEB-22
Rubidium (Rb)-Total			N/A	MS-B	%		-	23-FEB-22
Selenium (Se)-Total			N/A	MS-B	%		-	23-FEB-22
Silicon (Si)-Total			N/A	MS-B	%		-	23-FEB-22
Silver (Ag)-Total			94.2		%		70-130	23-FEB-22
Sodium (Na)-Total			N/A	MS-B	%		-	23-FEB-22
Strontium (Sr)-Total			N/A	MS-B	%		-	23-FEB-22
Sulfur (S)-Total			N/A	MS-B	%		-	23-FEB-22
Thallium (Tl)-Total			102.7		%		70-130	23-FEB-22
Tellurium (Te)-Total			108.1		%		70-130	23-FEB-22
Thorium (Th)-Total			94.6		%		70-130	23-FEB-22
Tin (Sn)-Total			107.3		%		70-130	23-FEB-22
Titanium (Ti)-Total			101.0		%		70-130	23-FEB-22
Tungsten (W)-Total			106.6		%		70-130	23-FEB-22
Uranium (U)-Total			N/A	MS-B	%		-	23-FEB-22
Vanadium (V)-Total			109.3		%		70-130	23-FEB-22
Zinc (Zn)-Total			N/A	MS-B	%		-	23-FEB-22
Zirconium (Zr)-Total			101.1		%		70-130	23-FEB-22

Quality Control Report

Workorder: L2687682 Report Date: 24-FEB-22

Client: Veolia Water Technologies Canada (Saint-Laurent)
4105 Sartelon
Saint-Laurent QC H4S 2B3

Contact: Josee Lalonde

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2687682-COFC

COC Number: 17 -

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Report To	Contact and company name below will appear on the final report
Company:	Veolia Water Technologies (26895)
Contact:	Josee Lalonde
Phone:	
	Company address below will appear on the final report
Street:	4105 Sartelon
City/Province:	Ville St-Laurent
Postal Code:	H2S 2B3
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	
Contact:	

Report Format

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☐ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax josee.lalonde@veolia.com

Email 2

Email 3

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax vwtcanada_payables@veolia.com

Email 2

- Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☑ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information

ALS Account # / Quote #:

Job #: 196035-MD

PO / AFE: 5000196035.606300.~~2~~20030003

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#

Major/Minor Code: | Routing Code:

...itioner:

...tion:

ALS Lab Work Order # (lab use only): L2687682 JD

ALS Contact: | Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	~~Cu~~	~~Hg~~	Metal Scan (Low Limit)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	CW-TOTE	22/2/22		WW				X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C:

FINAL COOLER TEMPERATURES °C: 14.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date: Feb 23/22	Time: 10:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY NOV 2016 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

Work Order :	248516
Sample Number :	72838

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-27
Location :	Saint-Laurent QC	Time Collected :	10:00
Substance :	196035_MD_CW_8C	Date Received :	2022-05-30
Sampling Method :	Not provided	Time Received :	09:40
Sampled By :	J. Lalonde	Temperature at Receipt :	20 °C
Sample Description :	Clear, pale yellow with brown settled solids.	Date Tested :	2022-05-30

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* . Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.4 days
Organism Batch :	Dm22-10	Average Brood Size :	28.4 young
Culture Mortality :	0.4% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Duration of Pre-Aeration :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.5 g/L
Date Tested :	2022-05-24	Warning Limits (± 2SD) :	5.8 - 7.2 g/L
LC50 :	6.4 g/L	Organism Batch :	Dm22-10
95% Confidence Limits :	6.2 - 6.6 g/L	Analyst(s) :	JJ
Statistical Method :	Spearman-Kärber		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________
Project Manager

AQUATOX

Work Order : 248516
Sample Number : 72838

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	8.2	3970	21	97	290 mg/L

0 HOURS

Date & Time 2022-05-30 11:40
Analyst(s) : CH (SV)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.2	8.2	3970	21	97	290
100	B	0	0	7.2	8.2	3970	21	97	290
100	C	0	0	7.2	8.2	3970	21	97	290
Control	A	0	0	8.4	8.5	580	20	100	160
Control	B	0	0	8.4	8.5	580	20	100	160
Control	C	0	0	8.4	8.5	580	20	100	160

Notes:

24 HOURS

Date & Time 2022-05-31 11:40
Analyst(s) : JCS

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	21
100	B	–	0	–	–	–	21
100	C	–	0	–	–	–	21
Control	A	–	0	–	–	–	21
Control	B	–	0	–	–	–	21
Control	C	–	0	–	–	–	21

Notes:

48 HOURS

Date & Time 2022-06-01 11:40
Analyst(s) : CH (NM)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.2	8.1	4010	21
100	B	0	0	8.2	8.1	4000	21
100	C	0	0	8.2	8.1	4010	21
Control	A	0	0	8.4	8.4	581	21
Control	B	0	0	8.4	8.4	581	21
Control	C	0	0	8.4	8.4	584	21

Notes:

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : JL
Date : 2022-06-06

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

Work Order :	248516
Sample Number :	72838

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-27
Location :	Saint-Laurent QC	Time Collected :	10:00
Substance :	196035_MD_CW_8C	Date Received :	2022-05-30
Sampling Method :	Not provided	Time Received :	09:40
Sampled By :	J. Lalonde	Temperature at Receipt :	20 °C
Sample Description :	Clear, pale yellow with brown settled solids.	Date Tested :	2022-05-30

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	44.2 mm (±6.0)
Organism Batch :	T22-11	Range of Fork Lengths :	39 - 47 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.84 g (±0.30)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.60 - 1.01 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.5 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	18
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2022-05-11
Organism Batch :	T22-11	Analyst(s) :	PC, CN, JW
LC50 :	4068 mg/L	Historical Mean LC50 :	3700 mg/L
95% Confidence Limits :	3733 - 4470 mg/L	Warning Limits (± 2SD) :	2777 - 4929 mg/L
Statistical Method :	Linear Regression (MLE)		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________

Project Manager

AQUATOX

TOXICITY TEST REPORT
Rainbow Trout
EPS 1/RM/13

Work Order : 248516
Sample Number : 72838

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	7.1	8.4	4021	16	92
After 30 min pre-aeration :	7.2	8.8	4070	16	96

0 HOURS

Date & Time 2022-05-30 12:40
Analyst(s) : JCS (SV)/JD (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	7.2	8.8	4070	16	96
Control	0	0	8.2	9.5	849	15	100

Notes:

24 HOURS

Date & Time 2022-05-31 12:40
Analyst(s) : JD (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

48 HOURS

Date & Time 2022-06-01 12:40
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

72 HOURS

Date & Time 2022-06-02 12:40
Analyst(s) : JCS (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

96 HOURS

Date & Time 2022-06-03 12:40
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.1	8.9	4076	15
Control	0	0	8.4	9.1	800	15

Notes:

"–" = not measured/not required

Number impaired does not include number dead.

* adjusted for temperature and barometric pressure

Test Data Reviewed By : JL

Date : 2022-06-06

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 248516

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	5000196035.606300.21030003
Field Sampler Name (print):	J. Lalonde
Signature:	
Affiliation:	Fridge
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	2022-05-27

Client:	VEOLIA Veolia Water Technologies Canada 4105 Sartelon Saint-Laurent, QC H4S 2B3 Tel. 514-334-7230
Phone:	
Fax:	
Contact:	J. Lalonde

Sample Identification					Analyses Requested										Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	Daphnia magna Single Concentration	Daphnia magna LC50	Fathead Minnow Survival & Growth	Ceriodaphnia dubia Survival & Reproduction	Lemna minor Growth	Pseudokirchneriella subcapitata Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
22-05-27	10:00	196035_MD_CW_8°C	72838	20°C	X		X									

For Lab Use Only	
Received By:	JP/BC
Date:	2022-05-30
Time:	9:40
Storage Location:	
Storage Temp.(°C):	

Please list any special requests or instructions:

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

PRELIMINARY

ACUTE LETHALITY REPORT SUMMARY

Work Order : 248516

Josée Lalonde
Veolia Water Technologies Canada Inc.
4105 Sartelon
Saint-Laurent QC
H4S 2B3

RESULTS

Substance	Date Collected	Date Tested	Species / Test	LC50	Mortality in 100% Concentration (%)
196035_MD_CW_8C	2022-05-27	2022-05-30	Dm SC	-	0
	2022-05-27	2022-05-30	RBT SC	-	0

RBT = rainbow trout
Dm = *Daphnia magna*
* = pH Stabilized
SC = single concentration

Test Protocols

Reference Method for Determining Acute Lethality of Effluents to Daphnia magna. Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments)

Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments) .

Although test results are generated under strict QA/QC protocols, the results provided herein, along with any unsigned test reports, faxes, or emails are considered preliminary.

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Daphnia magna
EPS 1/RM/14

Work Order :	248414
Sample Number :	72702

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-17
Location :	Saint-Laurent QC	Time Collected :	12:00
Substance :	196035_MD_CW15C	Date Received :	2022-05-18
Sampling Method :	Not provided	Time Received :	12:05
Sampled By :	J. Lalonde	Temperature on Receipt :	17 °C
Sample Description :	Clear, yellow.	Date Tested :	2022-05-18

Test Method : Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* . Environment Canada EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments).

48-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Immobility	0.0 %
	Mean Mortality	0.0 %
100%	Mean Immobility	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Species :	*Daphnia magna*	Time to First Brood :	8.2 days
Organism Batch :	Dm22-09	Average Brood Size :	32.7 young
Culture Mortality :	3.0% (previous 7 days)		

TEST CONDITIONS

Sample Treatment :	None	Number of Replicates :	3
pH Adjustment :	None	Organisms / Replicate :	10
Pre-aeration Rate :	~30 mL/min/L	Organisms / Test Level :	30
Duration of Pre-Aeration :	0 minutes	Organism Loading Rate :	15.0 mL/organism
Test Aeration :	None	Impaired Control Organisms :	0.0%
Hardness Adjustment :	None	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Sodium Chloride	Historical Mean LC50 :	6.5 g/L
Date Tested :	2022-05-10	Warning Limits (± 2SD) :	5.8 - 7.2 g/L
LC50 :	6.3 g/L	Organism Batch :	Dm22-09
95% Confidence Limits :	5.8 - 6.8 g/L	Analyst(s) :	JJ
Statistical Method :	Binomial		

COMMENTS

All test validity criteria as specified in the test method were satisfied.

Approved By : ____________________________
Project Manager

AQUATOX

Work Order : 248414
Sample Number : 72702

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*	Hardness (as $CaCO_3$)
Initial Chemistry (100%) :	7.2	8.4	4310	20	100	400 mg/L

0 HOURS

Date & Time 2022-05-18 12:55
Analyst(s) : CH (NM)/NM

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*	Hardness
100	A	0	0	7.2	8.4	4310	20	100	400
100	B	0	0	7.2	8.4	4310	20	100	400
100	C	0	0	7.2	8.4	4310	20	100	400
Control	A	0	0	8.5	8.8	557	20	100	160
Control	B	0	0	8.5	8.8	557	20	100	160
Control	C	0	0	8.5	8.8	557	20	100	160

Notes:

24 HOURS

Date & Time 2022-05-19 12:55
Analyst(s) : JGR (NM)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	–	0	–	–	–	20
100	B	–	0	–	–	–	20
100	C	–	0	–	–	–	20
Control	A	–	0	–	–	–	20
Control	B	–	0	–	–	–	20
Control	C	–	0	–	–	–	20

Notes:

48 HOURS

Date & Time 2022-05-20 12:55
Analyst(s) : JCS/JGR (KP)

Concentration (%)	Replicate	Dead	Immobile	pH	Dissolved O_2	Conductivity	Temperature
100	A	0	0	8.5	7.4	4310	22
100	B	0	0	8.3	7.3	4290	22
100	C	0	0	8.4	7.4	4340	22
Control	A	0	0	8.3	8.2	567	22
Control	B	0	0	8.4	8.1	568	22
Control	C	0	0	8.4	8.3	569	22

Notes:

Number immobile does not include number dead.

"–" = not measured/not required
* adjusted for temperature and barometric pressure

Test Data Reviewed By : FS
Date : 2022-05-27

AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13

Work Order :	248414
Sample Number :	72702

SAMPLE IDENTIFICATION

Company :	Veolia Water Technologies Canada Inc.	Sample Date :	2022-05-17
Location :	Saint-Laurent QC	Time Collected :	12:00
Substance :	196035_MD_CW15C	Date Received :	2022-05-18
Sampling Method :	Not provided	Time Received :	12:05
Sampled By :	J. Lalonde	Temperature on Receipt :	17 °C
Sample Description :	Clear, yellow.	Date Tested :	2022-05-18

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	0.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Average Fork Length (± 2 SD) :	41.2 mm (±5.9)
Organism Batch :	T22-11	Range of Fork Lengths :	36 - 44 mm
Control Sample Size :	10	Average Wet Weight (± 2 SD) :	0.66 g (±0.30)
Cumulative stock tank mortality rate :	0% (previous 7 days)	Range of Wet Weights :	0.42 - 0.87 g
Control organisms showing stress :	0 (at test completion)	Organism Loading Rate :	0.4 g/L

TEST CONDITIONS

Sample Treatment :	None	Volume Tested (L) :	18
pH Adjustment :	None	Number of Replicates :	1
Test Aeration :	Yes	Organisms Per Replicate :	10
Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L	Organisms Per Test Level :	10
Duration of Pre-Aeration :	30 minutes	Test Method Deviation(s) :	None

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride	Date Tested :	2022-05-11
Organism Batch :	T22-11	Analyst(s) :	PC, CN, JW
LC50 :	4068 mg/L	Historical Mean LC50 :	3700 mg/L
95% Confidence Limits :	3733 - 4470 mg/L	Warning Limits (± 2SD) :	2777 - 4929 mg/L
Statistical Method :	Linear Regression (MLE)		

COMMENTS

•All test validity criteria as specified in the test method were satisfied.

Approved By : ______________________

Project Manager

Work Order : 248414
Sample Number : 72702

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)*
Initial Water Chemistry (100%) :	7.0	8.7	4360	15	94
After 30 min pre-aeration :	7.2	8.9	4365	15	96

0 HOURS

Date & Time 2022-05-18 13:25
Analyst(s) : JW/BC (JW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation*
100%	0	0	7.2	8.9	4365	15	96
Control	0	0	8.3	9.6	819	14	100

Notes:

24 HOURS

Date & Time 2022-05-19 13:25
Analyst(s) : JCS (KP)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	15
Control	0	0	–	–	–	15

Notes:

48 HOURS

Date & Time 2022-05-20 13:25
Analyst(s) : JCS (JW)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

72 HOURS

Date & Time 2022-05-21 13:25
Analyst(s) : JCS (JL)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	–	–	–	14
Control	0	0	–	–	–	14

Notes:

96 HOURS

Date & Time 2022-05-22 13:25
Analyst(s) : JCS (SV)

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature
100%	0	0	8.5	9.1	4377	14
Control	0	0	8.4	9.3	761	14

Notes:

"–" = not measured/not required
Number impaired does not include number dead.
* adjusted for temperature and barometric pressure

Test Data Reviewed By : EM
Date : 2022-05-24

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 248414

Shipping Address: AquaTox Testing & Consulting Inc.
B-11 Nicholas Beaver Road
Puslinch, Ontario Canada N0B 2J0

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number:	5000196035.606300.21030003
Field Sampler Name (print):	J. LALANDE
Signature:	
Affiliation:	Fridge
Sample Storage (prior to shipping):	
Custody Relinquished by:	
Date/Time Shipped:	2022.05.17

Client:	VWT 4105 Sartelon St-Laurent QC H4S 2B3
Phone:	514-607-5930
Fax:	
Contact:	J. Lalonde

Sample Identification					Analyses Requested									Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	Rainbow Trout Single Concentration	Rainbow Trout LC50	*Daphnia magna* Single Concentration	*Daphnia magna* LC50	Fathead Minnow Survival & Growth	*Ceriodaphnia dubia* Survival & Reproduction	*Lemna minor* Growth	*Pseudokirchneriella subcapitata* Growth	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. 2 x 1L, 3 x 10L, etc.)
2022.05.17	12:00	196035-MD-CW15°C	72702	17°C	X		X									

For Lab Use Only

Received By:	JW / BC
Date:	2022-05-18
Time:	12:05
Storage Location:	
Storage Temp.(°C)	

Please list any special requests or instructions: