Water Resources Audit Report

Mayo Wastewater Facility (WL MN10-055-4)

Water Resources Branch
[June 16, 2023]

The Water Resources Branch (WRB) works together with various partners to foster a healthy relationship with Yukon's waters. As technical experts in water science, we provide advice for compliance and inspection purposes, and conduct reviews of projects undergoing water licensing and environmental assessment processes.

One of WRB's responsibilities is to conduct investigations at various undertakings that use or deposit waste to water. These investigations, called audits, are undertaken to improve our knowledge and understanding of a project's effects on the receiving water environment. Through the audit process we aim to identify emerging issues and build enhanced understanding of water quality and quantity conditions to support input into assessment, licensing, and post-licensing processes. The opinions and recommendations expressed in this report are based on relevant data, reports, field observations, interpretation/analyses of scientific information available to WRB and is subject to evolve as further information becomes available. While most of the findings are based on western science, we strive to recognize diverse ways of knowing and being and intend to create space to learn from both Indigenous and western perspectives side-by-side.

While WRB provides support to inspectors on enforcement and compliance matters related to water licences, it is not WRB's role to determine or enforce compliance. As such, the findings of this report should not be considered as a determination of compliance with any existing permit or licence.

Executive Summary

The Mayo municipal wastewater treatment facility is located within the traditional territory of the Na-cho Nyak Dun First Nation within the municipal boundary of the Village of Mayo. The facility is located at the confluence of the Mayo and Stewart rivers, west of the Mayo River. The facility itself consists of two anaerobic primary cells followed by two large infiltration cells. Settlement of solids and anaerobic treatment is provided in the primary cells prior to overflow into the infiltration cells where it is subject to final treatment and disposal. The treated effluent is disposed of through a combination of evapotranspiration and exfiltration. Trucked sewage wastes are also delivered to the lagoon where they are discharged into the first primary cell through a corrugated metal discharge structure. The lagoons are permitted to discharge to surface in the event that the water levels increase to a point that a controlled release is required. To date, however, there has never been a discharge of effluent to surface.

The objectives of this audit were to:

1. identify any potential impacts of the wastewater treatment facility to the receiving water environment by determining the flow path of wastewater from the facility,
2. understand whether residual wastewater persists within the surrounding ponds and groundwater monitoring wells, and
3. confirm compliance with water licence MN10-055.

To achieve these objectives, WRB collected nine water quality samples:

- two from groundwater monitoring wells on site,
- three from the lagoons and anaerobic cells, and
- the remaining four from natural ponds surrounding the facility.

Wastewater at the Mayo municipal treatment facility effectively infiltrates to ground (as evidenced by no history of discharges to surface); however, the fate of that wastewater is not clear because a hydrogeological assessment of the facility has not been conducted and the existing network of groundwater monitoring wells is inadequate (T-4 is frequently dry, T-5 is frost-jacked). This audit represents a snapshot in time and suggests (based on sweetener results) that wastewater travels at least to the west and southwest of the facility. The audit did find some sample parameters to be in exceedance of CCME

and CSR guidelines at stations ACX, IC1, IC2, T-5, SEP, SWP and WP2, most commonly total iron and ammonia (Table 11).

Based on the findings in this report, WRB recommends the following:

1. The Licensee should submit to the Board a hydrogeological assessment,
2. Initiate regular sampling of influent at ACX and monitor for additional parameters at all monthly monitoring locations,
3. Repair or replace the flow meter that measures influent volume.

Furthermore, WRB recommends that future audits or investigations should include samples from the Village of Mayo's municipal water supply for analysis of stable water isotopes and artificial sweeteners.

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1 Introduction/Background

Government of Yukon, Department of Environment, Water Resources Branch (WRB) conducted an audit of the Village of Mayo municipal wastewater treatment facility. The purpose of the audit was to learn about the facility, particularly to identify any potential impacts to the receiving water environment and any implications as it relates to their water licence. The objectives of the audit were to:

1. determine the flow path of wastewater from the facility,
2. understand whether residual wastewater persists within the surrounding ponds and groundwater monitoring wells, and
3. confirm compliance with water licence MN10-055-4 and identify relevant findings to inform future water licenses

WRB visited the facility on September 7-8, 2023 to collect water quality samples. WRB also conducted a review of historic site documents, former water licenses, and all existing license water quality data. Although the Village of Mayo water licence (MN10-055-4) authorizes drinking water treatment and distribution and wastewater treatment, the scope of this audit only addresses the wastewater treatment facility.

1.1 Facility history

The Mayo sewage lagoon was constructed in 1992 to treat wastewater that had previously been discharged directly to Stewart River. The Village of Mayo has held a Type A Municipal water licence for this facility since it began operation, and this license has seen a number of changes and amendments over the lifespan of the facility. Generally, the terms and conditions from the license were carried over, and changes related to the Effluent Quality Standards (EQS) have been listed below (Table 1). As many of these changes pertain to water supply, engineering or lagoon infrastructure, only changes related to water quality have been outlined.

Table 1. Overview of past licence iterations and amendments with relevant changes to WQ outlined. Historic water licences are available online at https://www.yukonwaterboard.ca/waterline/.

License	Effective Dates	Notable Changes
MN90-002	Sept. 11, 1990 – Aug.15, 2000	While the sewage lagoon was not fully operational at the time this license was issued, EQS were developed and included in anticipation of the facility reaching operating capacity
MN00-029	Aug. 16, 2000 – Nov. 18, 2010	Residual Chlorine EQS removed from license
MN10-055	Nov. 19, 2010 – Jan. 11, 2012	Residual Chlorine returned to license EQS, TSS EQS removed from quarterly monitoring sites
MN10-055-1	Jan. 12, 2012 – Feb 25, 2014	Cold Water Well #2 added to licence
MN10-055-2	Feb. 26, 2014 – May 9, 2021	BOD_5 changed to $CBOD_5$ throughout document, bioassay requirements added
MN10-055-3	May 10, 2021 – May 13, 2023	Updated digital file submission format requirements for WQ data
MN10-055-4	Mar. 14, 2023 – Nov. 1, 2030	EQS (deposit of waste) for 2 new warm water wells to Mayo River (monitoring station T-6e) and associated adaptive management plans to be developed once drilled. These wells will heat the potable municipal drinking water system to prevent freezing.

The above listed water licenses authorizes the Village of Mayo to operate a drinking water treatment and distribution system, as well as a sewage collection and disposal facility (Figure 1).

Figure 1. Village of Mayo drinking water treatment and distribution facility and wastewater treatment facility.

The drinking water system consists of three groundwater wells – a cold water well to supply drinking water and two warm water wells to be used only as a heat source. Wastewater is collected through sewer mains which gravity feed to the Stewart River Lift Station located near the corner of Center Street where it is then pumped to the sewage lagoons. The sewer main system consists of a network of 150mm and 200mm diameter HDPE sewer mains and manholes. The lift station pumps sewage through a 150mm diameter HDPE forcemain to the sewage lagoon system located west of the community. Settlement of solids and anaerobic treatment is provided in the primary cells prior to overflow into the infiltration cells where it is disposed of through a combination

of evapotranspiration and exfiltration. Trucked sewage waste is also delivered to the lagoon where they are discharged into the first primary cell through a corrugated metal discharge structure. Figure 2 illustrates the wastewater treatment facility construction.

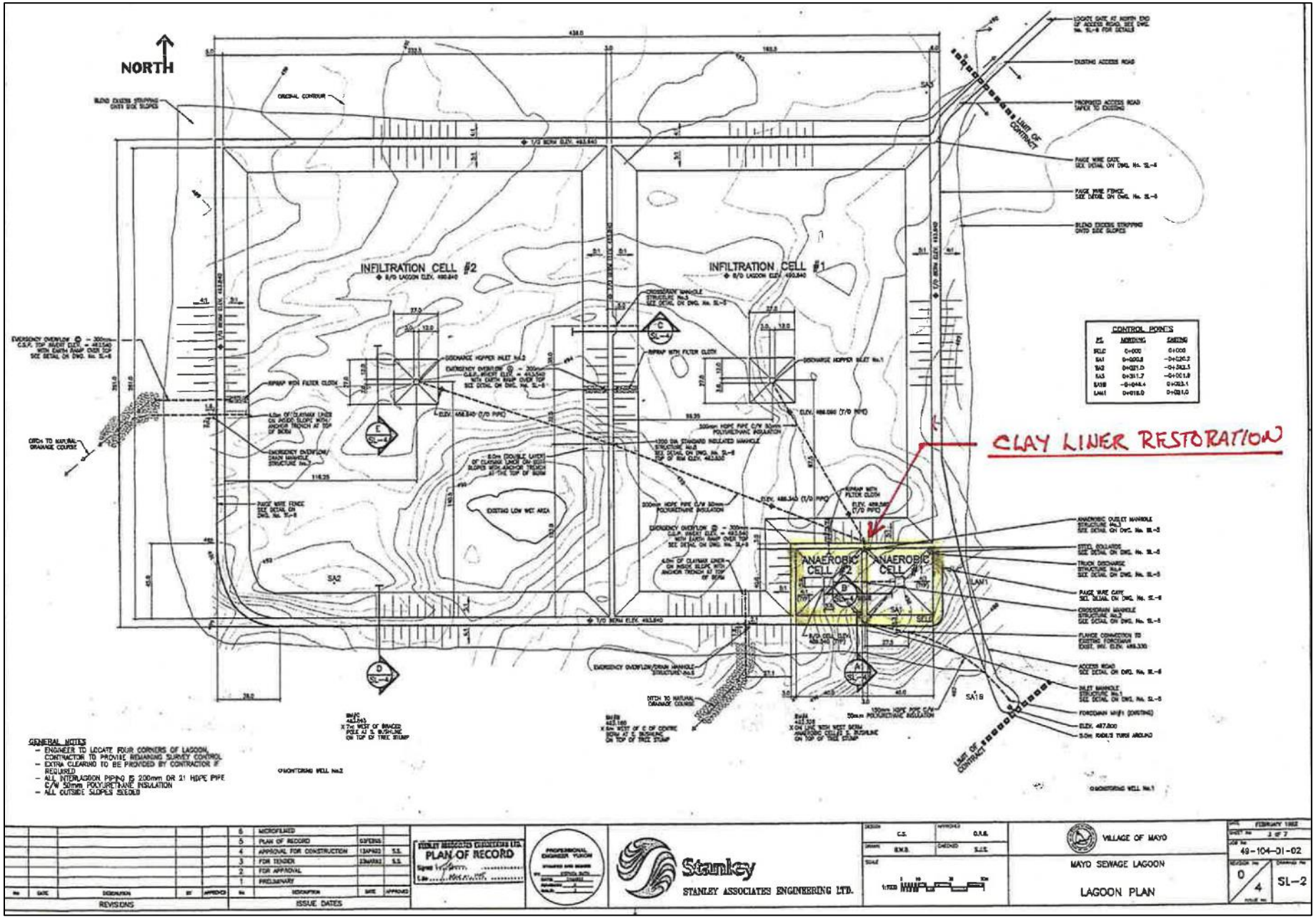

Figure 2. Engineering diagram of Mayo municipal wastewater treatment facility (Stanley 2014).

1.2 Current water use license MN10-055-4

Under the current water licence MN10-055-4, the Village of Mayo is required to conduct regular water quality and flow monitoring (see Table 2 and Table 3). It is important to note that the license includes authorization for a drinking water supply, however WRB is only examining wastewater-related portions of this license.

Table 2. MN10-055-4 monitoring locations and descriptions.

Sampling Station	Description
T-1a	Raw water supply at CWW#1
T-1b	Raw water supply at CWW#2
T-1c	Raw water supply at CWW#1a
T-1d	Raw water supply at CWW#3
T-1f	Raw water supply at CWW#5
T-3	Raw sewage influent to sewage lagoon at lift station
T-4	Treated effluent at westerly monitoring well located approximately 100 metres from lagoon
T-5	Treated effluent at easterly monitoring well located approximately 100 metres from lagoon
T-6a	Water supply at WWW#1
T-6b	Water supply at WWW#2
T-6c	Water supply at WWW#3
T-6d	Water supply at WWW#4
T-6e	Discharge from warm water wells at the heat exchanger
T-7	Discharge from wastewater treatment lagoon at emergency overflow structure, if discharge occurs

As displayed in Table 3 below, water quality monitoring is required on two surrounding groundwater wells (T-4 and T-5) and the treated effluent surface discharge (T-7) that has never occurred. There are additional flow monitoring requirements for raw sewage influent (T-3). The remaining monitoring requirements are associated with the water supply system.

Table 3. MN10-055-4 monitoring schedule.

Station Analysis	T-1a, T-1b, T-1c, T-1d, T-1f, T-3, T-6a, T-6b, T-6c, T-6d	T-4	T-5	T-6e	T-7[1]
Cadmium (Dissolved)	-	-	-	**B**	-
Mercury (Dissolved)	-	-	-	**B**	-
Silver (Dissolved)	-	-	-	**B**	-
Escherichia coli	-	**Q**	**Q**	-	**B**
Total Coliforms	-	**Q**	**Q**	-	**B**

Station Analysis	T-1a, T-1b, T-1c, T-1d, T-1f, T-3, T-6a, T-6b, T-6c, T-6d	T-4	T-5	T-6e	T-7[1]
Cadmium (Dissolved)	-	-	-	**B**	-
Mercury (Dissolved)	-	-	-	**B**	-
Silver (Dissolved)	-	-	-	**B**	-
Dissolved Oxygen	-	**Q**	**Q**	-	**B**
Specific Conductance	-	**Q**	**Q**	-	**B**
Temperature	-	**Q**	**Q**	-	**B**
BOD_5	-	**Q**	**Q**	-	**B**
Suspended Solids	-	**Q**	**Q**	-	**B**
pH	-	**Q**	**Q**	**B**	**B**
Oil and Grease	-	**Q**	**Q**	-	**B**
Ammonia	-	**Q**	**Q**	-	**B**
Total Phosphorus	-	-	-	-	**B**
Total Residual Chlorine					
Bioassay (LC50 static 96 hour bioassay - 100% concentration)	-	-	-	-	**B**
Flow Rate	**D**	-	-	**D**	**D**
1 – Samples must be four-hour composites					

Groundwater from monitoring stations T-4 and T-5 and warm water well discharge at T-6e are required to meet the Effluent Quality Standards (EQS) outlined in MS10-055-4 (Table 4 and Table 5, respectively).

Table 4. MN10-055-4 license Effluent Quality Standards at T-4 and T-5 monitoring stations.

License Parameter	Concentration
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	25 mg/L
pH	6 – 9
Oil & Grease	5 mg/L
Escherichia coli	2000 cfu/L
Total residual chlorine	0.02 mg/L

Table 5. MN10-055-4 license Effluent Quality Standards at T-6e monitoring station.

License Parameter	Concentration
pH	6 – 9
Cadmium (Dissolved)	0.002 mg/L
Mercury (Dissolved)	0.001 mg/L
Silver (Dissolved)	0.01 mg/L

Water discharged from the lagoon is to be sampled once a year during this discharge period, if surface discharge occurs, at the T-7 monitoring station. If/when discharging, water quality at T-7 is required to meet the EQS listed below in Table .

Table 6. MN10-055-4 licence Effluent Quality Standards at T-7 monitoring station.

License Parameter	Concentration
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	25 mg/L
pH units	6 – 9
Oil and Grease	5 mg/L
Escherichia Coli	2000 cfu/L
Suspended Solids	25 mg/L
Bioassay (LC50 static 96 hour bioassay - 100% concentration)	Non-toxic
Toxic Substances	Nil
Total Residual Chlorine (TRC)	0.02 mg/L

2 Materials and Methods

2.1 Field methods and equipment

To understand potential impacts of the wastewater facility on the receiving water environment, WRB wanted to understand the flow paths of wastewater from the facility and understand whether residual wastewater persists within the surrounding ponds and groundwater monitoring wells. WRB wanted to understand whether there was surface-groundwater interaction between groundwater wells and nearby ponds (T-4 and SWP, and T-5 and SEP), interactions between the infiltration cells and nearby ponds (IC1 and EP, and IC2 and WP2), and site-wide flow paths of water between surface and groundwater (Figure 3).

WRB conducted a short site reconnaissance visit on September 7, 2022 followed by the field sampling event conducted on September 8, 2022. WRB collected water quality samples at the anaerobic cell junction (ACX), two infiltration cells (IC1 & IC2), groundwater monitoring wells (T-4 and T-5), and four natural ponds in the immediate area surrounding the lagoon on the east, south and west sides (EP, WP, SEP, SWP). See Table 7 for details of each sampling location. A suite of typical water quality parameters,

stable water isotopes and artificial sweeteners as tracers of wastewater were analyzed at a number of stations in and around the lagoon (Table).

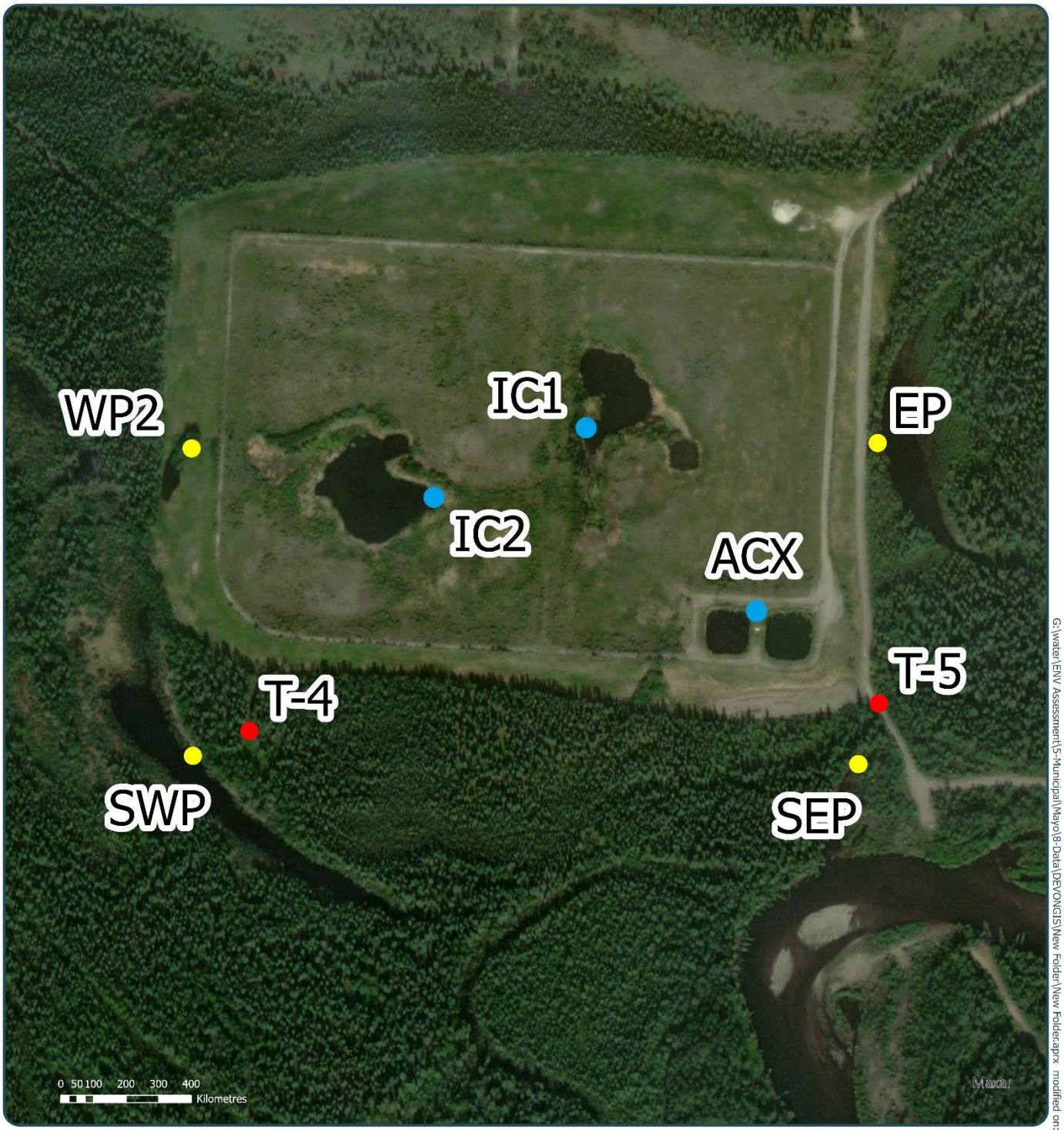

Figure 3

Yukon

Surface and groundwater monitoring locations for the 2022 site audit

MARCH 2023

Legend

- Groundwater Well
- Surface Water
- Lagoon

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Samples were collected by WRB staff following the Water Quality Sampling Protocol for Government of Yukon Monitoring Programs (Government of Yukon 2021) and followed the requirements from the commercial lab conducting the analyses. In-situ water quality field parameters were measured using a YSI ProDSS handheld multimeter. The multimeter was calibrated before going in the field by WRB staff as per manufacturer specifications and best practices. Unfortunately a portion of field data was lost and therefore WRB has utilized equivalent lab parameters where necessary. WRB staff collected seven surface water samples and two groundwater samples during the September 2022 audit, outlined in Table below. The sampling locations are also presented in Figure 3. Complete results from sample analysis can be found in Appendix A.

Table 7. Surface water samples collected during the September 2022 site audit.

Station Code	Location	Date & Time	Coordinates		Rationale
			Lat	Long	
T-5	"Treated effluent" at easterly monitoring well located approximately 100 m from lagoon	08-Sep-2022 11:00	63.594341	-135.911062	Quarterly monitoring requirement of MN10-055
T-4	"Treated effluent" at westerly monitoring well located approximately 100 m from lagoon	08-Sep-2022 12:45	63.594025	-135.920201	Quarterly monitoring requirement of MN10-055
SWP	Natural pond on southwest corner of facility approximately 30 m from T-4	08-Sep-2022 13:00	63.593755	-135.920717	Assess potential impact to receiving environment
WP2	Natural pond on immediate west edge of facility	08-Sep-2022 13:40	63.595638	-135.921250	Assess potential impact to receiving environment
SEP	Natural pond on southeast corner of facility approximately 10 m from T-5	08-Sep-2022 14:15	63.594029	-135.911376	Assess potential impact to receiving environment
EP	Pond on east edge of facility adjacent to roadway access	08-Sep-2022 14:35	63.596115	-135.911387	Assess potential impact to receiving environment
ACX	Junction of anaerobic cells accessed through manhole between both cells on north side	08-Sep-2022 15:15	63.594985	-135.912917	Understand water chemistry of influent

Station Code	Location	Date & Time	Coordinates		Rationale
			Lat	Long	
IC1	Eastern infiltration cell	08-Sep-2022 16:00	63.595916	-135.915795	Further understanding of influent/effluent water chemistry, replicate sample collected
IC2	Western infiltration cell	08-Sep-2022 16:16:45	63.595569	-135.917578	Further understanding of influent/effluent water chemistry

Samples collected during the September 2022 site visit were analyzed for a suite of analytical parameters (Table). These parameters were selected to support site audit objectives and to allow for comparison with the effluent quality standards listed in MN10-055-4.

Table 8. Analysis performed for samples collected during the September 2022 audit.

Parameter
- Field parameters - Major ions (bicarbonate, bromide, calcium, carbonate, chloride, fluoride, hydroxide, magnesium, potassium, sodium, and sulphate) - Nutrients (nitrate, nitrite, nitrate+nitrite, total ammonia, total nitrogen, total phosphorus, dissolved phosphorus, and dissolved phosphorus as phosphate) - Total suspended/dissolved solids - Turbidity, conductivity, pH - Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC) - Artificial sweeteners - Stable water isotopes - Total and dissolved metals including mercury - Fecal coliforms (T-4 and T-5 only)

2.2 QA/QC

In addition to standard samples collected from site, WRB collected a replicate sample at station IC1. It should be noted that there was an unintended deviation from protocol during the September 2022 sampling event and no field blank or travel blank QA/QC samples were collected. Replicate samples for stable water isotopes were collected as well, and the University of Waterloo Environmental Isotopes Lab performs laboratory QA/QC (Appendix B). Procedurally, a regular sample is collected followed immediately by an identical replicate sample being collected adhering to all of the same standard protocols and procedures. One replicate is collected for every ten samples, rounded up to the nearest ten samples. Analytical results are compared and Relative Percent

Difference (RPD) is calculated. The collection of replicates can help identify precision of sampling technique and methods and provide an estimate of sampling error and analytical error.

3 Results & Discussion

3.1 QA/QC results

Replicate results were compared to determine Relative Percent Difference (RPD) while factoring in the Practical Qualifying Limit (PQL), which takes into account how close the result is to the Reported Detection Limit (RDL). RPD's greater than 25% are assessed further to determine the cause of the variance if possible. The results that are above 25% are outlined in Table below. Parameters with RPD below 25% are not presented in this table.

Table 9. Results of replicate QA/QC analysis from September 2022 replicate sample at IC1.

Parameter	**Units**	**RDL**	**IC1**	**IC1-R**	**RPD** Should be below 25%	**PQL1** Must be above 5	**PQL2** Must be above 5
Total Aluminum	mg/L	0.0030	0.0691	0.0501	32%	23.0	16.7
DOC	mg/L	0.50	16.5	10.2	47%	33.0	20.4
Total Cadmium	mg/L	0.0000050	0.0000366	0.0000279	27%	7.3	5.6
Total Lead	mg/L	0.000050	0.000728	0.000548	28%	14.6	11.0

The high RPD parameters mentioned in Table above did not present any issues for the purposes of this report, as there are no metals EQS in the license, and DOC is primarily used to calculate guideline standards, which also do not apply in this case. In-situ field data was compared against lab data as another check of quality assurance however surface water field data was lost thus only groundwater data was compared in Table below. pH of samples is known to vary any time after 15 minutes and therefore likely the reason for an RPD over 10%. The specific chemistry of a single water sample will cause changes to the pH, but this change is not always linear or predictable.

Table 10. Results of in-situ and lab data comparison from September 2022 groundwater samples.

Sample Location	**Field pH** (pH Units)	**Lab pH** (pH Units)	**RPD** Should be below 10%	**Field Conductivity** (µS/cm)	**Lab Conductivity** (µS/cm)	**RDP** Should be below 20%
T-4	6.66	8.17	20.4%	389.4	393	0.9%
T-5	6.78	8.30	20.2%	266.8	269	0.8%

3.2 Comparison with Effluent Quality Standards and guidelines

The sampling conducted by WRB in 2022 indicated no exceedances of EQS at T-4 or T-5. There was no surface discharge at T-7, therefore no data could be compared to EQS for this station. Additionally, although EQS only apply at the licenced stations, the sample collected at IC1 exceeded the TSS standard for T-7. The samples collected from IC2 and the surrounding surface water ponds (SWP, SEP, WP2) were below the water licence wastewater EQS listed in Table 4 and Table 6. Monitoring data collected by the licensee (available on Waterline) was assessed to identify any past exceedances and issues with water quality at the facility. A relatively good record is available for water quality, however frequency of sampling is inconsistent with quarterly sampling sometimes only happening once or twice that year. There are other instances where monitoring did occur four times in a year, however sampling was not evenly distributed or "quarterly", with two sampling events sometimes occurring in the same month. Although the available record has some intermittent inconsistency, there is no obvious trend in water quality at the T-4 and T-5 monitoring stations.

For this audit, data was also compared with guidelines including Canadian Council of Ministers of the Environment guidelines for Protection of Aquatic Life (CCME PAL), and the Yukon Contaminated Sites Regulation (CSR). Many of these guideline values are calculated based on in-situ parameters such as temperature or pH, or other analytical parameters such as hardness, and the actual guideline values have been displayed only as "*Calculated*" in Table 11. Table 11 outlines concentrations in samples collected during the September 2022 site audit that exceed the generic CCME guideline for the Protection of Aquatic Life, or the Contaminated Site Regulation standards. Additionally, key

parameters related to municipal wastewater have been highlighted in Table 12 across all sites.

Table 11. Summary of parameters measured that exceed relevant guidelines in samples collected during the September 2022 site audit. Information below is for comparison only and does not represent non-compliance.

Site	Parameter	Concentration (mg/L)	Guideline Value (mg/L)	Guideline Source
ACX	Total Copper	0.031	*Calculated*	CSR
	Ammonia	5.3	*Calculated*	CSR
IC1	Total Copper	0.00964	*Calculated*	CSR
	Total Iron	0.309	0.3	CCME
	Ammonia	7.89	*Calculated*	CSR
IC2	Total Copper	0.00693	*Calculated*	CSR
	Ammonia	2.99	*Calculated*	CSR
T-5	Total Arsenic	0.00574	0.005	CCME
	Total Cadmium	0.0000965	*Calculated*	CSR
	Total Cobalt	0.00099	0.0009	CSR
	Total Iron	1.10	0.3	CCME
SEP	Total Iron	0.36	0.3	CCME
	Total Cadmium	0.000126	*Calculated*	CCME
SWP	Total Arsenic	0.00587	0.005	CCME
	Total Iron	1.55	0.3	CCME
WP2	Total Arsenic	0.00649	0.005	CCME
	Total Iron	0.666	0.3	CCME

Table 12. Summary of parameters of interest measured in the September 2022 samples.

Parameter (mg/L)	ACX	IC1	IC2	T-5	T-4	EP	SEP	SWP	WP2
NH_4	5.30	7.89	2.99	N.D.	N.D.	0.0066	N.D.	0.143	0.0338
NO_2	0.0026	0.0038	0.0099	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
NO_3	N.D.	0.0091	0.0143	0.0130	1.97	N.D.	N.D.	N.D.	0.0125
Chloride	5.45	27.3	7.48	N.D.	3.92	0.82	N.D.	1.57	3.50
Total Cadmium	0.0000330	0.0000366	0.0000051	0.0000965	0.0000131	N.D.	0.000126	0.0000080	0.0000067
Total Copper	0.0310	0.00964	0.00693	0.00138	0.00064	N.D.	N.D.	N.D.	N.D.
Total Iron	0.235	0.309	0.244	1.10	N.D.	0.158	0.360	1.55	0.666
Total Aluminum	0.0907	0.0691	0.0774	0.0697	0.0040	0.0041	0.0031	0.0297	0.0049
N.D. = Non Detect									

3.3 Site stable water isotope characterization

Water Resources Branch analyzed samples for stable water isotopes (δ^2H and $\delta^{18}O$) to support interpretations of site water movement across the Mayo sewage lagoon. All natural waters contain variable ratios of elemental isotopes of different masses. The principal element ratios of interest for isotope tracing are Oxygen ($^{18}O/^{16}O$, also referred to as $\delta^{18}O$) and Hydrogen ($^{2}H/^{1}H$, also referred to as $\delta^{2}H$), although isotopes of other elements are sometimes used. The ratio of the lighter isotopes to heavier isotopes provides information about the environment of formation or source of the containing waters. Water molecules enriched in heavier ^{18}O isotopes do not evaporate as readily from surface water bodies, causing surface waters that have stagnated for long periods of time to gradually become enriched in ^{18}O. Precipitation that condenses in warmer temperatures (rain) is generally more enriched in ^{18}O than lighter precipitation that condenses in colder temperatures (snow).

Figure 4 shows δ^2H and $\delta^{18}O$ ratios for surface water samples (solid circles) collected during the September 2022 monitoring event and precipitation (hollow circles) collected in Whitehorse from 1960-1990 via the Global Network of Isotopes in Precipitation (GNIP; IAEA 2021). Precipitation that fell between May and September is inferred to be rain (red hollow circles) whereas precipitation that fell between October and April is inferred to be snow (blue hollow circles). A local meteoric water line (LMWL) was generated based on the stable water isotope ratios for precipitation samples collected from the Mayo GNIP station. The LMWL is a line of best fit ($R^2 = 0.93$) that represents the site-specific long-term covariation of hydrogen and oxygen stable isotope ratios. As water condenses in precipitation, heavier isotopes (^{2}H) condense more readily and fall as rain or snow. As precipitation recharges groundwater, it is not exposed to evaporation and resembles precipitation. Comparatively, water that is exposed to evaporation will lose lighter isotopes more readily, and become increasingly enriched in the lighter isotopes of water.

Typically, groundwater samples plot approximately along the LMWL and have stable water isotope compositions similar to that of weighted average precipitation (Kendall & Doctor, 2005). A weighted average is a calculation that takes into account the varying

degrees of importance of the numbers in a data set. It is useful to compare $\delta^{18}O$ and $\delta^{2}H$ values in groundwater to amount-weighted average $\delta^{18}O$ and $\delta^{2}H$ values in precipitation. This is because larger precipitation events typically contribute disproportionately to groundwater recharge. To calculate amount-weighted average $\delta^{18}O$ or $\delta^{2}H$ values in precipitation, $\delta^{18}O$ or $\delta^{2}H$ values from individual precipitation events are multiplied by the amount of precipitation in the events (expressed in millimetres) before the average is calculated. Note that, in certain circumstances, $\delta^{18}O$ and $\delta^{2}H$ values in groundwater differ from those in annual precipitation due to seasonal biases in recharge. This appears to be true across much of the Yukon, where infiltration of snowmelt (and possibly cool spring rains) recharges aquifers when losses to evapotranspiration are low.

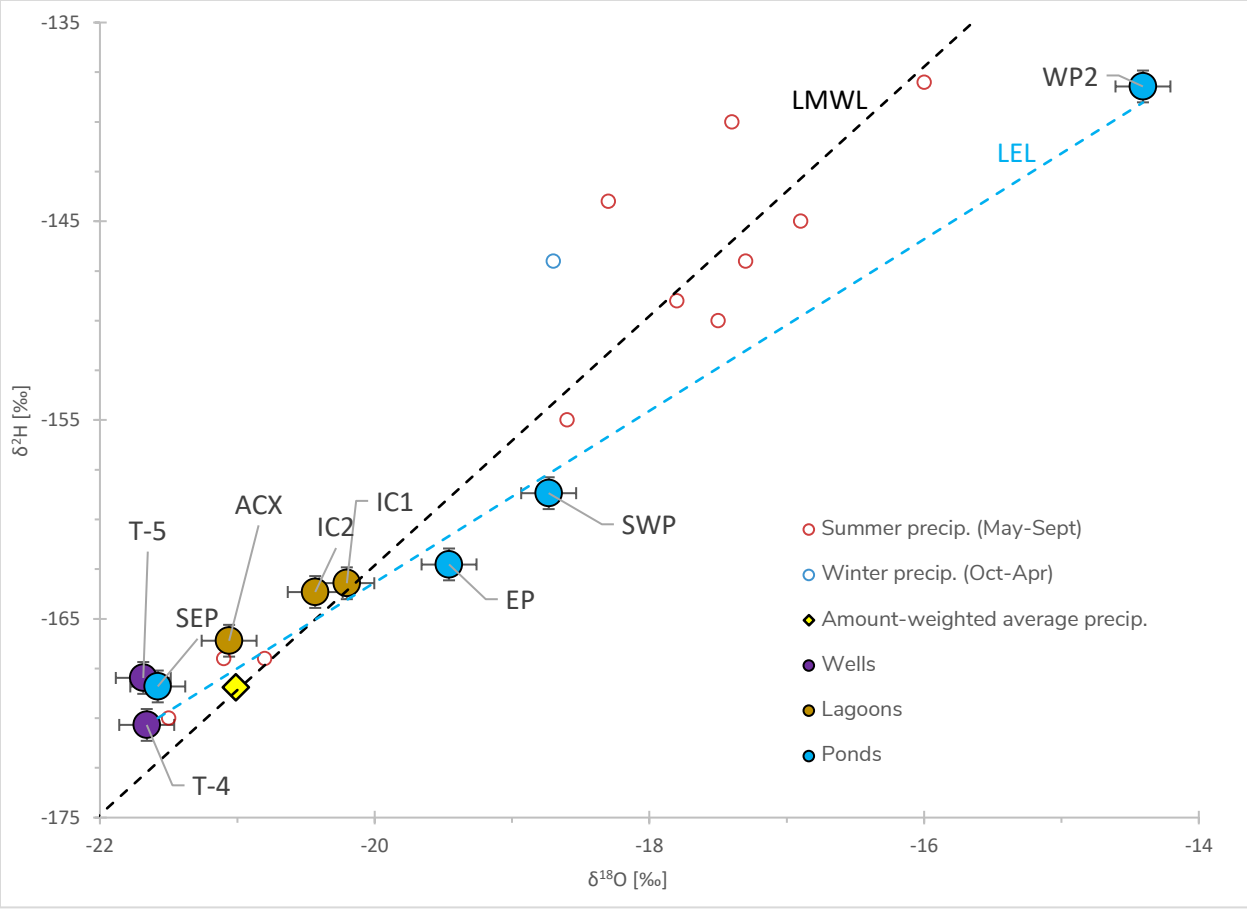

Figure 4. Stable water isotope compositions for samples collected at the Mayo sewage lagoon.

The sample collected from the facility influent (ACX) is suspected to be representative of groundwater, as it compares well to the amount-weighted average precipitation and could likely characterize the source water, which in this case is a series of municipal

supply wells. However, in order to properly characterize the isotopic signature of source water, WRB would need to collect a sample directly from municipal supply wells. As such, ACX should be considered representative of source water for the purposes of comparison in this report only. Functionally, water from ACX is piped to the infiltration cells IC1 and IC2, which are similar to each other in Figure 4. They appear to be slightly evaporated versions of ACX, which would be expected as they spend a greater amount of time within the infiltration cells and are thus exposed to evaporation.

The ponds surrounding the lagoons are suspected to be natural features and therefore behave differently than engineered infiltration cells. As seen in Figure 4 it would appear that SEP, EP, SWP and WP2 have different infiltration rates and therefore some ponds would have longer residence times than others. It appears that SEP could be groundwater-fed, as the isotopic signature closely resembles the eastern monitoring well T-5 and had visible flow at the time of sampling, which was originating only a few meters from the monitoring well itself. The residence time of this pond water would likely be short due to surface connectivity with the Mayo River, although flow was visually estimated to be <1 L/s at the time of sampling. This short residence time would however explain the isotopic signatures of SEP and T-5 being similar to each other. The second monitoring well T-4 is also nearly identical to these samples.

Water that has evaporated from open surfaces typically plots below the LMWL with a slope between two and five (Kendall & Doctor, 2005). The remaining natural ponds EP, SWP and WP2 all show evidence of evaporation, where WP2 appears to be the most evaporated based on isotopic composition. In Figure 4, the dotted blue “LEL” or Local Evaporation Line is based on the isotopic signature of the surrounding ponds and diverges from the LMWL due to longer evaporation time in the different ponds. As such, it is expected that these ponds are infiltrating to ground at a much slower rate than the infiltration cells and therefore experiencing greater amounts of evaporation and plotting progressively up and to the right on Figure 4.

Stable water isotopes can be useful but must be considered along with other lines of evidence when making interpretations. Stable water isotopes can reveal information

about age, origin, depth of circulation, but they cannot definitively determine connectivity or impact to receiving environment.

3.4 Artificial sweeteners and wastewater flow paths

Artificial sweeteners are man-made compounds commonly used as food additives. They are widespread in products consumed by humans such as diet beverages, pharmaceuticals, and toothpaste, and therefore are ubiquitous in domestic wastewater. These compounds have no natural source, are persistent in the natural environment (particularly acesulfame and sucralose), and can be detected at relatively low concentrations (i.e. on the order of nanograms per litre), making them useful as tracers of human wastewater. Four commonly used artificial sweeteners (acesulfame, sucralose, saccharin, and cyclamate) are used as a tracer of wastewater in this audit to understand possible flow paths and receptors.

Artificial sweeteners are emerging as useful tracers of wastewater; as Spoelstra et al. (2017) states: "*Numerous studies have now demonstrated that artificial sweeteners are powerful tracers of wastewater in the environment*." Peer-reviewed studies have been published over the last 15 years demonstrating the efficacy of using artificial sweeteners as a tracer of domestic wastewater (Spoelstra et al. 2017). Since 2018, Water Resources Branch has used artificial sweeteners to support audits of several municipal wastewater treatment facilities around the Yukon. Artificial sweetener results are reported in ng/L. Some results are reported as below the method detection limit (<MDL) or between the method detection limit and the practical quantitation limit (MDL< x < PQL). Results below the MDL indicate no detectable concentrations of the parameter. Results between the MDL and PQL indicate that there is a very low but detectable concentration present with a level of uncertainty that is significantly greater than for concentrations above the PQL. Figure 5 below shows relative concentrations of artificial sweeteners (depicted using pie charts) and total concentrations (indicated by the size of the pie charts). The data is also presented in Table 13.

The sweetener results indicate that wastewater from the facility is flowing west/south-west from the infiltration cells to nearby ponds WP2 and SWP and groundwater well

T-4 (Figure 5). ACX is the wastewater influent, however a greater concentration of sweeteners was measured in the infiltration cell. This suggests that the quality of influent at ACX is variable, and that IC1 and IC2 better represent the average quality of influent. Acesulfame and sucralose were detected at T-4, WP2 and SWP. These two artificial sweeteners persist longer than saccharin and cyclamate (Spoelstra et al. 2017). This suggests that impacted water from the lagoons takes a relatively long time (i.e. long enough for concentrations of saccharin and cyclamate to attenuate) to report to these sites. T-4 is commonly reported as being dry, which makes it difficult to speculate on impact from infiltrated water; however, it is likely that water infiltrating to ground in IC1 and IC2 takes long enough to travel to WP2 and SWP that some of the sweeteners are attenuated along the flow path.

There were virtually no sweeteners present in groundwater well T-5 and SEP, despite those stations being close in proximity to ACX. This suggests there are likely no significant impacts from wastewater to surface or groundwater on the east side of the facility at the time of sampling. It should be noted that artificial sweeteners themselves are not currently known to be harmful to the environment. The samples collected provide valuable insight to flow paths from the facility, but do not provide a comprehensive understanding of groundwater flow paths. Results from the single sweetener sampling event suggest that groundwater is generally travelling in a southwesterly direction from the facility, but this cannot be confirmed due to the lack of groundwater wells and information, particularly on the south and east sides of the facility. It would be valuable to conduct a hydrogeological assessment to investigate groundwater flow directions and seasonal groundwater levels and provide further information on potential impacts to the receiving water environment and if additional monitoring stations are required.

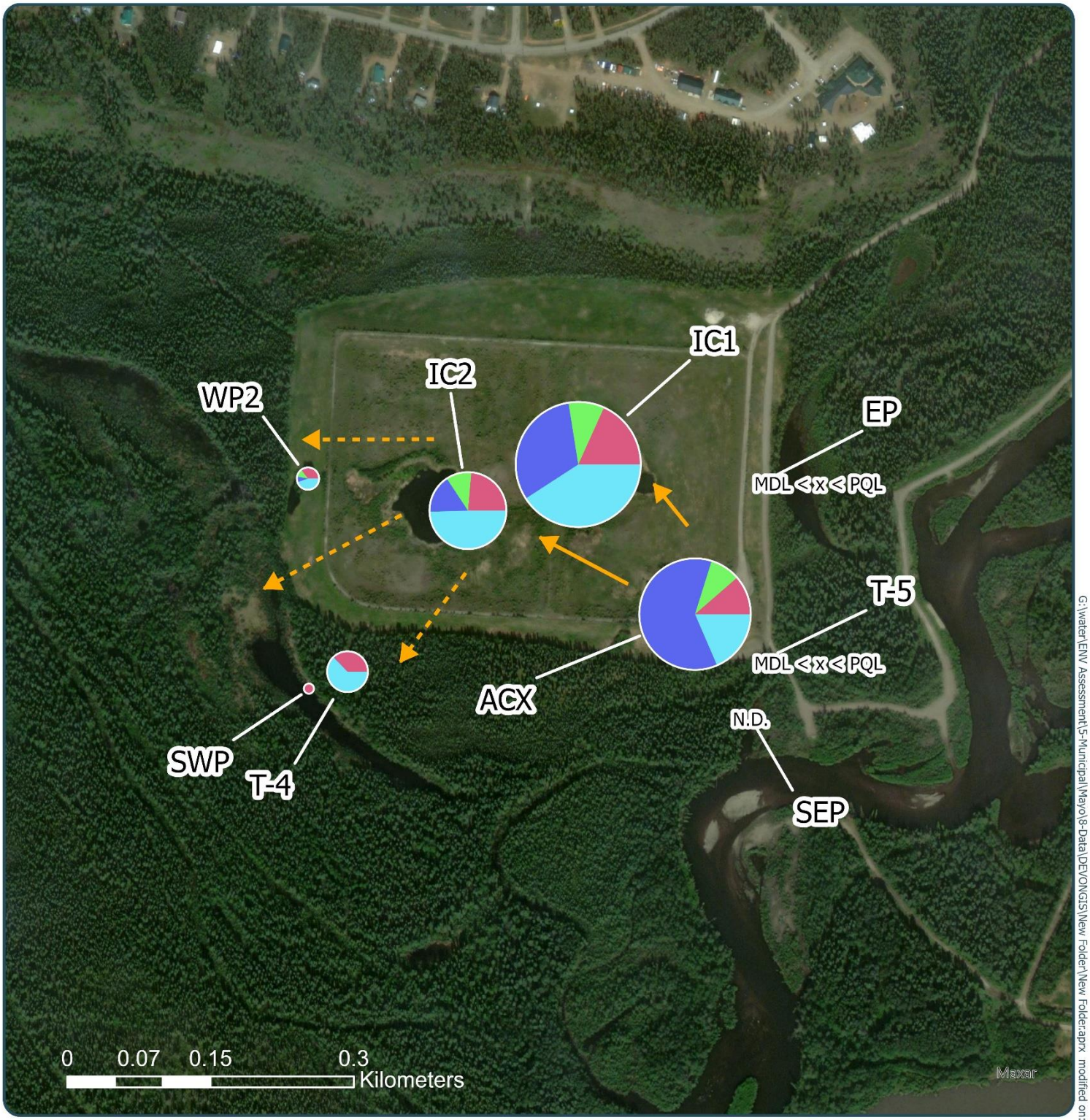

Figure 5

Yukon

Distribution and concentration of artificial sweeteners at the municipal wastewater treatment facility in Mayo

MARCH 2023

Sweeteners

- Acesulfame (ng/L)
- Saccharin (ng/L)
- Cyclamate (ng/L)
- Sucralose (ng/L)

25,000
9,500
1,400

Known flowpath

Suspected connectivity

G:\water\ENV Assessment\5-Municipal\Mayo\8-Data\DEVONGIS\New Folder\New Folder.aprx modified on: March 10, 2023 9:30 AM by djoconno

Table 13. Complete sweetener analysis results for September 2022 samples.

Sample Name	Acesulfame (ng/L)	Saccharin (ng/L)	Cyclamate (ng/L)	Sucralose (ng/L)
T-5	n.d.	4	n.d.	n.d.
T-4	1763	n.d.	12	2982
T-4 (Dup)	1733	n.d.	12	3162
SWP	293	n.d.	n.d.	n.d.
IC1	8156	4144	14161	18266
IC2	3989	1805	2735	8371
ACX	4045	3121	21783	6581
WP2	503	163	117	634
SEP	n.d.	n.d.	n.d.	n.d.
EP	n.d.	2	n.d.	n.d.
MDL	**2**	**2**	**3**	**20**
PQL	**6**	**6**	**8**	**60**

Method: IC/ESI/MS/MS ACS500 suppressor
MDL: minimum detection limit
PQL: practical quantitation limit
N.D.: not detected

3.5 Lagoon Water Balance

The influent volumes of raw sewage that report to the facility have been reported at approximately 230,000 m^3/year (Figure 6). This is based on average influent from 2012-2015; annual reports since 2016 have indicated the influent flow meter has been inoperable and more recent volumes have been estimated based on a percentage of water supply volumes. The reported influent volumes makes Mayo the fourth largest wastewater facility in the Yukon in terms of influent volumes (Figure 6).

Previous studies of the lagoon water balance concluded that the rate of seepage from the lagoon was close to the design value (22 mm/day compared to designed 20 mm/day) (Burke and Burn, 2004). The same study also noted that the time wastewater spent in the secondary ponds (approximately 3 weeks) was considerably less than designed.

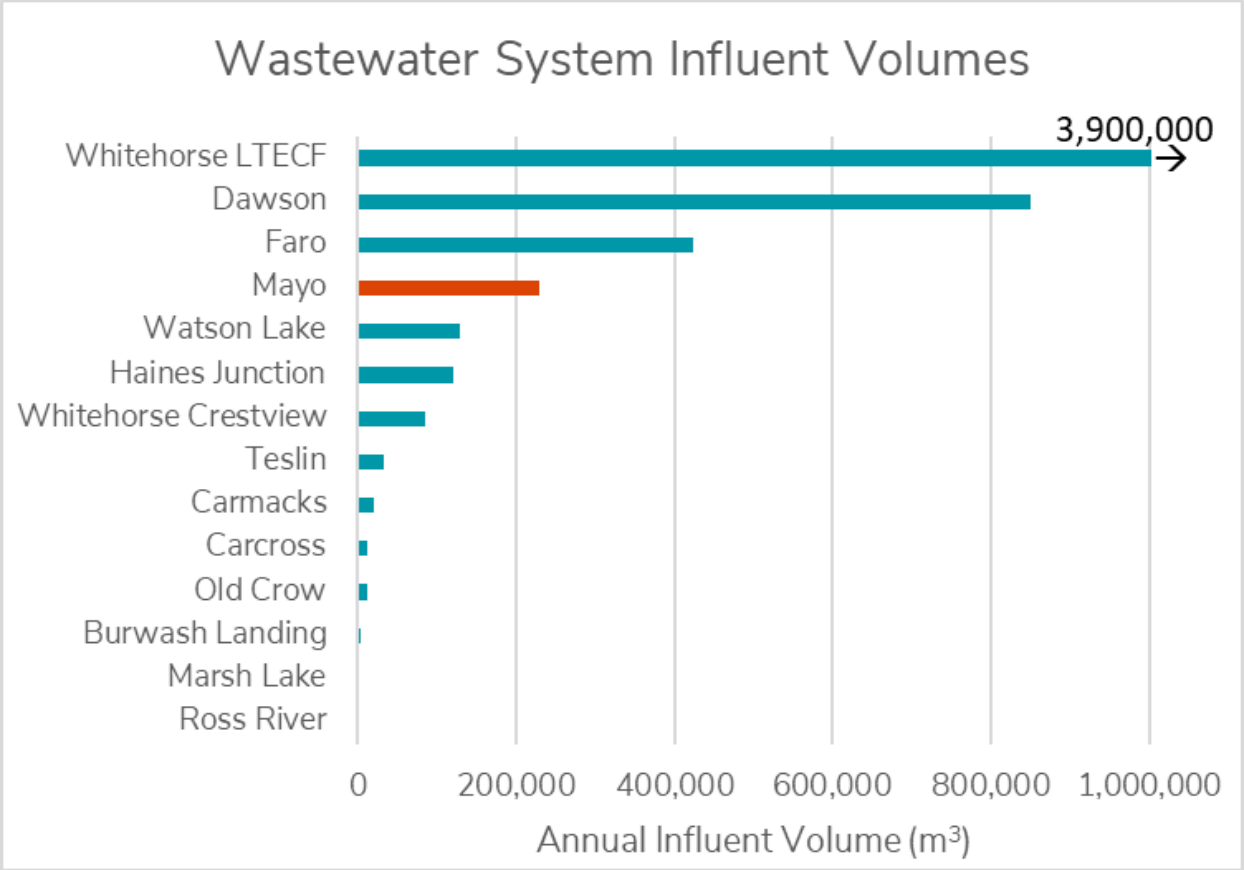

Figure 6. Influent raw wastewater volumes reported for the Mayo facility compared to other sites in Yukon. Time periods vary (generally averaged between 2012-2019). Methods and quality of data likely vary significantly between different locations. Data obtained by WRB via WATERLINE reports.

4 Conclusions & recommendations

Wastewater at the Mayo municipal treatment facility effectively infiltrates to ground (as evidenced by no history of discharges to surface); however, the fate of that wastewater is not clear because a hydrogeological assessment of the facility has not been conducted and the existing network of groundwater monitoring wells is inadequate (T-4 is frequently dry, T-5 is frost-jacked). This audit represents a snapshot in time and suggests (based on sweetener results) that wastewater travels at least to the west and southwest of the facility. The audit did find some sample parameters to be in exceedance of CCME

and CSR guidelines at stations ACX, IC1, IC2, T-5, SEP, SWP and WP2, most commonly total iron and ammonia (Table 11).

These conclusions lead WRB to put forward the following recommendations;

1. **The Licensee should submit to the Board a hydrogeological assessment that includes:**

- **determination of the direction and rate of groundwater flow;**
- **assessment of upgradient (background) groundwater quality;**
- **assessment of downgradient groundwater quality;**
- **identification of potential receptors, including surface water bodies and drinking water wells; and**
- **estimation of groundwater travel times to potential receptors,**

which is based on:

- **a minimum of one well upgradient and two wells downgradient of the sewage lagoons;**
- **wells installed and sampled in accordance with Protocol No. 7 (Groundwater Monitoring Well Installation, Sampling, and Decommissioning) pursuant to the *Contaminated Sites Regulation*; and**
- **wells drilled to a depth that will allow for adequate characterization of the groundwater regime as determined by a qualified hydrogeologist.**

Background groundwater quality has not been characterized so potential impacts of the facility on downgradient groundwater quality cannot be evaluated. Furthermore, an understanding of the direction of groundwater flow and likely areas of groundwater discharge is necessary to inform the locations of surface water quality sampling. The existing wells are not functioning as intended (T-4 is frequently dry, T-5 is frost-jacked). A hydrogeological assessment is required at municipal wastewater treatment facilities across the territory, many of which are smaller than the facility in Mayo. The Mayo facility is the fourth-largest in the territory based on annual influent volumes.

2. **Initiate regular sampling of influent at ACX and monitor for additional parameters at all monthly monitoring locations including fecal coliforms, general chemistry, total and dissolved metals, conductivity, temperature, CBOD, TSS, pH, ammonia, total phosphorus, NO_2, NO_3 and hydrocarbons prior to the next licence amendment.**
   Since there has never been a surface discharge, there is currently no ongoing monitoring of wastewater influent or effluent water quality and there is a poor understanding of the quality of the effluent that infiltrates to ground. Monitoring the quality of the effluent that comes in to the facility will help inform future assessment of the impact of the facility on groundwater. Additionally, the EQS listed in MN10-055-4 are outdated, vague and unclear (for example: current EQS refer to "toxic substances") and will need to be revised and updated to include contaminants of potential concern. We suggest monitoring the above-mentioned parameters in order to accumulate data that will inform the future license amendment.

3. **Repair or replace flow meter that measures influent volume.**
   Accurate measurements of lagoon water balance components allow for future investigations into functionality of the facility relative to its designs. For example, examining rate of infiltration, time of water stored in the secondary cell, and available storage capacity.

Furthermore, future audits or investigations should include samples from the Village of Mayo's municipal water supply for analysis of stable water isotopes and artificial sweeteners in order to characterize source water entering the facility.

5 Authors & Contact Information

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-OR-
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Appendix A – Field notes and site conditions

Table 14. Site visit dates and conditions.

Date	Weather	Site Conditions
September 8, 2022	Overcast, no precipitation, high of 11°C, low of 0°C	Site was accessible by truck and on foot. Accessed the two monitoring wells located south of the infiltration lagoons, the surrounding ponds to the west, south and east of the lagoons, the two infiltration cells and the primary discharge lagoons.
September 9, 2022	Overcast, no precipitation, high of 18°C, low of 4°C	Accessed the two monitoring wells by truck. Fecal coliforms samples were collected at T-4 and T-5 on September 9 to meet the holding time.

Table 15. Field notes.

Station Code	Station Description	Field Notes
(T-4)	Southwest monitoring well	High visible TSS
(T-5)	Southeast monitoring well	The PVC well casing was noted to be heaved, high visible TSS
(SWP)	Natural pond southwest of the lagoon	High visible TSS
(SEP)	Natural pond southeast of the lagoon	Visible surface connectivity with Mayo River, flowing <1 L/s, originating from ground within 10 m of T-5
(EP)	Natural pond east of site	Water brown and turbid
(WP2)	Ponded water west of lagoons	Water brown and turbid
(IC1)	West secondary lagoon storage/infiltration cell	Strong sewage odour, water level appears relatively low
(IC2)	East secondary lagoon storage/infiltration cell	Strong sewage odour, water level appears relatively low
(ACX)	Primary storage cell / Anaerobic cell intersection	Water turbid and with strong sewage odour, sample collected from manhole between aerobic cells

Appendix B – ALS water quality sample results

CERTIFICATE OF ANALYSIS

Work Order	: **WR2201065**	Page	: 1 of 12
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Devon O'Connor	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 419 Range Road Whitehorse YT Canada Y1A 3V1	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Mayo Sewage Lagoon	Date Samples Received	: 11-Sep-2022 12:30
PO	: ----	Date Analysis Commenced	: 12-Sep-2022
C-O-C number	: 17-773859, 17-773860	Issue Date	: 11-Oct-2022 16:21
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

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
- Surrogate Control Limits

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*
Anshim Anshim	Lab Assistant	Metals, Burnaby, British Columbia
Benjamin Oke	Lab Assistant	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Erin Sanchez		Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, 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*
-	No Unit
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
NTU	nephelometric turbidity units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
DTSE	*Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ACX	EP	SEP	MW2	IC2
					Client sampling date / time	08-Sep-2022 15:15	08-Sep-2022 14:35	08-Sep-2022 14:15	08-Sep-2022 12:45	08-Sep-2022 16:45
						WR2201065-001	WR2201065-002	WR2201065-003	WR2201065-004	WR2201065-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		108	136	106	157	112
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		108	136	106	157	112
conductivity	----	E100	2.0	µS/cm		290	287	252	393	299
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		108	143	122	186	110
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		113	151	127	190	115
solids, total dissolved [TDS]	----	E162	10	mg/L		157	174	143	227	166
solids, total suspended [TSS]	----	E160	3.0	mg/L		15.2	<3.0	3.8	<3.0	8.6
turbidity	----	E121	0.10	NTU		4.91	0.57	2.41	0.12	3.80
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		5.30	0.0066	<0.0050	<0.0050	2.99
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L		5.45	0.82	<0.50	3.92	7.48
fluoride	16984-48-8	E235.F	0.020	mg/L		0.092	0.051	0.054	0.024	0.064
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	1.97	0.0143
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0026	<0.0010	<0.0010	<0.0010	0.0099
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.322	<0.0010	<0.0010	<0.0010	0.526
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		28.2	20.0	27.2	37.7	30.7
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		17.5	7.67	2.58	3.19 RRV	12.2 RRV
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		21.1	7.23	2.13	2.01 RRV	7.31 RRV
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0907	0.0041	0.0031	0.0040	0.0774
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00025	0.00012	0.00015	0.00013	0.00031
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00068	0.00201	0.00164	0.00016	0.00108
barium, total	7440-39-3	E420	0.00010	mg/L		0.110	0.0611	0.128	0.0816	0.0860
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		0.000571	<0.000050	<0.000050	<0.000050	0.000109

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ACX	EP	SEP	MW2	IC2
					Client sampling date / time	08-Sep-2022 15:15	08-Sep-2022 14:35	08-Sep-2022 14:15	08-Sep-2022 12:45	08-Sep-2022 16:45
						WR2201065-001	WR2201065-002	WR2201065-003	WR2201065-004	WR2201065-005
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		0.020	<0.010	<0.010	0.014	0.060
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000330	<0.0000050	0.000126	0.0000131	0.0000051
calcium, total	7440-70-2	E420	0.050	mg/L		32.6	35.9	36.9	54.7	33.6
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000017	<0.000010	<0.000010	<0.000010	0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00020	<0.00010	0.00043	<0.00010	0.00014
copper, total	7440-50-8	E420	0.00050	mg/L		0.0310	<0.00050	<0.00050	0.00064	0.00693
iron, total	7439-89-6	E420	0.010	mg/L		0.235	0.158	0.360	<0.010	0.244
lead, total	7439-92-1	E420	0.000050	mg/L		0.000434	<0.000050	<0.000050	<0.000050	0.000214
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0034	0.0041	0.0028	0.0048	0.0030
magnesium, total	7439-95-4	E420	0.0050	mg/L		7.66	15.0	8.45	13.0	7.47
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0381	0.0125	0.0388	0.00154	0.0225
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000292	<0.000050	0.000163	<0.000050	0.000366
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00124	<0.00050	0.00266	0.00073	0.00066
phosphorus, total	7723-14-0	E420	0.050	mg/L		0.861	<0.050	<0.050	<0.050	0.822
potassium, total	7440-09-7	E420	0.050	mg/L		3.13	0.504	0.652	1.84	3.40
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00251	0.00035	<0.00020	0.00033	0.00264
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000222	0.000128	0.000093	0.000411	0.000302
silicon, total	7440-21-3	E420	0.10	mg/L		2.56	1.12	2.54	3.46	1.92
silver, total	7440-22-4	E420	0.000010	mg/L		0.000013	<0.000010	<0.000010	0.000037	0.000025
sodium, total	7440-23-5	E420	0.050	mg/L		5.21	2.20	1.38	4.45	6.50
strontium, total	7440-24-6	E420	0.00020	mg/L		0.180	0.220	0.181	0.241	0.169
sulfur, total	7704-34-9	E420	0.50	mg/L		9.80	7.73	10.4	13.9	12.4
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		0.00022	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00324	<0.00030	<0.00030	<0.00030	0.00080
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000288	0.000309	0.000359	0.000647	0.000421

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ACX	EP	SEP	MW2	IC2
					Client sampling date / time	08-Sep-2022 15:15	08-Sep-2022 14:35	08-Sep-2022 14:15	08-Sep-2022 12:45	08-Sep-2022 16:45
						WR2201065-001	WR2201065-002	WR2201065-003	WR2201065-004	WR2201065-005
						Result	Result	Result	Result	Result
Total Metals										
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	0.00065	<0.00050	0.00086
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0128	<0.0030	<0.0030	<0.0030	0.0050
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00028	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0157	0.0058	0.0069	0.0032	0.0219
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00015	0.00011	0.00014	0.00011	0.00030
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00043	0.00180	0.00118	0.00011	0.00093
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0936	0.0589	0.120	0.0818	0.0823
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		0.000068	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.019	<0.010	<0.010	0.015	0.060
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000154	<0.0000050	0.0000897	0.0000159	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		31.3	33.8	36.1	53.5	31.7
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00016	<0.00010	0.00040	<0.00010	0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.0223	<0.00020	0.00025	0.00068	0.00259
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.125	0.072	0.218	<0.010	0.088
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000190	<0.000050	<0.000050	<0.000050	0.000076
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0030	0.0037	0.0025	0.0045	0.0028
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		7.28	14.2	7.80	12.8	7.42
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0332	0.0106	0.0359	0.00019	0.0293
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000195	<0.000050	0.000142	<0.000050	0.000337
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00097	<0.00050	0.00244	0.00075	0.00065
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.717	<0.050	<0.050	<0.050	0.529
potassium, dissolved	7440-09-7	E421	0.050	mg/L		2.94	0.486	0.612	1.83	3.18
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00241	0.00039	<0.00020	0.00032	0.00253
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000839 DTSE	0.000106	0.000099	0.000386	0.000207
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.38	1.06	2.37	3.43	2.18
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ACX	EP	SEP	MW2	IC2
					Client sampling date / time	08-Sep-2022 15:15	08-Sep-2022 14:35	08-Sep-2022 14:15	08-Sep-2022 12:45	08-Sep-2022 16:45
						WR2201065-001	WR2201065-002	WR2201065-003	WR2201065-004	WR2201065-005
						Result	Result	Result	Result	Result
Dissolved Metals										
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.75	2.16	1.34	4.37	7.68
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.171	0.209	0.175	0.231	0.165
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		11.2	7.36	9.93	14.1	11.8
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000216	0.000302	0.000361	0.000620	0.000397
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0058	<0.0010	0.0013	<0.0010	0.0023
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	IC1	IC1-R	WP2	MW1	SWP
					Client sampling date / time	08-Sep-2022 16:00	08-Sep-2022 16:10	08-Sep-2022 13:40	08-Sep-2022 11:00	08-Sep-2022 13:00
						WR2201065-006	WR2201065-007	WR2201065-008	WR2201065-009	WR2201065-010
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		175	163	214	122	117
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		175	163	214	122	117
conductivity	----	E100	2.0	µS/cm		437	439	398	269	231
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		132	132	193	136	113
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		141	140	193	137	116
solids, total dissolved [TDS]	----	E162	10	mg/L		227	216	251	163	172
solids, total suspended [TSS]	----	E160	3.0	mg/L		29.4	24.4	<3.0	7.8	<3.0
turbidity	----	E121	0.10	NTU		15.1	14.1	2.19	6.83	2.31
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		7.89	7.25	0.0338	<0.0050	0.143
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L		27.3	27.3	3.50	<0.50	1.57
fluoride	16984-48-8	E235.F	0.020	mg/L		0.083	0.088	0.107	0.056	0.051
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0091	0.0117	0.0125	0.0130	<0.0050
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0038	0.0040	<0.0010	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.934	0.901	0.0142	<0.0010	0.0283
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		19.1	19.4	1.14	26.4	5.71
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		16.5	10.2	17.0	2.54	27.3
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		20.0	24.3	18.6	2.59	28.2
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0691	0.0501	0.0049	0.0697	0.0297
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00023	0.00022	0.00024	0.00037	0.00031
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00155	0.00153	0.00649	0.00574	0.00587
barium, total	7440-39-3	E420	0.00010	mg/L		0.0775	0.0799	0.139	0.133	0.0592
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		0.000622	0.000637	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.071	0.072	<0.010	<0.010	<0.010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	IC1	IC1-R	WP2	MW1	SWP
					Client sampling date / time	08-Sep-2022 16:00	08-Sep-2022 16:10	08-Sep-2022 13:40	08-Sep-2022 11:00	08-Sep-2022 13:00
						WR2201065-006	WR2201065-007	WR2201065-008	WR2201065-009	WR2201065-010
						Result	Result	Result	Result	Result
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000366	0.0000279	0.0000067	0.0000965	0.0000080
calcium, total	7440-70-2	E420	0.050	mg/L		41.0	40.8	48.0	39.8	28.3
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000030	0.000020	<0.000010	0.000011	<0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00028	0.00027	0.00030	0.00099	0.00080
copper, total	7440-50-8	E420	0.00050	mg/L		0.00964	0.00797	<0.00050	0.00138	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		0.309	0.316	0.666	1.10	1.55
lead, total	7439-92-1	E420	0.000050	mg/L		0.000728	0.000548	<0.000050	0.000194	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0039	0.0040	0.0020	0.0028	0.0021
magnesium, total	7439-95-4	E420	0.0050	mg/L		9.34	9.32	17.8	9.21	11.1
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0737	0.0776	0.124	0.213	0.344
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000288	0.000269	0.00133	0.000214	0.000070
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00125	0.00133	0.00137	0.00351	0.00236
phosphorus, total	7723-14-0	E420	0.050	mg/L		1.62	1.72	0.118	<0.050	0.063
potassium, total	7440-09-7	E420	0.050	mg/L		4.63	4.69	8.54	0.746	4.04
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00417	0.00433	0.00135	0.00031	0.00400
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000266	0.000243	0.000142	0.000107	0.000174
silicon, total	7440-21-3	E420	0.10	mg/L		3.42	3.40	2.44	3.10	3.40
silver, total	7440-22-4	E420	0.000010	mg/L		0.000026	0.000018	<0.000010	0.000030	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		20.2	20.0	3.82	1.44	2.62
strontium, total	7440-24-6	E420	0.00020	mg/L		0.194	0.195	0.241	0.193	0.116
sulfur, total	7704-34-9	E420	0.50	mg/L		8.45	8.10	1.18	10.4	3.29
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		0.00023	0.00023	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00240 DLM	<0.00150 DLM	<0.00030	0.00178	0.00059
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000409	0.000366	0.000460	0.000352	0.000062
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00070	0.00064	<0.00050	0.00071	0.00067

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	IC1	IC1-R	WP2	MW1	SWP
					Client sampling date / time	08-Sep-2022 16:00	08-Sep-2022 16:10	08-Sep-2022 13:40	08-Sep-2022 11:00	08-Sep-2022 13:00
						WR2201065-006	WR2201065-007	WR2201065-008	WR2201065-009	WR2201065-010
						Result	Result	Result	Result	Result
Total Metals										
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0142	0.0137	<0.0030	0.0032	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00041
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0148	0.0138	0.0059	0.0012	0.0237
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00018	0.00017	0.00024	0.00030	0.00030
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00125	0.00120	0.00513	0.00044	0.00539
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0666	0.0663	0.138	0.126	0.0573
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		0.000080	0.000061	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.069	0.069	<0.010	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000366	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		38.5	38.8	48.2	39.9	27.5
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000017	0.000016	<0.000010	<0.000010	<0.000010
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00020	0.00020	0.00029	<0.00010	0.00073
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00232	0.00205	<0.00020	0.00574 DTC	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.102	0.093	0.272	<0.010	1.39
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000112	0.000114	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0036	0.0037	0.0018	0.0024	0.0018
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		8.71	8.60	17.7	8.91	10.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0595	0.0587	0.122	0.00662	0.334
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000215	0.000219	0.00120	0.000152	0.000054
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00115	0.00107	0.00129	0.00195	0.00223
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		1.06	1.01	<0.050	<0.050	0.057
potassium, dissolved	7440-09-7	E421	0.050	mg/L		4.20	4.22	8.67	0.707	3.82
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00359	0.00366	0.00143	<0.00020	0.00375
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000195	0.000224	0.000125	0.000065	0.000185
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.23	3.20	2.37	2.86	3.33
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		20.4	20.2	3.92	1.37	2.54

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	IC1	IC1-R	WP2	MW1	SWP
					Client sampling date / time	08-Sep-2022 16:00	08-Sep-2022 16:10	08-Sep-2022 13:40	08-Sep-2022 11:00	08-Sep-2022 13:00
						WR2201065-006	WR2201065-007	WR2201065-008	WR2201065-009	WR2201065-010
						Result	Result	Result	Result	Result
Dissolved Metals										
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.185	0.180	0.241	0.187	0.115
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		7.80	7.24	1.24	9.63	2.97
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	0.00012	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	0.00042
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000326	0.000335	0.000472	0.000329	0.000066
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0031	0.0032	<0.0010	0.0044	0.0014
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00050
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

Sub-Matrix: Water (Matrix: Water)				Client sample ID	AUS	ADS	----	----	----
				Client sampling date / time	07-Sep-2022 17:10	07-Sep-2022 17:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	WR2201065-011	WR2201065-012	--------	--------	--------
					Result	Result	----	----	----
Volatile Organic Compounds [Fuels]									
benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	----	----	----
xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	----	----	----
xylenes, total	1330-20-7	E611A	0.50	µg/L	<0.50	<0.50	----	----	----
BTEX, total	----	E611A	1.0	µg/L	<1.0	<1.0	----	----	----
Hydrocarbons									
EPH (C10-C19)	----	E601A	250	µg/L	<250	<250	----	----	----
EPH (C19-C32)	----	E601A	250	µg/L	<250	<250	----	----	----
HEPHw	----	EC600A	250	µg/L	<250	<250	----	----	----
LEPHw	----	EC600A	250	µg/L	<250	<250	----	----	----
Hydrocarbons Surrogates									
bromobenzotrifluoride, 2- (EPH surr)	392-83-6	E601A	1.0	%	77.3	77.0	----	----	----
Volatile Organic Compounds Surrogates									
bromofluorobenzene, 4-	460-00-4	E611A	1.0	%	91.2	91.0	----	----	----
difluorobenzene, 1,4-	540-36-3	E611A	1.0	%	98.8	98.6	----	----	----
Polycyclic Aromatic Hydrocarbons									
acenaphthene	83-32-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
acenaphthylene	208-96-8	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
acridine	260-94-6	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
anthracene	120-12-7	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
benz(a)anthracene	56-55-3	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
benzo(a)pyrene	50-32-8	E641A	0.0050	µg/L	<0.0050	<0.0050	----	----	----
benzo(b+j)fluoranthene	n/a	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
benzo(b+j+k)fluoranthene	n/a	E641A	0.015	µg/L	<0.015	<0.015	----	----	----
benzo(g,h,i)perylene	191-24-2	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
benzo(k)fluoranthene	207-08-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
chrysene	218-01-9	E641A	0.010	µg/L	<0.010	<0.010	----	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: AUS	ADS	----	----	----
					Client sampling date / time: 07-Sep-2022 17:10	07-Sep-2022 17:00	----	----	----
					WR2201065-011	**WR2201065-012**	--------	--------	--------
					Result	Result	----	----	----
Polycyclic Aromatic Hydrocarbons									
dibenz(a,h)anthracene	53-70-3	E641A	0.0050	µg/L	<0.0050	<0.0050	----	----	----
fluoranthene	206-44-0	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
fluorene	86-73-7	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
methylnaphthalene, 1-	90-12-0	E641A	0.010	µg/L	<0.010	0.014	----	----	----
methylnaphthalene, 2-	91-57-6	E641A	0.010	µg/L	<0.010	0.018	----	----	----
naphthalene	91-20-3	E641A	0.050	µg/L	<0.050	<0.050	----	----	----
phenanthrene	85-01-8	E641A	0.020	µg/L	<0.020	<0.020	----	----	----
pyrene	129-00-0	E641A	0.010	µg/L	<0.010	<0.010	----	----	----
quinoline	91-22-5	E641A	0.050	µg/L	<0.050	<0.050	----	----	----
Polycyclic Aromatic Hydrocarbons Surrogates									
chrysene-d12	1719-03-5	E641A	0.1	%	76.0	80.4	----	----	----
naphthalene-d8	1146-65-2	E641A	0.1	%	107	108	----	----	----
phenanthrene-d10	1517-22-2	E641A	0.1	%	112	116	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2201065**	Page	: 1 of 32
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Devon O'Connor	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 419 Range Road Whitehorse YT Canada Y1A 3V1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Mayo Sewage Lagoon	Date Samples Received	: 11-Sep-2022 12:30
PO	: ----	Issue Date	: 11-Oct-2022 16:21
C-O-C number	: 17-773859, 17-773860		
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- 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				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
ACX	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
EP	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
IC1	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
IC1-R	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
IC2	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW1	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
MW2	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SEP	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
SWP	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
WP2	E298	08-Sep-2022	13-Sep-2022	----	----		16-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
ACX	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
EP	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
IC1	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
IC1-R	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
IC2	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
MW1	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE MW2	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE SEP	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE SWP	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE WP2	E235.Br-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE ACX	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE EP	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE IC1	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE IC1-R	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE IC2	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE MW1	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW2	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SEP	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SWP	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE WP2	E235.Cl	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE ACX	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE EP	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE IC1	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE IC1-R	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE IC2	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE MW1	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE MW2	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE SEP	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE SWP	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE WP2	E378-U	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Fluoride in Water by IC										
HDPE ACX	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE EP	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE IC1	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE IC1-R	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE IC2	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW1	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW2	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE SEP	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE SWP	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE WP2	E235.F	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE ACX	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE EP	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE IC1	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE IC1-R	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE IC2	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW1	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW2	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SEP	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SWP	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE WP2	E235.NO3-L	08-Sep-2022	12-Sep-2022	3 days	4 days	× EHTL	12-Sep-2022	3 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE ACX	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE EP	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE IC1	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE IC1-R	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE IC2	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW1	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW2	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SEP	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SWP	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE WP2	E235.NO2-L	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	3 days	4 days	× EHTL
Anions and Nutrients : Sulfate in Water by IC										
HDPE ACX	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE EP	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE IC1	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE IC1-R	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE IC2	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW1	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW2	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SEP	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SWP	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
WP2	E235.SO4	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
ACX	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
EP	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
IC1	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
IC1-R	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
IC2	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW1	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW2	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
SEP	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
SWP	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
WP2	E509	08-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
ACX	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
EP	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
IC1	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
IC1-R	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
IC2	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW1	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW2	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SEP	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SWP	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) WP2	E421	08-Sep-2022	17-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Hydrocarbons : BC PHCs - EPH by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) ADS	E601A	07-Sep-2022	19-Sep-2022	14 days	12 days	✓	20-Sep-2022	40 days	1 days	✓
Hydrocarbons : BC PHCs - EPH by GC-FID										
Amber glass/Teflon lined cap (sodium bisulfate) AUS	E601A	07-Sep-2022	19-Sep-2022	14 days	12 days	✓	20-Sep-2022	40 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) ACX	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) EP	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) IC1	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
IC1-R	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
IC2	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
MW1	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
MW2	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
SEP	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
SWP	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
WP2	E358-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
ACX	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
EP	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
IC1	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
IC1-R	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
IC2	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
MW1	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
MW2	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
SEP	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
SWP	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
WP2	E355-L	08-Sep-2022	13-Sep-2022	----	----		13-Sep-2022	28 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
ACX	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE EP	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE IC1	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE IC1-R	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE IC2	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW1	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW2	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SEP	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SWP	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE WP2	E290	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	14 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE ACX	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE EP	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE IC1	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE IC1-R	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE IC2	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE MW1	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE MW2	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE SEP	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE SWP	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE WP2	E100	08-Sep-2022	12-Sep-2022	----	----		12-Sep-2022	28 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE ACX	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE EP	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE IC1	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE IC1-R	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE IC2	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW1	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW2	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE SEP	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE SWP	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE WP2	E162	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE ACX	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE EP	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE IC1	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE IC1-R	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE IC2	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW1	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE MW2	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE SEP	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SWP	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE WP2	E160	08-Sep-2022	----	----	----		14-Sep-2022	7 days	6 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE ACX	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE EP	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE IC1	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE IC1-R	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE IC2	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE MW1	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE MW2	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE SEP	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE SWP	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Physical Tests : Turbidity by Nephelometry										
HDPE WP2	E121	08-Sep-2022	----	----	----		16-Sep-2022	3 days	8 days	× EHTL
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) ADS	E641A	07-Sep-2022	19-Sep-2022	14 days	12 days	✓	19-Sep-2022	40 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hexane LVI GC-MS										
Amber glass/Teflon lined cap (sodium bisulfate) AUS	E641A	07-Sep-2022	19-Sep-2022	14 days	12 days	✓	19-Sep-2022	40 days	0 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) ACX	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) EP	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) IC1	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) IC1-R	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) IC2	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MW1	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) MW2	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SEP	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SWP	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) WP2	E508	08-Sep-2022	14-Sep-2022	----	----		14-Sep-2022	28 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) ACX	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) EP	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) IC1	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) IC1-R	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) IC2	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW1	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) MW2	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) SEP	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) SWP	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid) WP2	E420	08-Sep-2022	18-Sep-2022	----	----		18-Sep-2022	180 days	10 days	✓
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) ADS	E611A	07-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	14 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Volatile Organic Compounds [Fuels] : BTEX by Headspace GC-MS										
Glass vial (sodium bisulfate) AUS	E611A	07-Sep-2022	15-Sep-2022	----	----		15-Sep-2022	14 days	8 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	643615	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	644283	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	643619	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	648603	1	17	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	643618	1	17	5.8	5.0	✓
Conductivity in Water	E100	643616	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	648559	2	28	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	651954	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	644280	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	643623	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	643617	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	643620	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	643621	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	643622	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	646996	1	13	7.6	5.0	✓
Total Mercury in Water by CVAAS	E508	646857	2	28	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	651127	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	644281	1	16	6.2	5.0	✓
TSS by Gravimetry	E160	646974	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	650755	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	643615	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	644283	1	16	6.2	5.0	✓
BC PHCs - EPH by GC-FID	E601A	654306	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	643619	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	648603	1	17	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	643618	1	17	5.8	5.0	✓
Conductivity in Water	E100	643616	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	648559	2	28	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	651954	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	644280	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	643623	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	643617	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	643620	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	643621	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	654307	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	643622	1	17	5.8	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*
Laboratory Control Samples (LCS) - Continued							
TDS by Gravimetry	E162	646996	1	13	7.6	5.0	✓
Total Mercury in Water by CVAAS	E508	646857	2	28	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	651127	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	644281	1	16	6.2	5.0	✓
TSS by Gravimetry	E160	646974	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	650755	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	643615	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	644283	1	16	6.2	5.0	✓
BC PHCs - EPH by GC-FID	E601A	654306	1	15	6.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	643619	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	648603	1	17	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	643618	1	17	5.8	5.0	✓
Conductivity in Water	E100	643616	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	648559	2	28	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	651954	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	644280	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	643623	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	643617	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	643620	1	18	5.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	643621	1	18	5.5	5.0	✓
PAHs by Hexane LVI GC-MS	E641A	654307	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	643622	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	646996	1	13	7.6	5.0	✓
Total Mercury in Water by CVAAS	E508	646857	2	28	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	651127	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	644281	1	16	6.2	5.0	✓
TSS by Gravimetry	E160	646974	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	650755	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	644283	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	643619	1	17	5.8	5.0	✓
BTEX by Headspace GC-MS	E611A	648603	1	17	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	643618	1	17	5.8	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	648559	2	28	7.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	651954	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	644280	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	643623	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	643617	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	643620	1	18	5.5	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*
Matrix Spikes (MS) - Continued							
Nitrite in Water by IC (Low Level)	E235.NO2-L	643621	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	643622	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	646857	2	28	7.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	651127	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	644281	1	16	6.2	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
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 Vancouver - 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 Vancouver - 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 (Low Level)	E235.Br-L Vancouver - 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 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - 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 Vancouver - 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 (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a 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 Vancouver - 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.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
BC PHCs - EPH by GC-FID	E601A Vancouver - Environmental	Water	BC MOE Lab Manual	Sample extracts are analyzed by GC-FID for BC hydrocarbon fractions.
BTEX by Headspace GC-MS	E611A Vancouver - Environmental	Water	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hexane LVI GC-MS	E641A Vancouver - Environmental	Water	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are analyzed by large volume injection (LVI) GC-MS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
LEPH and HEPH: EPH-PAH	EC600A Vancouver - Environmental	Water	BC MOE Lab Manual (LEPH and HEPH) (mod)	Light Extractable Petroleum Hydrocarbons (LEPH) and Heavy Extractable Petroleum Hydrocarbons (HEPH) are calculated as follows: LEPH = Extractable Petroleum Hydrocarbons (EPH10-19) minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene; HEPH = Extractable Petroleum Hydrocarbons (EPH19-32) minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.
VOCs Preparation for Headspace Analysis	EP581 Vancouver - Environmental	Water	EPA 5021A (mod)	Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler. An aliquot of the headspace is then injected into the GC/MS-FID system.
PHCs and PAHs Hexane Extraction	EP601 Vancouver - Environmental	Water	EPA 3511 (mod)	Petroleum Hydrocarbons (PHCs) and Polycyclic Aromatic Hydrocarbons (PAHs) are extracted using a hexane liquid-liquid extraction.

QUALITY CONTROL REPORT

Work Order	: **WR2201065**	Page	: 1 of 20
Client	: Government of Yukon	Laboratory	: Whitehorse - Environmental
Contact	: Devon O'Connor	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 419 Range Road Whitehorse YT Canada Y1A 3V1	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Mayo Sewage Lagoon	Date Samples Received	: 11-Sep-2022 12:30
PO	: ----	Date Analysis Commenced	: 12-Sep-2022
C-O-C number	: 17-773859, 17-773860	Issue Date	: 11-Oct-2022 16:27
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anshim Anshim	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Benjamin Oke	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
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Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Vancouver Organics, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, 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: 643615)											
FJ2202507-003	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	143	138	4.06%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	143	138	4.06%	20%	----
Physical Tests (QC Lot: 643616)											
FJ2202507-003	Anonymous	conductivity	----	E100	2.0	µS/cm	739	733	0.815%	10%	----
Physical Tests (QC Lot: 646974)											
VA22C1819-021	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	4.6	3.8	0.8	Diff <2x LOR	----
Physical Tests (QC Lot: 646996)											
VA22C1819-021	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	1670	1590	4.99%	20%	----
Physical Tests (QC Lot: 650755)											
FJ2202576-001	Anonymous	turbidity	----	E121	0.10	NTU	4.07	3.87	4.94%	15%	----
Anions and Nutrients (QC Lot: 643617)											
FJ2202507-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.126	0.123	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 643618)											
FJ2202507-001	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	<2.50	<2.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 643619)											
FJ2202507-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 643620)											
FJ2202507-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	1.45	1.45	0.0611%	20%	----
Anions and Nutrients (QC Lot: 643621)											
FJ2202507-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 643622)											
FJ2202507-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	269	269	0.202%	20%	----
Anions and Nutrients (QC Lot: 643623)											
FJ2202507-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0109	0.0106	2.70%	20%	----
Anions and Nutrients (QC Lot: 644283)											
FJ2202512-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 644280)											
FJ2202512-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.54	1.77	0.23	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Organic / Inorganic Carbon (QC Lot: 644281)											
FJ2202512-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.48	1.69	0.20	Diff <2x LOR	----
Total Metals (QC Lot: 646857)											
VA22C1661-006	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 646858)											
WR2201065-008	WP2	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 651127)											
VA22C2052-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0738	0.0746	1.14%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00276	0.00276	0.113%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00485	0.00504	3.73%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0111	0.0113	1.48%	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	0.100	0.102	1.85%	20%	----
		cadmium, total	7440-43-9	E420	0.0000350	mg/L	<0.0000350	<0.0000350	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	46.2	46.3	0.347%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.00133	0.00134	0.555%	20%	----
		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	0.00040	0.00043	0.00003	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00100	0.00103	0.00003	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.843	0.855	1.38%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0086	0.0087	0.00008	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	71.6	73.1	2.06%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0142	0.0144	1.34%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0431	0.0437	1.40%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00818	0.00847	3.43%	20%	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	0.095	0.133	0.038	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	39.6	40.3	1.84%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0175	0.0184	5.00%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	40.3 µg/L	0.0419	3.82%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	6.72	7.00	4.01%	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	10.5	10.8	2.79%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.112	0.113	0.449%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	12.7	13.4	5.51%	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: 651127) - continued											
VA22C2052-001	Anonymous	tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	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	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00409	0.00417	1.98%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.0139	0.0141	1.44%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.0136	0.0138	0.903%	20%	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 648559)											
VA22C1657-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 648560)											
WR2201065-004	MW2	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 651954)											
VA22C1701-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0090	0.0085	0.0005	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00068	0.00064	0.00005	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0234	0.0235	0.320%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	18.4	19.1	4.24%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00031	0.00031	0.000003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.017	0.017	0.0003	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	3.04	3.02	0.592%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00239	0.00248	3.81%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000735	0.000734	0.136%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 651954) - continued											
VA22C1701-001	Anonymous	phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	0.808	0.828	0.020	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00047	0.00049	0.00002	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	0.000069	0.000019	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.76	4.82	1.26%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	3.63	3.67	1.01%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.128	0.136	6.51%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	1.74	1.96	0.22	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000117	0.000118	0.645%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00051	0.00054	0.00003	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 648603)											
VA22C1829-001	Anonymous	benzene	71-43-2	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		ethylbenzene	100-41-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		styrene	100-42-5	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		toluene	108-88-3	E611A	0.50	µg/L	<0.50	<0.50	0	Diff <2x LOR	----
		xylene, m+p-	179601-23-1	E611A	0.40	µg/L	<0.40	<0.40	0	Diff <2x LOR	----
		xylene, o-	95-47-6	E611A	0.30	µg/L	<0.30	<0.30	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: 643615)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	1.1	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.1	----
Physical Tests (QCLot: 643616)						
conductivity	----	E100	1	µS/cm	1.1	----
Physical Tests (QCLot: 646974)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 646996)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 650755)						
turbidity	----	E121	0.1	NTU	<0.10	----
Anions and Nutrients (QCLot: 643617)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 643618)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 643619)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 643620)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 643621)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 643622)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 643623)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 644283)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 644280)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 644281)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 646857)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 646858)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 651127)						
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	----
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 651127) - continued						
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	----
Dissolved Metals (QCLot: 648559)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 648560)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 651954)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 651954) - continued						
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Volatile Organic Compounds (QCLot: 648603)						
benzene	71-43-2	E611A	0.5	µg/L	<0.50	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	<0.50	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	<0.50	----
styrene	100-42-5	E611A	0.5	µg/L	<0.50	----
toluene	108-88-3	E611A	0.5	µg/L	<0.50	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	<0.40	----
xylene, o-	95-47-6	E611A	0.3	µg/L	<0.30	----
Hydrocarbons (QCLot: 654306)						
EPH (C10-C19)	----	E601A	250	µg/L	<250	----
EPH (C19-C32)	----	E601A	250	µg/L	<250	----
Polycyclic Aromatic Hydrocarbons (QCLot: 654307)						
acenaphthene	83-32-9	E641A	0.01	µg/L	<0.010	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	<0.010	----
acridine	260-94-6	E641A	0.01	µg/L	<0.010	----
anthracene	120-12-7	E641A	0.01	µg/L	<0.010	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	<0.010	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	<0.0050	----
benzo(b+j)fluoranthene	n/a	E641A	0.01	µg/L	<0.010	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	<0.010	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 654307) - continued						
chrysene	218-01-9	E641A	0.01	µg/L	<0.010	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	<0.0050	----
fluoranthene	206-44-0	E641A	0.01	µg/L	<0.010	----
fluorene	86-73-7	E641A	0.01	µg/L	<0.010	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	<0.010	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	<0.010	----
naphthalene	91-20-3	E641A	0.05	µg/L	<0.050	----
phenanthrene	85-01-8	E641A	0.02	µg/L	<0.020	----
pyrene	129-00-0	E641A	0.01	µg/L	<0.010	----
quinoline	91-22-5	E641A	0.05	µg/L	<0.050	----

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: 643615)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	121	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	106	85.0	115	----
Physical Tests (QCLot: 643616)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 646974)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	103	85.0	115	----
Physical Tests (QCLot: 646996)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	108	85.0	115	----
Physical Tests (QCLot: 650755)									
turbidity	----	E121	0.1	NTU	200 NTU	102	85.0	115	----
Anions and Nutrients (QCLot: 643617)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	94.1	90.0	110	----
Anions and Nutrients (QCLot: 643618)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	98.5	90.0	110	----
Anions and Nutrients (QCLot: 643619)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	99.3	85.0	115	----
Anions and Nutrients (QCLot: 643620)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.9	90.0	110	----
Anions and Nutrients (QCLot: 643621)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	97.6	90.0	110	----
Anions and Nutrients (QCLot: 643622)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 643623)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	97.1	80.0	120	----
Anions and Nutrients (QCLot: 644283)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.1	85.0	115	----
Organic / Inorganic Carbon (QCLot: 644280)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	99.6	80.0	120	----
Organic / Inorganic Carbon (QCLot: 644281)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	104	80.0	120	----
Total Metals (QCLot: 646857)									

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: 646857) - continued									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	88.6	80.0	120	----
Total Metals (QCLot: 646858)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	91.0	80.0	120	----
Total Metals (QCLot: 651127)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.8	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	98.6	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	98.6	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	93.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	99.5	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	99.2	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.1	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	97.9	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	98.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	96.6	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	98.6	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	98.3	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.8	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	97.6	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	97.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	95.4	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	94.9	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	99.1	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	97.3	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	105	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	97.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	99.4	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	93.8	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.6	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: 651127) - continued									
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.9	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	95.8	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.6	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	99.4	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.2	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	99.0	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	92.3	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	89.3	80.0	120	----
Dissolved Metals (QCLot: 651954)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.9	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.3	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.3	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.6	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.3	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	98.7	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	98.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	94.2	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.5	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	95.5	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.2	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.2	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	97.2	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.8	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.9	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	99.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	98.0	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	94.4	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	98.2	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	97.8	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
Dissolved Metals (QCLot: 651954) - continued									
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	111	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.1	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	91.1	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.9	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	92.0	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	94.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	93.1	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.7	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	96.9	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.0	80.0	120	----
Volatile Organic Compounds (QCLot: 648603)									
benzene	71-43-2	E611A	0.5	µg/L	100 µg/L	104	70.0	130	----
ethylbenzene	100-41-4	E611A	0.5	µg/L	100 µg/L	106	70.0	130	----
methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	0.5	µg/L	100 µg/L	104	70.0	130	----
styrene	100-42-5	E611A	0.5	µg/L	100 µg/L	104	70.0	130	----
toluene	108-88-3	E611A	0.5	µg/L	100 µg/L	105	70.0	130	----
xylene, m+p-	179601-23-1	E611A	0.4	µg/L	200 µg/L	108	70.0	130	----
xylene, o-	95-47-6	E611A	0.3	µg/L	100 µg/L	102	70.0	130	----
Hydrocarbons (QCLot: 654306)									
EPH (C10-C19)	----	E601A	250	µg/L	6491 µg/L	95.6	70.0	130	----
EPH (C19-C32)	----	E601A	250	µg/L	3363 µg/L	97.4	70.0	130	----
Polycyclic Aromatic Hydrocarbons (QCLot: 654307)									
acenaphthene	83-32-9	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
acenaphthylene	208-96-8	E641A	0.01	µg/L	0.5 µg/L	107	60.0	130	----
acridine	260-94-6	E641A	0.01	µg/L	0.5 µg/L	100	60.0	130	----
anthracene	120-12-7	E641A	0.01	µg/L	0.5 µg/L	115	60.0	130	----
benz(a)anthracene	56-55-3	E641A	0.01	µg/L	0.5 µg/L	78.8	60.0	130	----
benzo(a)pyrene	50-32-8	E641A	0.005	µg/L	0.5 µg/L	105	60.0	130	----
benzo(b+j)fluoranthene	n/a	E641A	0.01	µg/L	0.5 µg/L	107	60.0	130	----
benzo(g,h,i)perylene	191-24-2	E641A	0.01	µg/L	0.5 µg/L	121	60.0	130	----
benzo(k)fluoranthene	207-08-9	E641A	0.01	µg/L	0.5 µg/L	122	60.0	130	----
chrysene	218-01-9	E641A	0.01	µg/L	0.5 µg/L	97.1	60.0	130	----
dibenz(a,h)anthracene	53-70-3	E641A	0.005	µg/L	0.5 µg/L	111	60.0	130	----
fluoranthene	206-44-0	E641A	0.01	µg/L	0.5 µg/L	117	60.0	130	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 654307) - continued									
fluorene	86-73-7	E641A	0.01	µg/L	0.5 µg/L	118	60.0	130	----
indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.01	µg/L	0.5 µg/L	109	60.0	130	----
methylnaphthalene, 1-	90-12-0	E641A	0.01	µg/L	0.5 µg/L	112	60.0	130	----
methylnaphthalene, 2-	91-57-6	E641A	0.01	µg/L	0.5 µg/L	106	60.0	130	----
naphthalene	91-20-3	E641A	0.05	µg/L	0.5 µg/L	104	50.0	130	----
phenanthrene	85-01-8	E641A	0.02	µg/L	0.5 µg/L	118	60.0	130	----
pyrene	129-00-0	E641A	0.01	µg/L	0.5 µg/L	120	60.0	130	----
quinoline	91-22-5	E641A	0.05	µg/L	0.5 µg/L	110	60.0	130	----

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: 643617)										
FJ2202507-002	Anonymous	fluoride	16984-48-8	E235.F	4.45 mg/L	5 mg/L	88.9	75.0	125	----
Anions and Nutrients (QCLot: 643618)										
FJ2202507-002	Anonymous	chloride	16887-00-6	E235.Cl	461 mg/L	500 mg/L	92.2	75.0	125	----
Anions and Nutrients (QCLot: 643619)										
FJ2202507-002	Anonymous	bromide	24959-67-9	E235.Br-L	2.34 mg/L	2.5 mg/L	93.7	75.0	125	----
Anions and Nutrients (QCLot: 643620)										
FJ2202507-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	11.7 mg/L	12.5 mg/L	93.6	75.0	125	----
Anions and Nutrients (QCLot: 643621)										
FJ2202507-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.25 mg/L	2.5 mg/L	90.0	75.0	125	----
Anions and Nutrients (QCLot: 643622)										
FJ2202507-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	471 mg/L	500 mg/L	94.2	75.0	125	----
Anions and Nutrients (QCLot: 643623)										
FJ2202507-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0291 mg/L	0.03 mg/L	96.9	70.0	130	----
Anions and Nutrients (QCLot: 644283)										
FJ2202512-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.102 mg/L	0.1 mg/L	102	75.0	125	----
Organic / Inorganic Carbon (QCLot: 644280)										
FJ2202512-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.13 mg/L	5 mg/L	103	70.0	130	----
Organic / Inorganic Carbon (QCLot: 644281)										
FJ2202512-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.50 mg/L	5 mg/L	110	70.0	130	----
Total Metals (QCLot: 646857)										
VA22C1661-007	Anonymous	mercury, total	7439-97-6	E508	0.0000933 mg/L	0.0001 mg/L	93.3	70.0	130	----
Total Metals (QCLot: 646858)										
WR2201065-009	MW1	mercury, total	7439-97-6	E508	0.0000932 mg/L	0.0001 mg/L	93.2	70.0	130	----
Total Metals (QCLot: 651127)										
WR2201062-001	Anonymous	aluminum, total	7429-90-5	E420	9.62 mg/L	10 mg/L	96.2	70.0	130	----
		antimony, total	7440-36-0	E420	0.968 mg/L	1 mg/L	96.8	70.0	130	----
		arsenic, total	7440-38-2	E420	0.990 mg/L	1 mg/L	99.0	70.0	130	----
		barium, total	7440-39-3	E420	0.938 mg/L	1 mg/L	93.8	70.0	130	----
		beryllium, total	7440-41-7	E420	2.00 mg/L	2 mg/L	100	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: 651127) - continued										
WR2201062-001	Anonymous	bismuth, total	7440-69-9	E420	0.473 mg/L	0.5 mg/L	94.6	70.0	130	----
		boron, total	7440-42-8	E420	4.53 mg/L	5 mg/L	90.6	70.0	130	----
		cadmium, total	7440-43-9	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		calcium, total	7440-70-2	E420	198 mg/L	200 mg/L	98.9	70.0	130	----
		cesium, total	7440-46-2	E420	0.485 mg/L	0.5 mg/L	97.1	70.0	130	----
		chromium, total	7440-47-3	E420	2.00 mg/L	2 mg/L	100	70.0	130	----
		cobalt, total	7440-48-4	E420	0.964 mg/L	1 mg/L	96.4	70.0	130	----
		copper, total	7440-50-8	E420	0.981 mg/L	1 mg/L	98.1	70.0	130	----
		iron, total	7439-89-6	E420	95.9 mg/L	100 mg/L	95.9	70.0	130	----
		lead, total	7439-92-1	E420	0.955 mg/L	1 mg/L	95.5	70.0	130	----
		lithium, total	7439-93-2	E420	4.99 mg/L	5 mg/L	99.8	70.0	130	----
		magnesium, total	7439-95-4	E420	48.4 mg/L	50 mg/L	96.8	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.989 mg/L	1 mg/L	98.9	70.0	130	----
		nickel, total	7440-02-0	E420	2.03 mg/L	2 mg/L	102	70.0	130	----
		phosphorus, total	7723-14-0	E420	479 mg/L	500 mg/L	95.8	70.0	130	----
		potassium, total	7440-09-7	E420	199 mg/L	200 mg/L	99.3	70.0	130	----
		rubidium, total	7440-17-7	E420	1.03 mg/L	1 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	1.97 mg/L	2 mg/L	98.5	70.0	130	----
		silicon, total	7440-21-3	E420	469 mg/L	500 mg/L	93.8	70.0	130	----
		silver, total	7440-22-4	E420	0.206 mg/L	0.2 mg/L	103	70.0	130	----
		sodium, total	7440-23-5	E420	98.4 mg/L	100 mg/L	98.4	70.0	130	----
		strontium, total	7440-24-6	E420	0.996 mg/L	1 mg/L	99.6	70.0	130	----
		sulfur, total	7704-34-9	E420	972 mg/L	1000 mg/L	97.2	70.0	130	----
		tellurium, total	13494-80-9	E420	1.98 mg/L	2 mg/L	98.9	70.0	130	----
		thallium, total	7440-28-0	E420	0.196 mg/L	0.2 mg/L	97.8	70.0	130	----
		thorium, total	7440-29-1	E420	1.02 mg/L	1 mg/L	102	70.0	130	----
		tin, total	7440-31-5	E420	0.977 mg/L	1 mg/L	97.7	70.0	130	----
		titanium, total	7440-32-6	E420	1.90 mg/L	2 mg/L	95.1	70.0	130	----
		tungsten, total	7440-33-7	E420	0.950 mg/L	1 mg/L	95.0	70.0	130	----
		uranium, total	7440-61-1	E420	0.200 mg/L	0.2 mg/L	99.8	70.0	130	----
		vanadium, total	7440-62-2	E420	4.73 mg/L	5 mg/L	94.6	70.0	130	----
		zinc, total	7440-66-6	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		zirconium, total	7440-67-7	E420	2.02 mg/L	2 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 648559)										
VA22C1657-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000948 mg/L	0.0001 mg/L	94.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 648560)										
WR2201065-005	IC2	mercury, dissolved	7439-97-6	E509	0.0000902 mg/L	0.0001 mg/L	90.2	70.0	130	----
Dissolved Metals (QCLot: 651954)										
VA22C1701-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.196 mg/L	0.2 mg/L	97.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00866 mg/L	0.01 mg/L	86.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.100 mg/L	0.1 mg/L	99.5	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00403 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00990 mg/L	0.01 mg/L	99.0	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0393 mg/L	0.04 mg/L	98.4	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.94 mg/L	2 mg/L	96.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0987 mg/L	0.1 mg/L	98.7	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0199 mg/L	0.02 mg/L	99.6	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	9.98 mg/L	10 mg/L	99.8	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.85 mg/L	4 mg/L	96.2	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0419 mg/L	0.04 mg/L	105	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.19 mg/L	10 mg/L	91.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.7 mg/L	20 mg/L	98.5	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0372 mg/L	0.04 mg/L	93.1	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
Dissolved Metals (QCLot: 651954) - continued										
VA22C1701-002	Anonymous	tungsten, dissolved	7440-33-7	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00374 mg/L	0.004 mg/L	93.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0984 mg/L	0.1 mg/L	98.4	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.389 mg/L	0.4 mg/L	97.2	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
Volatile Organic Compounds (QCLot: 648603)										
VA22C1829-002	Anonymous	benzene	71-43-2	E611A	101 µg/L	100 µg/L	101	60.0	140	----
		ethylbenzene	100-41-4	E611A	106 µg/L	100 µg/L	106	60.0	140	----
		methyl-tert-butyl ether [MTBE]	1634-04-4	E611A	106 µg/L	100 µg/L	106	60.0	140	----
		styrene	100-42-5	E611A	100 µg/L	100 µg/L	100	60.0	140	----
		toluene	108-88-3	E611A	105 µg/L	100 µg/L	105	60.0	140	----
		xylene, m+p-	179601-23-1	E611A	215 µg/L	200 µg/L	107	60.0	140	----
		xylene, o-	95-47-6	E611A	101 µg/L	100 µg/L	101	60.0	140	----

Chain of Custody (COC) / Analytical Request Form

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Yukon Water Resources Branch	Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Devon O'Connor	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	867-689-1894	☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Street:	419 Range Road	Email 1 or Fax: Devon.O'Connor@Yukon.ca	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Whitehorse	Email 2: Norbert.Botz@Yukon.ca	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:		Email 3	
Invoice To	Same as Report To ☒ YES ☐ NO	**Invoice Distribution**	**Analysis Request**
	Copy of Invoice with Report ☒ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Mayo Sewage Lagoon	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This descript	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below: Major Ions & Nutrients	Nitrate, Nitrite, Ammonia	Unionized ammonia	Chloride	TSS, TDS	Turbidity, Conductivity	Alkalinity	TOC/DOC	T/D metals & mercury					SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	ACX	8-Sep-2022	15:15	Water	7	✓	✓	✓	✓	✓	✓	✓	✓	✓						
	ED		14:35		10															
	SEP		14:15																	
	MW2		12:45																	
	IC2		16:45																	
	IC1		16:00																	
	IC1-R		16:10																	
	WP2		13:40																	
	MW1		11:00																	
	SWP		13:00																	

Environmental Division
Whitehorse
Work Order Reference
WR2201065

Telephone : +1 867 668 6689

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			
							7

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:	Time:
Devon O'Connor	10-Sep-2022					HA	9/11	12:30p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2015 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 773860

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Yukon Water Resources Branch	Select Report Format: ☐ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	~~Cole Fisher~~ Fischer	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	867-667-3439	☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
Street:	419 Range Rd	Email 1 or Fax: Cole.Fischer@Yukon.ca	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Whitehorse Yukon	Email 2: Devon.OConnor@Yukon.ca	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:		Email 3	

Invoice To		Invoice Distribution
	Same as Report To ☒ YES ☐ NO	Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX
	Copy of Invoice with Report ☒ YES ☐ NO	
Company:		Email 1 or Fax
Contact:	~~Cole Fisher~~ Cole.Fischer@Yukon.ca	Email 2

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Keno Audit	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		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	PAH	BTEX	LEPH	HEPH	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	AUS -	7-Sep-2022	17:10	Water	6	✓	✓	✓	✓		
	ADS	1	17:00	Water	6	✓	✓	✓	✓		

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			
							7

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:	Time:
Devon O'Connor	10-Sep-2022					HO	9/11	12:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix C – Water isotope and artificial sweetener sample results

Water Isotope Data

Environmental Isotope Laboratory – University of Waterloo

#	Sample	Date	Lab#	$\delta^{18}O$	Result	Repeat	$\delta^{2}H$	Result	Repeat
				H_2O	VSMOW ± 0.2‰		H_2O	VSMOW ± 0.8‰	
16	MW-1	2022-09-08	489122	x	-21.68	-21.49	x	-167.97	-167.92
17	MW-2	2022-09-08	489123	x	-21.66		x	-170.34	
18	IC2	2022-09-08	489124	x	-20.43		x	-163.65	
19	SEP	2022-09-08	489125	x	-21.58		x	-168.40	
20	WP2	2022-09-08	489126	x	-14.41		x	-138.22	
21	SWP	2022-09-08	489127	x	-18.73	-18.71	x	-158.68	-157.88
22	EP	2022-09-08	489128	x	-19.46		x	-162.26	
23	IC1	2022-09-08	489129	x	-20.20		x	-163.21	
24	ACX	2022-09-08	489130	x	-21.06	-21.07	x	-166.10	-166.50

NSL= No sample left, bottle arrived empty

^{18}O Isotope Analysis:

Equipment, data report guide and precision details

The analysis of solid materials for 18O isotope measurements was determined through high temperature (1440^{O}C) pyrolysis combustion conversion of sample material to CO gas. This is accomplished through the use of an Elementar Vario Pyro Cube elemental analyzer coupled to an Isoprime (GV Instruments) continuous flow isotope ratio mass spectrometer (CFIRMS).

Results report and column guide;

All samples that arrive at EIL (Sample column) are assigned unique Lab numbers (Lab # column) the total of which (# column) is grouped within a unique EIL ISO file number (2018XXX).

The sample weight (Weight column) used in analysis along with the measured CO signal (Major Peak Area column) may or may not be included in the final report. This is usually of interest to researchers and clients that are weighing out their own samples and require the information to adjust the sample target weight for sample repeat submission; these details are available upon request.

The %O element content (Total % column) is a bulk measurement based on the sample weight against known certified elemental standard materials. This is only secondary information to the isotope results and is often subject to wide variation due to material combustion difficulties and sometimes impurity issues causing fluctuating peak areas. For this reason this information is often omitted or used only as a sample purity or combustion efficiency guide.

The $\delta^{18}O$ data ($\delta^{18}O$ RESULT / VSMOW column) is the corrected delta value, reported in per mil (‰) units, relative to the primary reference scale of VSMOW water.

General Precision details;

Data quality control is monitored and corrections made using an array of international reference material and in-house EIL standards that are calibrated using certified international reference materials (IAEA-SO-5 + SO-6, NBS-127, IAEA-600, IAEA-601 + 602), with values provided through CIAAW. Whenever possible, we find it best to run like-against-like materials i.e. sulphate Std /Ref materials with sulphate samples. For cellulose analysis (tree ring, sediment cellulose), isotopic values have been determined for cellulose materials (IAEA-CH3, EIL-52 and EIL-54) and are used for data correction of these sample materials.

Sample materials are repeated every 4-5 sample. Of the total sample number dropped in an analytical run, no less than 20% are Std/Ref materials. These Std/Ref measurements are used in data normalization and to ensure daily mass spec precision and accuracy; also to assess linearity issues or mass spec drift throughout the duration of the run. With these QA/QC checks, an error of 0.3‰ $\delta^{18}O$ are required for reportable data.

Artificial Sweetener Analysis

John Spoelstra Environment and Climate Change Canada

Method: IC/ESI/MS/MS
mdl minimum detection limit
pql practical quantitation limit
j indicates >mdl but < pql
n.d. not detected

	Acesulfame	Saccharin	Cyclamate	Sucralose
	ng/L	ng/L	ng/L	ng/L
mdl	2	2	3	20
pql	6	6	8	60

Sample Name	Date Sampled	Date Analysed	Analysis Sample Name	Acesulfame	Saccharin	Cyclamate	Sucralose
MW-1	9-Sep-22	15-Nov-22	20220303	n.d.	4j	n.d.	n.d.
MW-2	9-Sep-22	15-Nov-22	20220304	1763	n.d.	12	2982
MW-2	9-Sep-22	15-Nov-22	20220304 du	1733	n.d.	12	3162
SWP	9-Sep-22	15-Nov-22	20220305	293	n.d.	n.d.	n.d.
IC1	9-Sep-22	15-Nov-22	20220306	8156	4144	14161	18266
IC2	9-Sep-22	15-Nov-22	20220307	3989	1805	2735	8371
ACX	9-Sep-22	15-Nov-22	20220308	4045	3121	21783	6581
WP2	9-Sep-22	15-Nov-22	20220309	503	163	117	634
SEP	9-Sep-22	15-Nov-22	20220310	n.d.	n.d.	n.d.	n.d.
EP	8-Sep-22	15-Nov-22	20220519	n.d.	2j	n.d.	n.d.

Appendix D – Photo log

Photo 1. T-5

Eastern monitoring well, damaged by suspected frost heaving.

Photo 2. T-4

Western monitoring well. Good condition.

Photo 3. SEP

South east pond, looking downstream towards Mayo River.

Photo 4. SEP

South east pond looking upstream towards T-5..

Photo 5. SWP

South west pond, looking west.

Photo 6. WP2

West pond adjacent to facility and spillway location. Looking west.

Photo 7. WP2

West pond adjacent to facility and spillway location. Looking east towards spillway/facility. Pond immediately behind photographer.

Photo 8. ACX

Influent junction between anaerobic cells, discharging to infiltration cells.

Photo 9. ACX

Influent junction between anaerobic cells, discharging to infiltration cells.

Photo 10. East Anaerobic Cell

ACX sample accessed via manhole immediately behind photographer.

Photo 11. West anaerobic cell

ACX sample accessed via manhole immediately behind photographer.

Photo 12. IC2

West infiltration cell.

Photo 13. IC1

East infiltration cell.