Water Resources Audit Report

Dawson City Municipal Wastewater Facility

Water Resources Branch
August 2024

Preface

The Water Resources Branch (WRB) within the Government of Yukon's Department of Environment includes a team of water scientists and technologists in water quality, groundwater, and hydrology. We conduct periodic studies at various sites across the Yukon that have a potential to impact water. These studies, called audits, are undertaken to improve our knowledge and understanding of a project's effects on the receiving water environment.

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. Through the audit process we aim to identify emerging issues and build enhanced understanding of water quality and quantity conditions to support input into these regulatory 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 a determination of compliance with any existing permit or licence.

Executive summary

WRB conducted an audit of the Dawson City Wastewater Treatment Facility (WWTF) during the 2024 open-water season to evaluate its operational performance, environmental impacts and compliance with licence standards and other guidelines. The facility, which uses a compact Vertreat system specifically designed for Dawson's extreme climate and small urban footprint, has demonstrated consistent success in treating un-ionized ammonia and maintaining stable pH levels, with no exceedances recorded since monitoring began. However, there are ongoing challenges with other key parameters including carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS) and fecal coliforms, which have been measured to be above effluent quality standards during the summer months.

Across the period of record, values measured above EQS are most common during summer months when there is: 1) increased tourist activity and population that results in more waste to the system; and 2) less clean water dilution provided by operation of bleeder valves.

Operational logs indicated that grease in the influent – a contaminant the facility was not designed to treat – has resulted in the increased frequency of filter clogging and resultant maintenance issues. The facility's biological treatment processes, while effective for ammonia and organic matter, are vulnerable to difficulties caused by high grease concentrations in the influent, which increases operational costs and reduces the system's overall efficiency.

Additionally, to reduce excess water consumption by bleeders during the summer months, Dawson City transitioned to the Metered Water Program. This may further challenge operations by reducing the volume of clean water entering the system and is suspected to increase the relative concentration of contaminants.

Despite these challenges, facility operators have communicated the implementation of proactive measures such as regular filter maintenance and additional monitoring outside of licence requirements.

The audit also included an assessment of potential impacts on the receiving environment, (the Yukon River), using a simple mixing calculation. Due to the river's immense volume and natural dilution capacity, the facility's discharge was found to have low potential for effects on a fully mixed Yukon River. A worst-case scenario model simulating the release of untreated wastewater during periods of extreme low river flow predicted only minor increases in total ammonia and fecal coliform concentrations, and concentrations remained below thresholds for the protection of aquatic life. This analysis underscores that any notable effects from the facility discharge is likely confined to an area within the mixing zone of the effluent and river.

The final point of discharge is located mid-channel in the Yukon River, and satellite imagery shows this is in the vicinity of the visual colour boundary created by the Klondike and Yukon Rivers. As such, monitoring of the effluent mixing zone is complicated by the additional mixing zone that occurs between these two rivers.

As a result of the above-mentioned analyses, the following is recommended:

1) **Improve source controls for oil and grease**: Our understanding is there are efforts underway with the Department of Community Services and the municipality to explore ways to reduce the potential for oil and grease in influent water.
2) **Consider facility upgrades**: WRB understands the Department of Community Services is investigating options to retrofit the system to include an oil and grease treatment capacity.
3) **Add oil and grease monitoring to the schedule of the licence**: The licence proponent should include oil and grease sampling in the licence at DC-2 and DC-3 to verify and quantify oil and grease in wastewater.

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1 Introduction and background

The Government of Yukon, Department of Environment - Water Resources Branch (WRB) conducted an audit of the Dawson City Wastewater Facility during the open-water season of 2024. The purpose of the audit was to learn about the facility, gain familiarity with the site and identify any potential impacts to the receiving water environment. The facility is centrally located at 397 Fifth Ave in Dawson City and is on the traditional territory of the Tr'ondëk Hwëch'in Government.

Throughout the development of this report, site operators communicated with WRB that they have been working with the City of Dawson to develop ways they can collaborate to monitor and inspect the major impactors of influent water quality.

1.1 Facility overview

Currently, the operating facility is a mechanical wastewater treatment plant constructed in 2011 and is located on 5th Avenue between Turner and Church Streets (Figure 1). The Dawson WWTF is a Vertreat facility which uses an aerobic activated sludge system that can achieve a high rate of treatment in a compact facility, utilizing an in-ground shaft reactor. The Vertreat facility was chosen as the best option to treat wastewater in Dawson City because the facility can be contained within such a small footprint, allowing it to be constructed in the downtown area and be directly connected to municipal sewage lines. Also, the system is indoors, negating many of the issues posed by the extreme winter temperatures in Dawson City (NORAM Engineering and Constructors Ltd., 2015). A lagoon-type facility would have to be located outside of the downtown area, would rely on trucked waste transport, and would encounter all the difficulties posed by extreme weather conditions.

Municipal sewer lines direct wastewater from commercial and residential sources in Dawson City, and this influent enters the plant into a large sump which acts as an initial holding area. Mechanical screens remove large debris from the water and assist with reducing TSS, followed by grit screening and the flammable liquid diverter. Then the

water is mixed with “activated sludge” which is a deliberately maintained collection of microorganisms that help break down organic waste. This mix is all pumped into the bioreactor to be aerated which encourages the microorganisms to digest organic waste and reduce contaminants such as nutrients and organic pollutants (addressing CBOD, un-ionized ammonia and fecal coliforms). After the organic matter is fully broken down, the wastewater moves to the flotation clarifier to remove remaining solid particles and sludge from the wastewater. Post-clarifier cloth filters remove ammonia and nitrogen compounds. Finally, a bay of UV disinfection lights further sterilizes the water as it leaves the facility. The facility processes are illustrated in as a flow chart based on design documents of the facility.

Treated effluent is discharged into the Yukon River mid-channel (Figure 1), in line with Church Street, downstream of the city’s water supply wells. The WWTF is designed to treat $CBOD_5$, TSS, ammonia and fecal coliform; however, there have been operational challenges that have led to increased maintenance costs and some performance issues. Operators of the WWTF have taken several steps to improve the facility function and operation in recent years, and details surrounding these improvements are included in maintenance logs and daily activity logs.

Figure 1. Dawson City municipal wastewater treatment facility location and approximate path of effluent discharge as it is piped underground to the Yukon River mid-channel.

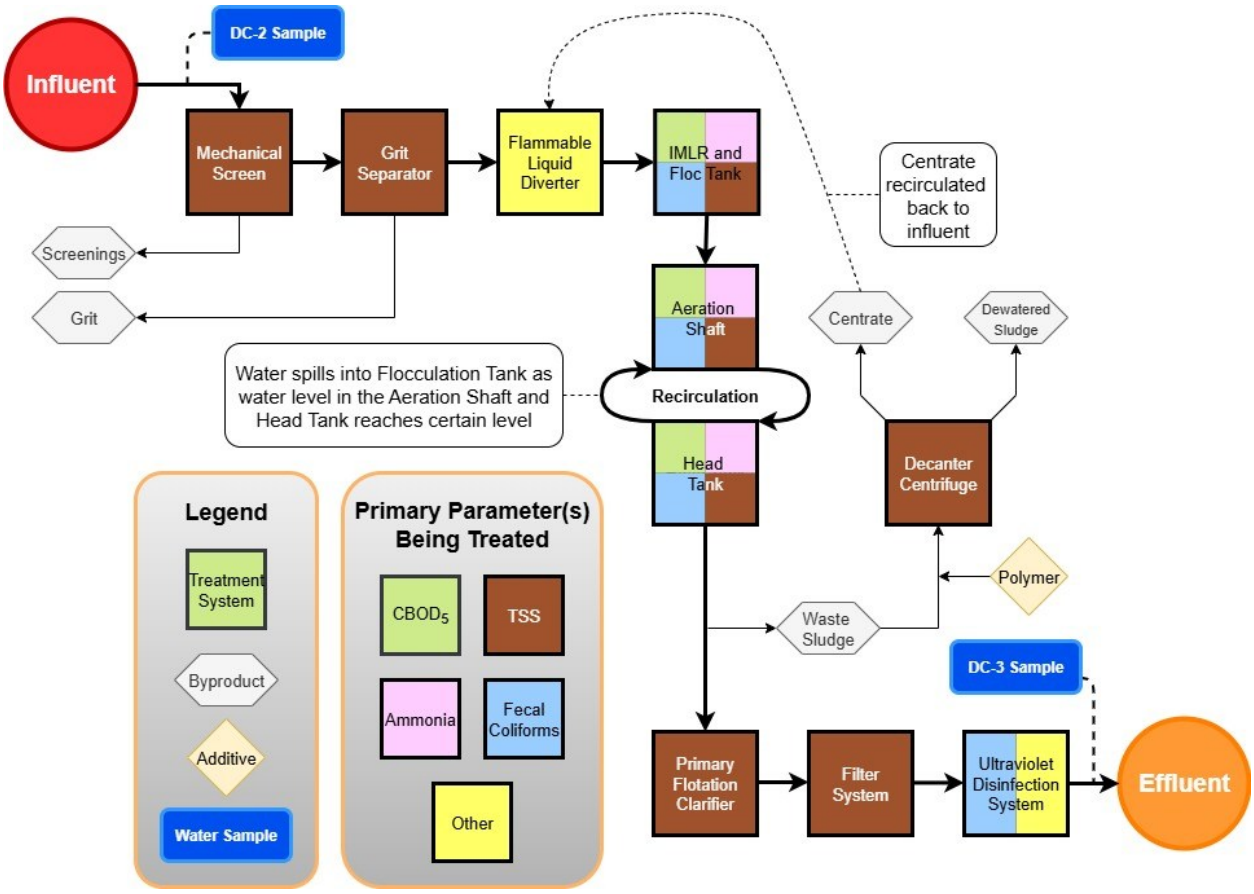

Figure 2. Flow diagram of the Vertreat facility wastewater treatment processes.

2 Current water use licence

The Government of Yukon, Department of Community Services currently holds a municipal water use licence, MN10-086-4 (and amendment MN10-086-5 is in progress), which allowed/allows for the construction, operation and maintenance of the Dawson City Wastewater Treatment Facility; this includes the collection, treatment and disposal of waste. Under the current water licence MN10-086-4, the Department of Community Services is required to conduct regular water quality and flow monitoring. Monitoring locations outlined in the licence and their descriptions have been summarized in Table 1 below.

Water quality monitoring is required at various times depending on the monitoring station. Table 2 outlines the current water quality sampling schedule for each monitoring station as listed in MN10-086-4.

As a requirement of MN10-086-4, effluent discharged from the treatment facility at station DC-3 must meet the Effluent Quality Standards (EQS) outlined in Table 3 below.

Table 1. MN10-086-4 monitoring locations and descriptions.

Sampling Station	Description
DC-2	Influent to wastewater treatment facility
DC-3	Effluent from wastewater treatment facility
DC-4	Yukon River, 100 m downstream of effluent outfall
PW4N	Dawson City Community Drinking Water Well

Table 2. MN10-086 current monitoring schedule.

Station Analysis	DC-2	DC-3	DC-4
Fecal Coliform	-	Monthly	Monthly
Dissolved Oxygen (in-situ)	Monthly	Monthly	Monthly
Temperature (in-situ)	Monthly	Monthly	Monthly
Specific Conductance	Monthly	Monthly	Monthly
$CBOD_5$	Monthly	Monthly	Monthly
Total Suspended Solids	Monthly	Monthly	Monthly
pH (in-situ and lab)	Monthly	Monthly	Monthly
Total Ammonia Nitrogen	Monthly	Monthly	Monthly
Un-ionized NH_3 as N	Monthly	Monthly	Monthly
Acute Toxicity 96-hr LC_{50} (rainbow trout)	-	Monthly*	-
TKN (ammonia & organic N)	Monthly	Monthly	Monthly
Flow Rate	Daily	Daily	-
* Monthly from May 1 to September 30 only (during open water), sampling events at least two weeks apart			

Table 3. MN10-086-4 Effluent Quality Standards for water discharged from compliance monitoring location DC-3.

Licence Parameter	Concentration
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	25 mg/L
Total Suspended Solids	25 mg/L
Un-ionized NH_3 as N	1.25 mg/L
pH	6 – 9
Fecal Coliforms	1000 cfu/100mL
Acute Toxicity 96-hr LC_{50}	Non-toxic

3 Field sampling and methods

To understand the potential impacts of the wastewater facility on the receiving water environment, WRB wanted to determine how residual wastewater may persist in the Yukon River as it flows downstream and is diluted by tributary inputs. To achieve this, WRB planned a one-time sampling event on the Yukon River downstream of Dawson City at Moosehide, Chandindu River and Fifteenmile River.

In addition to the one-time downstream sampling event, a monitoring location upstream of the effluent discharge (2EB-DC-4) was sampled monthly by Environmental Dynamics Incorporated (EDI) (on behalf of the licensee) during the open water season in 2024. EDI also sampled artificial sweeteners at the licensed monitoring locations for the open-water season (April – September). Sampling locations and dates relevant to this report are outlined in

Table 4 below.

Due to unforeseen scheduling issues in the 2024 season, the audit sampling event was conducted by the current licence monitoring consultant, EDI, in conjunction with one of their regular licence monitoring events. In lieu of a handheld multimeter, in-situ water quality field parameters were measured by EDI using a standard thermometer, Oakton Conductivity meter, a handheld pH probe and a Hack dissolved oxygen titration kit. EDI collected 10 surface water samples including three QA/QC sets (a replicate, a travel blank and a field blank). The sampling locations are presented in Figure 2. Complete results from sample analyses can be found in Appendix A.

Samples collected from the locations in

Table 4 were analysed for a suite of typical water quality parameters, stable water isotopes and artificial sweeteners as tracers of wastewater. These parameters were selected to support audit objectives and to allow for comparison with the effluent quality standards listed in MN10-086-4 as well as other relevant guidelines. These sampling parameters have been detailed in Table 5 below.

Results from the 2024 audit sampling were compared against relevant guidelines to gain understanding of and characterize the influent, effluent, background and receiving water quality as it relates to the Dawson City wastewater treatment facility. These guidelines include the Canadian Council of Ministers of Environment (CCME) guidelines for the Protection of Aquatic Life long-term exposure, the British Columbia Ministers of Environment (BCMOE) guidelines for Aquatic Life and the Yukon Contaminated Sites Regulations (CSR 2024) for surface water.

Table 4. Surface water samples collected for the Dawson Wastewater Facility audit for the 2024 open-water season.

Station Code	Location	Sample Date(s)	Coordinates Lat	Coordinates Long	Rationale
2EB-DC-4	Yukon River immediately upstream of outfall from sewage treatment facility (mid-channel)	Monthly*, July 14, 2024 audit	64.0597	-139.4435	Existing data in the WRB database for this station, intended to represent background Yukon River WQ
DC-2	Sewage treatment Influent	Monthly licence monitoring	Inside treatment facility		Characterizing influent
DC-3	Sewage treatment effluent	Monthly licence monitoring	64.0614	-139.4451	Effluent monitoring compliance sample
DC-4	Yukon River 100 m downstream of the effluent outfall	Monthly licence monitoring, July 14, 2024 audit	64.0612	-139.4416	Intended to help characterize effluent mixing with Yukon River water
WRB-1	Yukon River upstream of Moosehide Creek	July 14, 2024 audit	64.0915	-139.443	Added to understand potential downstream effects, also at request of TH
WRB-2	Yukon River upstream of Chandindu River	July 14, 2024 audit	64.2505	-139.7104	Added to understand potential downstream effects, also at request of TH
WRB-3	Yukon River upstream of Fifteenmile River	July 14, 2024 audit	64.2807	-139.8145	Added to understand potential downstream effects, also at request of TH
* 2024 open-water season only, collected by EDI at request of WRB					

Table 5. Analysis performed on 2024 audit samples.

Water quality parameters analyzed	
- Field parameters (temperature, pH, dissolved oxygen, specific conductance, turbidity) - Alkalinity, low level chloride & sulphate - Nitrate + Nitrite, Ammonia - Lab pH, conductivity & turbidity - Total & low-level Ammonia - Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) - BTEX, VOC	- Total Dissolved Solids, Total Suspended Solids - Total & dissolved metals - Nutrients (Dissolved Organic Carbon, Nitrogen, phosphorus, sulphide) - Total oil & grease - Artificial sweeteners - Stable water isotopes

4 Results & discussion

4.1 Standards and guideline comparison

Samples collected during the 2024 audit in the Yukon River that had exceedances of standards or guidelines have been outlined below. The guideline comparisons in Table 6 do not represent any form of non-compliance and are used for reference only. All the parameters that exceeded relevant guidelines are likely to be unrelated to wastewater treatment, and the exceedances listed in Table 6 are suspected to be background concentrations in the Yukon River. The Yukon River at Dawson City has high TSS (many values in the record greater than 1000 mg/L) which would contribute to the increase of total metals in the background water. These comparisons and the concentrations measured above guideline values indicate that high sediment loads (TSS) in Yukon River water at Dawson City contribute to elevated concentrations of "tot*al*" metals parameters. Upstream glacially fed catchments captured by the White River contribute to significant sediment loads, and the elevated total metals in Table 6 should be considered naturally occurring.

It is important to note that there are many examples of samples that were collected above and beyond the licensing requirements, including the samples collected for this audit. Some of the samples, while they may be measured above a licence EQS or other guidelines, are often confirmatory samples, replicates, one-time investigations or other unique instances where the proponent has simply uploaded this data to Waterline to share with WRB. These instances where parameters are measured above licence EQS should be considered when reviewing the following sections that address the number of exceedances versus the number of samples on record.

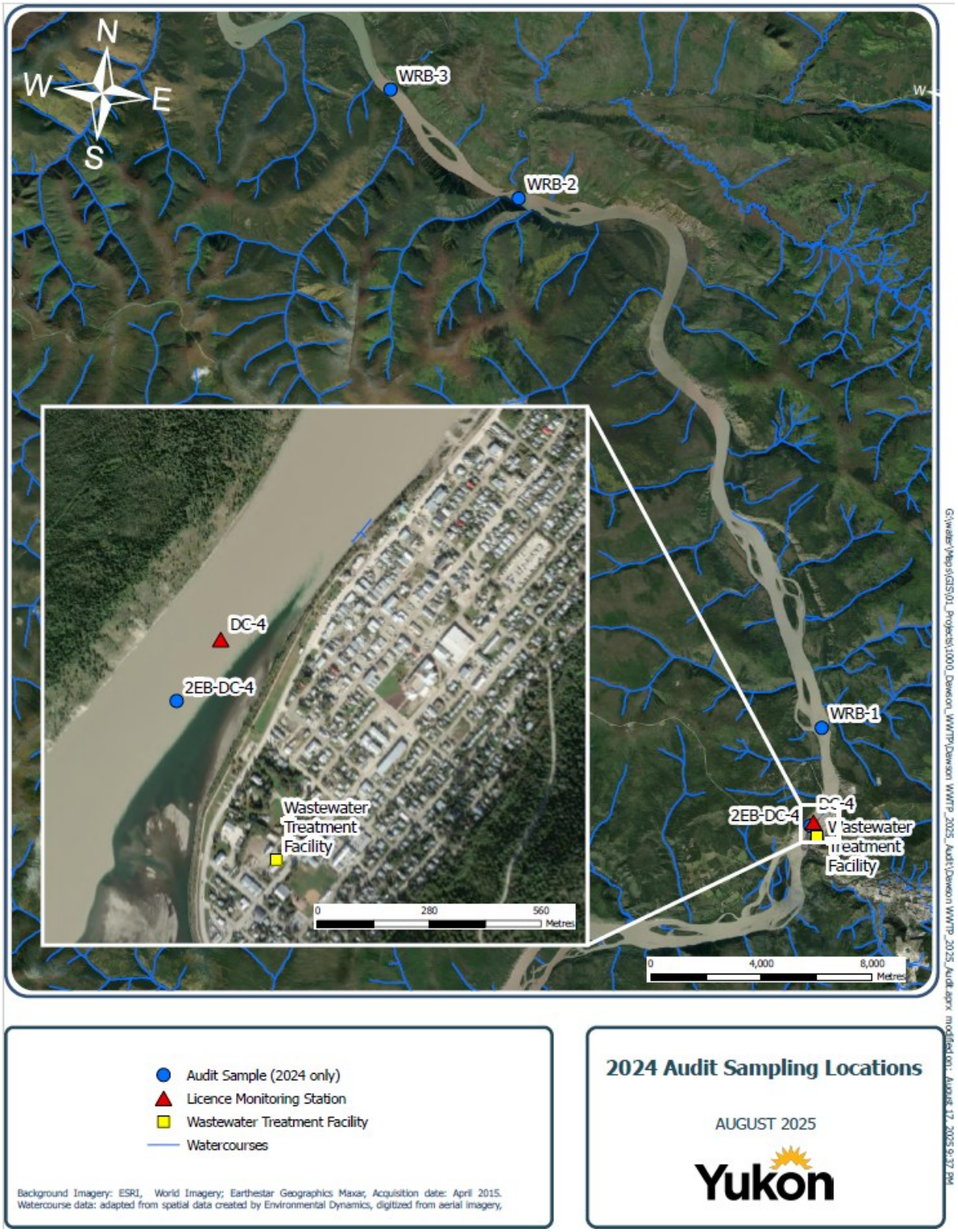

Figure 2. Overview of the 2024 audit sampling locations. DC-2 and DC-3 were also sampled and are located within the Wastewater Treatment Facility.

Table 6. Summary of water quality parameters exceeding British Columbia and/or CCME aquatic life guidelines in the Yukon River for samples collected during the 2024 audit. Contaminants with a BLM based guideline were not compared to the guideline. All results are total metals in mg/L.

	Station	Aluminium	Arsenic	Cadmium	Cobalt	Copper	Iron	Mercury		Zinc
CCME guideline		calc	0.005	calc ST and LT			calc	0.3	0.000026	
BC guideline			0.005			ST: 0.11 LT: 0.004		1.0		calc ST and LT
Downstream <-----Upstream	2EB-DC-4*	**6.26**	0.00421	**0.000203**	0.00457	**0.0127**	**9.35**	0.0000109		0.0325
		5.5	0.00369	0.000183		0.00395	**0.0112**	**8.39**	0.0000126	0.0312
	DC-4	**5.72**	0.00388	**0.000198**	0.00424	**0.0122**	**8.78**	0.0000111		0.0361
	WRB-1 (Moosehide)	**5.9**	0.00407	**0.000192**	0.00441	**0.0123**	**8.73**	**0.000105**		0.0334
	WRB-2 (Chandindu)	**5.68**	0.00395	0.00018	0.00408	**0.0116**	**8.53**	0.0000132		0.0338
	WRB-3 (Fifteenmile)	**7.74**	**0.00507**	**0.000223**	0.00574	**0.0156**	**11.7**	0.0000163		0.0414

*A replicate sample was collected at 2EB-DC-4 and both results are shown in the table

Bolded values exceeded a CCME aquatic life guideline and underlined values exceeded a British Columbia aquatic life guideline.

LT= long-term guideline, ST= short-term guideline.

4.2 Artificial sweeteners and stable water isotopes

Artificial sweeteners are anthropogenic 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 published over the last 15 years demonstrated 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 samples were collected for this audit to determine the extent of potential wastewater impacts in the Yukon River and how dilution may impact artificial sweetener concentrations. Unexpectedly, however, sweeteners were detected at the upstream location (2EB-DC-4) and in the furthest downstream sampling location (WRB-3). Interpretations are also complicated by the mixing of the Klondike and Yukon Rivers. As such, there are no meaningful interpretations that can be made from the limited sweetener results. Full sweetener results are provided in Appendix C.

According to Kendall & Doctor (2005), stable water isotopes can be used as tracers of waters in shallow, low-temperature environments because:

i. Waters that were recharged at different times, different locations, or which followed different flow paths are often isotopically distinct; in other words, they have distinctive "fingerprints."
ii. Unlike most chemical tracers, stable water isotopes are relatively conservative because they retain their distinctive fingerprints until they mix with other waters.

Typically, groundwater has stable water isotope compositions like that of weighted average precipitation (Kendall & Doctor, 2005). A weighted average is a calculation that considers the varying degrees of importance of the numbers in a data set. It is useful for comparing $\delta^{18}O$ 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 the amount-weighted average and $\delta^{18}O$ 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.

Stable water isotope results from the Yukon River showed they were isotopically indistinguishable between sampling locations. This is expected given the substantial dilution in the Yukon River compared with DC-4. All isotope results are provided in Appendix B.

4.3 Historical water quality data record

Since the current facility licence monitoring began in 2013, the number of samples collected each year has varied by year and parameter. The sampling frequency is dependent upon the previous year's annual average daily volume. For example, MN10-086 outlines that "If the annual average daily volume of effluent deposited for the previous calendar year is ≤ 2500 m^3/day, sampling in the following calendar for $CBOD_5$, TSS and un-ionized ammonia shall be conducted monthly" while "if the flow is > 2500 m^3/day sampling will be bi-weekly." This is worth noting as it is the reason for the difference in sampling frequency each year for each parameter. Since un-ionized ammonia and pH have never exceeded licence EQS, they have not been included in plots below. Fecal coliform samples exceeded EQS the most with 39% of all samples exceeding EQS. TSS is next with 38% of samples exceeding EQS, followed by $CBOD_5$ exceeding 20%. Across the entire record, exceedances tend to occur more in the summer months for all parameters, specifically between the months of May and November.

Water Licence MN10-086 has a unique "Notes" section on the final page that is important to consider when reviewing the number of samples collected each year. This section can explain the highly variable sample numbers by year. The section states:

1) Calendar year is defined as January to December for a given year.
2) If the annual average daily volume of effluent deposited for the previous calendar year is ≤2500 m^3/day, sampling in the following calendar year for $CBOD_5$, Total Suspended Solids and Unionized NH_3 shall be conducted monthly.
3) If the annual average daily volume of effluent deposited for the previous calendar year is >2500 m^3/day, sampling in the following calendar year for $CBOD_5$, Total Suspended Solids and Unionized NH_3 shall be conducted bi-weekly.
4) If the annual average daily volume of effluent deposited for the previous calendar year is ≤2500 m^3/day, sampling in the following calendar year for Acute Lethality shall be conducted monthly from May 1 to September 30 only.
5) If the annual average daily volume of effluent deposited for the previous calendar year is >2500 m^3/day, sampling in the following calendar year for Acute Lethality shall be conducted monthly from May 1 to September 30, with one additional

sampling event in March and one additional sampling event in December of the same calendar year.

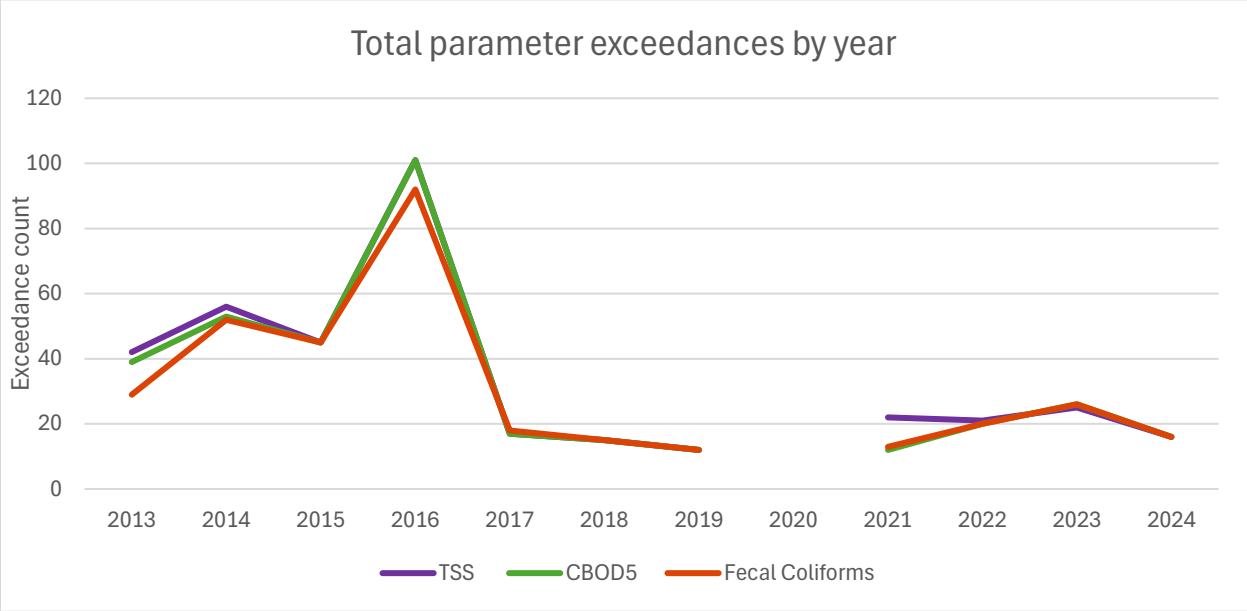

Figure 3. Total count of TSS, $CBOD_5$ and fecal coliform samples exceeding Effluent Quality Standards by year.

Table 7. Assessment of values measured above Effluent Quality Standards versus total sample count.

	$CBOD_5$	TSS	Un-ionized ammonia	pH	Fecal Coliforms
Total # of exceedances on record	73	140	0	0	131
Total # of samples on record	357	373	239	310	339
% of samples exceeding EQS	20.45%	37.53%	0%	0%	38.64%

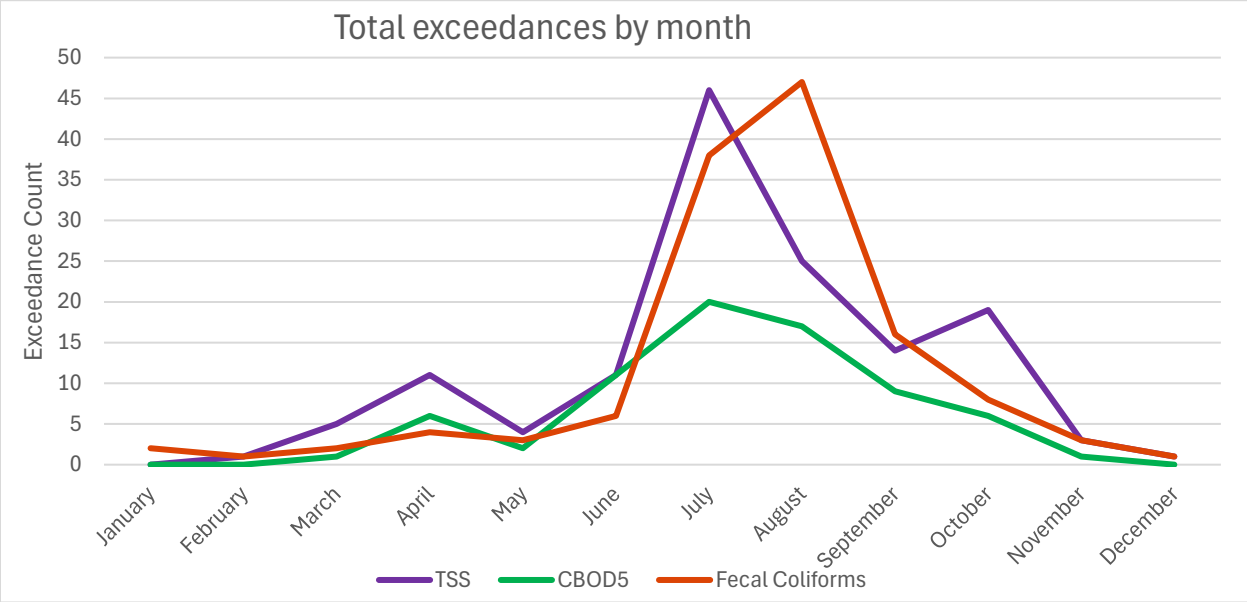

Figure 4. Total count of TSS, CBOD₅ and fecal coliform exceedances by month.

4.3.1 CBOD₅

"Carbonaceous Biochemical Oxygen Demand over 5 days", or CBOD₅ is a measure of the amount of oxygen consumed by microorganisms as they break down organic matter over a standard period of five days. "Carbonaceous" refers to the carbon-based compounds in wastewater that are biodegradable, and the "biochemical oxygen demand" is a measure of the oxygen that is required by bacteria to decompose organic matter in a solution.

In the case of wastewater, there is a high presence of CBOD₅ due to high organic loads present (i.e. human waste). CBOD₅ is a parameter with EQS because it can reduce or deplete oxygen levels in the receiving water environment and cause harm to aquatic life. The Dawson WWTF treats CBOD₅ with large, in-ground aeration shafts that use compressors to pump air into the water and allow for rapid and effective aerobic degradation of organic matter and digestion by specialized bacteria that are deliberately maintained in the system. Site operators have documented maintenance to the system that would impact CBOD₅ concentrations including replacing and repairing compressors

that aerate the head tank, repairing and cleaning various components of filtering systems, and added backups to several pieces of equipment.

The annual number of exceedances for $CBOD_5$ have remained low and consistent (between 1 and 13 exceedances per year), and there is a minimum of one sample per month as per licence requirements. When more samples have been collected (2013 - 2016), it did not necessarily correlate to increased exceedances. When viewed by month, it is apparent that $CBOD_5$ exceedances coincide with peak tourist season and therefore a greater demand on municipal wastewater systems. Exceedances are seen to be extremely uncommon in the winter months when tourism is insignificant.

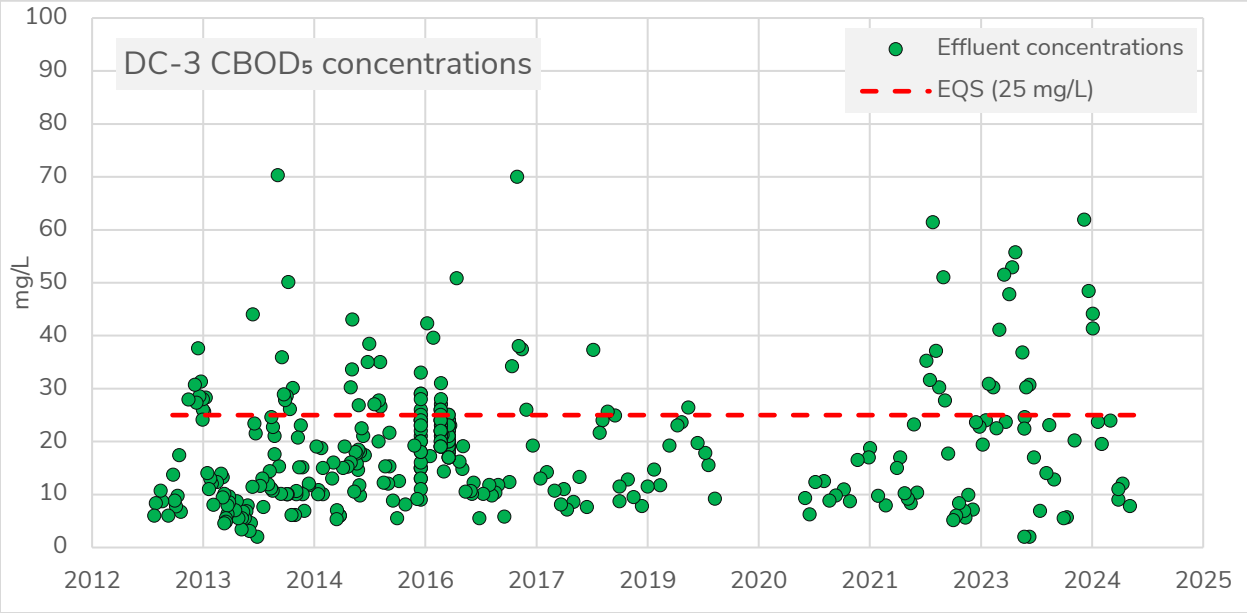

Figure 5. Complete record of effluent $CBOD_5$ concentrations sampled at DC-3.

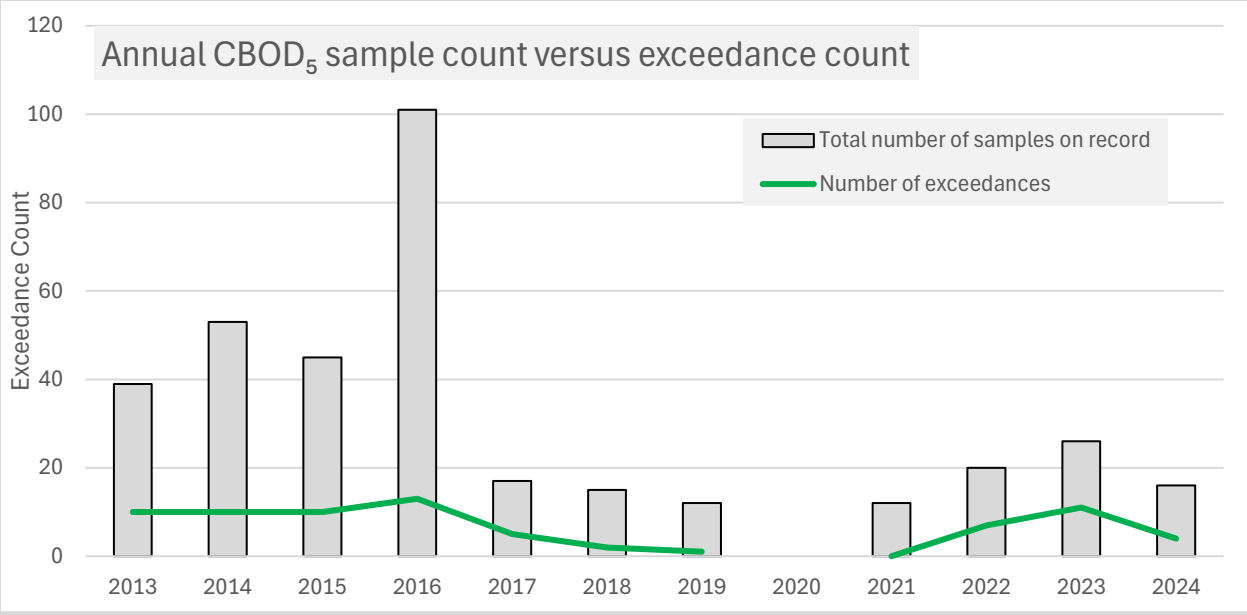

Figure 6. Complete record of effluent CBOD₅ concentrations versus total number of samples plotted by year.

Table 8. Summary of CBOD₅ exceedances versus total sample count at DC-3. Note the lack of exceedances in 2020 were associated with a lack of sampling concurrent with the COVID-19 pandemic.

Year	Total exceedances on record	Total number of samples	% Exceedances
2013	10	39	26
2014	10	53	19
2015	10	45	22
2016	13	101	13
2017	5	17	29
2018	2	15	13
2019	1	12	8
2020	-	-	-
2021	0	12	0
2022	7	20	35
2023	11	26	42
2024	4	16	25

4.3.2 Total suspended solids

Total Suspended Solids (TSS) is a measure of the solid particles suspended in water that are large enough to be removed by filtration and are not dissolved into the solution. These solids can include a variety of materials such as dirt or silt, organic matter, algae, bacteria and other debris. TSS is present in residential and commercial wastewater for a variety

of reasons: human waste, food waste, laundry particles, hair particles, skin particles and other undissolved materials that find their way down household drains.

High TSS impacts the ability of organisms to transfer oxygen from water, as suspended particles can create a barrier to diffusion which can harm aquatic organisms. For fish, this can clog the gills and impair respiration. For photosynthesizers such as algae, a high TSS can reduce light penetration into the water column. Additionally, TSS can carry attached pollutants such as heavy metals, pathogens or other toxic chemicals.

Unlike $CBOD_5$ which is primarily treated with microorganisms, TSS is a physical parameter that is primarily treated with mechanical controls such as filtering and separation. The Dawson City WWTF uses screening and settling tanks which help remove coarse solids and allow heavier solids to settle. The secondary treatment, biological removal, aims to oxygenate water and allow microorganisms to break down organic matter and agglomerate smaller particles into larger “flocs” which are easier to remove.

The annual number of samples exceeding EQS for TSS have been between 1 and 34 samples per year, with an average of 12 samples exceeding EQS per year since 2013. The number of high TSS values per year is closely tied to how many samples were collected that year, unlike $CBOD_5$. From 2013 to 2016, there were anywhere from 2 – 5 times the samples collected than other years, and this was reflected by a greater number of samples exceeding EQS. In later years, the number of exceedances goes down because fewer samples were collected. When viewed by month, it is apparent that TSS exceedances also tend to happen almost exclusively during peak tourist season.

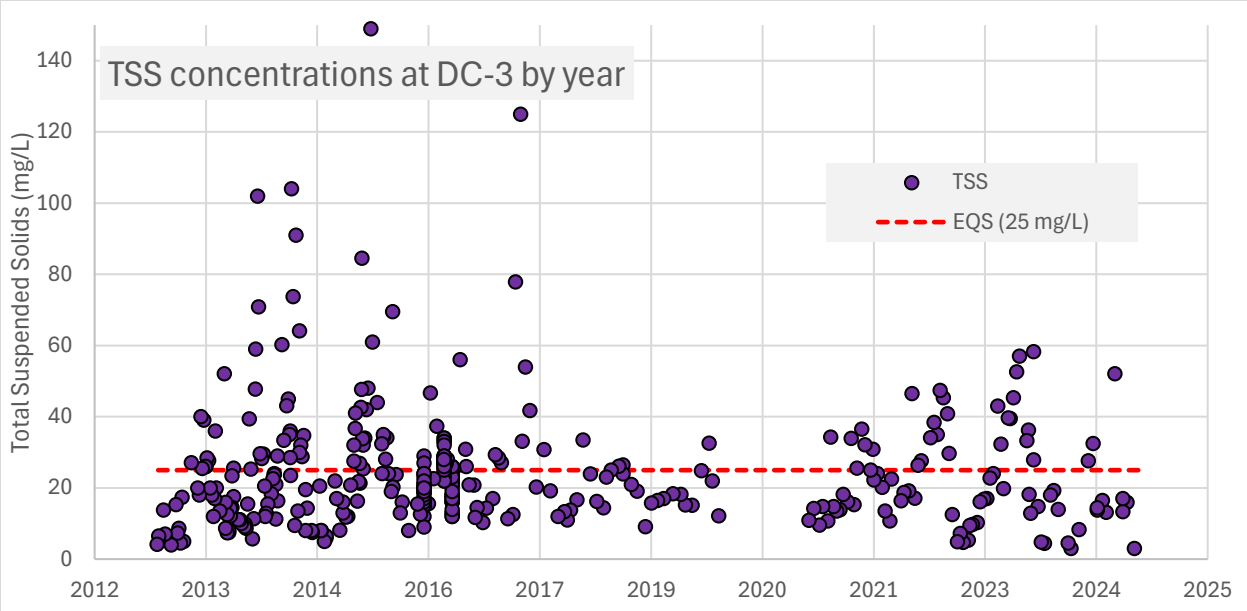

Figure 7. Complete record of effluent TSS concentrations sampled at DC-3

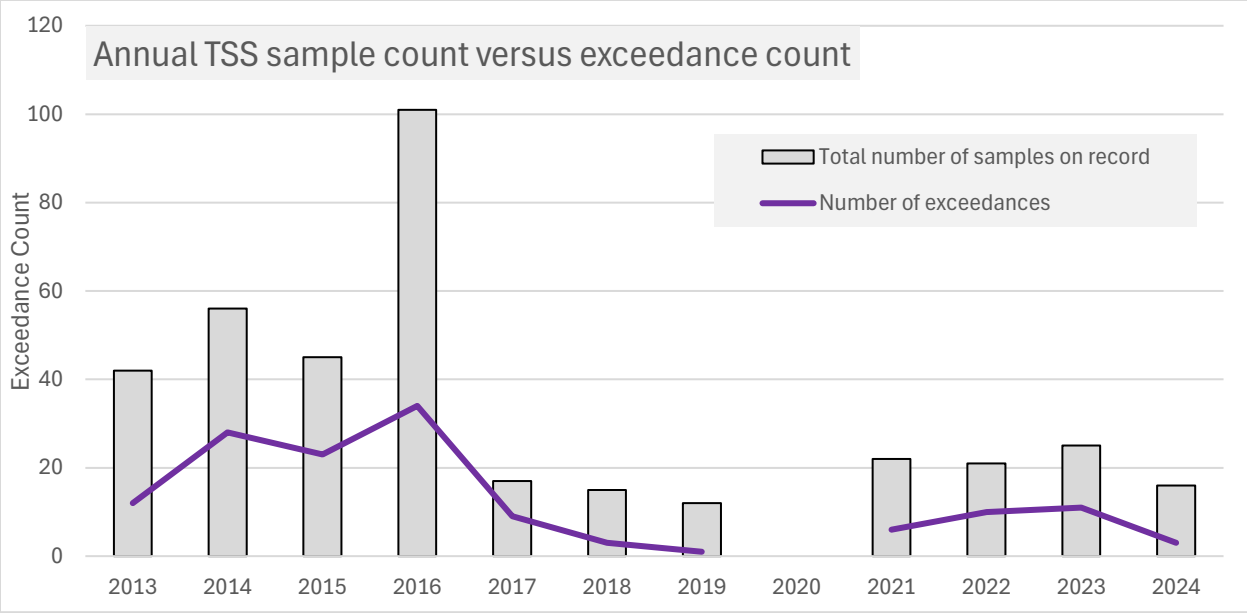

Figure 8. Complete record of effluent TSS concentrations versus total number of samples plotted by year.

Table 9. Summary of TSS exceedances versus total sample count at DC-3. Note the lack of exceedances in 2020 were associated with a lack of sampling concurrent with the pandemic.

Year	Total exceedances on record	Total number of samples	% Exceedances
2013	12	42	29
2014	28	56	50
2015	23	45	51

Year	Total exceedances on record	Total number of samples	% Exceedances
2016	34	101	34
2017	9	17	53
2018	3	15	20
2019	1	12	8
2020	-	-	-
2021	6	12	27
2022	10	21	48
2023	11	25	44
2024	3	16	19

4.3.3 Fecal coliforms

Fecal coliforms are bacteria that exist in the intestines of warm-blooded mammals that are subsequently present in municipal wastewater via human waste. The discharge of water with high levels of fecal coliform into the natural environment poses obvious risks to human health thus is one of the key parameters to be treated by any wastewater system. The UV treatment system is the primary way to treat fecal coliforms specifically. The system efficacy is largely co-dependant on TSS values, as high TSS prevents UV penetration and reduces fecal coliform treatment. Thus, when other parameters are elevated and other systems are struggling, it is likely to have an impact on fecal coliforms as they are reduced as a byproduct of the function of the screening, aeration, separation etc.

Being the most frequent parameter to exceed EQS, the annual number of fecal coliform exceedances have been between 2 and 50 per year, with an average of 12 exceedances per year where, much like TSS, the number of exceedances per year is closely tied to how many samples were collected that year (Table 10). Over half of the samples collected in 2016 had fecal coliforms exceed EQS, and 70% exceeded in 2022. Fecal coliforms are the parameter that perhaps is the most impacted by population booms in the summer months where exceedances tend to be densely concentrated between June and October.

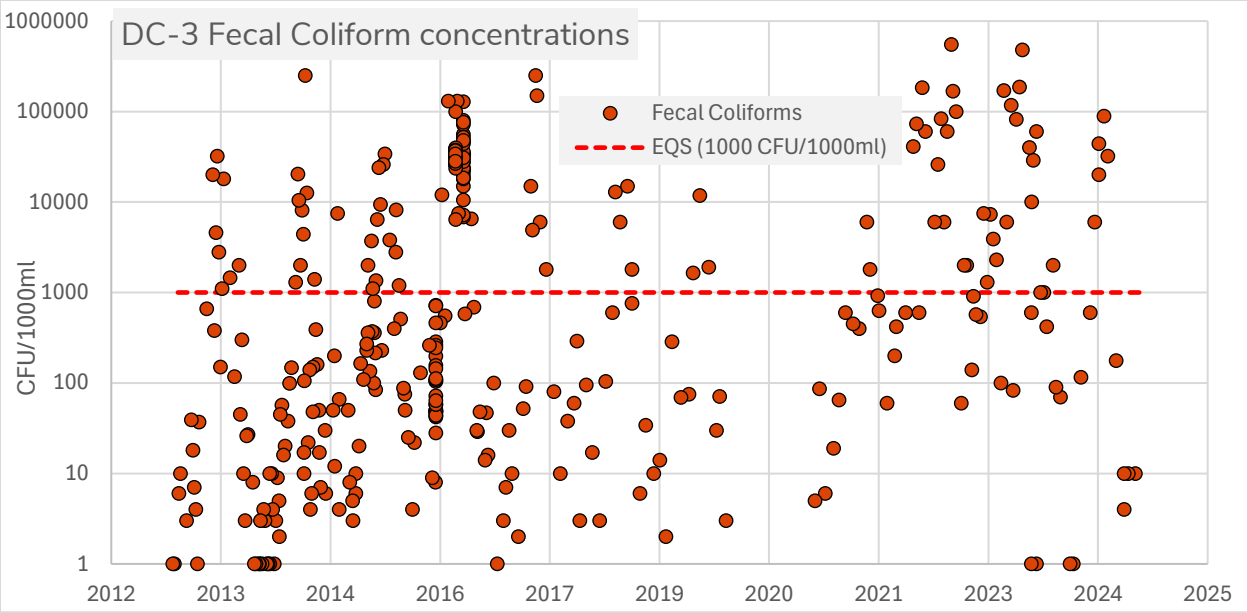

Figure 9. Complete record of effluent Fecal Coliform concentrations sampled at DC-3

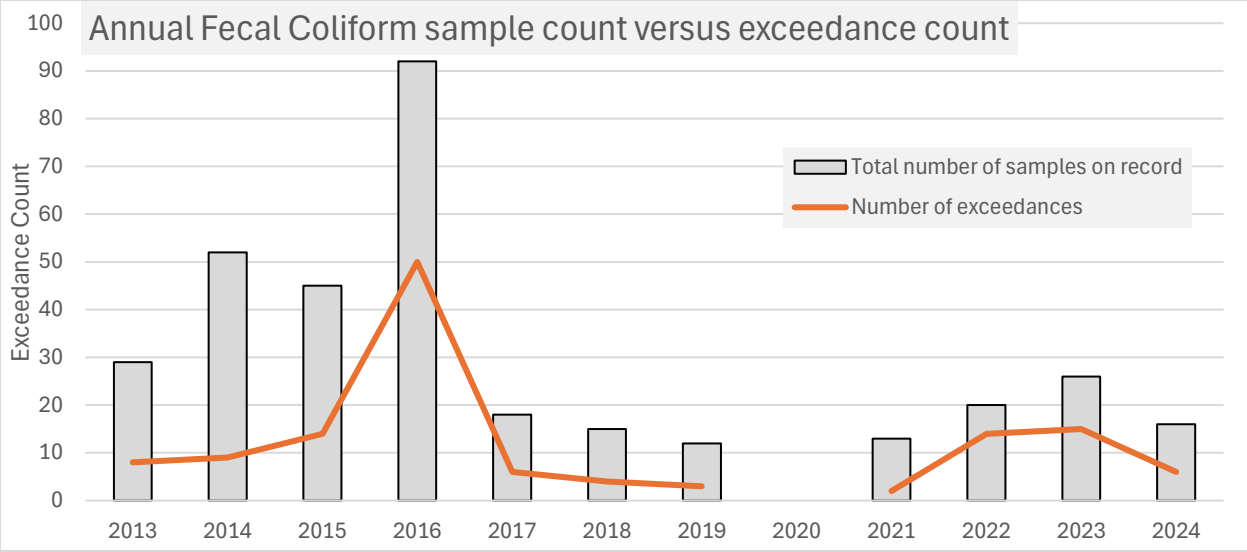

Figure 10. Complete record of effluent Fecal Coliform concentrations versus total number of samples plotted by year

Table 10. Summary of fecal coliform exceedances versus total sample count at DC-3. Note the lack of exceedances in 2020 were associated with a lack of sampling concurrent with the pandemic.

Year	Total values greater than EQS on record	Total number of samples	% Exceedances
2013	8	29	28
2014	9	52	17
2015	14	45	31
2016	50	92	54

Year	Total values greater than EQS on record	Total number of samples	% Exceedances
2017	6	18	33
2018	4	15	27
2019	3	12	25
2020	-	-	-
2021	2	13	15
2022	14	20	70
2023	15	26	58
2024	6	16	37

4.3.4 Remaining licence parameters

Un-ionized ammonia is a parameter included in the water licence, and the Dawson City WWTF has had ongoing success treating it. There have been zero exceedances of this EQS for the entire period of record (Table 7). Un-ionized ammonia is a naturally occurring component of wastewater, as it is produced by the breakdown of organic nitrogen-containing compounds which are the primary contents of municipal wastewater. Un-ionized ammonia is of specific concern as it is highly toxic to fish and other aquatic life. Even low concentrations can be harmful.

The Dawson City WWTF treats ammonia by aerating the wastewater in biological reactors, which use bacteria to oxidize un-ionized ammonia into nitrate and nitrite, known at nitrification. This process also helps maintain a low pH and cooler temperatures which further reduces the proportion of un-ionized ammonia. This means the nitrogen present in the wastewater is discharged as a much less environmentally toxic form. The Dawson City WWTF is effective at treating un-ionized ammonia because the biological treatment process employed by the facility is specifically designed to treat this contaminant. Additionally, the stable operating conditions of an indoor facility makes maintaining the healthy bacteria much more consistent.

Similarly, the pH EQS have never been exceeded, and the pH has remained stable for the period on record. pH is a parameter that is maintained more consequentially and can indicate efficacy of other treatment systems. For example, the aeration and nitrification process would naturally lower pH in wastewater due to the production of acids during the conversion of ammonia to nitrate. Also, the cold environment in Dawson City could

contribute to stabilizing pH passively, as lower temperatures favor the formation of ammonium over un-ionized ammonia, further stabilizing pH and reducing the likelihood of un-ionized ammonia exceedances. It is expected that if the aeration and nitrification process occurring in the biological reactors used by a Vertreat plant are working correctly, it would have a positive impact on both pH as well as un-ionized ammonia.

4.4 Operational changes and constraints

From reviewing water licence documents, corresponding with site operators and multiple visits to the facility, WRB was made aware of two significant factors outside of the control of facility operators: water meter installation and grease influent. These factors have a high potential of impacting influent water quality and therefore site functionality. These factors should be considered to fully understand if the plant is functioning properly or if the issues stem from outside the facility.

4.4.1 Dawson City water use

Over time, changes in water use affect the volume of influent reporting to the treatment facility. A bleeder reduction program was introduced in September 2002. Additionally, between 2022 and 2024 Dawson City installed municipal water meters during the summer months. This transition was completed in the spring of 2024 and likely altered the behaviour of water users, particularly through the use of these bleeder valves. A bleeder valve is installed in a household or commercial water system and allows for a controlled, continuous low-level flow of water from a tap into a drain. This moving water makes pipes less likely to freeze and, prior to the metering of water, users would commonly leave these bleeder valves on year-round. This bleeder valve flow through the summer months would be expected to dilute wastewater and potentially alleviate stress on the treatment system, and site operators report decreases in flows when bleeder valves are known to go off in mid-May. More information would be needed to determine the exact impact bleeder water has on water quality.

The 2024 annual report provided by EDI and Kerr Wood Leidal Associated Ltd. (KWL) for this facility makes note of this likely impact and states the charge for additional water use may be reflected in high (200 mg/L) $CBOD_5$ concentrations combined with the post-

pandemic return to an increase in tourism levels. While the metering of water was intended to improve conservation and enhance measurement, the unintended consequence may have been that a substantial volume of clean, diluting water was removed from the influent, resulting in the apparent increase in influent contamination. Increasing contaminant concentrations may add stress to the system as more energy is required to remove contaminants.

4.4.2 Grease in influent

As per MN10-086-4, there is no monitoring of oil and grease at any location. The Vertreat system used is not designed to treat wastewater containing oil & grease, and it relies on start-of-pipe controls to prevent oil and grease from entering wastewater at the source. These upstream controls include grease traps in restaurants to prevent grease from entering the wastewater system. The summer months, when restaurants are at full capacity, may coincide with the high number of exceedances of EQS. It may also be exacerbated by the bleeder valve issue mentioned above. Grease in the influent clogs specialized filters that are not designed for this purpose and causes extreme stress on the backwashing and cleaning processes.

The earliest maintenance notes available to WRB regarding issues caused by grease occurred on February 15, 2024, when site operators made note of the filter system being down for maintenance; all 10 filters would need to be cleaned, and this process would require four days. On February 22, the filter system was not operating, and facility maintenance logs pointed to issues with grease on the filter cloths that would once again require an additional ten days of downtime. Site operators suspect this initial reference of grease was likely due to historic lack of maintenance. After the initial cleanout, however, issues were also reported with the influent sump and pumping station that required major clean-outs of grease from the system to remove buildup from pumping station walls (EDI 2025). This process is now regularly scheduled by site operators, as the facility was not designed to receive oil and grease-laden water.

When mechanical filters in the system are blocked, they cannot effectively separate TSS from wastewater. This is the reason site staff have begun cleaning the filter cloths. Increasing this regular maintenance requirement reduces the run-time of the plant and

hinders treatment ability while increasing operational cost. Oil and grease can also attach to the TSS particles themselves, making them more difficult to remove even with a functioning filter. Again, these impacts cascade through the system and inhibit the downstream systems' ability to treat TSS. High TSS then move through the system and become an issue in and of itself, interfering with microbial digestion of organic solids or other processes.

During 2024, site operators independently collected oil and grease samples to understand the influent contamination levels. The 2024 annual report notes that up to 100 mg/L of oil and grease was measured in the influent; a value well above normal municipal concentrations and the high concentrations created significant issues for the treatment plant. The report claims higher than normal municipal wastewater oil and grease concentrations will inevitably lead to process issues with the biological treatment system and continued "blinding" of filter cloths in the disk filters. Blinding refers to the process of filters getting physically clogged or blocked by the accumulation of, in this case, grease particles.

There are several instances referencing filter blinding in the annual report and the maintenance logs provided by site operators to WRB. The system is equipped with a backwashing process which takes 6-8 minutes and occurs approximately every 40 – 50 minutes. This process helps purge filters so that wastewater can still pass through and does not overflow the filter cloths. As grease accumulates, this backwashing process takes longer and achieves less, eventually becoming ineffective. Site staff must drain the filter, spray it with a degreaser to sit overnight, then clean and replace it the following morning. This process must occur every 10 – 14 days due to high concentrations of oil and grease in influent. Completing this process allows the filter time to return to 40 – 50 minutes with 6-8 minutes backwashing, but only until oil and grease accumulates again.

As the first step in the Dawson City WWTF process, filter cloth blinding would have obvious cascading effects on the subsequent treatment systems. The annual report mentions the high cost of filter cloths and the decrease in their longevity from oil and grease. This suggests that the high concentrations of oil and grease in the influent should be investigated and resolved by the Dawson City Public Works Department. Considering

that the WWTF is not designed to treat oil and grease, source control may be the most effective means of improving effluent water quality. (KWL 2024).

4.5 Receiving environment impacts

To evaluate potential impacts of wastewater on the receiving environment in a worst-case scenario, a simple mass balance equation is used to model contaminants in the Yukon River. This hypothetical scenario, simulating a complete system failure, applies untreated discharged directly into the Yukon River at low flows. This calculation is driven by the 95th percentile concentration of contaminants in untreated influent (DC-2), 95th percentile discharge rate for the facility on record, and the lowest recorded flow rate for the Yukon River at Dawson City in the past 50 years as per Water Survey Canada's monitoring. Background concentrations on the Yukon River are applied from 5th percentile concentrations at monitoring location 2EB-DC-4 (note 2EB-DC-4 only contains 10 samples on record).

The modelling below assumes that the contaminants from the untreated wastewater mix completely with the water in the Yukon River, and the resulting concentration is a weighted average of the two sources.

The concentration in the Yukon River after mixing (C_{mix}) is given by:

$$C_{mix} = \frac{C_{eff} \cdot Q_{eff} + C_{river} \cdot Q_{river}}{Q_{eff} + Q_{river}}$$

- C_{eff} – 95th *percentile* contaminant concentration in untreated wastewater (DC-2) (mg/L)
- Q_{eff} – wastewater facility 95th percentile discharge rate at DC-3 (0.03749 m³/s)
- C_{river} – 5th percentile background contaminant concentration in Yukon River (2EB-DC-4) (mg/L)
- Q_{river} – *Reported* 50-year minimum Yukon River discharge rate at Water Survey Canada Dawson City station (343 m³/s)

For the sake of this modelling, EQS parameters $CBOD_5$, TSS, total ammonia and fecal coliforms were used. Note we have used total ammonia versus the actual EQS parameter of un-ionized ammonia. Un-ionized ammonia is a proportion of total ammonia that is

based on water temperature and pH, since the effluent volumes are small relative to flow in the Yukon River, the pH and temperature of the river are controlled by upstream conditions, and the amount of un-ionized ammonia in the river will be controlled by the amount of ammonium in the effluent. Table 11 outlines the rate that wastewater would have to discharge to result in a 1% increase to background contamination (where $C_{mix} = C_{river} * 1.01$) in the Yukon River if water were contaminated to the 95th percentile of the entire untreated record. A 1% increase is a small and arbitrary increase that would be below what could be detected in the river given analytical uncertainties.

Table 11. Background (Yukon River) flow and contaminant concentration, and the discharge rate of untreated wastewater that would be required to cause a 1% increase to the background concentrations.

	Variable	**CBOD$_5$ (mg/L)**	**TSS (mg/L)**	**Total Ammonia (mg/L)**	**Fecal Coliforms (cfu/100mL)**
5th percentile background concentration	C_{river}	2	8.85	0.00054	1
95th percentile untreated effluent	C_{eff}	158	162	0.087	5,600,000
Estimated 50-year minimum background discharge rate	Q_{river}	343 m³/s			
95th percentile effluent discharge	Q_{eff}	0.0037 m³/s			
Volume required to achieve 1% increase in background contamination		0.044 m³/s	0.2 m³/s	0.021 m³/s	0.0006 L/s

Similarly, a calculation can be made to determine at the 95th percentile discharge rate of effluent at what concentration of contamination would be needed to create a 1% increase in concentration in the Yukon River. The resulting values in Table 12Table 12 show the concentration of contaminant that would need to be present in the untreated wastewater to achieve a 1% increase from background.

Table 12. Background (Yukon River) flow and contaminant concentration, and the contamination level of untreated wastewater that would be required to cause a 1% increase to the background concentrations.

	Variable	CBOD	TSS	Total Ammonia	Fecal Coliforms
Estimated 50-year minimum background discharge rate	Q_{river}	343 m³/s			
95th percentile effluent discharge	Q_{eff}	0.003745 m³/s			
95th percentile untreated effluent	C_{eff}	158 mg/L	162 mg/L	0.087 mg/L	1 cfu/100mL
5th percentile background concentration	C_{river}	2 mg/L	8.9 mg/L	0.00054 mg/L	5,600,000 cfu/100mL
Concentration required to achieve 1% increase to background		183 mg/L	811 mg/L	0.049 mg/L	92 cfu/100mL

The above-mentioned calculations show how total ammonia and fecal coliforms would result in noticeable downstream changes in this worst-case scenario. The resultant total ammonia concentration downstream (C_{mix}) from this simplified calculation is 0.2 mg/L and the fecal coliforms is 612 cfu/100mL. There are no CCME or BC aquatic life guidelines for fecal coliforms. Considering the proportion of un-ionized ammonia by applying 95th percentile DC-4 water temperature (16.8°C) and field pH (8.5), the un-ionized ammonia calculates to 0.018 mg/L, slightly below the CCME aquatic life guideline (0.019 mg/L).

It should be noted that this is an exercise in the extreme worst-case scenario, and it is very unlikely that these conditions would ever arise, including that:

- Statistically, annual low flows are increasing in Dawson making it increasingly unlikely that the Yukon River would ever have a discharge rate as low as 343 m³/s again.
- For the entire period of record, the maximum effluent discharge rate is 0.0044 m³/s and the minimum is 0.0011 m³/s. Given that it is a low flow rate, it would be unlikely that the plant could physically discharge the volume of untreated wastewater required to impact background based on the facility's infrastructure.

5 Conclusions & recommendations

The analysis and exercises conducted in this report, analysis of the July 14th sampling data and review of the licence monitoring record have resulted in the following conclusions:

The facility has had some treatment difficulties, but current operators are making improvements where possible: The site has been effective at treating ammonia and maintaining pH, but has had issues treating $CBOD_5$, TSS and fecal coliforms. Improvements to site protocols are expected to help with this. These protocols have been developed to address issues presented by influent quality which are outside of the facility's control.

It is unlikely the facility is having a substantial impact on Yukon River water quality: The Yukon River has enormous dilution potential, and it is likely that any detectable impacts in the river are confined to a mixing zone.

Monitoring of the Yukon River is complicated by the confluence of the Klondike and Yukon Rivers: Effluent is discharged at DC-4 within the mixing zone of the Klondike and Yukon Rivers, and it is difficult to know if effluent-impacted water is truly being sampled.

Based on the findings of this report we make the following recommendations:

1) **Improve source controls for oil and grease**: Our understanding is that positive efforts are underway with the Department of Community Services and the municipality to explore ways to reduce the potential for oil and grease in influent water.
2) **Consider facility upgrades**: WRB understands the Department of Community Services is investigating options to retrofit the system to include an oil and grease treatment capacity.
3) **Add oil and grease monitoring to the schedule of the licence**: The licence proponent should include oil and grease sampling in the licence at DC-2 and DC-3 to verify and quantify oil and grease in wastewater.

6 Authors & contact information

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Reviewers

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- Cole Fischer, A/ Senior Scientist Groundwater
- Nicole Novodvorsky, Operations Manager
- Tyler Williams, Water Resource Scientist

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References

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Appendix A – BV water quality sample results

Your Project #: DAWSON WASTEWATER AUDIT
Your C.O.C. #: C#728123-01-01

Attention: Devon O'Connor

Government of Yukon – Dept of ENV
Environment
Water Resources Branch (V-310)
Box 2703
Whitehorse, YT
CANADA Y1A 2C6

Report Date: 2024/07/25
Report #: R3532328
Version: 2 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453040
Received: 2024/07/15, 12:37

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	8	N/A	2024/07/18	BBY6SOP-00026	SM 24 2320 B m
Carbonate, Bicarbonate and Hydroxide	8	N/A	2024/07/19		Auto Calc
Biochemical Oxygen Demand (Inhibited)	8	2024/07/17	2024/07/22	BBY6SOP-00045	SM 24 5210 B m
BTEX/MTBE LH, VH, F1 SIM/MS	8	N/A	2024/07/17	BBY8SOP-00010 / BBY8SOP-00011 / BBY8SOP-00012	BCMOE BCLM Jul 2017
Low level chloride/sulphate by AC	8	N/A	2024/07/18	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Carbon (DOC) Lab filtered (3)	7	N/A	2024/07/23	BBY6SOP-00053	SM 24 5310 B m
Conductivity @25C	8	N/A	2024/07/18	BBY6SOP-00026	SM 24 2510 B m
Sulphide (as H2S) (1)	8	N/A	2024/07/18		Auto Calc
Hardness Total (calculated as CaCO3) (4)	6	N/A	2024/07/18	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (4)	1	N/A	2024/07/19	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (4)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	7	N/A	2024/07/18	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV (5)	8	2024/07/19	2024/07/19	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	8	2024/07/19	2024/07/19	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	7	N/A	2024/07/18	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Elements by ICPMS Low Level (dissolved) (5)	2	N/A	2024/07/18	BBY7SOP-00002	EPA 6020b R2 m
Elements by ICPMS Low Level (lab filter) (6)	6	N/A	2024/07/18	BBY7SOP-00002	EPA 6020b R2 m
Elements by ICPMS Digested LL (total)	6	2024/07/18	2024/07/18	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	6	N/A	2024/07/18	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2024/07/19	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Elements by ICPMS Low Level (total)	2	N/A	2024/07/19	BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	8	N/A	2024/07/19	BBY6SOP-00016	SM 24 4500-N C m
Un-ionized Ammonia as N @ 15 C	1	N/A	2024/07/19	BBY WI-00033	Auto Calc

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BUREAU VERITAS JOB #: C453040
Received: 2024/07/15, 12:37

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Un-ionized Ammonia as N @ 15 C	7	N/A	2024/07/22	BBY WI-00033	Auto Calc
Ammonia-N Low Level (Preserved)	1	N/A	2024/07/18	AB SOP-00007	SM 24 4500 NH3 A G m
Ammonia-N Low Level (Preserved)	7	N/A	2024/07/22	AB SOP-00007	SM 24 4500 NH3 A G m
Nitrate+Nitrite (N) (low level)	8	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) (low level)	8	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N) Low Level Calc	8	N/A	2024/07/19	BBY WI-00033	Auto Calc
pH measured @ 15 C (2, 7)	8	N/A	2024/07/18	EENVSOP-00159	SM 24 4500 H+ B m
pH @25°C (7)	8	N/A	2024/07/18	BBY6SOP-00026	SM 24 4500-H+ B m
Total Sulphide (1)	8	N/A	2024/07/18	AB SOP-00080	SM 24 4500 S2-A D Fm
Total Dissolved Solids - Low Level (1)	8	2024/07/18	2024/07/18	AB SOP-00065	SM 24 2540 C m
Carbon (Total Organic) (8)	7	N/A	2024/07/22	BBY6SOP-00053	SM 24 5310 B m
Carbon (Total Organic) (8)	1	N/A	2024/07/23	BBY6SOP-00053	SM 24 5310 B m
Total Oil and Grease	8	N/A	2024/07/18	BBY8SOP-00004	BCMOE BCLM Nov2015 m
Total Phosphorus-Dis-Low-Lab Filtered (9)	7	2024/07/17	2024/07/19	BBY6SOP-00013	SM 24 4500-P E m
Total Phosphorus-Dis-Low-Lab Filtered (9)	1	2024/07/20	2024/07/20	BBY6SOP-00013	SM 24 4500-P E m
Total Phosphorus Low Level Total	7	2024/07/17	2024/07/18	BBY6SOP-00013	SM 24 4500-P E m
Total Phosphorus Low Level Total	1	2024/07/17	2024/07/19	BBY6SOP-00013	SM 24 4500-P E m
Total Suspended Solids (NFR)	8	2024/07/18	2024/07/19	BBY6SOP-00034	SM 24 2540 D m
Volatile HC-BTEX (10)	8	N/A	2024/07/18	BBY WI-00033	Auto Calc

Remarks:

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

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

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or

Your Project #: DAWSON WASTEWATER AUDIT
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Report Date: 2024/07/25
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CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453040
Received: 2024/07/15, 12:37

implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Edmonton Environmental, 4326 76 Avenue NW , Edmonton, AB, T6B 2H8
(3) DOC present in the sample should be considered as non-purgeable DOC. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(5) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(6) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling.
For Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(8) TOC present in the sample should be considered as non-purgeable TOC.
(9) Dissolved Phosphorus > Total Phosphorus Imbalance: When applicable, Dissolved Phosphorus and Total Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(10) VPH = VH - (Benzene + Toluene + Ethylbenzene + m & p-Xylene + o-Xylene + Styrene)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Atikin Hehn, Customer Solutions Representative
Email: Atikin.Hehn@bureauveritas.com
Phone# (604) 734 7276

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

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG721			CRG721		
Sampling Date		2024/07/14 14:14			2024/07/14 14:14		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	2EB-DC-4	RDL	QC Batch	2EB-DC-4 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Nitrate (N)	mg/L	0.0295	0.0020	B440223			
Sulphide (as H2S)	mg/L	0.031	0.0020	B441029			
Un-Ionized Ammonia @ 15 °C	mg/L	<0.00050	0.00050	B441834			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	81	1.0	B441829			
Carb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Demand Parameters							
Biochemical Oxygen Demand (inhib.)	mg/L	<2.0	2.0	B441702			
Misc. Inorganics							
Conductivity	uS/cm	260	2.0	B443745			
Dissolved Organic Carbon (C)	mg/L	2.0	0.20	B448587	2.0	0.20	B448587
pH	pH	7.80	N/A	B443739			
Total Organic Carbon (C)	mg/L	2.1	0.20	B448584			
Total Suspended Solids	mg/L	300	1.0	B443412			
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B443743			
Alkalinity (Total as CaCO3)	mg/L	81	1.0	B443743			
Bicarbonate (HCO3)	mg/L	98	1.0	B443743			
Carbonate (CO3)	mg/L	<1.0	1.0	B443743			
Hydroxide (OH)	mg/L	<1.0	1.0	B443743			
Total Sulphide	mg/L	0.029	0.0018	B443641			
Chloride (Cl)	mg/L	<0.50	0.50	B442629			
Sulphate (SO4)	mg/L	47	0.50	B442629			
Nutrients							
Total Phosphorus (P)	mg/L	0.37	0.0010	B442230			
Total Ammonia (N)	mg/L	<0.0050	0.0050	B444209			
Nitrate plus Nitrite (N)	mg/L	0.0295	0.0020	B442575			
Nitrite (N)	mg/L	<0.0020	0.0020	B442584			
Total Nitrogen (N)	mg/L	0.217	0.020	B443540			

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

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG721			CRG721		
Sampling Date		2024/07/14 14:14			2024/07/14 14:14		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	**2EB-DC-4**	**RDL**	**QC Batch**	**2EB-DC-4 Lab-Dup**	**RDL**	**QC Batch**
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	mg/L	0.0029	0.0010	B445203			
OIL & GREASE							
Total Oil and grease	mg/L	<1.0	1.0	B442985			
Physical Properties							
pH (15 C)	pH	7.78		B443866	7.76		B443866
Physical Properties							
Total Dissolved Solids	mg/L	162	1.0	B443021			

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG722			CRG722		
Sampling Date		2024/07/14 13:46			2024/07/14 13:46		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	DC-4	RDL	QC Batch	DC-4 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Nitrate (N)	mg/L	0.0309	0.0020	B440223			
Sulphide (as H2S)	mg/L	0.027	0.0020	B441029			
Un-Ionized Ammonia @ 15 °C	mg/L	<0.00050	0.00050	B441834			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	80	1.0	B441829			
Carb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Demand Parameters							
Biochemical Oxygen Demand (inhib.)	mg/L	<2.0	2.0	B441702			
Misc. Inorganics							
Conductivity	uS/cm	270	2.0	B443745			
Dissolved Organic Carbon (C)	mg/L	2.1	0.20	B448587			
pH	pH	7.90	N/A	B443739			
Total Organic Carbon (C)	mg/L	2.0	0.20	B448584			
Total Suspended Solids	mg/L	240	1.0	B443412			
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B443743			
Alkalinity (Total as CaCO3)	mg/L	80	1.0	B443743			
Bicarbonate (HCO3)	mg/L	98	1.0	B443743			
Carbonate (CO3)	mg/L	<1.0	1.0	B443743			
Hydroxide (OH)	mg/L	<1.0	1.0	B443743			
Total Sulphide	mg/L	0.025	0.0018	B443641			
Chloride (Cl)	mg/L	<0.50	0.50	B442629			
Sulphate (SO4)	mg/L	49	0.50	B442629			
Nutrients							
Total Phosphorus (P)	mg/L	0.32	0.0010	B442230			
Total Ammonia (N)	mg/L	0.013	0.0050	B448063	0.012	0.0050	B448063
Nitrate plus Nitrite (N)	mg/L	0.0309	0.0020	B442575			
Nitrite (N)	mg/L	<0.0020	0.0020	B442584			
Total Nitrogen (N)	mg/L	0.232	0.020	B443540			

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

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG722			CRG722		
Sampling Date		2024/07/14 13:46			2024/07/14 13:46		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	**DC-4**	**RDL**	**QC Batch**	**DC-4 Lab-Dup**	**RDL**	**QC Batch**
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	mg/L	0.0055	0.0010	B445203	0.0036	0.0010	B445203
OIL & GREASE							
Total Oil and grease	mg/L	1.5	1.0	B442985			
Physical Properties							
pH (15 C)	pH	7.97		B443866			
Physical Properties							
Total Dissolved Solids	mg/L	163	1.0	B443021	170	1.0	B443021

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG723	CRG724		CRG725		
Sampling Date		2024/07/14 13:03	2024/07/14 11:42		2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01		C#728123-01-01		
	UNITS	DC-WRB-1	DC-WRB-2	RDL	DC-WRB-3	RDL	QC Batch
Calculated Parameters							
Nitrate (N)	mg/L	0.0297	0.0308	0.0020	0.0304	0.0020	B440223
Sulphide (as H2S)	mg/L	0.027	0.032	0.0020	0.030	0.0020	B441029
Un-Ionized Ammonia @ 15 °C	mg/L	<0.00050	0.00091	0.00050	<0.00050	0.00050	B441834
Bicarb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	81	81	1.0	81	1.0	B441829
Carb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	<1.0	1.0	<1.0	1.0	B441829
Hydrox. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	<1.0	1.0	<1.0	1.0	B441829
Demand Parameters							
Biochemical Oxygen Demand (inhib.)	mg/L	<2.0	<2.0	2.0	<2.0	2.0	B441702
Misc. Inorganics							
Conductivity	uS/cm	260	260	2.0	260	2.0	B443745
Dissolved Organic Carbon (C)	mg/L	2.0	2.1	0.20	2.1	0.20	B448587
pH	pH	7.92	7.87	N/A	7.90	N/A	B443739
Total Organic Carbon (C)	mg/L	2.1	2.0	0.20	2.1	0.20	B448584
Total Suspended Solids	mg/L	350 (1)	310 (1)	1.7	340	1.0	B443412
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	<1.0	1.0	<1.0	1.0	B443743
Alkalinity (Total as CaCO3)	mg/L	81	81	1.0	81	1.0	B443743
Bicarbonate (HCO3)	mg/L	99	98	1.0	99	1.0	B443743
Carbonate (CO3)	mg/L	<1.0	<1.0	1.0	<1.0	1.0	B443743
Hydroxide (OH)	mg/L	<1.0	<1.0	1.0	<1.0	1.0	B443743
Total Sulphide	mg/L	0.025	0.030	0.0018	0.029	0.0018	B443641
Chloride (Cl)	mg/L	<0.50	<0.50	0.50	<0.50	0.50	B442629
Sulphate (SO4)	mg/L	47	48	0.50	45	0.50	B442629
Nutrients							
Total Phosphorus (P)	mg/L	0.36	0.36	0.0010	0.37	0.0010	B442230
Total Ammonia (N)	mg/L	0.0095	0.028	0.0050	0.013	0.0050	B448063
Nitrate plus Nitrite (N)	mg/L	0.0297	0.0308	0.0020	0.0304	0.0020	B442575
Nitrite (N)	mg/L	<0.0020	<0.0020	0.0020	<0.0020	0.0020	B442584
Total Nitrogen (N)	mg/L	0.221	0.212	0.020	0.227	0.020	B443540

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) RDL raised due to high concentration of solids in the sample.

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG723	CRG724		CRG725		
Sampling Date		2024/07/14 13:03	2024/07/14 11:42		2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01		C#728123-01-01		
	UNITS	**DC-WRB-1**	**DC-WRB-2**	**RDL**	**DC-WRB-3**	**RDL**	**QC Batch**
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	mg/L	0.0022	0.0050	0.0010	<0.0010	0.0010	B445203
OIL & GREASE							
Total Oil and grease	mg/L	3.3	<1.0	1.0	<1.0	1.0	B442985
Physical Properties							
pH (15 C)	pH	8.02	8.08		8.03		B443866
Physical Properties							
Total Dissolved Solids	mg/L	162	162	1.0	162	1.0	B443021
RDL = Reportable Detection Limit							

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG726		CRG727		
Sampling Date		2024/07/14 13:15		2024/07/14 14:14		
COC Number		C#728123-01-01		C#728123-01-01		
	UNITS	FIELD BLANK	QC Batch	REPLICATE	RDL	QC Batch
Calculated Parameters						
Nitrate (N)	mg/L	<0.0020	B440223	0.0316	0.0020	B440223
Sulphide (as H2S)	mg/L	<0.0020	B441029	0.030	0.0020	B441029
Un-Ionized Ammonia @ 15 °C	mg/L	<0.00050	B441834	0.00054	0.00050	B441834
Bicarb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	B441829	81	1.0	B441829
Carb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	B441829	<1.0	1.0	B441829
Hydrox. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	B441829	<1.0	1.0	B441829
Demand Parameters						
Biochemical Oxygen Demand (inhib.)	mg/L	<2.0	B441702	<2.0	2.0	B441702
Misc. Inorganics						
Conductivity	uS/cm	<2.0	B443745	270	2.0	B443745
Dissolved Organic Carbon (C)	mg/L	<0.20	B448587	2.1	0.20	B448587
pH	pH	6.25	B443739	7.82	N/A	B443739
Total Organic Carbon (C)	mg/L	<0.20	B448584	2.0	0.20	B448584
Total Suspended Solids	mg/L	<1.0	B443412	350	1.0	B443412
Anions						
Alkalinity (PP as CaCO3)	mg/L	<1.0	B443743	<1.0	1.0	B443743
Alkalinity (Total as CaCO3)	mg/L	<1.0	B443743	81	1.0	B443743
Bicarbonate (HCO3)	mg/L	<1.0	B443743	99	1.0	B443743
Carbonate (CO3)	mg/L	<1.0	B443743	<1.0	1.0	B443743
Hydroxide (OH)	mg/L	<1.0	B443743	<1.0	1.0	B443743
Total Sulphide	mg/L	<0.0018	B443641	0.028	0.0018	B443641
Chloride (Cl)	mg/L	<0.50	B442629	<0.50	0.50	B442629
Sulphate (SO4)	mg/L	<0.50	B442629	48	0.50	B442629
Nutrients						
Total Phosphorus (P)	mg/L	0.0012 (1)	B442230	0.33	0.0010	B446723
Total Ammonia (N)	mg/L	<0.0050	B448063	0.022	0.0050	B448063
Nitrate plus Nitrite (N)	mg/L	<0.0020	B442575	0.0316	0.0020	B442575
Nitrite (N)	mg/L	<0.0020	B442584	<0.0020	0.0020	B442584
Total Nitrogen (N)	mg/L	0.025	B443540	0.224	0.020	B443540

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) TP < DP: Both values fall within the method uncertainty for duplicates and are likely equivalent.

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG726		CRG727		
Sampling Date		2024/07/14 13:15		2024/07/14 14:14		
COC Number		C#728123-01-01		C#728123-01-01		
	UNITS	FIELD BLANK	QC Batch	REPLICATE	RDL	QC Batch
Lab Filtered Nutrients						
Dissolved Phosphorus (P)	mg/L	0.0014	B445203	<0.0010	0.0010	B445203
OIL & GREASE						
Total Oil and grease	mg/L	<1.0	B442985	<1.0	1.0	B442985
Physical Properties						
pH (15 C)	pH	6.31	B443866	7.97		B443866
Physical Properties						
Total Dissolved Solids	mg/L	<1.0	B443021	162	1.0	B443021
RDL = Reportable Detection Limit						

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG728			CRG728		
Sampling Date		2024/07/14			2024/07/14		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	TRIP BLANK	RDL	QC Batch	TRIP BLANK Lab-Dup	RDL	QC Batch
Calculated Parameters							
Nitrate (N)	mg/L	<0.0020	0.0020	B440223			
Sulphide (as H2S)	mg/L	<0.0020	0.0020	B441029			
Un-Ionized Ammonia @ 15 °C	mg/L	<0.00050	0.00050	B441834			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	1.0	1.0	B441829			
Carb. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L CaCO3	<1.0	1.0	B441829			
Demand Parameters							
Biochemical Oxygen Demand (inhib.)	mg/L	<2.0	2.0	B441702			
Misc. Inorganics							
Conductivity	uS/cm	<2.0	2.0	B443745			
pH	pH	6.23	N/A	B443739			
Total Organic Carbon (C)	mg/L	0.22	0.20	B449375	<0.20	0.20	B449375
Total Suspended Solids	mg/L	<1.0	1.0	B443412			
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B443743			
Alkalinity (Total as CaCO3)	mg/L	1.0	1.0	B443743			
Bicarbonate (HCO3)	mg/L	1.2	1.0	B443743			
Carbonate (CO3)	mg/L	<1.0	1.0	B443743			
Hydroxide (OH)	mg/L	<1.0	1.0	B443743			
Total Sulphide	mg/L	<0.0018	0.0018	B443641			
Chloride (Cl)	mg/L	<0.50	0.50	B442629			
Sulphate (SO4)	mg/L	<0.50	0.50	B442629			
Nutrients							
Total Phosphorus (P)	mg/L	<0.0010 (1)	0.0010	B442233			
Total Ammonia (N)	mg/L	<0.0050	0.0050	B448063			
Nitrate plus Nitrite (N)	mg/L	<0.0020	0.0020	B442575			
Nitrite (N)	mg/L	<0.0020	0.0020	B442584			
Total Nitrogen (N)	mg/L	0.038	0.020	B443540			
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	mg/L	0.0015	0.0010	B438009			

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) TP < DP: Both values fall within the method uncertainty for duplicates and are likely equivalent.

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRG728			CRG728		
Sampling Date		2024/07/14			2024/07/14		
COC Number		C#728123-01-01			C#728123-01-01		
	UNITS	**TRIP BLANK**	**RDL**	**QC Batch**	**TRIP BLANK Lab-Dup**	**RDL**	**QC Batch**
OIL & GREASE							
Total Oil and grease	mg/L	<1.0	1.0	B442985			
Physical Properties							
pH (15 C)	pH	6.23		B443866			
Physical Properties							
Total Dissolved Solids	mg/L	<1.0	1.0	B443021			

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	**2EB-DC-4**	**DC-4**	**DC-WRB-1**	**DC-WRB-2**	**RDL**	**QC Batch**
Elements							
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	0.0019	B445607
RDL = Reportable Detection Limit							

Bureau Veritas ID		CRG725	CRG725	CRG727		
Sampling Date		2024/07/14 10:48	2024/07/14 10:48	2024/07/14 14:14		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	**DC-WRB-3**	**DC-WRB-3 Lab-Dup**	**REPLICATE**	**RDL**	**QC Batch**
Elements						
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	0.0019	B445777
RDL = Reportable Detection Limit Lab-Dup = Laboratory Initiated Duplicate						

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724	CRG725		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42	2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	2EB-DC-4	DC-4	DC-WRB-1	DC-WRB-2	DC-WRB-3	RDL	QC Batch
Total Metals by ICPMS								
Total Aluminum (Al)	ug/L	6260	5720	5900	5680 (1)	7740	3.0	B443923
Total Antimony (Sb)	ug/L	0.492	0.447	0.495	0.451	0.553	0.020	B443923
Total Arsenic (As)	ug/L	4.21	3.88	4.07	3.95	5.07	0.020	B443923
Total Barium (Ba)	ug/L	114	110	108	102	129	0.050	B443923
Total Beryllium (Be)	ug/L	0.188	0.174	0.185	0.162	0.247	0.010	B443923
Total Bismuth (Bi)	ug/L	0.047	0.042	0.043	0.042	0.054	0.010	B443923
Total Boron (B)	ug/L	17	16	16	14	16	10	B443923
Total Cadmium (Cd)	ug/L	0.203	0.198	0.192	0.180	0.223	0.0050	B443923
Total Chromium (Cr)	ug/L	12.0	11.1	11.4	10.8	15.2	0.10	B443923
Total Cobalt (Co)	ug/L	4.57	4.24	4.41	4.08	5.74	0.010	B443923
Total Copper (Cu)	ug/L	12.7	12.2	12.3	11.6	15.6	0.10	B443923
Total Iron (Fe)	ug/L	9350	8780	8730	8530	11700	5.0	B443923
Total Lead (Pb)	ug/L	2.53	2.36	2.51	2.30	3.14	0.020	B443923
Total Lithium (Li)	ug/L	8.74	7.79	8.12	7.56	9.34	0.50	B443923
Total Manganese (Mn)	ug/L	227	215	216	196	285	0.10	B443923
Total Molybdenum (Mo)	ug/L	1.56	1.34	1.45	1.36	1.54	0.050	B443923
Total Nickel (Ni)	ug/L	14.9	14.1	14.5	13.6	18.6	0.10	B443923
Total Phosphorus (P)	ug/L	277	289	271	247	372	5.0	B443923
Total Selenium (Se)	ug/L	0.625	0.606	0.586	0.571	0.645	0.040	B443923
Total Silicon (Si)	ug/L	11600	10700	10700	10500	13400	50	B443923
Total Silver (Ag)	ug/L	0.045	0.045	0.044	0.043	0.056	0.010	B443923
Total Strontium (Sr)	ug/L	230	216	214	205	232	0.050	B443923
Total Thallium (Tl)	ug/L	0.0552	0.0552	0.0575	0.0555	0.0676	0.0020	B443923
Total Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	B443923
Total Titanium (Ti)	ug/L	280	257	266	254	350	2.0	B443923
Total Uranium (U)	ug/L	1.33	1.26	1.32	1.20	1.37	0.0050	B443923
Total Vanadium (V)	ug/L	17.0	15.7	16.2	15.0	21.1	0.20	B443923
Total Zinc (Zn)	ug/L	32.5	36.1	33.4	33.8	41.4	1.0	B443923
Total Zirconium (Zr)	ug/L	0.78	0.69	0.77	0.73	0.95	0.10	B443923

RDL = Reportable Detection Limit

(1) Matrix Spike outside acceptance criteria due to sample matrix interference.

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRG727		
Sampling Date		2024/07/14 14:14		
COC Number		C#728123-01-01		
	UNITS	REPLICATE	RDL	QC Batch
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	5500	3.0	B443923
Total Antimony (Sb)	ug/L	0.436	0.020	B443923
Total Arsenic (As)	ug/L	3.69	0.020	B443923
Total Barium (Ba)	ug/L	103	0.050	B443923
Total Beryllium (Be)	ug/L	0.155	0.010	B443923
Total Bismuth (Bi)	ug/L	0.042	0.010	B443923
Total Boron (B)	ug/L	14	10	B443923
Total Cadmium (Cd)	ug/L	0.183	0.0050	B443923
Total Chromium (Cr)	ug/L	10.2	0.10	B443923
Total Cobalt (Co)	ug/L	3.95	0.010	B443923
Total Copper (Cu)	ug/L	11.2	0.10	B443923
Total Iron (Fe)	ug/L	8390	5.0	B443923
Total Lead (Pb)	ug/L	2.15	0.020	B443923
Total Lithium (Li)	ug/L	7.49	0.50	B443923
Total Manganese (Mn)	ug/L	194	0.10	B443923
Total Molybdenum (Mo)	ug/L	1.35	0.050	B443923
Total Nickel (Ni)	ug/L	13.1	0.10	B443923
Total Phosphorus (P)	ug/L	249	5.0	B443923
Total Selenium (Se)	ug/L	0.572	0.040	B443923
Total Silicon (Si)	ug/L	10600	50	B443923
Total Silver (Ag)	ug/L	0.039	0.010	B443923
Total Strontium (Sr)	ug/L	200	0.050	B443923
Total Thallium (Tl)	ug/L	0.0481	0.0020	B443923
Total Tin (Sn)	ug/L	<0.20	0.20	B443923
Total Titanium (Ti)	ug/L	244	2.0	B443923
Total Uranium (U)	ug/L	1.21	0.0050	B443923
Total Vanadium (V)	ug/L	14.8	0.20	B443923
Total Zinc (Zn)	ug/L	31.2	1.0	B443923
Total Zirconium (Zr)	ug/L	0.67	0.10	B443923
RDL = Reportable Detection Limit				

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CSR BTEX/VPH IN WATER (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724	CRG725		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42	2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	2EB-DC-4	DC-4	DC-WRB-1	DC-WRB-2	DC-WRB-3	RDL	QC Batch
Calculated Parameters								
VPH (VH6 to 10 - BTEX)	ug/L	<300	<300	<300	<300	<300	300	B440663
Volatiles								
Methyl-tert-butylether (MTBE)	ug/L	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	B442603
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
m & p-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
Styrene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
Xylenes (Total)	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	B442603
VH C6-C10	ug/L	<300	<300	<300	<300	<300	300	B442603
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	105	104	103	104	104		B442603
4-Bromofluorobenzene (sur.)	%	91	91	92	91	92		B442603
D4-1,2-Dichloroethane (sur.)	%	120	122	123	127	127		B442603

RDL = Reportable Detection Limit

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CSR BTEX/VPH IN WATER (WATER)

Bureau Veritas ID		CRG726	CRG727	CRG728		
Sampling Date		2024/07/14 13:15	2024/07/14 14:14	2024/07/14		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	FIELD BLANK	REPLICATE	TRIP BLANK	RDL	QC Batch
Calculated Parameters						
VPH (VH6 to 10 - BTEX)	ug/L	<300	<300	<300	300	B440663
Volatiles						
Methyl-tert-butylether (MTBE)	ug/L	<4.0	<4.0	<4.0	4.0	B442603
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
Toluene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
m & p-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
o-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
Styrene	ug/L	<0.40	<0.40	<0.40	0.40	B442603
Xylenes (Total)	ug/L	<0.40	<0.40	<0.40	0.40	B442603
VH C6-C10	ug/L	<300	<300	<300	300	B442603
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	105	103	104		B442603
4-Bromofluorobenzene (sur.)	%	91	91	91		B442603
D4-1,2-Dichloroethane (sur.)	%	123	124	128		B442603
RDL = Reportable Detection Limit						

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LOW LEVEL D. METALS W/ CV HG-DISS (WATER)

Bureau Veritas ID		CRG726			CRG726			CRG728		
Sampling Date		2024/07/14 13:15			2024/07/14 13:15			2024/07/14		
COC Number		C#728123-01-01			C#728123-01-01			C#728123-01-01		
	UNITS	FIELD BLANK	RDL	QC Batch	FIELD BLANK Lab-Dup	RDL	QC Batch	TRIP BLANK	RDL	QC Batch
Calculated Parameters										
Dissolved Hardness (CaCO3)	mg/L	0.50	0.50	B445291				<0.50	0.50	B440213
Elements										
Dissolved Mercury (Hg)	ug/L	<0.0019	0.0019	B445777				0.0026	0.0019	B445777
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	<0.50	0.50	B442314	<0.50	0.50	B442314	<0.50	0.50	B442314
Dissolved Antimony (Sb)	ug/L	<0.020	0.020	B442314	<0.020	0.020	B442314	<0.020	0.020	B442314
Dissolved Arsenic (As)	ug/L	<0.020	0.020	B442314	<0.020	0.020	B442314	<0.020	0.020	B442314
Dissolved Barium (Ba)	ug/L	1.13	0.020	B442314	1.13	0.020	B442314	<0.020	0.020	B442314
Dissolved Beryllium (Be)	ug/L	<0.010	0.010	B442314	<0.010	0.010	B442314	<0.010	0.010	B442314
Dissolved Bismuth (Bi)	ug/L	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314
Dissolved Boron (B)	ug/L	<10	10	B442314	<10	10	B442314	<10	10	B442314
Dissolved Cadmium (Cd)	ug/L	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314
Dissolved Chromium (Cr)	ug/L	0.23	0.10	B442314	0.25	0.10	B442314	<0.10	0.10	B442314
Dissolved Cobalt (Co)	ug/L	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314
Dissolved Copper (Cu)	ug/L	<0.050	0.050	B442314	<0.050	0.050	B442314	<0.050	0.050	B442314
Dissolved Iron (Fe)	ug/L	1.9	1.0	B442314	1.9	1.0	B442314	<1.0	1.0	B442314
Dissolved Lead (Pb)	ug/L	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314
Dissolved Lithium (Li)	ug/L	<0.50	0.50	B442314	<0.50	0.50	B442314	<0.50	0.50	B442314
Dissolved Manganese (Mn)	ug/L	<0.050	0.050	B442314	<0.050	0.050	B442314	<0.050	0.050	B442314
Dissolved Molybdenum (Mo)	ug/L	<0.050	0.050	B442314	<0.050	0.050	B442314	<0.050	0.050	B442314
Dissolved Nickel (Ni)	ug/L	0.123	0.020	B442314	0.121	0.020	B442314	<0.020	0.020	B442314
Dissolved Phosphorus (P)	ug/L	<2.0	2.0	B442314	<2.0	2.0	B442314	<2.0	2.0	B442314
Dissolved Selenium (Se)	ug/L	<0.040	0.040	B442314	<0.040	0.040	B442314	<0.040	0.040	B442314
Dissolved Silicon (Si)	ug/L	<50	50	B442314	<50	50	B442314	<50	50	B442314
Dissolved Silver (Ag)	ug/L	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314	<0.0050	0.0050	B442314
Dissolved Strontium (Sr)	ug/L	0.087	0.050	B442314	0.082	0.050	B442314	<0.050	0.050	B442314
Dissolved Thallium (Tl)	ug/L	<0.0020	0.0020	B442314	<0.0020	0.0020	B442314	<0.0020	0.0020	B442314
Dissolved Tin (Sn)	ug/L	<0.20	0.20	B442314	<0.20	0.20	B442314	<0.20	0.20	B442314
Dissolved Titanium (Ti)	ug/L	<0.50	0.50	B442314	<0.50	0.50	B442314	<0.50	0.50	B442314
Dissolved Uranium (U)	ug/L	<0.0020	0.0020	B442314	<0.0020	0.0020	B442314	<0.0020	0.0020	B442314
Dissolved Vanadium (V)	ug/L	<0.20	0.20	B442314	<0.20	0.20	B442314	<0.20	0.20	B442314

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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LOW LEVEL D. METALS W/ CV HG-DISS (WATER)

Bureau Veritas ID		CRG726			CRG726			CRG728		
Sampling Date		2024/07/14 13:15			2024/07/14 13:15			2024/07/14		
COC Number		C#728123-01-01			C#728123-01-01			C#728123-01-01		
	UNITS	FIELD BLANK	RDL	QC Batch	FIELD BLANK Lab-Dup	RDL	QC Batch	TRIP BLANK	RDL	QC Batch
Dissolved Zinc (Zn)	ug/L	0.28	0.10	B442314	0.28	0.10	B442314	<0.10	0.10	B442314
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	B442314	<0.10	0.10	B442314	<0.10	0.10	B442314
Dissolved Calcium (Ca)	mg/L	0.201	0.050	B445023				<0.050	0.050	B440221
Dissolved Magnesium (Mg)	mg/L	<0.050	0.050	B445023				<0.050	0.050	B440221
Dissolved Potassium (K)	mg/L	<0.050	0.050	B445023				<0.050	0.050	B440221
Dissolved Sodium (Na)	mg/L	<0.050	0.050	B445023				<0.050	0.050	B440221
Dissolved Sulphur (S)	mg/L	<3.0	3.0	B445023				<3.0	3.0	B440221

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		CRG728		
Sampling Date		2024/07/14		
COC Number		C#728123-01-01		
	UNITS	TRIP BLANK Lab-Dup	RDL	QC Batch
Elements				
Dissolved Mercury (Hg)	ug/L	0.0081 (1)	0.0019	B445777

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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LOW LEVEL D. METALS W/ CV HG-LAB FILT (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724	CRG725		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42	2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	2EB-DC-4	DC-4	DC-WRB-1	DC-WRB-2	DC-WRB-3	RDL	QC Batch
Calculated Parameters								
Dissolved Hardness (CaCO3)	mg/L	122	128	123	125	123	0.50	B440213
Dissolved Metals by ICPMS								
Dissolved Calcium (Ca)	mg/L	32.5	34.0	33.5	33.4	32.9	0.050	B440221
Dissolved Magnesium (Mg)	mg/L	9.85	10.4	9.65	10.0	9.85	0.050	B440221
Dissolved Potassium (K)	mg/L	1.33	1.27	1.41	1.39	1.45	0.050	B440221
Dissolved Sodium (Na)	mg/L	2.63	2.50	2.65	2.52	2.63	0.050	B440221
Dissolved Sulphur (S)	mg/L	15.3	16.2	14.9	16.4	15.6	3.0	B440221
Lab Filtered Metals								
Dissolved Aluminum (Al)	ug/L	27.3	26.3	26.3	26.1	31.7	0.50	B442357
Dissolved Antimony (Sb)	ug/L	0.194	0.184	0.206	0.191	0.202	0.020	B442357
Dissolved Arsenic (As)	ug/L	0.571	0.531	0.536	0.540	0.582	0.020	B442357
Dissolved Barium (Ba)	ug/L	39.8	41.4	39.0	41.0	40.6	0.020	B442357
Dissolved Beryllium (Be)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	B442357
Dissolved Bismuth (Bi)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	B442357
Dissolved Boron (B)	ug/L	13	11	14	12	12	10	B442357
Dissolved Cadmium (Cd)	ug/L	0.0078	0.0100	0.0093	0.0088	0.0091	0.0050	B442357
Dissolved Chromium (Cr)	ug/L	<0.10	<0.10	<0.10	<0.10	0.12	0.10	B442357
Dissolved Cobalt (Co)	ug/L	0.0159	0.0163	0.0150	0.0150	0.0262	0.0050	B442357
Dissolved Copper (Cu)	ug/L	1.01	1.01	1.06	1.09	1.48	0.050	B442357
Dissolved Iron (Fe)	ug/L	1.5	1.4	1.2	1.6	5.0	1.0	B442357
Dissolved Lead (Pb)	ug/L	0.0082	<0.0050	0.0573	0.0070	0.0082	0.0050	B442357
Dissolved Lithium (Li)	ug/L	3.12	3.01	3.33	2.94	3.05	0.50	B442357
Dissolved Manganese (Mn)	ug/L	0.319	0.464	0.337	0.435	0.334	0.050	B442357
Dissolved Molybdenum (Mo)	ug/L	1.45	1.32	1.50	1.46	1.63	0.050	B442357
Dissolved Nickel (Ni)	ug/L	0.936	1.10	0.893	0.946	0.965	0.020	B442357
Dissolved Phosphorus (P)	ug/L	3.1	3.3	3.0	3.4	3.0	2.0	B442357
Dissolved Selenium (Se)	ug/L	0.542	0.549	0.554	0.552	0.524	0.040	B442357
Dissolved Silicon (Si)	ug/L	2780	2800	2850	2850	2790	50	B442357
Dissolved Silver (Ag)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	B442357
Dissolved Strontium (Sr)	ug/L	165	170	168	175	174	0.050	B442357
Dissolved Thallium (Tl)	ug/L	0.0068	0.0064	0.0070	0.0074	0.0069	0.0020	B442357
Dissolved Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	B442357
Dissolved Titanium (Ti)	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	B442357

RDL = Reportable Detection Limit

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LOW LEVEL D. METALS W/ CV HG-LAB FILT (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724	CRG725		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42	2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	**2EB-DC-4**	**DC-4**	**DC-WRB-1**	**DC-WRB-2**	**DC-WRB-3**	**RDL**	**QC Batch**
Dissolved Uranium (U)	ug/L	1.05	1.02	1.02	1.02	1.04	0.0020	B442357
Dissolved Vanadium (V)	ug/L	0.30	0.28	0.33	0.34	0.35	0.20	B442357
Dissolved Zinc (Zn)	ug/L	0.61	2.01	0.68	0.63	1.24	0.10	B442357
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	B442357
RDL = Reportable Detection Limit								

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LOW LEVEL D. METALS W/ CV HG-LAB FILT (WATER)

Bureau Veritas ID		CRG727		
Sampling Date		2024/07/14 14:14		
COC Number		C#728123-01-01		
	UNITS	REPLICATE	RDL	QC Batch
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	127	0.50	B440213
Dissolved Metals by ICPMS				
Dissolved Calcium (Ca)	mg/L	34.5	0.050	B440221
Dissolved Magnesium (Mg)	mg/L	9.90	0.050	B440221
Dissolved Potassium (K)	mg/L	1.31	0.050	B440221
Dissolved Sodium (Na)	mg/L	2.58	0.050	B440221
Dissolved Sulphur (S)	mg/L	15.8	3.0	B440221
Lab Filtered Metals				
Dissolved Aluminum (Al)	ug/L	26.9	0.50	B442357
Dissolved Antimony (Sb)	ug/L	0.188	0.020	B442357
Dissolved Arsenic (As)	ug/L	0.527	0.020	B442357
Dissolved Barium (Ba)	ug/L	39.9	0.020	B442357
Dissolved Beryllium (Be)	ug/L	<0.010	0.010	B442357
Dissolved Bismuth (Bi)	ug/L	<0.0050	0.0050	B442357
Dissolved Boron (B)	ug/L	12	10	B442357
Dissolved Cadmium (Cd)	ug/L	0.0085	0.0050	B442357
Dissolved Chromium (Cr)	ug/L	<0.10	0.10	B442357
Dissolved Cobalt (Co)	ug/L	0.0168	0.0050	B442357
Dissolved Copper (Cu)	ug/L	0.985	0.050	B442357
Dissolved Iron (Fe)	ug/L	1.4	1.0	B442357
Dissolved Lead (Pb)	ug/L	0.0089	0.0050	B442357
Dissolved Lithium (Li)	ug/L	3.00	0.50	B442357
Dissolved Manganese (Mn)	ug/L	0.574	0.050	B442357
Dissolved Molybdenum (Mo)	ug/L	1.46	0.050	B442357
Dissolved Nickel (Ni)	ug/L	0.973	0.020	B442357
Dissolved Phosphorus (P)	ug/L	3.0	2.0	B442357
Dissolved Selenium (Se)	ug/L	0.545	0.040	B442357
Dissolved Silicon (Si)	ug/L	2890	50	B442357
Dissolved Silver (Ag)	ug/L	<0.0050	0.0050	B442357
Dissolved Strontium (Sr)	ug/L	166	0.050	B442357
Dissolved Thallium (Tl)	ug/L	0.0062	0.0020	B442357
Dissolved Tin (Sn)	ug/L	<0.20	0.20	B442357
Dissolved Titanium (Ti)	ug/L	<0.50	0.50	B442357
RDL = Reportable Detection Limit				

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LOW LEVEL D. METALS W/ CV HG-LAB FILT (WATER)

Bureau Veritas ID		CRG727		
Sampling Date		2024/07/14 14:14		
COC Number		C#728123-01-01		
	UNITS	**REPLICATE**	**RDL**	**QC Batch**
Dissolved Uranium (U)	ug/L	1.02	0.0020	B442357
Dissolved Vanadium (V)	ug/L	0.31	0.20	B442357
Dissolved Zinc (Zn)	ug/L	0.72	0.10	B442357
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	B442357
RDL = Reportable Detection Limit				

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Bureau Veritas ID		CRG721	CRG722	CRG723	CRG724	CRG725		
Sampling Date		2024/07/14 14:14	2024/07/14 13:46	2024/07/14 13:03	2024/07/14 11:42	2024/07/14 10:48		
COC Number		C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01	C#728123-01-01		
	UNITS	2EB-DC-4	DC-4	DC-WRB-1	DC-WRB-2	DC-WRB-3	RDL	QC Batch
Calculated Parameters								
Total Hardness (CaCO3)	mg/L	210	200	190	180	220	0.50	B440451
Elements								
Total Mercury (Hg)	ug/L	0.0109	0.0111	0.105	0.0132	0.0163	0.0019	B445923
Total Metals by ICPMS								
Total Calcium (Ca)	mg/L	56.5	55.0	52.9	50.2	60.5	0.25	B440611
Total Magnesium (Mg)	mg/L	15.7	15.2	14.8	13.9	16.5	0.25	B440611
Total Potassium (K)	mg/L	2.29	2.06	2.23	2.13	2.60	0.25	B440611
Total Sodium (Na)	mg/L	3.14	2.92	3.01	2.79	3.24	0.25	B440611
Total Sulphur (S)	mg/L	15.2	15.3	15.0	14.3	14.2	3.0	B440611
RDL = Reportable Detection Limit								

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LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Bureau Veritas ID		CRG726			CRG726			CRG727		
Sampling Date		2024/07/14 13:15			2024/07/14 13:15			2024/07/14 14:14		
COC Number		C#728123-01-01			C#728123-01-01			C#728123-01-01		
	UNITS	FIELD BLANK	RDL	QC Batch	FIELD BLANK Lab-Dup	RDL	QC Batch	REPLICATE	RDL	QC Batch
Calculated Parameters										
Total Hardness (CaCO3)	mg/L	<0.50	0.50	B446256				190	0.50	B440451
Elements										
Total Mercury (Hg)	ug/L	<0.0019	0.0019	B445923				0.0126	0.0019	B445923
Total Metals by ICPMS										
Total Aluminum (Al)	ug/L	0.94	0.50	B442692	1.05	0.50	B442692			
Total Antimony (Sb)	ug/L	<0.020	0.020	B442692	<0.020	0.020	B442692			
Total Arsenic (As)	ug/L	<0.020	0.020	B442692	<0.020	0.020	B442692			
Total Barium (Ba)	ug/L	0.908	0.020	B442692	0.897	0.020	B442692			
Total Beryllium (Be)	ug/L	<0.010	0.010	B442692	<0.010	0.010	B442692			
Total Bismuth (Bi)	ug/L	<0.0050	0.0050	B442692	<0.0050	0.0050	B442692			
Total Boron (B)	ug/L	<10	10	B442692	<10	10	B442692			
Total Cadmium (Cd)	ug/L	<0.0050	0.0050	B442692	<0.0050	0.0050	B442692			
Total Chromium (Cr)	ug/L	<0.10	0.10	B442692	<0.10	0.10	B442692			
Total Cobalt (Co)	ug/L	<0.0050	0.0050	B442692	<0.0050	0.0050	B442692			
Total Copper (Cu)	ug/L	<0.050	0.050	B442692	<0.050	0.050	B442692			
Total Iron (Fe)	ug/L	<1.0	1.0	B442692	<1.0	1.0	B442692			
Total Lead (Pb)	ug/L	<0.0050	0.0050	B442692	<0.0050	0.0050	B442692			
Total Lithium (Li)	ug/L	<0.50	0.50	B442692	<0.50	0.50	B442692			
Total Manganese (Mn)	ug/L	<0.050	0.050	B442692	<0.050	0.050	B442692			
Total Molybdenum (Mo)	ug/L	<0.050	0.050	B442692	<0.050	0.050	B442692			
Total Nickel (Ni)	ug/L	<0.020	0.020	B442692	<0.020	0.020	B442692			
Total Phosphorus (P)	ug/L	<2.0	2.0	B442692	<2.0	2.0	B442692			
Total Selenium (Se)	ug/L	<0.040	0.040	B442692	<0.040	0.040	B442692			
Total Silicon (Si)	ug/L	<50	50	B442692	<50	50	B442692			
Total Silver (Ag)	ug/L	<0.0050	0.0050	B442692	<0.0050	0.0050	B442692			
Total Strontium (Sr)	ug/L	0.066	0.050	B442692	0.071	0.050	B442692			
Total Thallium (Tl)	ug/L	<0.0020	0.0020	B442692	<0.0020	0.0020	B442692			
Total Tin (Sn)	ug/L	<0.20	0.20	B442692	<0.20	0.20	B442692			
Total Titanium (Ti)	ug/L	<0.50	0.50	B442692	<0.50	0.50	B442692			
Total Uranium (U)	ug/L	<0.0020	0.0020	B442692	<0.0020	0.0020	B442692			
Total Vanadium (V)	ug/L	<0.20	0.20	B442692	<0.20	0.20	B442692			

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Bureau Veritas ID		CRG726			CRG726			CRG727		
Sampling Date		2024/07/14 13:15			2024/07/14 13:15			2024/07/14 14:14		
COC Number		C#728123-01-01			C#728123-01-01			C#728123-01-01		
	UNITS	**FIELD BLANK**	**RDL**	**QC Batch**	**FIELD BLANK Lab-Dup**	**RDL**	**QC Batch**	**REPLICATE**	**RDL**	**QC Batch**
Total Zinc (Zn)	ug/L	1.90	0.10	B442692	1.90	0.10	B442692			
Total Zirconium (Zr)	ug/L	<0.10	0.10	B442692	<0.10	0.10	B442692			
Total Calcium (Ca)	mg/L	0.189	0.050	B445024				51.4	0.25	B440611
Total Magnesium (Mg)	mg/L	<0.050	0.050	B445024				13.9	0.25	B440611
Total Potassium (K)	mg/L	<0.050	0.050	B445024				2.00	0.25	B440611
Total Sodium (Na)	mg/L	<0.050	0.050	B445024				2.72	0.25	B440611
Total Sulphur (S)	mg/L	<3.0	3.0	B445024				14.0	3.0	B440611

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

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LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Bureau Veritas ID		CRG728		
Sampling Date		2024/07/14		
COC Number		C#728123-01-01		
	UNITS	TRIP BLANK	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	<0.50	0.50	B440451
Elements				
Total Mercury (Hg)	ug/L	<0.0019	0.0019	B445923
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	<0.50	0.50	B442692
Total Antimony (Sb)	ug/L	<0.020	0.020	B442692
Total Arsenic (As)	ug/L	<0.020	0.020	B442692
Total Barium (Ba)	ug/L	<0.020	0.020	B442692
Total Beryllium (Be)	ug/L	<0.010	0.010	B442692
Total Bismuth (Bi)	ug/L	<0.0050	0.0050	B442692
Total Boron (B)	ug/L	<10	10	B442692
Total Cadmium (Cd)	ug/L	<0.0050	0.0050	B442692
Total Chromium (Cr)	ug/L	<0.10	0.10	B442692
Total Cobalt (Co)	ug/L	<0.0050	0.0050	B442692
Total Copper (Cu)	ug/L	<0.050	0.050	B442692
Total Iron (Fe)	ug/L	<1.0	1.0	B442692
Total Lead (Pb)	ug/L	<0.0050	0.0050	B442692
Total Lithium (Li)	ug/L	<0.50	0.50	B442692
Total Manganese (Mn)	ug/L	<0.050	0.050	B442692
Total Molybdenum (Mo)	ug/L	<0.050	0.050	B442692
Total Nickel (Ni)	ug/L	<0.020	0.020	B442692
Total Phosphorus (P)	ug/L	<2.0	2.0	B442692
Total Selenium (Se)	ug/L	<0.040	0.040	B442692
Total Silicon (Si)	ug/L	<50	50	B442692
Total Silver (Ag)	ug/L	<0.0050	0.0050	B442692
Total Strontium (Sr)	ug/L	<0.050	0.050	B442692
Total Thallium (Tl)	ug/L	<0.0020	0.0020	B442692
Total Tin (Sn)	ug/L	<0.20	0.20	B442692
Total Titanium (Ti)	ug/L	<0.50	0.50	B442692
Total Uranium (U)	ug/L	<0.0020	0.0020	B442692
Total Vanadium (V)	ug/L	<0.20	0.20	B442692
Total Zinc (Zn)	ug/L	<0.10	0.10	B442692
RDL = Reportable Detection Limit				

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LOW LEVEL TOTAL METALS WITH CV HG (WATER)

Bureau Veritas ID		CRG728		
Sampling Date		2024/07/14		
COC Number		C#728123-01-01		
	UNITS	**TRIP BLANK**	**RDL**	**QC Batch**
Total Zirconium (Zr)	ug/L	<0.10	0.10	B442692
Total Calcium (Ca)	mg/L	<0.050	0.050	B440611
Total Magnesium (Mg)	mg/L	<0.050	0.050	B440611
Total Potassium (K)	mg/L	<0.050	0.050	B440611
Total Sodium (Na)	mg/L	<0.050	0.050	B440611
Total Sulphur (S)	mg/L	<3.0	3.0	B440611
RDL = Reportable Detection Limit				

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GENERAL COMMENTS

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

Package 1	17.7°C
Package 2	8.0°C
Package 3	12.7°C

Samples received in non-standard containers and analyzed with client consent for TOGGRVV-W on batch: B442985. Please refer to BBY PDF-00161.

Sample CRG728 [TRIP BLANK] : Headspace was noted in sample container at the time of volatiles extraction.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B438009	NKT	Spiked Blank	Dissolved Phosphorus (P)	2024/07/20		111	%	N/A
B438009	NKT	Method Blank	Dissolved Phosphorus (P)	2024/07/20	<0.0010		mg/L	
B441702	SYC	Spiked Blank	Biochemical Oxygen Demand (inhib.)	2024/07/22		91	%	N/A
B441702	SYC	Method Blank	Biochemical Oxygen Demand (inhib.)	2024/07/22	<2.0 (1)		mg/L	
B441702	SYC	RPD	Biochemical Oxygen Demand (inhib.)	2024/07/22	4.1		%	20
B442230	NKT	Matrix Spike	Total Phosphorus (P)	2024/07/18		NC	%	N/A
B442230	NKT	Spiked Blank	Total Phosphorus (P)	2024/07/18		106	%	80 - 120
B442230	NKT	Method Blank	Total Phosphorus (P)	2024/07/18	<0.0010		mg/L	
B442230	NKT	RPD	Total Phosphorus (P)	2024/07/18	0.17		%	20
B442233	NKT	Spiked Blank	Total Phosphorus (P)	2024/07/18		106	%	80 - 120
B442233	NKT	Method Blank	Total Phosphorus (P)	2024/07/19	<0.0010		mg/L	
B442314	AA1	Matrix Spike	Dissolved Aluminum (Al)	2024/07/18		96	%	80 - 120
			Dissolved Antimony (Sb)	2024/07/18		102	%	80 - 120
			Dissolved Arsenic (As)	2024/07/18		102	%	80 - 120
			Dissolved Barium (Ba)	2024/07/18		97	%	80 - 120
			Dissolved Beryllium (Be)	2024/07/18		97	%	80 - 120
			Dissolved Bismuth (Bi)	2024/07/18		96	%	80 - 120
			Dissolved Boron (B)	2024/07/18		95	%	80 - 120
			Dissolved Cadmium (Cd)	2024/07/18		101	%	80 - 120
			Dissolved Chromium (Cr)	2024/07/18		96	%	80 - 120
			Dissolved Cobalt (Co)	2024/07/18		96	%	80 - 120
			Dissolved Copper (Cu)	2024/07/18		95	%	80 - 120
			Dissolved Iron (Fe)	2024/07/18		101	%	80 - 120
			Dissolved Lead (Pb)	2024/07/18		96	%	80 - 120
			Dissolved Lithium (Li)	2024/07/18		91	%	80 - 120
			Dissolved Manganese (Mn)	2024/07/18		97	%	80 - 120
			Dissolved Molybdenum (Mo)	2024/07/18		106	%	80 - 120
			Dissolved Nickel (Ni)	2024/07/18		97	%	80 - 120
			Dissolved Phosphorus (P)	2024/07/18		102	%	80 - 120
			Dissolved Selenium (Se)	2024/07/18		100	%	80 - 120
			Dissolved Silicon (Si)	2024/07/18		107	%	80 - 120
			Dissolved Silver (Ag)	2024/07/18		100	%	80 - 120
			Dissolved Strontium (Sr)	2024/07/18		NC	%	80 - 120
			Dissolved Thallium (Tl)	2024/07/18		101	%	80 - 120
			Dissolved Tin (Sn)	2024/07/18		101	%	80 - 120
			Dissolved Titanium (Ti)	2024/07/18		101	%	80 - 120
			Dissolved Uranium (U)	2024/07/18		108	%	80 - 120
			Dissolved Vanadium (V)	2024/07/18		102	%	80 - 120
			Dissolved Zinc (Zn)	2024/07/18		101	%	80 - 120
			Dissolved Zirconium (Zr)	2024/07/18		106	%	80 - 120
B442314	AA1	Spiked Blank	Dissolved Aluminum (Al)	2024/07/18		99	%	80 - 120
			Dissolved Antimony (Sb)	2024/07/18		102	%	80 - 120
			Dissolved Arsenic (As)	2024/07/18		103	%	80 - 120
			Dissolved Barium (Ba)	2024/07/18		98	%	80 - 120
			Dissolved Beryllium (Be)	2024/07/18		97	%	80 - 120
			Dissolved Bismuth (Bi)	2024/07/18		98	%	80 - 120
			Dissolved Boron (B)	2024/07/18		97	%	80 - 120
			Dissolved Cadmium (Cd)	2024/07/18		102	%	80 - 120
			Dissolved Chromium (Cr)	2024/07/18		97	%	80 - 120
			Dissolved Cobalt (Co)	2024/07/18		97	%	80 - 120
			Dissolved Copper (Cu)	2024/07/18		97	%	80 - 120
			Dissolved Iron (Fe)	2024/07/18		104	%	80 - 120
			Dissolved Lead (Pb)	2024/07/18		98	%	80 - 120
			Dissolved Lithium (Li)	2024/07/18		94	%	80 - 120
			Dissolved Manganese (Mn)	2024/07/18		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Molybdenum (Mo)	2024/07/18		108	%	80 - 120
			Dissolved Nickel (Ni)	2024/07/18		99	%	80 - 120
			Dissolved Phosphorus (P)	2024/07/18		100	%	80 - 120
			Dissolved Selenium (Se)	2024/07/18		101	%	80 - 120
			Dissolved Silicon (Si)	2024/07/18		108	%	80 - 120
			Dissolved Silver (Ag)	2024/07/18		100	%	80 - 120
			Dissolved Strontium (Sr)	2024/07/18		100	%	80 - 120
			Dissolved Thallium (Tl)	2024/07/18		100	%	80 - 120
			Dissolved Tin (Sn)	2024/07/18		104	%	80 - 120
			Dissolved Titanium (Ti)	2024/07/18		102	%	80 - 120
			Dissolved Uranium (U)	2024/07/18		111	%	80 - 120
			Dissolved Vanadium (V)	2024/07/18		101	%	80 - 120
			Dissolved Zinc (Zn)	2024/07/18		103	%	80 - 120
			Dissolved Zirconium (Zr)	2024/07/18		104	%	80 - 120
B442314	AA1	Method Blank	Dissolved Aluminum (Al)	2024/07/18	<0.50		ug/L	
			Dissolved Antimony (Sb)	2024/07/18	<0.020		ug/L	
			Dissolved Arsenic (As)	2024/07/18	<0.020		ug/L	
			Dissolved Barium (Ba)	2024/07/18	<0.020		ug/L	
			Dissolved Beryllium (Be)	2024/07/18	<0.010		ug/L	
			Dissolved Bismuth (Bi)	2024/07/18	<0.0050		ug/L	
			Dissolved Boron (B)	2024/07/18	<10		ug/L	
			Dissolved Cadmium (Cd)	2024/07/18	<0.0050		ug/L	
			Dissolved Chromium (Cr)	2024/07/18	<0.10		ug/L	
			Dissolved Cobalt (Co)	2024/07/18	<0.0050		ug/L	
			Dissolved Copper (Cu)	2024/07/18	<0.050		ug/L	
			Dissolved Iron (Fe)	2024/07/18	<1.0		ug/L	
			Dissolved Lead (Pb)	2024/07/18	<0.0050		ug/L	
			Dissolved Lithium (Li)	2024/07/18	<0.50		ug/L	
			Dissolved Manganese (Mn)	2024/07/18	<0.050		ug/L	
			Dissolved Molybdenum (Mo)	2024/07/18	<0.050		ug/L	
			Dissolved Nickel (Ni)	2024/07/18	<0.020		ug/L	
			Dissolved Phosphorus (P)	2024/07/18	<2.0		ug/L	
			Dissolved Selenium (Se)	2024/07/18	<0.040		ug/L	
			Dissolved Silicon (Si)	2024/07/18	<50		ug/L	
			Dissolved Silver (Ag)	2024/07/18	<0.0050		ug/L	
			Dissolved Strontium (Sr)	2024/07/18	<0.050		ug/L	
			Dissolved Thallium (Tl)	2024/07/18	<0.0020		ug/L	
			Dissolved Tin (Sn)	2024/07/18	<0.20		ug/L	
			Dissolved Titanium (Ti)	2024/07/18	<0.50		ug/L	
			Dissolved Uranium (U)	2024/07/18	0.0035, RDL=0.0020 (2)		ug/L	
			Dissolved Vanadium (V)	2024/07/18	<0.20		ug/L	
			Dissolved Zinc (Zn)	2024/07/18	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2024/07/18	<0.10		ug/L	
B442314	AA1	RPD	Dissolved Aluminum (Al)	2024/07/18	9.2		%	20
			Dissolved Antimony (Sb)	2024/07/18	3.5		%	20
			Dissolved Arsenic (As)	2024/07/18	2.1		%	20
			Dissolved Barium (Ba)	2024/07/18	3.0		%	20
			Dissolved Beryllium (Be)	2024/07/18	NC		%	20
			Dissolved Bismuth (Bi)	2024/07/18	NC		%	20
			Dissolved Boron (B)	2024/07/18	4.8		%	20
			Dissolved Cadmium (Cd)	2024/07/18	20		%	20
			Dissolved Chromium (Cr)	2024/07/18	7.3		%	20
			Dissolved Iron (Fe)	2024/07/18	1.0		%	20
			Dissolved Lead (Pb)	2024/07/18	3.3		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Lithium (Li)	2024/07/18	0.33		%	20
			Dissolved Manganese (Mn)	2024/07/18	2.2		%	20
			Dissolved Molybdenum (Mo)	2024/07/18	1.6		%	20
			Dissolved Nickel (Ni)	2024/07/18	2.9		%	20
			Dissolved Selenium (Se)	2024/07/18	0.97		%	20
			Dissolved Silver (Ag)	2024/07/18	NC		%	20
			Dissolved Strontium (Sr)	2024/07/18	2.1		%	20
			Dissolved Thallium (Tl)	2024/07/18	5.7		%	20
			Dissolved Tin (Sn)	2024/07/18	NC		%	20
			Dissolved Titanium (Ti)	2024/07/18	5.9		%	20
			Dissolved Uranium (U)	2024/07/18	0.076		%	20
			Dissolved Vanadium (V)	2024/07/18	NC		%	20
			Dissolved Zinc (Zn)	2024/07/18	5.8		%	20
B442314	AA1	RPD [CRG726-15]	Dissolved Aluminum (Al)	2024/07/18	NC		%	20
			Dissolved Antimony (Sb)	2024/07/18	NC		%	20
			Dissolved Arsenic (As)	2024/07/18	NC		%	20
			Dissolved Barium (Ba)	2024/07/18	0.12		%	20
			Dissolved Beryllium (Be)	2024/07/18	NC		%	20
			Dissolved Bismuth (Bi)	2024/07/18	NC		%	20
			Dissolved Boron (B)	2024/07/18	NC		%	20
			Dissolved Cadmium (Cd)	2024/07/18	NC		%	20
			Dissolved Chromium (Cr)	2024/07/18	6.6		%	20
			Dissolved Cobalt (Co)	2024/07/18	NC		%	20
			Dissolved Copper (Cu)	2024/07/18	NC		%	20
			Dissolved Iron (Fe)	2024/07/18	2.3		%	20
			Dissolved Lead (Pb)	2024/07/18	NC		%	20
			Dissolved Lithium (Li)	2024/07/18	NC		%	20
			Dissolved Manganese (Mn)	2024/07/18	NC		%	20
			Dissolved Molybdenum (Mo)	2024/07/18	NC		%	20
			Dissolved Nickel (Ni)	2024/07/18	1.3		%	20
			Dissolved Phosphorus (P)	2024/07/18	NC		%	20
			Dissolved Selenium (Se)	2024/07/18	NC		%	20
			Dissolved Silicon (Si)	2024/07/18	NC		%	20
			Dissolved Silver (Ag)	2024/07/18	NC		%	20
			Dissolved Strontium (Sr)	2024/07/18	5.4		%	20
			Dissolved Thallium (Tl)	2024/07/18	NC		%	20
			Dissolved Tin (Sn)	2024/07/18	NC		%	20
			Dissolved Titanium (Ti)	2024/07/18	NC		%	20
			Dissolved Uranium (U)	2024/07/18	NC		%	20
			Dissolved Vanadium (V)	2024/07/18	NC		%	20
			Dissolved Zinc (Zn)	2024/07/18	0.86		%	20
			Dissolved Zirconium (Zr)	2024/07/18	NC		%	20
B442357	AA1	Matrix Spike	Dissolved Aluminum (Al)	2024/07/18		101	%	80 - 120
			Dissolved Antimony (Sb)	2024/07/18		104	%	80 - 120
			Dissolved Arsenic (As)	2024/07/18		107	%	80 - 120
			Dissolved Barium (Ba)	2024/07/18		100	%	80 - 120
			Dissolved Beryllium (Be)	2024/07/18		106	%	80 - 120
			Dissolved Bismuth (Bi)	2024/07/18		53 (3)	%	80 - 120
			Dissolved Boron (B)	2024/07/18		98	%	80 - 120
			Dissolved Cadmium (Cd)	2024/07/18		104	%	80 - 120
			Dissolved Chromium (Cr)	2024/07/18		94	%	80 - 120
			Dissolved Cobalt (Co)	2024/07/18		94	%	80 - 120
			Dissolved Copper (Cu)	2024/07/18		93	%	80 - 120
			Dissolved Iron (Fe)	2024/07/18		NC	%	80 - 120
			Dissolved Lead (Pb)	2024/07/18		93	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Lithium (Li)	2024/07/18		103	%	80 - 120
			Dissolved Manganese (Mn)	2024/07/18		120	%	80 - 120
			Dissolved Molybdenum (Mo)	2024/07/18		55 (3)	%	80 - 120
			Dissolved Nickel (Ni)	2024/07/18		96	%	80 - 120
			Dissolved Phosphorus (P)	2024/07/18		110	%	80 - 120
			Dissolved Selenium (Se)	2024/07/18		101	%	80 - 120
			Dissolved Silicon (Si)	2024/07/18		100	%	80 - 120
			Dissolved Silver (Ag)	2024/07/18		59 (3)	%	80 - 120
			Dissolved Strontium (Sr)	2024/07/18		NC	%	80 - 120
			Dissolved Thallium (Tl)	2024/07/18		98	%	80 - 120
			Dissolved Tin (Sn)	2024/07/18		99	%	80 - 120
			Dissolved Titanium (Ti)	2024/07/18		99	%	80 - 120
			Dissolved Uranium (U)	2024/07/18		96	%	80 - 120
			Dissolved Vanadium (V)	2024/07/18		100	%	80 - 120
			Dissolved Zinc (Zn)	2024/07/18		105	%	80 - 120
			Dissolved Zirconium (Zr)	2024/07/18		91	%	80 - 120
B442357	AA1	Spiked Blank	Dissolved Aluminum (Al)	2024/07/18		97	%	80 - 120
			Dissolved Antimony (Sb)	2024/07/18		101	%	80 - 120
			Dissolved Arsenic (As)	2024/07/18		101	%	80 - 120
			Dissolved Barium (Ba)	2024/07/18		97	%	80 - 120
			Dissolved Beryllium (Be)	2024/07/18		98	%	80 - 120
			Dissolved Bismuth (Bi)	2024/07/18		98	%	80 - 120
			Dissolved Boron (B)	2024/07/18		96	%	80 - 120
			Dissolved Cadmium (Cd)	2024/07/18		100	%	80 - 120
			Dissolved Chromium (Cr)	2024/07/18		96	%	80 - 120
			Dissolved Cobalt (Co)	2024/07/18		97	%	80 - 120
			Dissolved Copper (Cu)	2024/07/18		97	%	80 - 120
			Dissolved Iron (Fe)	2024/07/18		103	%	80 - 120
			Dissolved Lead (Pb)	2024/07/18		97	%	80 - 120
			Dissolved Lithium (Li)	2024/07/18		95	%	80 - 120
			Dissolved Manganese (Mn)	2024/07/18		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2024/07/18		106	%	80 - 120
			Dissolved Nickel (Ni)	2024/07/18		98	%	80 - 120
			Dissolved Phosphorus (P)	2024/07/18		98	%	80 - 120
			Dissolved Selenium (Se)	2024/07/18		100	%	80 - 120
			Dissolved Silicon (Si)	2024/07/18		106	%	80 - 120
			Dissolved Silver (Ag)	2024/07/18		98	%	80 - 120
			Dissolved Strontium (Sr)	2024/07/18		97	%	80 - 120
			Dissolved Thallium (Tl)	2024/07/18		98	%	80 - 120
			Dissolved Tin (Sn)	2024/07/18		101	%	80 - 120
			Dissolved Titanium (Ti)	2024/07/18		100	%	80 - 120
			Dissolved Uranium (U)	2024/07/18		106	%	80 - 120
			Dissolved Vanadium (V)	2024/07/18		100	%	80 - 120
			Dissolved Zinc (Zn)	2024/07/18		102	%	80 - 120
			Dissolved Zirconium (Zr)	2024/07/18		101	%	80 - 120
B442357	AA1	Method Blank	Dissolved Aluminum (Al)	2024/07/18	<0.50		ug/L	
			Dissolved Antimony (Sb)	2024/07/18	<0.020		ug/L	
			Dissolved Arsenic (As)	2024/07/18	<0.020		ug/L	
			Dissolved Barium (Ba)	2024/07/18	<0.020		ug/L	
			Dissolved Beryllium (Be)	2024/07/18	<0.010		ug/L	
			Dissolved Bismuth (Bi)	2024/07/18	<0.0050		ug/L	
			Dissolved Boron (B)	2024/07/18	<10		ug/L	
			Dissolved Cadmium (Cd)	2024/07/18	<0.0050		ug/L	
			Dissolved Chromium (Cr)	2024/07/18	<0.10		ug/L	
			Dissolved Cobalt (Co)	2024/07/18	<0.0050		ug/L	

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			Dissolved Copper (Cu)	2024/07/18	<0.050		ug/L	
			Dissolved Iron (Fe)	2024/07/18	<1.0		ug/L	
			Dissolved Lead (Pb)	2024/07/18	<0.0050		ug/L	
			Dissolved Lithium (Li)	2024/07/18	<0.50		ug/L	
			Dissolved Manganese (Mn)	2024/07/18	<0.050		ug/L	
			Dissolved Molybdenum (Mo)	2024/07/18	<0.050		ug/L	
			Dissolved Nickel (Ni)	2024/07/18	<0.020		ug/L	
			Dissolved Phosphorus (P)	2024/07/18	<2.0		ug/L	
			Dissolved Selenium (Se)	2024/07/18	<0.040		ug/L	
			Dissolved Silicon (Si)	2024/07/18	<50		ug/L	
			Dissolved Silver (Ag)	2024/07/18	<0.0050		ug/L	
			Dissolved Strontium (Sr)	2024/07/18	<0.050		ug/L	
			Dissolved Thallium (Tl)	2024/07/18	<0.0020		ug/L	
			Dissolved Tin (Sn)	2024/07/18	<0.20		ug/L	
			Dissolved Titanium (Ti)	2024/07/18	<0.50		ug/L	
			Dissolved Uranium (U)	2024/07/18	<0.0020		ug/L	
			Dissolved Vanadium (V)	2024/07/18	<0.20		ug/L	
			Dissolved Zinc (Zn)	2024/07/18	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2024/07/18	<0.10		ug/L	
B442357	AA1	RPD	Dissolved Aluminum (Al)	2024/07/18	3.1		%	20
			Dissolved Antimony (Sb)	2024/07/18	11		%	20
			Dissolved Arsenic (As)	2024/07/18	3.4		%	20
			Dissolved Barium (Ba)	2024/07/18	1.2		%	20
			Dissolved Beryllium (Be)	2024/07/18	NC		%	20
			Dissolved Bismuth (Bi)	2024/07/18	NC		%	20
			Dissolved Boron (B)	2024/07/18	0.92		%	20
			Dissolved Cadmium (Cd)	2024/07/18	NC		%	20
			Dissolved Chromium (Cr)	2024/07/18	0.49		%	20
			Dissolved Cobalt (Co)	2024/07/18	2.3		%	20
			Dissolved Copper (Cu)	2024/07/18	2.8		%	20
			Dissolved Iron (Fe)	2024/07/18	1.1		%	20
			Dissolved Lead (Pb)	2024/07/18	1.5		%	20
			Dissolved Lithium (Li)	2024/07/18	NC		%	20
			Dissolved Manganese (Mn)	2024/07/18	0.29		%	20
			Dissolved Molybdenum (Mo)	2024/07/18	2.0		%	20
			Dissolved Nickel (Ni)	2024/07/18	0.29		%	20
			Dissolved Phosphorus (P)	2024/07/18	2.7		%	20
			Dissolved Selenium (Se)	2024/07/18	12		%	20
			Dissolved Silicon (Si)	2024/07/18	2.9		%	20
			Dissolved Silver (Ag)	2024/07/18	NC		%	20
			Dissolved Strontium (Sr)	2024/07/18	0.14		%	20
			Dissolved Thallium (Tl)	2024/07/18	NC		%	20
			Dissolved Tin (Sn)	2024/07/18	NC		%	20
			Dissolved Titanium (Ti)	2024/07/18	1.8		%	20
			Dissolved Uranium (U)	2024/07/18	NC		%	20
			Dissolved Vanadium (V)	2024/07/18	1.7		%	20
			Dissolved Zinc (Zn)	2024/07/18	5.8		%	20
			Dissolved Zirconium (Zr)	2024/07/18	NC		%	20
B442575	BB3	Matrix Spike	Nitrate plus Nitrite (N)	2024/07/17		113	%	80 - 120
B442575	BB3	Spiked Blank	Nitrate plus Nitrite (N)	2024/07/17		110	%	80 - 120
B442575	BB3	Method Blank	Nitrate plus Nitrite (N)	2024/07/17	<0.0020		mg/L	
B442575	BB3	RPD	Nitrate plus Nitrite (N)	2024/07/17	2.4		%	25
B442584	BB3	Matrix Spike	Nitrite (N)	2024/07/17		106	%	80 - 120
B442584	BB3	Spiked Blank	Nitrite (N)	2024/07/17		101	%	80 - 120
B442584	BB3	Method Blank	Nitrite (N)	2024/07/17	<0.0020		mg/L	

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B442584	BB3	RPD	Nitrite (N)	2024/07/17	NC		%	25
B442603	DWL	Matrix Spike	1,4-Difluorobenzene (sur.)	2024/07/17		99	%	70 - 130
			4-Bromofluorobenzene (sur.)	2024/07/17		98	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2024/07/17		126	%	70 - 130
			Methyl-tert-butylether (MTBE)	2024/07/17		99	%	70 - 130
			Benzene	2024/07/17		115	%	70 - 130
			Toluene	2024/07/17		99	%	70 - 130
			Ethylbenzene	2024/07/17		93	%	70 - 130
			m & p-Xylene	2024/07/17		97	%	70 - 130
			o-Xylene	2024/07/17		98	%	70 - 130
			Styrene	2024/07/17		75	%	70 - 130
B442603	DWL	Spiked Blank	1,4-Difluorobenzene (sur.)	2024/07/17		102	%	70 - 130
			4-Bromofluorobenzene (sur.)	2024/07/17		99	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2024/07/17		119	%	70 - 130
			Methyl-tert-butylether (MTBE)	2024/07/17		96	%	70 - 130
			Benzene	2024/07/17		112	%	70 - 130
			Toluene	2024/07/17		100	%	70 - 130
			Ethylbenzene	2024/07/17		96	%	70 - 130
			m & p-Xylene	2024/07/17		93	%	70 - 130
			o-Xylene	2024/07/17		101	%	70 - 130
			Styrene	2024/07/17		78	%	70 - 130
			VH C6-C10	2024/07/17		106	%	70 - 130
B442603	DWL	Method Blank	1,4-Difluorobenzene (sur.)	2024/07/17		107	%	70 - 130
			4-Bromofluorobenzene (sur.)	2024/07/17		93	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2024/07/17		122	%	70 - 130
			Methyl-tert-butylether (MTBE)	2024/07/17	<4.0		ug/L	
			Benzene	2024/07/17	<0.40		ug/L	
			Toluene	2024/07/17	<0.40		ug/L	
			Ethylbenzene	2024/07/17	<0.40		ug/L	
			m & p-Xylene	2024/07/17	<0.40		ug/L	
			o-Xylene	2024/07/17	<0.40		ug/L	
			Styrene	2024/07/17	<0.40		ug/L	
			Xylenes (Total)	2024/07/17	<0.40		ug/L	
			VH C6-C10	2024/07/17	<300		ug/L	
B442603	DWL	RPD	Methyl-tert-butylether (MTBE)	2024/07/17	NC		%	30
			Benzene	2024/07/17	NC		%	30
			Toluene	2024/07/17	NC		%	30
			Ethylbenzene	2024/07/17	NC		%	30
			m & p-Xylene	2024/07/17	NC		%	30
			o-Xylene	2024/07/17	NC		%	30
			Styrene	2024/07/17	NC		%	30
			Xylenes (Total)	2024/07/17	NC		%	30
			VH C6-C10	2024/07/17	NC		%	30
B442629	RLC	Matrix Spike	Chloride (Cl)	2024/07/18		103	%	80 - 120
			Sulphate (SO4)	2024/07/18		NC	%	80 - 120
B442629	RLC	Spiked Blank	Chloride (Cl)	2024/07/18		101	%	80 - 120
			Sulphate (SO4)	2024/07/18		106	%	80 - 120
B442629	RLC	Method Blank	Chloride (Cl)	2024/07/18	<0.50		mg/L	
			Sulphate (SO4)	2024/07/18	<0.50		mg/L	
B442629	RLC	RPD	Chloride (Cl)	2024/07/18	NC		%	20
			Sulphate (SO4)	2024/07/18	2.8		%	20
B442692	AA1	Matrix Spike	Total Aluminum (Al)	2024/07/19		92	%	80 - 120
			Total Antimony (Sb)	2024/07/19		96	%	80 - 120
			Total Arsenic (As)	2024/07/19		95	%	80 - 120
			Total Barium (Ba)	2024/07/19		93	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Beryllium (Be)	2024/07/19		94	%	80 - 120
			Total Bismuth (Bi)	2024/07/19		93	%	80 - 120
			Total Boron (B)	2024/07/19		91	%	80 - 120
			Total Cadmium (Cd)	2024/07/19		94	%	80 - 120
			Total Chromium (Cr)	2024/07/19		94	%	80 - 120
			Total Cobalt (Co)	2024/07/19		89	%	80 - 120
			Total Copper (Cu)	2024/07/19		89	%	80 - 120
			Total Iron (Fe)	2024/07/19		95	%	80 - 120
			Total Lead (Pb)	2024/07/19		94	%	80 - 120
			Total Lithium (Li)	2024/07/19		90	%	80 - 120
			Total Manganese (Mn)	2024/07/19		92	%	80 - 120
			Total Molybdenum (Mo)	2024/07/19		98	%	80 - 120
			Total Nickel (Ni)	2024/07/19		91	%	80 - 120
			Total Phosphorus (P)	2024/07/19		95	%	80 - 120
			Total Selenium (Se)	2024/07/19		91	%	80 - 120
			Total Silicon (Si)	2024/07/19		101	%	80 - 120
			Total Silver (Ag)	2024/07/19		93	%	80 - 120
			Total Strontium (Sr)	2024/07/19		94	%	80 - 120
			Total Thallium (Tl)	2024/07/19		95	%	80 - 120
			Total Tin (Sn)	2024/07/19		95	%	80 - 120
			Total Titanium (Ti)	2024/07/19		96	%	80 - 120
			Total Uranium (U)	2024/07/19		91	%	80 - 120
			Total Vanadium (V)	2024/07/19		93	%	80 - 120
			Total Zinc (Zn)	2024/07/19		94	%	80 - 120
			Total Zirconium (Zr)	2024/07/19		95	%	80 - 120
B442692	AA1	Spiked Blank	Total Aluminum (Al)	2024/07/19		96	%	80 - 120
			Total Antimony (Sb)	2024/07/19		100	%	80 - 120
			Total Arsenic (As)	2024/07/19		99	%	80 - 120
			Total Barium (Ba)	2024/07/19		97	%	80 - 120
			Total Beryllium (Be)	2024/07/19		101	%	80 - 120
			Total Bismuth (Bi)	2024/07/19		98	%	80 - 120
			Total Boron (B)	2024/07/19		98	%	80 - 120
			Total Cadmium (Cd)	2024/07/19		98	%	80 - 120
			Total Chromium (Cr)	2024/07/19		98	%	80 - 120
			Total Cobalt (Co)	2024/07/19		93	%	80 - 120
			Total Copper (Cu)	2024/07/19		94	%	80 - 120
			Total Iron (Fe)	2024/07/19		102	%	80 - 120
			Total Lead (Pb)	2024/07/19		98	%	80 - 120
			Total Lithium (Li)	2024/07/19		101	%	80 - 120
			Total Manganese (Mn)	2024/07/19		97	%	80 - 120
			Total Molybdenum (Mo)	2024/07/19		102	%	80 - 120
			Total Nickel (Ni)	2024/07/19		96	%	80 - 120
			Total Phosphorus (P)	2024/07/19		96	%	80 - 120
			Total Selenium (Se)	2024/07/19		97	%	80 - 120
			Total Silicon (Si)	2024/07/19		103	%	80 - 120
			Total Silver (Ag)	2024/07/19		97	%	80 - 120
			Total Strontium (Sr)	2024/07/19		98	%	80 - 120
			Total Thallium (Tl)	2024/07/19		98	%	80 - 120
			Total Tin (Sn)	2024/07/19		100	%	80 - 120
			Total Titanium (Ti)	2024/07/19		99	%	80 - 120
			Total Uranium (U)	2024/07/19		95	%	80 - 120
			Total Vanadium (V)	2024/07/19		97	%	80 - 120
			Total Zinc (Zn)	2024/07/19		98	%	80 - 120
			Total Zirconium (Zr)	2024/07/19		99	%	80 - 120
B442692	AA1	Method Blank	Total Aluminum (Al)	2024/07/19	<0.50		ug/L	

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Antimony (Sb)	2024/07/19	<0.020		ug/L	
			Total Arsenic (As)	2024/07/19	<0.020		ug/L	
			Total Barium (Ba)	2024/07/19	<0.020		ug/L	
			Total Beryllium (Be)	2024/07/19	<0.010		ug/L	
			Total Bismuth (Bi)	2024/07/19	<0.0050		ug/L	
			Total Boron (B)	2024/07/19	<10		ug/L	
			Total Cadmium (Cd)	2024/07/19	<0.0050		ug/L	
			Total Chromium (Cr)	2024/07/19	<0.10		ug/L	
			Total Cobalt (Co)	2024/07/19	<0.0050		ug/L	
			Total Copper (Cu)	2024/07/19	<0.050		ug/L	
			Total Iron (Fe)	2024/07/19	<1.0		ug/L	
			Total Lead (Pb)	2024/07/19	<0.0050		ug/L	
			Total Lithium (Li)	2024/07/19	<0.50		ug/L	
			Total Manganese (Mn)	2024/07/19	<0.050		ug/L	
			Total Molybdenum (Mo)	2024/07/19	<0.050		ug/L	
			Total Nickel (Ni)	2024/07/19	<0.020		ug/L	
			Total Phosphorus (P)	2024/07/19	<2.0		ug/L	
			Total Selenium (Se)	2024/07/19	<0.040		ug/L	
			Total Silicon (Si)	2024/07/19	<50		ug/L	
			Total Silver (Ag)	2024/07/19	<0.0050		ug/L	
			Total Strontium (Sr)	2024/07/19	<0.050		ug/L	
			Total Thallium (Tl)	2024/07/19	<0.0020		ug/L	
			Total Tin (Sn)	2024/07/19	<0.20		ug/L	
			Total Titanium (Ti)	2024/07/19	<0.50		ug/L	
			Total Uranium (U)	2024/07/19	<0.0020		ug/L	
			Total Vanadium (V)	2024/07/19	<0.20		ug/L	
			Total Zinc (Zn)	2024/07/19	<0.10		ug/L	
			Total Zirconium (Zr)	2024/07/19	<0.10		ug/L	
B442692	AA1	RPD [CRG726-05]	Total Aluminum (Al)	2024/07/19	11		%	20
			Total Antimony (Sb)	2024/07/19	NC		%	20
			Total Arsenic (As)	2024/07/19	NC		%	20
			Total Barium (Ba)	2024/07/19	1.2		%	20
			Total Beryllium (Be)	2024/07/19	NC		%	20
			Total Bismuth (Bi)	2024/07/19	NC		%	20
			Total Boron (B)	2024/07/19	NC		%	20
			Total Cadmium (Cd)	2024/07/19	NC		%	20
			Total Chromium (Cr)	2024/07/19	NC		%	20
			Total Cobalt (Co)	2024/07/19	NC		%	20
			Total Copper (Cu)	2024/07/19	NC		%	20
			Total Iron (Fe)	2024/07/19	NC		%	20
			Total Lead (Pb)	2024/07/19	NC		%	20
			Total Lithium (Li)	2024/07/19	NC		%	20
			Total Manganese (Mn)	2024/07/19	NC		%	20
			Total Molybdenum (Mo)	2024/07/19	NC		%	20
			Total Nickel (Ni)	2024/07/19	NC		%	20
			Total Phosphorus (P)	2024/07/19	NC		%	20
			Total Selenium (Se)	2024/07/19	NC		%	20
			Total Silicon (Si)	2024/07/19	NC		%	20
			Total Silver (Ag)	2024/07/19	NC		%	20
			Total Strontium (Sr)	2024/07/19	6.6		%	20
			Total Thallium (Tl)	2024/07/19	NC		%	20
			Total Tin (Sn)	2024/07/19	NC		%	20
			Total Titanium (Ti)	2024/07/19	NC		%	20
			Total Uranium (U)	2024/07/19	NC		%	20
			Total Vanadium (V)	2024/07/19	NC		%	20

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			Total Zinc (Zn)	2024/07/19	0.042		%	20
			Total Zirconium (Zr)	2024/07/19	NC		%	20
B442692	AA1	RPD	Total Aluminum (Al)	2024/07/19	7.0		%	20
			Total Antimony (Sb)	2024/07/19	NC		%	20
			Total Arsenic (As)	2024/07/19	NC		%	20
			Total Barium (Ba)	2024/07/19	NC		%	20
			Total Beryllium (Be)	2024/07/19	NC		%	20
			Total Bismuth (Bi)	2024/07/19	NC		%	20
			Total Boron (B)	2024/07/19	NC		%	20
			Total Cadmium (Cd)	2024/07/19	NC		%	20
			Total Chromium (Cr)	2024/07/19	NC		%	20
			Total Cobalt (Co)	2024/07/19	NC		%	20
			Total Copper (Cu)	2024/07/19	NC		%	20
			Total Iron (Fe)	2024/07/19	NC		%	20
			Total Lead (Pb)	2024/07/19	NC		%	20
			Total Lithium (Li)	2024/07/19	NC		%	20
			Total Manganese (Mn)	2024/07/19	NC		%	20
			Total Molybdenum (Mo)	2024/07/19	NC		%	20
			Total Nickel (Ni)	2024/07/19	NC		%	20
			Total Phosphorus (P)	2024/07/19	NC		%	20
			Total Selenium (Se)	2024/07/19	NC		%	20
			Total Silicon (Si)	2024/07/19	NC		%	20
			Total Silver (Ag)	2024/07/19	NC		%	20
			Total Strontium (Sr)	2024/07/19	NC		%	20
			Total Thallium (Tl)	2024/07/19	NC		%	20
			Total Tin (Sn)	2024/07/19	NC		%	20
			Total Titanium (Ti)	2024/07/19	NC		%	20
			Total Uranium (U)	2024/07/19	NC		%	20
			Total Vanadium (V)	2024/07/19	NC		%	20
			Total Zinc (Zn)	2024/07/19	NC		%	20
			Total Zirconium (Zr)	2024/07/19	NC		%	20
B442985	MPE	Spiked Blank	Total Oil and grease	2024/07/18		97	%	70 - 130
B442985	MPE	Method Blank	Total Oil and grease	2024/07/18	<1.0		mg/L	
B443021	TNY	Matrix Spike [CRG721-02]	Total Dissolved Solids	2024/07/18		NC	%	80 - 120
B443021	TNY	Spiked Blank	Total Dissolved Solids	2024/07/18		112	%	80 - 120
B443021	TNY	Method Blank	Total Dissolved Solids	2024/07/18	<1.0		mg/L	
B443021	TNY	RPD [CRG722-02]	Total Dissolved Solids	2024/07/18	4.1		%	20
B443412	VMP	Matrix Spike	Total Suspended Solids	2024/07/19		106	%	80 - 120
B443412	VMP	Spiked Blank	Total Suspended Solids	2024/07/19		100	%	80 - 120
B443412	VMP	Method Blank	Total Suspended Solids	2024/07/19	<1.0		mg/L	
B443412	VMP	RPD	Total Suspended Solids	2024/07/19	NC		%	20
B443540	IC4	Matrix Spike	Total Nitrogen (N)	2024/07/19		NC	%	80 - 120
B443540	IC4	Spiked Blank	Total Nitrogen (N)	2024/07/19		109	%	80 - 120
B443540	IC4	Method Blank	Total Nitrogen (N)	2024/07/19	<0.020		mg/L	
B443540	IC4	RPD	Total Nitrogen (N)	2024/07/19	2.8		%	20
B443641	NJD	Matrix Spike	Total Sulphide	2024/07/18		113	%	80 - 120
B443641	NJD	Spiked Blank	Total Sulphide	2024/07/18		98	%	80 - 120
B443641	NJD	Method Blank	Total Sulphide	2024/07/18	<0.0018		mg/L	
B443641	NJD	RPD	Total Sulphide	2024/07/18	NC		%	20
B443739	BB3	Spiked Blank	pH	2024/07/18		101	%	97 - 103
B443739	BB3	RPD	pH	2024/07/18	0.18		%	N/A
B443743	BB3	Spiked Blank	Alkalinity (Total as CaCO3)	2024/07/18		95	%	80 - 120
B443743	BB3	Method Blank	Alkalinity (PP as CaCO3)	2024/07/18	<1.0		mg/L	
			Alkalinity (Total as CaCO3)	2024/07/18	<1.0		mg/L	
			Bicarbonate (HCO3)	2024/07/18	<1.0		mg/L	

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			Carbonate (CO3)	2024/07/18	<1.0		mg/L	
			Hydroxide (OH)	2024/07/18	<1.0		mg/L	
B443743	BB3	RPD	Alkalinity (PP as CaCO3)	2024/07/18	4.6		%	20
			Alkalinity (Total as CaCO3)	2024/07/18	0.50		%	20
			Bicarbonate (HCO3)	2024/07/18	13		%	20
			Carbonate (CO3)	2024/07/18	4.6		%	20
			Hydroxide (OH)	2024/07/18	NC		%	20
B443745	BB3	Spiked Blank	Conductivity	2024/07/18		101	%	90 - 110
B443745	BB3	Method Blank	Conductivity	2024/07/18	<2.0		uS/cm	
B443745	BB3	RPD	Conductivity	2024/07/18	0.26		%	10
B443866	CSH	Spiked Blank	pH (15 C)	2024/07/18		100	%	97 - 103
B443866	CSH	RPD [CRG721-03]	pH (15 C)	2024/07/18	0.26		%	N/A
B443923	AA1	Matrix Spike	Total Aluminum (Al)	2024/07/18		124 (3)	%	80 - 120
			Total Antimony (Sb)	2024/07/18		101	%	80 - 120
			Total Arsenic (As)	2024/07/18		103	%	80 - 120
			Total Barium (Ba)	2024/07/18		97	%	80 - 120
			Total Beryllium (Be)	2024/07/18		102	%	80 - 120
			Total Bismuth (Bi)	2024/07/18		98	%	80 - 120
			Total Boron (B)	2024/07/18		104	%	80 - 120
			Total Cadmium (Cd)	2024/07/18		102	%	80 - 120
			Total Chromium (Cr)	2024/07/18		97	%	80 - 120
			Total Cobalt (Co)	2024/07/18		96	%	80 - 120
			Total Copper (Cu)	2024/07/18		94	%	80 - 120
			Total Iron (Fe)	2024/07/18		NC	%	80 - 120
			Total Lead (Pb)	2024/07/18		100	%	80 - 120
			Total Lithium (Li)	2024/07/18		99	%	80 - 120
			Total Manganese (Mn)	2024/07/18		100	%	80 - 120
			Total Molybdenum (Mo)	2024/07/18		109	%	80 - 120
			Total Nickel (Ni)	2024/07/18		96	%	80 - 120
			Total Phosphorus (P)	2024/07/18		105	%	80 - 120
			Total Selenium (Se)	2024/07/18		102	%	80 - 120
			Total Silicon (Si)	2024/07/18		108	%	80 - 120
			Total Silver (Ag)	2024/07/18		100	%	80 - 120
			Total Strontium (Sr)	2024/07/18		NC	%	80 - 120
			Total Thallium (Tl)	2024/07/18		104	%	80 - 120
			Total Tin (Sn)	2024/07/18		100	%	80 - 120
			Total Titanium (Ti)	2024/07/18		101	%	80 - 120
			Total Uranium (U)	2024/07/18		115	%	80 - 120
			Total Vanadium (V)	2024/07/18		103	%	80 - 120
			Total Zinc (Zn)	2024/07/18		102	%	80 - 120
			Total Zirconium (Zr)	2024/07/18		107	%	80 - 120
B443923	AA1	Spiked Blank	Total Aluminum (Al)	2024/07/18		103	%	80 - 120
			Total Antimony (Sb)	2024/07/18		105	%	80 - 120
			Total Arsenic (As)	2024/07/18		104	%	80 - 120
			Total Barium (Ba)	2024/07/18		101	%	80 - 120
			Total Beryllium (Be)	2024/07/18		108	%	80 - 120
			Total Bismuth (Bi)	2024/07/18		103	%	80 - 120
			Total Boron (B)	2024/07/18		110	%	80 - 120
			Total Cadmium (Cd)	2024/07/18		105	%	80 - 120
			Total Chromium (Cr)	2024/07/18		101	%	80 - 120
			Total Cobalt (Co)	2024/07/18		101	%	80 - 120
			Total Copper (Cu)	2024/07/18		101	%	80 - 120
			Total Iron (Fe)	2024/07/18		106	%	80 - 120
			Total Lead (Pb)	2024/07/18		102	%	80 - 120
			Total Lithium (Li)	2024/07/18		106	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Manganese (Mn)	2024/07/18		105	%	80 - 120
			Total Molybdenum (Mo)	2024/07/18		110	%	80 - 120
			Total Nickel (Ni)	2024/07/18		104	%	80 - 120
			Total Phosphorus (P)	2024/07/18		102	%	80 - 120
			Total Selenium (Se)	2024/07/18		105	%	80 - 120
			Total Silicon (Si)	2024/07/18		112	%	80 - 120
			Total Silver (Ag)	2024/07/18		103	%	80 - 120
			Total Strontium (Sr)	2024/07/18		101	%	80 - 120
			Total Thallium (Tl)	2024/07/18		105	%	80 - 120
			Total Tin (Sn)	2024/07/18		104	%	80 - 120
			Total Titanium (Ti)	2024/07/18		104	%	80 - 120
			Total Uranium (U)	2024/07/18		110	%	80 - 120
			Total Vanadium (V)	2024/07/18		106	%	80 - 120
			Total Zinc (Zn)	2024/07/18		106	%	80 - 120
			Total Zirconium (Zr)	2024/07/18		104	%	80 - 120
B443923	AA1	Method Blank	Total Aluminum (Al)	2024/07/18	<3.0		ug/L	
			Total Antimony (Sb)	2024/07/18	<0.020		ug/L	
			Total Arsenic (As)	2024/07/18	<0.020		ug/L	
			Total Barium (Ba)	2024/07/18	<0.050		ug/L	
			Total Beryllium (Be)	2024/07/18	<0.010		ug/L	
			Total Bismuth (Bi)	2024/07/18	<0.010		ug/L	
			Total Boron (B)	2024/07/18	<10		ug/L	
			Total Cadmium (Cd)	2024/07/18	<0.0050		ug/L	
			Total Chromium (Cr)	2024/07/18	<0.10		ug/L	
			Total Cobalt (Co)	2024/07/18	<0.010		ug/L	
			Total Copper (Cu)	2024/07/18	<0.10		ug/L	
			Total Iron (Fe)	2024/07/18	<5.0		ug/L	
			Total Lead (Pb)	2024/07/18	<0.020		ug/L	
			Total Lithium (Li)	2024/07/18	<0.50		ug/L	
			Total Manganese (Mn)	2024/07/18	<0.10		ug/L	
			Total Molybdenum (Mo)	2024/07/18	<0.050		ug/L	
			Total Nickel (Ni)	2024/07/18	<0.10		ug/L	
			Total Phosphorus (P)	2024/07/18	<5.0		ug/L	
			Total Selenium (Se)	2024/07/18	<0.040		ug/L	
			Total Silicon (Si)	2024/07/18	<50		ug/L	
			Total Silver (Ag)	2024/07/18	<0.010		ug/L	
			Total Strontium (Sr)	2024/07/18	<0.050		ug/L	
			Total Thallium (Tl)	2024/07/18	<0.0020		ug/L	
			Total Tin (Sn)	2024/07/18	<0.20		ug/L	
			Total Titanium (Ti)	2024/07/18	<2.0		ug/L	
			Total Uranium (U)	2024/07/18	<0.0050		ug/L	
			Total Vanadium (V)	2024/07/18	<0.20		ug/L	
			Total Zinc (Zn)	2024/07/18	<1.0		ug/L	
			Total Zirconium (Zr)	2024/07/18	<0.10		ug/L	
B443923	AA1	RPD	Total Aluminum (Al)	2024/07/18	0.020		%	20
			Total Antimony (Sb)	2024/07/18	2.1		%	20
			Total Arsenic (As)	2024/07/18	0.36		%	20
			Total Barium (Ba)	2024/07/18	0.42		%	20
			Total Beryllium (Be)	2024/07/18	1.0		%	20
			Total Bismuth (Bi)	2024/07/18	NC		%	20
			Total Boron (B)	2024/07/18	NC		%	20
			Total Cadmium (Cd)	2024/07/18	4.2		%	20
			Total Chromium (Cr)	2024/07/18	10		%	20
			Total Cobalt (Co)	2024/07/18	0.86		%	20
			Total Copper (Cu)	2024/07/18	0.018		%	20

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			Total Iron (Fe)	2024/07/18	2.3		%	20
			Total Lead (Pb)	2024/07/18	0.19		%	20
			Total Lithium (Li)	2024/07/18	0.69		%	20
			Total Manganese (Mn)	2024/07/18	0.50		%	20
			Total Molybdenum (Mo)	2024/07/18	9.3		%	20
			Total Nickel (Ni)	2024/07/18	0.085		%	20
			Total Phosphorus (P)	2024/07/18	6.0		%	20
			Total Selenium (Se)	2024/07/18	6.2		%	20
			Total Silicon (Si)	2024/07/18	0.011		%	20
			Total Silver (Ag)	2024/07/18	NC		%	20
			Total Strontium (Sr)	2024/07/18	1.4		%	20
			Total Thallium (Tl)	2024/07/18	NC		%	20
			Total Titanium (Ti)	2024/07/18	NC		%	20
			Total Uranium (U)	2024/07/18	6.9		%	20
			Total Vanadium (V)	2024/07/18	NC		%	20
			Total Zinc (Zn)	2024/07/18	0.58		%	20
			Total Zirconium (Zr)	2024/07/18	NC		%	20
B444209	CBK	Matrix Spike	Total Ammonia (N)	2024/07/18		100	%	80 - 120
B444209	CBK	Spiked Blank	Total Ammonia (N)	2024/07/18		101	%	80 - 120
B444209	CBK	Method Blank	Total Ammonia (N)	2024/07/18	<0.0050		mg/L	
B444209	CBK	RPD	Total Ammonia (N)	2024/07/18	NC		%	20
B445203	NKT	Matrix Spike [CRG722-01]	Dissolved Phosphorus (P)	2024/07/19		104	%	N/A
B445203	NKT	Spiked Blank	Dissolved Phosphorus (P)	2024/07/19		107	%	80 - 120
B445203	NKT	Method Blank	Dissolved Phosphorus (P)	2024/07/19	<0.0010		mg/L	
B445203	NKT	RPD [CRG722-01]	Dissolved Phosphorus (P)	2024/07/19	NC		%	20
B445607	JC8	Matrix Spike	Dissolved Mercury (Hg)	2024/07/19		103	%	80 - 120
B445607	JC8	Spiked Blank	Dissolved Mercury (Hg)	2024/07/19		102	%	80 - 120
B445607	JC8	Method Blank	Dissolved Mercury (Hg)	2024/07/19	<0.0019		ug/L	
B445607	JC8	RPD	Dissolved Mercury (Hg)	2024/07/19	NC		%	20
B445777	JC8	Matrix Spike [CRG725-09]	Dissolved Mercury (Hg)	2024/07/19		104	%	80 - 120
B445777	JC8	Spiked Blank	Dissolved Mercury (Hg)	2024/07/19		103	%	80 - 120
B445777	JC8	Method Blank	Dissolved Mercury (Hg)	2024/07/19	<0.0019		ug/L	
B445777	JC8	RPD [CRG725-09]	Dissolved Mercury (Hg)	2024/07/19	NC		%	20
B445777	JC8	RPD [CRG728-09]	Dissolved Mercury (Hg)	2024/07/22	102 (3)		%	20
B445923	JC8	Matrix Spike	Total Mercury (Hg)	2024/07/19		101	%	80 - 120
B445923	JC8	Spiked Blank	Total Mercury (Hg)	2024/07/19		102	%	80 - 120
B445923	JC8	Method Blank	Total Mercury (Hg)	2024/07/19	<0.0019		ug/L	
B445923	JC8	RPD	Total Mercury (Hg)	2024/07/19	NC		%	20
B446723	NKT	Spiked Blank	Total Phosphorus (P)	2024/07/19		107	%	80 - 120
B446723	NKT	Method Blank	Total Phosphorus (P)	2024/07/19	<0.0010		mg/L	
B448063	IC4	Matrix Spike [CRG722-13]	Total Ammonia (N)	2024/07/22		92	%	80 - 120
B448063	IC4	Spiked Blank	Total Ammonia (N)	2024/07/22		100	%	80 - 120
B448063	IC4	Method Blank	Total Ammonia (N)	2024/07/22	<0.0050		mg/L	
B448063	IC4	RPD [CRG722-13]	Total Ammonia (N)	2024/07/22	0.72		%	20
B448584	M2S	Matrix Spike	Total Organic Carbon (C)	2024/07/22		106	%	80 - 120
B448584	M2S	Spiked Blank	Total Organic Carbon (C)	2024/07/22		98	%	80 - 120
B448584	M2S	Method Blank	Total Organic Carbon (C)	2024/07/22	<0.20		mg/L	
B448584	M2S	RPD	Total Organic Carbon (C)	2024/07/22	3.4		%	20
B448587	M2S	Matrix Spike [CRG721-01]	Dissolved Organic Carbon (C)	2024/07/23		103	%	80 - 120
B448587	M2S	Spiked Blank	Dissolved Organic Carbon (C)	2024/07/23		100	%	80 - 120
B448587	M2S	Method Blank	Dissolved Organic Carbon (C)	2024/07/23	<0.20		mg/L	
B448587	M2S	RPD [CRG721-01]	Dissolved Organic Carbon (C)	2024/07/23	3.0		%	20
B449375	M2S	Matrix Spike [CRG728-07]	Total Organic Carbon (C)	2024/07/23		105	%	80 - 120
B449375	M2S	Spiked Blank	Total Organic Carbon (C)	2024/07/23		99	%	80 - 120
B449375	M2S	Method Blank	Total Organic Carbon (C)	2024/07/23	<0.20		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
B449375	M2S	RPD [CRG728-07]	Total Organic Carbon (C)	2024/07/23	11		%	20

N/A = Not Applicable

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

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

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

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

(1) Method blank exceeds 0.2 mg/L stipulated in Reference Method. No other Quality Control measures affected.

(2) Method blank exceeds acceptance limits- 2X RDL acceptable for low level metals determination.

(3) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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VALIDATION SIGNATURE PAGE

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

David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Maria Magdalena Florescu, Ph.D., P.Chem., QP, Laboratory Manager SR

Mauro Oselin, Scientific Specialist

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

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C453040
2024/07/15 12:37

Bureau Veritas
4000 19st N.E, Calgary, Alberta Canada T2E 6P8 Tel:(403) 291-3077 Toll-free:800-563-6266 Fax:(403) 291-9468 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#4977 Government of Yukon – Dept of ENV	Company Name		Quotation #	C40560	Bureau Veritas Job #	Bottle Order #:
Contact Name	Devon O'Connor	Contact Name	Devon O'Connor	P.O. #			728123
Address	Water Resources Branch (V-310) Box 2703	Address		Project #	Dawson Wastewater Audit	Chain Of Custody Record	Project Manager
	Whitehorse YT Y1A 2C6			Project Name		C#728123-01-01	Atikin Hehn
Phone	Fax:	Phone	Fax:	Site #			
Email	Devon.O'Connor@yukon.ca	Email	Devon.O'Connor@yukon.ca	Sampled By			

Regulatory Criteria

Special Instructions

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

Samples must be kept cool (< 10°C) from time of sampling until delivery to Bureau Veritas

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT [X]
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ______ Time Required: ______
Rush Confirmation Number ______ (call lab for #)

Analysis Requested

#	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Alkalinity and pH in Water	Un-ionized Ammonia	CSR BTEX/VPH in Water	Low Level D. Metals w/ CV Hg-Diss	Low Level Total Metals with CV Hg	Biochemical Oxygen Demand (Inhibited)	Carbon (DOC)	Carbon (Total Organic)	Conductivity @25C	Low level chloride/sulphate by AC	# of Bottles	Comments
1		2EB-DC-4	July 14	14:14	Water	N	Y	X	X	X	X	X	X	X	X	X	X	16	
2		~~DC-2~~	↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
3		~~DC-3~~	↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
4		DC-4	↓	13:46	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	All dissolved parameters field filtered
5		DC-5	↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
6		DC-6	↓		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
7		DC-WRB-1	↓	13:03	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
8		DC-WRB-2	↓	11:42	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
9		DC-WRB-3	↓	10:48	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
10		~~DC-WRB-Source~~					Y												

MVAN-2024-07-728

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only		
			HAN TAN [signature]	2024/07/15	12:37		Time Sensitive ☐	Temperature (°C) on Receipt: 24/18/11, 4/13/7, 12/12/14	Custody Seal intact on Cooler? ☐ Yes ☒ No

ICE FROZEN

White: Bureau Veritas Yellow: Client

C453040
2024/07/15 12:37

Bureau Veritas
4000 19st N.E, Calgary, Alberta Canada T2E 6P8 Tel:(403) 291-3077 Toll-free:800-563-6266 Fax:(403) 291-9468 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#4977 Government of Yukon – Dept of ENV	Company Name		Quotation #	C40560	Bureau Veritas Job #	Bottle Order #.
Contact Name	Devon O'Connor	Contact Name	Devon O'Connor	P.O. #			728123
Address	Water Resources Branch (V-310) Box 2703	Address		Project #	Dawson Wastewater Audit	Chain Of Custody Record	Project Manager
	Whitehorse YT Y1A 2C6			Project Name		C#728123-02-01	Atkin Hehn
Phone / Fax:		Phone / Fax:		Site #			
Email	Devon.O'Connor@yukon.ca	Email	Devon.O'Connor@yukon.ca	Sampled By			

Regulatory Criteria

Special Instructions

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

Samples must be kept cool (< 10°C) from time of sampling until delivery to Bureau Veritas

Turnaround Time (TAT) Required

Please provide advance notice for rush projects

Regular (Standard) TAT: ☐
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission) ☐
Date Required: ______ Time Required: ______
Rush Confirmation Number ______ *(call lab for #)*

#	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	Alkalinity and pH in Water	Un-ionized Ammonia	CSR BTEX/VPH in Water	Low Level D. Metals w/ CV Hg-Diss	Low Level Total Metals with CV Hg	Biochemical Oxygen Demand (Inhibited)	Carbon (DOC)	Carbon (Total Organic)	Conductivity @25C	Low level chloride/sulphate by AC	# of Bottles	Comments
1		Field Blank	July 14	13:15	Water	N	Y	X	X	X	X	X	X	X	X	X	X	16	
2		Replicate	↓	14:14	↓	↓	Y	↓	↓	↓	X	↓	↓	X	↓	↓	↓	↓	
3		TRIP BLANK	↓		↓	↓	N	↓	↓	↓		↓	↓		↓	↓	↓	↓	minus filtered parameters
4			July 14																
5																			
6																			
7																			
8																			
9																			
10																			

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
			BRIAN TAM	2024/07/15	12:37		☐	24/18/11	☐ Yes ☑ No

4/13/7
12/12/14
ZCE FROZEN

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

White: Bureau Veritas Yellow: Client

Appendix B – Water isotope sample results

Client: O'Connor/Yukon Water Resources Branch

Project:Dawson WWTF

ISO# 2024459
Location: B2
6 for 18O, 2H

Environmental Isotope Lab
2024-08-09

#	Sample	Date	Lab#	$\delta^{18}O$	Result	Repeat	$\delta^{2}H$	Result	Repeat		pH	EC	AZD	Comments
				H_2O	VSMOW	± 0.2‰	H_2O	VSMOW	± 0.8‰			uS/cm		
1	2EB-DC-4	14-Jul-24	535716	X	-20.94	-21.03	X	-163.05	-164.34	500ml	8.18	275		EC in SPC
2	2EB-DC-4-R	14-Jul-24	535717	X	-21.10		X	-164.56		500ml	8.18	275		
3	DC-WRB-1	14-Jul-24	535718	X	-21.07	-21.13	X	-164.20	-165.42	500ml	8.5	272		
4	DC-WRB-2	14-Jul-24	535719	X	-21.07		X	-165.47		500ml	8.54	268		
5	DC-WRB-3	14-Jul-24	535720	X	-21.16	-21.10	X	-165.66	-165.68	500ml	8.52	268		
6	DC-4	14-Jul-24	535721	X	-21.05	-21.07	X	-164.97	-165.19	500ml	8.02	275		

BAL= Below Analytical Limit
NA= Not Attempted (concentrations too low)
NES= Not Enough Sample
ND= Non-detect

ENVIRONMENTAL ISOTOPE LABORATORY

Appendix C – Artificial sweetener sample results

From: **Naomi Stock**
Water Quality Centre
1600 W Bank Dr
Peterborough, ON K9L 0G2
ESC B105
(705) 748-1011 x 7632
naomistock@trentu.ca

Project Title: Dawson WWTF

To: **Devon O'Connor**
Yukon Government Water Resources Branch
Date: November 29 2024
Samples Received: November 7 2024
Number of Samples: 4
Instrument: LC-MS/MS
Thermo Ultimate 3000 LC-QExactive Orbitrap MS

			Concentration (ng/L)			
#	**Sample ID**	**Date**	**Acesulfame**	**Saccharin**	**Cyclamate**	**Sucralose**
1	ZEB-DC-4	Sept 15 2024	< LOQ	0.70	< LOQ	< LOQ
2	DC-4	Sept 15 2024	< LOQ	1.10	< LOQ	< LOQ
3	ZEB-DC-4	Aug 21 2024	< LOQ	1.5	< LOQ	< LOQ
4	DC-4	Aug 21 2024	< LOQ	2.1	< LOQ	8.3
	Limit of Quantitation (LOQ)		**1.2**	**0.6**	**1.2**	**0.9**

We request that any publications, posters and oral presentations resulting from work performed by the Water Quality Centre at Trent University acknowledge the contribution by the Centre and/or research staff within the Centre. This allows the Centre to report information to our funding agencies.