Water Resources
2022 Keno Audit Report

Water Resources Branch
March 2023

Preface

The Water Resource Branch (WRB) is committed to fostering a healthy relationship with Yukon's waters and strives for collaborative management, protection and conservation of water. As technical scientific experts in water resources, we provide advice for compliance and inspection purposes, and conduct reviews of projects undergoing water licensing and environmental assessment processes.

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

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

As per WRB standard practice, a draft version of this report was shared with Hecla Mining Company prior to finalizing.

Executive summary

Water Resources Branch conducted an audit at the Keno Mine site, from August 29-31, 2022. Care and Maintenance at the United Keno Hill Mines is currently operating under Water Licence (QZ21-012). There is also a Water Licence (QZ18-044) and Quartz Mining Licence (QML-0009) in place for production in the United Keno Hill Mines. Both licences share overlapping areas where reclamation and mining could be coinciding.

The audit is intended to support the Branch in questions related to the Water Licences. The audit objectives are as follows:

- Investigate Silver King In-Situ treatment effects on Galena and Flat Creek
- Investigate Onek 400 Adit and adjacent groundwater monitoring wells
- Investigate Galkeno 300 Adit and adjacent groundwater monitoring wells
- Investigate No Cash Creek & No Cash Bog

Silver King

Surface water was investigated in the Silver King area to assess the impacts, if any, of water treatment on water quality in Galena and Flat Creek. Analysis of Silver King stations was focused on physical chemistry, nutrients and chlorophyll-a as an algae bloom was previously reported downstream of the Silver King adits. Opportunistic samples were also collected around Silver King 75 as a PHC odour was noticed by staff during the audit.

No algae blooms were observed around the Silver King site during the 2022 audit. DOC, DO, nutrients and chlorophyll-a concentrations were relatively low and did not exceed regulatory guidelines. There was no apparent correlation between historic soluble carbon injection and the aforementioned parameters concentrations in Galena and Flat Creek. The water treatment process at Silver King does not appear to be causing algae blooms or affecting DOC, DO, nutrients and chlorophyll-a concentrations in the area. No analytical detections of PHCs were observed in water samples collected upstream and downstream of Silver King 75 (except for 1-Methynaphthalene and 2-Methynaphthalene which were detected slightly above the MDL at the upstream sample).

Recommendation #1: The proponent should continue monitoring all stations around Silver King, including for nutrients.

Onek 400

ERDC has proposed cessation of monitoring of two of three wells at Onek 400 (ON-MW-1, ON-MW-2). Arsenic, cobalt and zinc have been observed in these wells at concentrations exceeding the aquatic life standards of the Yukon *Contaminated Sites Regulation* (CSR), as well as in the other monitoring well in the area (KC-MW-3) and the adit discharge (KV-45). Isotopic evidence (stable water and SO4) and chemistry data illustrates that the three monitoring wells in the Onek 400 area, and the adit water, are distinct but likely subject to a common influence or source. KC-MW-3 is most closely related to groundwater discharging from the adit, while ON-MW-2 is most closely related to groundwater that has not come into contact with underground workings. Due to the Yukon CSR exceedances in these wells and the increasing concentrations of the parameters mentioned above, continued monitoring is recommended:

Recommendation #2: The proponent should continue monitoring groundwater wells ON-MW-1, ON-MW-2, and KC-MW-3.

Galkeno 300

Monitoring well G300-MW-1 is located downgradient of the Galkeno 300 adit. This is the only monitoring well in the vicinity and the audit goal was to determine if this well is sufficient for monitoring potential downgradient impacts of the adit. G300-MW-1 was observed with increasing trends of zinc and cadmium, as well as cobalt and sulphate concentrations exceeding the Yukon CSR. Chemistry results and isotopic results suggest that G300-MW-1 and the Galkeno 300 Adit are subject to a common source.

Recommendation #3: The proponent should continue monitoring of G300-MW-1 and the adit discharge.

Recommendation #4: The proponent should install additional monitoring wells in the vicinity of Galkeno 300 to monitor and delineate increasing concentrations of several parameters and Yukon CSR exceedances observed in G300-MW-1. If feasible, this should include a background well above mining infrastructure to provide background water quality.

Recommendation #5: The proponent should investigate groundwater flows and natural attenuation potential to understand when groundwater from the Galkeno area may be noticed in Christal Creek.

No Cash Creek

No Cash Creek drains an area near the No Cash, Ruby and Bermingham (new and historic) underground workings. Flow is towards the South McQuesten River (Et'o Nyäk Tagé) where upon reaching the valley bottom, the creek disperses into a bog. ERDC and Hecla Mining have proposed objectives for the creek relying on the fact that the creek is non-fish bearing and that concentrations will be heavily naturally attenuated through the creek's reach. This location was investigated with a drone to visually assess whether No Cash Creek has a surficial connection to the South McQuesten River. There was no observable surface connection between No Cash Creek and the South McQuesten River (Et'o Nyäk Tagé). This supports previous findings that No Cash Creek was concluded to be non-fish bearing. It should be noted that these were the conditions in August 2023. Creek conditions can vary throughout the year. No Cash Creek would benefit from being inspected in the spring to assess whether frozen ground and freshet lead to a surface water connection being present.

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
Al	Aluminum
As	Arsenic
AW	Aquatic Wildlife
CCME	Canadian Council of Ministers of the Environment
Cd	Cadmium
YUKON CSR	Yukon Contaminated Sites Regulation
Cu	Copper
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
ECCC	Environment and Climate Change Canada
ERDC	Elsa Reclamation and Development Company
EQS	Effluent Quality Standards
FAL	Freshwater Aquatic life
Fe	Iron
GW	Groundwater
IAEA	International Atomic Energy Agency
LMWL	Local Meteoric Waterline
Masl	Meters above sea level
Mbtoc	Meters below top of casing
MDL	Method Detection Limit
Mg	Magnesium
mL	Millilitre
NH_4	Ammonium
NO_2	Nitrite
NO_3	Nitrate
ORP	Oxidation-Reduction Potential
pH	Inverse log of the activity of the hydrogen ion
RPD	Relative Percent Difference
Se	Selenium
SO_4	Sulphate

Acronym/ Abbreviation	Definition
SW	Surface Water
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UW-EIL	University of Waterloo - Environmental Isotope Laboratory
QAQC	Quality Assurance and Quality Control
WRB	Water Resources Branch – Government of Yukon
WTP	Water Treatment Plant
WQO	Water Quality Objectives
Zn	Zinc
-D	Dissolved phase (i.e., Zn-D = dissolved Zn)

1 Limitations

The Keno Mine site audit conducted by the Government of Yukon – Water Resources Branch, encompasses a one-time sampling event and therefore has inherent limitations that should be considered in the interpretation of its findings. The assessment's accuracy is contingent on the availability and completeness of historical information, and uncertainties regarding subsurface conditions due to limitations in intrusive investigations. Dependence on existing data, time constraints, and the assumption of good faith in information provided introduce further complexities. Additionally, the scope of the assessment defines its boundaries, potentially leaving certain aspects unexplored. Acknowledging these limitations is crucial for stakeholders to make informed decisions, recognizing that the assessment, conducted as a singular sampling event, provides a snapshot within specific constraints, and may not capture all environmental nuances of the site.

2 Introduction

The Water Resource Branch (WRB) is committed to fostering a healthy relationship with Yukon's waters and strives for collaborative management, protection and conservation of water. As technical experts in water resources, we provide advice for compliance and inspections purposes and conduct reviews of projects undergoing water licensing and environmental assessment processes. Care and Maintenance at the United Keno Hill Mines is currently operating under Water Licence (QZ21-012), which was issued in June 2023. There is also a Water Licence (QZ18-044) and Quartz Mining Licence (QML-0009) in place for production in the United Keno Hill Mines. Both licences share overlapping areas where reclamation and mining could be coinciding. The intention of this audit was to help familiarize WRB staff with the project and help answer questions related to the Water Licences.

3 Purpose, objectives and background

The audit objectives are as follows:

1. **Investigate Silver King in-situ treatment effects on Galena and Flat Creek**

Mine discharge water from Silver King 100 and Silver King 75 Adits is treated through soluble carbon injection (molasses or glycerol) into the underground workings. Soluble carbon promotes the growth of sulphate-reducing bacteria and in turn reduces sulphide minerals before they seep from the adits. Compliance Monitoring and Inspection staff had reported an algae bloom downstream of the Silver King Adits. Algal blooms can cause detrimental effects on aquatic organisms as they can reduce the amount of available dissolved oxygen. Water samples were analyzed for phosphorus, nitrogen, DOC, chlorophyll-a upstream (KV-60A), downstream (KV-60) and from the adits (Silver King 75 and 100) to help assess the potential impact of the effluent discharge on local periphyton growth.

2. **Evaluate Onek 400 adit water quality and adjacent groundwater monitoring wells to determine whether proposed groundwater monitoring in the area is sufficient.**

ERDC has proposed removing several wells from the monitoring program. There are three wells in the vicinity of the Onek 400 adit:

Table 1. Onek 400 monitoring wells & status

Well ID	Location (see)	Continued monitoring proposed?	Groundwater quality notes from YG's intervention re: QZ21-012 (YG, 2022)
ON-MW-1	~100 metres downgradient of the Onek underground workings; up/cross gradient of the Onek 400 Adit	No	An increasing arsenic trend that started an order of magnitude below Yukon CSR-AW and moved above Yukon CSR-AW until a single sampling event in 2020 where all concentrations dropped. Also appears to have increasing iron and cobalt.

ON-MW-2	~350 metres downgradient of the Onek underground workings; cross-gradient of the Onek 400 Adit	No	Arsenic, zinc, and cobalt are above the Yukon CSR and higher than ON-MW-1, but with no apparent trends. Sulphate concentrations are approximately 900 mg/L.
KC-MW-3	~75 metres downgradient of the Onek 400 Adit	Yes	Arsenic, cadmium, zinc, and cobalt all above Yukon CSR. Sulphate appears to have an increasing trend. As expected, given its proximity to the previously discharging Onek 400 Adit, this data relates strongly to the water quality of the adit (KV-43).

The 2019 ERDC Hydrochemical Report (ERDC, 2019) stated that the water chemistry at ON-MW-1 and ON-MW-2 is related to local bedrock geology while KC-MW-3 was described in this report to have elevated metal concentrations associated with the Onek mine.

The investigation of these three wells and the Onek adit is intended to aid in determining whether the water quality in ON-MW-1 & ON-MW-2 are related to mine workings or background geology. These four locations were sampled for a standard suite of mining related parameters as well as stable isotopic analysis of $\delta^{18}O$ and $\delta^{2}H$ of water and $\delta^{18}O$ and $\delta^{34}S$ of sulphate, which is intended to aid understanding on whether there is hydraulic connection between these wells and the mine workings (adit).

3. Evaluate Galkeno 300 adit water quality and adjacent groundwater monitoring wells to determine whether GW monitoring in the area should be enhanced.

Monitoring well G300-MW-1 is located downgradient of the Galkeno 300. G300-MW-1 was observed with increasing trends of zinc and cadmium as well as cobalt and sulphate concentrations exceeding the Yukon CSR (YG, 2022). ERDC concluded that the water quality at G300-MW-1 is not related to mining impacts but natural background geology (ERDC, 2019).

Investigating G300-MW-1 and the Galkeno adit is intended to provide valuable information for determining whether the water quality in this well is related to mine workings or background geology. G300-MW-1 & the Galkeno 300 Adit were sampled

for a standard suite of mining-related parameters as well as stable isotopic analysis of $\delta^{18}O$ and $\delta^{2}H$ of water and $\delta^{18}O$ and $\delta^{34}S$ of sulphate, which is intended to aid understanding on whether there is hydraulic connection between these wells and the mine workings (adit).

4. Investigate No Cash Creek & No Cash Bog

No Cash Creek drains an area near the No Cash, Ruby and Bermingham (new and historic) underground workings. Although affected by multiple sources, No Cash Creek water quality is strongly influenced by the No Cash 500 Adit. Flow is toward the South McQuesten River (Et'o Nyäk Tagé) where upon reaching the valley bottom, the creek disperses into a bog. Little is known about the water reaching this bog. Remediation activities are intended to improve the water quality in the creek, and this will complicate future WQO's in this system (particularly for the production activity), which will need to be revised from time to time as the water quality improves. ERDC and Hecla Mining have proposed objectives for the creek relying on the fact that the creek is non-fish bearing and that concentrations will be heavily naturally attenuated through the creek's reach. This location was investigated with a drone to visually assess whether No Cash Creek has a surficial connection to the South McQuesten River.

4 Traditional and current use

Et'o Nyak Tage, or South McQuesten River watershed is located in the traditional territory of the Na-Cho Nyäk Dun First Nation. All waters (surface and ground) from Silver King, No Cash Creek, Galkeno 300 and Onek 400 eventually reach the Et'o Nyak Tage's valley. Staff from the FNNND government shared with WRB staff that the Na-Cho Nyäk Dun people have used this river for travelling, hunting, trapping and fishing. Several fish camps have been set on the river. We have heard a story of people travelling on this river using "skin boats." Et'o Nyak Tage, South McQuesten River, is culturally important to FNNND people. Today, both Indigenous and non-Indigenous people use the South McQuesten River and surrounding areas for recreation, fishing, trapping and hunting. Commercial trapping and hunting concessions are allocated within the watershed.

5 Methods and materials

Samples were collected by WRB staff using best practices for water sampling and according to the specifications of the labs performing analysis. WRB staff adhered to standard sampling methods outlined by Environment and Climate Change Canada and Government of Yukon Department of Environment guidance documents. In-situ water quality field parameters were measured for each sample collected using YSI ProDSS Handheld Multimeters. WRB staff calibrated these meters as per manufacturer specifications prior to entering the field.

ALS performed water chemistry analysis for all parameters while the University of Waterloo Environmental Isotopes Laboratory analyzed the samples for stable water isotopes. In situ field measurements for pH and specific conductivity were submitted with the unfiltered samples for analysis of stable water isotopes. Isotope ratios were measured using a Los Gatos Research Liquid Water Isotope Analyser, model T-LWIA-45-EP with a precision (2σ) of $\delta^{2}H$ = ± 0.8 ‰ and $\delta^{18}O$ = ± 0.2 ‰. Appendix A and B present the complete analytical results from ALS and the University of Waterloo respectively.

5.1 Surface water

WRB staff collected five surface water samples during the August 2022 audit, outlined in Table 2 below. These sampling stations were selected to support audit objectives with the existing sampling locations sampled wherever possible. The exact sampling locations are depicted in Figure 1.

Parameters analysed in the surface water samples collected during the August 2022 audit included nutrients, chlorophyll-a, and basic routine and physical parameters. These parameters were chosen to support site audit objectives as well as allow for comparison against water quality guidelines outlined by the Canadian Council of Ministers of the Environment long-term Guidelines for Protection of Aquatic Life (CCME-PAL).

In addition to these parameters, WRB staff collected samples in Galena Creek near the Silver King 75 Adit which had hydrocarbon smell. The parameters analysed in these two samples included BTEX, LEPH, HEPH, EPH, and PAH.

Table 2. Surface water samples – Keno Audit – August 2022

Station Code	Location	Date & Time Sampled	Coordinates		Rationale
			Lat	Long	
KV-60	Galena Creek downstream of Silver King	Aug 31, 2022 – 14:15	-135.57231	63.89793	Galena Creek downstream of Silver King indicative of Silver King impacts to Galena Creek
KV-60A	Galena Creek upstream of Silver King	Aug 31, 2022 – 14:30	-135.57216	63.89429	Most upstream sampling location on Galena Creek, represents background Galena Creek water quality
KV-13	Silver King Adit	Aug 31, 2022 – 13:45	-135.342204	63.534981	First location which Silver King 100 Adit water reaches surface. Represents underground adit conditions
KV-14	Silver King Treatment Decant	Aug 31, 2022 – 13:00	-135.57507	63.89857	Discharge point from Silver King WTP to receiving environment. Compliance point.
KV-WRB	Downstream of Silver King Treatment Discharge	Aug 31, 2022 – 12:25	-135.57687	63.90005	Last known location of Silver King WTP water before it returns to ground
KV-ADS	Downstream of Silver King 75 Adit, before culvert	Sept 7, 2022 – 17:00	-135.34190	63.534381	Sampled downstream of Silver King 75 Adit which smelled strongly of hydrocarbons
KV-AUS	Upstream of Silver King 75 Adit	Sept 7, 2022 – 17:10	-135.34193	63.534129	Sampled upstream of Silver King 75 Adit which smelled strongly of hydrocarbons

5.2 Groundwater

WRB staff collected six groundwater samples, two from discharging adits and four from monitoring wells, as outlined in Table 3 below. These sampling stations were selected to support audit objectives and existing sampling locations were sampled wherever possible.

Groundwater and adit water samples collected during the August 2022 audit were analyzed for the following parameters: nutrients, total & dissolved metals, cyanide, isotopes ($\delta^{18}O$ and $\delta^{2}H$ of water, $\delta^{18}O$ and $\delta^{34}S$ of sulphate), and basic routine and physical parameters.

Water Resources Branch submitted stable water isotope and SO_4 isotope samples to the University of Waterloo-Environmental Isotope Laboratory. In-situ field measurements for pH, specific conductivity and SO_4 concentrations were submitted with the unfiltered samples for analysis. The lab at the University of Waterloo used a Los Gatos Research Liquid Water Isotope Analyser, model T-LWIA-45-EP to measure isotope ratios with a precision (2σ) of $\delta^{2}H = \pm 0.8$ ‰ and $\delta^{18}O = \pm 0.2$ ‰.

Stable water isotopes are a valuable tool used in water provenance determination. Analysis of the proportion of $\delta^{2}H$ and $\delta^{18}O$ in a given sample provides an estimate of the degree of evaporation to which a sample has been subjected. Generally, surface water samples with a longer residence time tend to be richer in $\delta^{18}O$, given the lighter $\delta^{16}O$ evaporates more readily. By comparing isotope ratios between water samples, scientists can make inferences concerning sources of water and water flow paths.

These parameters were chosen to support site audit objectives as well as allow for comparison against water quality guidelines outlined by the Yukon *Contaminated Site Regulation* – Schedule 3. Table 3 summarizes the location of each groundwater sample collected as part of the 2022 audit.

Groundwater samples were collected using various methods depending on site and well conditions. WRB staff employed a Submersible Pump and HydraSleeve discreet

samplers to collect groundwater samples during the August 2022 audit. Sampling methods were chosen based on well diameter casing, depth to the groundwater and well recharge rate. Sampling methods employed at each location have been outlined in Table 3, below.

Monitoring wells sampled with a submersible pump had the pump lowered into the well screen. Three well volumes were purged from each well prior to sampling to obtain a representative groundwater sample. HydraSleeves were used for sampling ON-MW-1 and ON-MW-2 because these wells were too deep for WRB's submersible pump. In each case, a HydraSleeve was lowered to the well screen as slowly as possible to minimize disturbance of the water column. Once at the proper depth, the HydraSleeve was opened to collect a water sample from within the screened area of the well. As the sample was raised, a ball valve closed to ensure the sample was not affected by water higher up in the water column.

Table 3. Groundwater sample locations – Keno Audit – August 2022

Station Code	Location	Date & Time Sampled	Coordinates		Sampling Method	Rationale
			Lat	Long		
KV-27	Galkeno 300 Adit	Aug 30, 2022 – 16:00	63.925185	-135.55796	Dip Sample	First location which Galkeno 300 Adit water reaches surface. Represents underground adit conditions
G300-MW-1	Downgradient of Galkeno 300 Adit	Aug 30, 2022 – 17:30	63.92599	-135.35316	Submersible pump	Represents groundwater conditions downgradient of Galkeno 300
KV-45	Onek 400 Adit	Aug 30, 2022 – 14:30	63.912398	-135.30365	Dip Sample	First location which Onek 400 Adit water reaches surface. Represents

						underground adit conditions
ON-MW-1	Upgradient/Cross Gradient of Onek 400 Adit. Downgradient of Onek 400 Underground workings	Aug 30, 2022 – 16:00	63.912301	-135.297935	HydraSleeve	Represents groundwater conditions downgradient of Onek 400 mine workings
ON-MW-2	Cross gradient of Onek 400 Adit	Aug 30, 2022 – 14:30	63.91051	-135.30111	HydraSleeve	Represents groundwater conditions downgradient of Onek 400 mine workings
KC-MW-3	Downgradient of Onek 400 Adit	Aug 30, 2022 – 13:00	63.912786	-135.30274	Submersible pump	Represents groundwater conditions directly downgradient of Onek 400 surface discharge

5.3 Aerial survey

Aerial reconnaissance was completed on Aug 29, 2023 using a DJI Matrice 300 RTK drone equipped with a Zenmuse H20 camera operated from the Silver Trail Highway. The flow path of No Cash Creek was traced as far as the horizontal range limit of the drone (approximately 2km). Photographs and videos were recorded while attempting to trace the flow path to provide visual evidence on the terminus of No Cash Creek. Photographs are presented in Appendix C.

5.4 Stable water isotopes

Stable water isotopes can be used as a valuable environmental tracer. Isotopes are atoms of the same element that have different numbers of neutrons but the same number of protons. Stable isotopes have nuclei that do not decay to other isotopes on geologic timescales but may themselves be produced by the decay of radioactive isotopes. Two stable isotopes of hydrogen (1H and 2H) and three of oxygen (16O, 17O and 18O) occur naturally in waters. The phrase "stable water isotopes" refers to (1H, 2H, 16O, and 18O), which are relatively abundant and can be easily measured by mass spectrometry. Stable water isotope samples are usually compared to the international reference material VSMOW (Vienna Standard Mean Ocean Water). The variations in isotope concentrations are relatively small and so are expressed in δ–values as the parts per thousand (permil; ‰) difference between the sample and the reference.

Samples for analysis of stable water isotopes were filtered in the field (0.45 micron) and collected in new, clean, 20 mL HDPE plastic bottles filled to the top with no head space and air-tight to prevent evaporation. The samples were submitted to the University of Waterloo-Environmental Isotope Laboratory (UWEIL). UW-EIL measured the isotopic ratios using a Los Gatos Research, Liquid Water Isotope Analyser, model T-LWIA-45-EP instrument with a precision (2σ) of $\delta^{2}H$ = ± 0.8 ‰ and $\delta^{18}O$ = ± 0.2 ‰. UWEIL's methods measure variations in stable isotope concentrations, rather than actual abundances of stable water isotopes. In this case, water samples collected during the August 2022 sampling event were compared to the international reference material VSMOW (Vienna Standard Mean Ocean Water). The variations in isotope concentrations are relatively small and so are expressed in δ–values as the parts per thousand (permil; ‰) difference between the sample and the reference.

5.5 Water quality benchmarks

5.5.1 Canadian Council of Ministers of the Environment (CCME) guidelines

Water samples from the 2022 Keno Audit were compared to the CCME long-term Water Quality Guidelines for the Protection of Aquatic Life to provide a basis of comparison (Table 4). These guidelines are intended to describe a generic threshold under which freshwater life is protected from anthropogenic stressors such as chemical inputs or changes to composition. These guidelines are numerical limits or narrative statements based on scientifically defensible toxicological data available at the time a particular guideline was developed. Guideline values are meant to protect all forms of aquatic life and all aspects of the aquatic life cycles, including the most sensitive life stage of the most sensitive species over the long term. Ambient water quality guidelines developed for the protection of aquatic life are meant to provide a science-based benchmark for a nationally consistent level of protection for aquatic life in Canada. It should be noted that several water quality guidelines are calculated using in-situ parameters, such as pH or temperature, and are therefore variable.

Table 4. CCME long-term Water Quality Guidelines for the Protection of Aquatic Life.

Parameter	Maximum Concentration
Aluminum (Total)	*Calculated, variable*
Ammonia (Total)	*Calculated, variable*
Arsenic (Total)	0.005 mg/L
Cadmium (Total)	*Calculated, variable*
Chromium (Total)	0.0089 mg/L
Copper (Total)	*Calculated, variable*
Cyanide (WAD)	0.005 mg/L
Dissolved Oxygen	8.0 mg/L (minimum)
Iron (Total)	0.3 mg/L
Lead (Total)	*Calculated, variable*
Manganese (Total & Dissolved)	*Calculated, variable*
Mercury (Total)	0.000026 mg/L
Molybdenum (Total)	0.073 mg/L
Nickel (Total)	*Calculated, variable*
Nitrate	2.9 mg/L
Nitrite	0.06
pH	6.5 to 9.0 pH units
Selenium (Total)	0.001 mg/L
Silver (Total)	0.00025 mg/L

Strontium (Dissolved)	2.5 mg/L
Thallium (Total)	0.0008 mg/L
Turbidity	*Calculated, variable*
Uranium (Total)	0.033 mg/L
Benzene	0.37 mg/L
Ethylbenzene	0.09 mg/L
Styrene	0.072 mg/L
Toluene	0.002 mg/l
Acenaphthene	0.0058 mg/L
Acridine	*0.0044 mg/L*
Anthracene	*0.000012 mg/L*
Benz(a)anthracene	*0.000018 mg/L*
Benz(a)pyrene	*0.000015 mg/L*
Flouranthene	*0.00004 mg/L*
Fluorene	*0.003 mg/L*
Naphthalene	*0.0011 mg/L*
Phenanthrene	*0.0004 mg/L*
Pyrene	*0.000025 mg/L*
Quinoline	*0.0034 mg/L*

5.5.2 Yukon Contaminated Site Regulation (Yukon CSR)

Schedule 3 of the *Contaminated Sites Regulations*, pursuant to the *Environment* Act, lists generic numerical water standards that are used to determine if sites are contaminated as per the regulation. The Yukon CSR standards for Aquatic Life that are relevant to the August 2022 site audit sampling are outlined in Table 5 below. Like CCME Guidelines above, several Yukon CSR guidelines are calculated using in-situ parameters such as pH or temperature and are therefore variable. For the purposes of this audit, these guidelines were utilized for basis of comparison only, as the CCME doesn't have exhaustive guidelines specific to groundwater. It is not the purpose of this audit to draw conclusions related to any exceedances of Yukon CSR standards with respect to the regulation.

Table 5. Yukon Contaminated Sites Regulations Schedule 3 Generic Numerical Water Standards for Aquatic Life.

Parameter	Maximum Concentration
Silver (Dissolved)	*Calculated, variable*
Arsenic (Dissolved)	0.05mg/L
Barium (Dissolved)	10mg/L
Beryllium (Dissolved)	0.053mg/L
Cadmium (Dissolved)	*Calculated, variable*
Chromium (Dissolved)	0.01mg/L
Cobalt (Dissolved)	0.009mg/L
Cyanide (WAD)	0.05mg/L
Copper (Dissolved)	*Calculated, variable*
Fluoride	*Calculated, variable*
Mercury (Dissolved)	0.001mg/L
Molybdenum (Dissolved)	1 mg/L
Nickel (Dissolved)	*Calculated, variable*
Ammonium	*Calculated, variable*
Nitrogen (as NO_2)	*Calculated, variable*
Nitrate	40 mg/L
Selenium (Dissolved)	0.01mg/L
Antimony (Dissolved)	0.2mg/L
Lead (Dissolved)	*Calculated, variable*
Sulphate	1000 mg/L
Sulphide	0.02mg/L
Thallium (Dissolved)	0.003mg/L
Titanium (Dissolved)	1 mg/L
Uranium (Dissolved)	3 mg/L
Zinc (Dissolved)	*Calculated, variable*
Benzene	4 mg/L
Ethylbenzene	2 mg/L
Styrene	0.72 mg/L
Toluene	0.39 mg/L
LEPH	0.5 mg/L
EPH	5 mg/L
VPH	1.5 mg/L
Acenaphthene	0.06 mg/L
Acridine	0.0005 mg/L
Anthracene	0.001 mg/L
Benz(a)anthracene	0.001 mg/L

Benz(a)pyrene	*0.0001 mg/L*
Chrysene	*0.001 mg/L*
Flouranthene	*0.002 mg/L*
Fluorene	*0.12 mg/L*
Naphthalene	*0.01 mg/L*
Phenanthrene	*0.003 mg/L*
Pyrene	*0.0002 mg/L*
Quinoline	*0.034 mg/L*

5.5.3 South McQuesten River (Et'o Nyak Tage), water quality objectives

Water Quality Objectives have been developed for a few parameters for the South McQuesten River (Et'o Nyak Tage), at the long-term water quality station (YT09DD0008) located downstream of Flat Creek (Slater Environmental Consulting and Minnow Environmental Inc. 2023). Although these WQO are specific to this station, they can provide a useful benchmark to compare water quality upstream in the watershed. The Water Quality Objective Derivation for the South McQuesten River report states that "because the non-degradation water management approach was used [to develop the WQO], it is expected that achievement of the numerical and narrative WQO at all areas upstream of YT09DD0008 would support achievement of WQO at YT09DD0008. The narrative objective is that baseline water quality must be maintained and the numerical and the report presents two types of numerical objectives, the 'average WQOs', based on the 95% Upper Confidence Limit of the Mean and the 'maximum WQOs', based on the upper 95th percentile of the baseline data. 14 Maximum WQO were proposed in the study but only five have been finalized at this time. The Final Maximum WQO are:

Table 6. South McQuesten Water Quality Objectives

Parameter	Maximum Concentration*
Arsenic (Total)	*2.3µg/L*
Chromium (Total)	*0.14µg/L*
Silver (Total)	*0.046µg/L*
Thallium (Total)	0.0040 µg/L
Vanadium (Total)	*0.19µg/L*

**These WQOs apply in clear-flow conditions only when turbidity is lower than 4NTU*

5.6 QA/QC

In addition to standard samples collected from site, WRB completed four Quality Assurance/Quality Control samples to comply with sampling best practices referenced above. QA/QC samples collected have been outlined in Table 7 below.

Table 7. QA/QC Samples – Keno Audit – August 2022

QA/QC Sample Type Collected	Procedure	Purpose
Field Blank	A sample bottle set is filled with lab grade deionized water in the field by sampling staff following all the standard protocols and procedures of a normal sample.	Can help identify if any contaminants have been introduced into the sample from the atmosphere at the sampling location or from sampling staff handling protocols and procedures.
Duplicate (x2)	A regular sample is collected followed immediately by an identical replicate sample being collected adhering to all the same standard protocols and procedures. One replicate is collected for every ten samples, rounded up to the nearest ten samples. Analytical results are compared, and Relative Percent Difference is calculated.	Can help identify precision of sampling technique and methods and provide an estimate of sampling error and analytical error.

6 Results

6.1 General site visit results

The 2022 Keno audit was completed from Aug 29 – 31, 2022. Drone reconnaissance along No Cash Creek was completed the afternoon of Aug 29, 2022. ERDC and Hecla provided a tour of site on the morning of Aug 30, 2022, after which sampling of Onek 400 and Galkeno 300 monitoring locations was completed. Sampling of the Silver King monitoring locations was completed Aug 31, 2022. Field notes collected during the site visit are in Appendix D.

6.1.1 In-situ measurements

During sample collection, WRB crews measured in-situ field parameters using a YSI ProDSS handheld multimeter. These measurements have been outlined in Table 8 and compared to CCME guidelines where applicable. pH at KV-27 (6.34) was outside of the recommended pH range (6.5-9.0) defined in the CCME guideline for the protection of aquatic life during the August 2022 audit. Groundwater monitored in the well G300-MW-1 was also outside of this range (6.07) although the guidelines were developed for surface water and not groundwater. There were no other in-situ field parameters exceedances of the CCME guidelines.

Table 8. In-situ Field Parameters Measured During Sample Collection – Keno Audit – August 2022.

Station Code	Temp (°C)	pH (pH Units)	DO (mg/L)	Specific Conductance (µs/cm)	Turbidity (NTU)	ORP (mv)
KV-45 (Onek Adit)	2.2	7.62	11.72	969	1.72	127.6
ON-MW-1	3.3	6.88	6.80	1784	7.10	5.1
ON-MW-2	2.6	6.90	7.48	1607	5.92	51.3
KC-MW-3	3.0	6.77	0.00	1213	69.5	80.7
KV-27 (Galkeno 300 Adit)	3.3	6.34	9.77	1474	20.25	63.8
G300-MW-1	2.6	6.07	0.00	2445	226	136.9
KV-13 (Silver King Adit)	1.4	6.58	8.56	1019	24.18	-
KV-14	4.3	8.00	11.24	1086	12.31	-
KV-60A	7.6	8.26	11.01	244	13.53	-
KV-60	7.6	8.09	10.9	260	9.4	-
KV-WRB	4.8	7.38	7.51	1058	1.38	-

6.1.2 Groundwater measurements

Standard groundwater well measurements were collected as part of groundwater sampling (Table 9). The top of each groundwater well casing rises above grade a known distance (known as “stick-up”), and subsequent measurements of depth to groundwater and depth to well bottom are relative to stick-up. From these values, the length of the water column and the volume of water in the well can be calculated. WRB uses a Solinst water level tape to measure depth to groundwater and depth to well bottom.

Table 9. Groundwater Well Measurements – Keno Audit – August 2022.

Groundwater Well Code	Depth to Groundwater (mbtoc)	Depth to Well Bottom (mbtoc)	Length of Water Column (m)	Volume of Water in Well (L)	Top of Well Elevation (masl)	Water Level Elevation (masl)	Screened Interval
ON-MW-1	36.348	76.00	39.652	570	999.26	962.91	Screened across multiple bedrock interfaces (7 screens): 17 – 20 mbgs 26 – 29 mbgs 35.5 – 38.5 mbgs 45 – 48 mbgs 53.5 – 56.5 mbgs 63 – 66 mbgs 72 – 75 mbgs
ON-MW-2*	29.730	70.840	41.110	82.2	959.15	929.42	Bedrock – Quartzite (~61 – 67 mbgs)
KC-MW-3	15.770	30.032	14.262	28.5	959.26	943.49	Bedrock (~15 – 29 mbgs)
G300-MW-1	13.450	29.165	15.715	31.4	1099.58	1086.13	Bedrock (24.99 -28.04 mbgs)

Mbtoc: metres below top of casing

**Four-inch diameter well, all others two-inch*

Monitoring Well elevations obtained from Yukon Water Well Registry

6.2 Silver King - summary of results

Sampling of the Silver King monitoring locations was conducted on Aug 30, 2022. Samples were collected from the 5 locations (KV-60A, KV-60, KV-13, KV-14 and KV-WRB) summarized in Figure 1 below. The sampling location of KV-WRB was altered upon arrival to site as the original sample was intended to be collected from the confluence of the WTP effluent and Galena Creek. Upon investigation it was observed that the effluent from the WTP flowed overland for approximately 100m before disappearing to ground. KV-WRB was collected from the last observed location of the WTP effluent. No algae blooms were observed during the audit in both Galena Creek and the WTP process and effluent. Reddish orange precipitate was observed in the WTP effluent for approximately 75m along the flow path after which the water became clear. Sampling results are summarized in Table 10 below. Full laboratory results are presented in Appendix A.

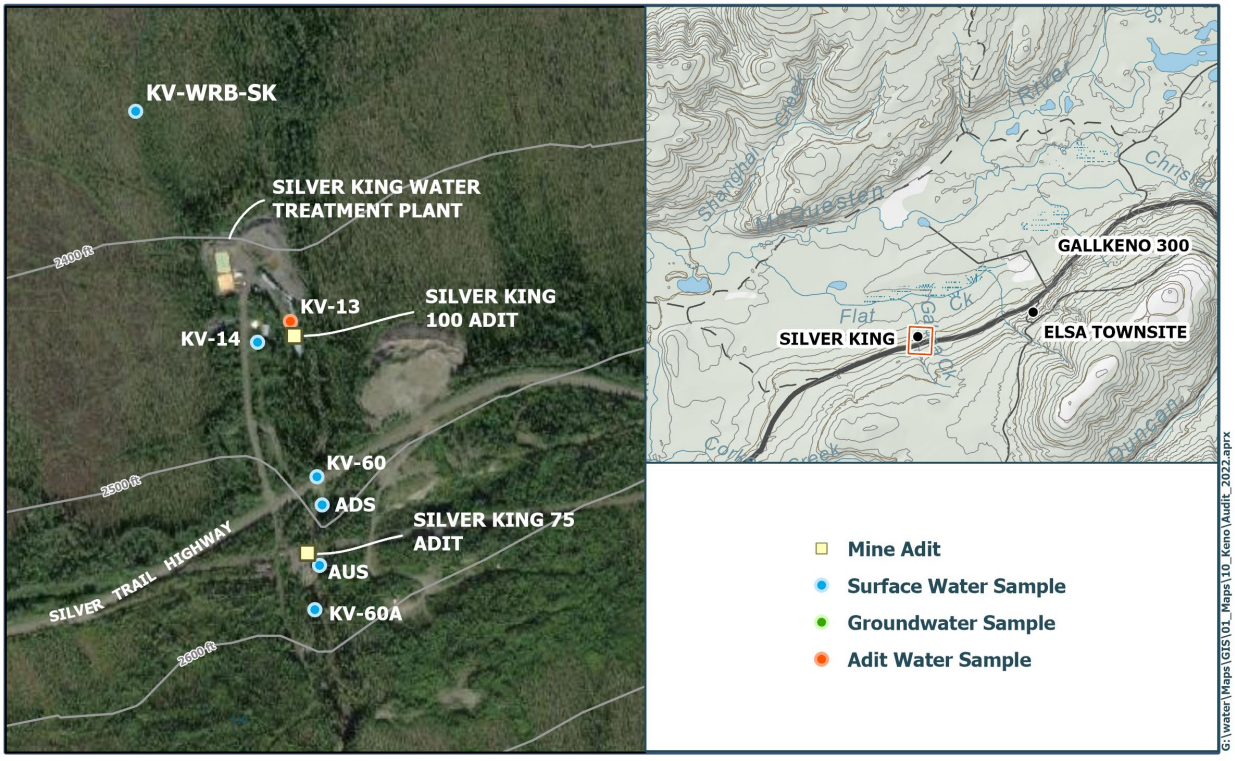

Figure 1 - Silver King sample locations

Table 10. Silver King Analytical Results – August 2022

Station			KV-13 (SK-100)	KV-14 (WTP-Eff)	WRB-SK	KV-60A	KV-60
Sample Date	**Units**	**CCME PAL**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**
TDS	mg/L		740	820	797	170	173
TSS	mg/L		29.4	21.2	<3.0	25.8	19.8
Alkalinity (Total)	mg/L		147	230	209	118	124
SO_4	mg/L		404	402	397	18.5	22.9
Sulphide	mg/L		0.0027	<0.0015	<0.0015	0.0034	0.0034
H2S	mg/L		0.0029	<0.0016	<0.0016	0.0036	0.0036
N-NO2	mg/L	0.06	<0.0050	<0.0050	<0.0050	<0.0010	<0.0010
N-NO3	mg/L	2.9	<0.0250	<0.0250	0.0572	<0.0050	<0.0050
N-NH4	mg/L		0.227	0.211	<0.0050	0.0093	0.0081
N-TN	mg/L		0.302	0.281	0.146	0.437	0.395
C-DOC	mg/L		1.72	1.78	1.68	12.3	11.3
P-T	mg/L		0.141	0.0152	<0.0020	0.0254	0.0176
Chlorophyll-a	µg/L		<0.040	0.16	0.072	0.664	0.524

CCME PAL – Canadian Council of Ministers of the Environment, Protection of Aquatic Life Standard

Conductivity and TDS in the adit water (KV-13) and WTP effluent (KV-14 & KV-WRB) was 5 times higher than water in Galena Creek (KV60 and KV-60A). pH was consistent in all 5 samples (approximately 8) except for the adit water which was 6.58. Sulphate was the highest in the adit and WTP effluent (approximately 20 times higher than Galena Creek). Nutrients NO_2, NO_3, NH_4, TN were consistent between all five samples showing little variability. Phosphorous and DOC was noticeably higher (approximately 10 times higher) in Galena Creek when compared to the adit and WTP effluent.

During the audit a strong PHC odour was noticed in the Galena Creek valley adjacent to Silver King 75 adit. The strongest odours were observed in the entrance of the adit. Two surface water samples were collected on Sept 7, 2022, upstream of the adit (KNO-AUS) and downstream of the adit (KNO-ADS). These samples were analyzed for LEPH, HEPH, BTEX and PAHs.

These results came back as non-detects for all of parameters analyzed except for 1-Methynaphthalene and 2-Methynaphthalene at KNO-AUS which were measured at 14ng/L and 18ng/L respectively, slightly above the laboratory detection limit of 10ng/L.

A summary of analytical results is presented in Table 11 below and full laboratory results are presented in Appendix A.

Table 11. Silver King PHC Analytical Results – September 2022

Station		YCSR Sch 3	(KNO)AUS	(KNO)ADS
Parameters	**Units**		**2022-09-07**	**2022-09-07**
1-Methylnaphthalene	ng/L		<10	**14**
2-Methylnaphthalene	ng/L		<10	**18**
Acenaphthene	ng/L	6000	<10	<10
Acenaphthylene	ng/L		<10	<10
Acridine	ng/L	50	<10	<10
Anthracene	ng/L	100	<10	<10
Benz	µg/L	400	<0.50	<0.50
Benz-a-anthracene	ng/L	100	<10	<10
Benzo-a-pyrene	ng/L	10	<5.0	<5.0
Benzo-bj-fluoranthene	ng/L		<10	<10
Benzo-bjk-fluoranthene	ng/L		<15	<15
Benzo-ghi-perylene	ng/L		<10	<10

Benzo-k-fluoranthene	ng/L		<10	<10
BTEX	µg/L		<1.0	<1.0
Chrysene	ng/L	100	<10	<10
Cond-F	µS/cm		279.2	279.2
Dibenz-ah-anthracene	ng/L		<5.0	<5.0
E-Benz	µg/L	200	<0.50	<0.50
EPH10-19	µg/L	500	<250	<250
EPH19-32	µg/L		<250	<250
Fluoranthene	ng/L	200	<10	<10
Fluorene	ng/L	12000	<10	<10
HEPH	µg/L		<250	<250
Indeno-123-cd-pyrene	ng/L		<10	<10
LEPH	µg/L	50	<250	<250
MTBE	µg/L		<0.50	<0.50
Naphthalene	ng/L	1000	<50	<50
O-DO-F	mg/L		11.96	11.85
ORP	mV		223.3	222.9
pH-F	pH units		8.29	8.32
Phenanthrene	ng/L	300	<20	<20
Pyrene	ng/L	20	<10	<10
quin	ng/L	3400	<50	<50
Styrn	µg/L	72	<0.50	<0.50
Temp-F	C		4	4.1
Tolue	µg/L	39	<0.50	<0.50
Turb-F	NTU		0.19	1.25
Xyl-mp	µg/L		<0.40	<0.40
Xyl-o	µg/L		<0.30	<0.30
Xyl-T	µg/L		<0.50	<0.50

YCSR Sch 3 – Yukon Contaminated Site Regulation, Schedule 3 Protection of Aquatic Life – 1:10 dilution factor removed.

6.3 Onek 400 -summary of results

Sampling at Onek 400 consisted of a sample from the adit water as it emerged from underground (KV-45) and from the monitoring wells ON-MW-1, ON-MW-2, and KC-MW-3. , below, summarizes the sampling locations at Onek 400. Sampling was completed in the afternoon of Aug 30, 2022. Results are summarized in Table 12 below. Full laboratory analytical results are presented in Appendix A.

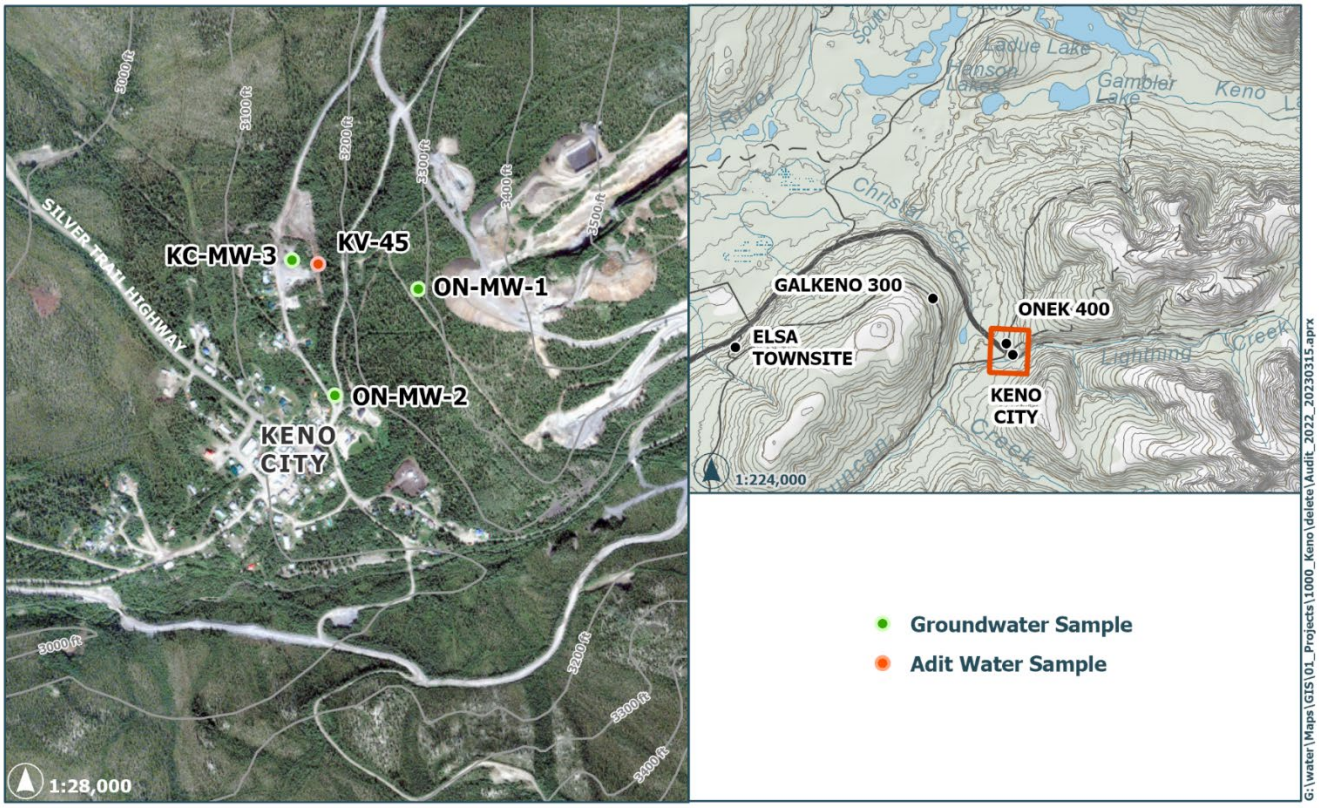

Figure 2 - Onek 400 sample locations

Table 12. Onek 400 Analytical Results – August 2022

Parameter	Units	YCSR Sch3	KV-45	ON-MW-1	ON-MW-2	KC-MW-3
			2022-08-30	2022-08-30	2022-08-30	2022-08-30
Ag-D	mg/L	0.15[1]	<0.000100	<0.000020	<0.000010	<0.000050
Ag-T	mg/L		<0.000100	0.000165	0.000044	<0.000050
Al-D	mg/L		0.0120	0.0134	0.0149	0.0088
Al-T	mg/L		<0.0300	0.102	0.135	0.0435
Alk-T	mg/L		150	328	313	185
As-D	mg/L	0.05	0.0166	0.0890	0.0140	0.00232
As-T	mg/L		0.0286	0.0958	0.0488	0.00326
B-D	mg/L		<0.100	<0.020	<0.010	<0.050
B-T	mg/L		<0.100	<0.010	<0.010	<0.050
Ba-D	mg/L	10	0.00725	0.0114	0.0432	0.00997
Ba-T	mg/L		0.00698	0.0162	0.0438	0.0140
Be-D	mg/L	0.053	<0.000200	<0.000100	<0.000100	<0.000100
Be-T	mg/L		<0.000200	<0.000100	<0.000100	<0.000100
Bi-D	mg/L		<0.000500	<0.000100	<0.000050	<0.000250
Bi-T	mg/L		<0.000500	<0.000050	<0.000050	<0.000250
C-DOC	mg/L		<0.50	0.75	6.38	0.51
Ca-D	mg/L		161	399	271	237
Ca-T	mg/L		157	386	303	226
Cd-D	mg/L	0.0006[1]	0.607	0.0000403	0.000309	0.128
Cd-T	mg/L		0.619	0.000285	0.000388	0.150
Chloride	mg/L		<2.50	<5.00	3.36	<2.50
CN-CNO	mg/L		<0.20	<0.20	<0.20	<0.20
CN-T	mg/L		<0.0050	<0.0050	<0.0050	<0.0050
CN-WAD	mg/L	0.05	<0.0050	<0.0050	<0.0050	<0.0050
Co-D	mg/L	0.009	0.00959	0.00805	0.0109	0.0174
Co-T	mg/L		0.00957	0.00788	0.0125	0.0179
Cond-F	µS/cm		969	1784	1607	1213
Cond-L	µS/cm		901	1740	1410	1170
Cr-D	mg/L		<0.00100	<0.00050	<0.00050	<0.00050
Cr-T	mg/L		<0.00100	0.00065	<0.00050	<0.00050
Cs-D	mg/L		0.000306	0.000666	0.000202	0.000474
Cs-T	mg/L		0.000333	0.000856	0.000321	0.000480
Cu-D	mg/L	0.09[1]	<0.00200	<0.00040	0.00108	<0.00100
Cu-T	mg/L		<0.00500	0.00174	0.00118	<0.00250
d18O-water	‰ VSMOW		-21.80	-21.78	-22.69	-22.20
d2H-water	‰ VSMOW		-170.17	-170.34	-177.47	-172.85
d18O-SO_4	‰ VSMOW		-14.09	-13.72	-13.62	-14.01
d34S –SO_4	‰ VSMOW		-0.59	-2.07	-0.60	-2.38

Parameter	Units	YCSR Sch3	KV-45	ON-MW-1	ON-MW-2	KC-MW-3
			2022-08-30	2022-08-30	2022-08-30	2022-08-30
Fe-D	mg/L		<0.100	4.02	0.891	0.326
Fe-T	mg/L		0.364	4.13	2.01	0.580
H2S	mg/L		<0.0040	0.0455	0.0220	0.0114
Hard-D	mg/L		477	1150	808	683
Hard-T	mg/L		463	1100	892	654
Hg-D	mg/L	0.001	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Hg-T	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050
K-D	mg/L		<0.500	0.484	0.602	0.546
K-T	mg/L		<0.500	0.495	0.640	0.639
Li-D	mg/L		0.0243	0.0316	0.0184	0.0345
Li-T	mg/L		0.0192	0.0301	0.0191	0.0329
Mg-D	mg/L		18.3	36.4	31.8	22.1
Mg-T	mg/L		17.2	32.8	32.8	21.8
Mn-D	mg/L		6.21	1.20	1.70	0.756
Mn-T	mg/L		5.86	1.14	1.92	0.773
Mo-D	mg/L	10	<0.000500	0.00204	0.000728	0.00108
Mo-T	mg/L		<0.000500	0.00214	0.000854	0.00111
N-NH4	mg/L	Varies[2]	0.0060	0.0204	0.0259	0.0150
N-NO2	mg/L	0.2[3]	<0.0050	<0.0100	<0.0050	<0.0050
N-NO3	mg/L	400	<0.0250	<0.0500	0.0766	<0.0250
N-TN	mg/L		<0.030	0.070	0.155	0.034
Na-D	mg/L		1.35	1.44	1.54	1.43
Na-T	mg/L		1.54	3.80	1.48	1.77
Ni-D	mg/L	1.5[1]	0.0205	0.0106	0.0343	0.0491
Ni-T	mg/L		0.0192	0.0105	0.0397	0.0507
O-DO-F	mg/L		11.72	6.8	7.48	-0.21
ORP	mV		127.6	5.1	51.3	80.7
P-D	mg/L		<0.500	<0.100	<0.050	<0.250
P-T	mg/L		<0.500	<0.050	<0.050	<0.250
Pb-D	mg/L	0.16[1]	<0.000500	<0.000100	<0.000050	<0.000250
Pb-T	mg/L		0.00102	0.00431	0.00180	0.00508
pH-F	pH units		7.62	6.88	6.9	6.77
pH-L	pH units		7.53	8.05	8.06	7.73
PurgeVol	L			0	0	90
Rb-D	mg/L		<0.00200	0.00139	0.00123	0.00116
Rb-T	mg/L		<0.00200	0.00143	0.00148	0.00115
S-D	mg/L		132	306	198	184
S-T	mg/L		123	296	226	168
Sb-D	mg/L	0.2	0.00580	<0.00020	0.00163	0.00062

Parameter	Units	YCSR Sch3	KV-45	ON-MW-1	ON-MW-2	KC-MW-3
			2022-08-30	2022-08-30	2022-08-30	2022-08-30
Sb-T	mg/L		0.00581	0.00105	0.00199	0.00078
Se-D	mg/L	0.01	<0.000500	0.000350	0.00124	<0.000250
Se-T	mg/L		<0.000500	0.000340	0.000837	<0.000250
Si-D	mg/L		5.66	7.33	5.32	5.62
Si-T	mg/L		5.23	6.77	5.54	5.19
Sn-D	mg/L		<0.00100	<0.00020	<0.00010	<0.00050
Sn-T	mg/L		<0.00100	0.00012	<0.00010	<0.00050
SO_4	mg/L	1000	376	840	605	536
Sr-D	mg/L		0.202	0.787	0.509	0.388
Sr-T	mg/L		0.203	0.780	0.592	0.382
Sulphd	mg/L	0.02	<0.0038	0.0428	0.0207	0.0107
TDS	mg/L		664	1510	1160	960
Te-D	mg/L		<0.00200	<0.00040	<0.00020	<0.00100
Te-T	mg/L		<0.00200	<0.00020	0.00020	<0.00100
Temp-F	C		2.2	3.3	2.6	3
Th-D	mg/L		<0.00100	<0.00020	<0.00010	<0.00050
Th-T	mg/L		<0.00100	<0.00010	0.00019	<0.00050
Ti-D	mg/L	1	<0.00300	<0.00060	<0.00030	<0.00150
Ti-T	mg/L		<0.00300	0.00439	0.00293	<0.00150
Tl-D	mg/L	0.003	<0.000100	<0.000020	0.000010	<0.000050
Tl-T	mg/L		<0.000100	0.000061	0.000016	<0.000050
TSS	mg/L		13.0	12.0	12.4	<3.0
Turb-F	NTU		1.72	7.1	5.92	69.5
U-D	mg/L	3	0.00131	0.00988	0.00750	0.00273
U-T	mg/L		0.00133	0.0104	0.00900	0.00268
V-D	mg/L		<0.00500	<0.00100	<0.00050	<0.00250
V-T	mg/L		<0.00500	<0.00050	<0.00050	<0.00250
W-D	mg/L		<0.00100	0.00022	<0.00010	<0.00050
W-T	mg/L		<0.00100	0.00050	<0.00010	<0.00050
WWaterLevel	m			36.348	29.73	15.77
Zn-D	mg/L	2.4[1]	47.0	0.0231	1.37	30.8
Zn-T	mg/L		45.4	0.116	1.55	31.0
Zr-D	mg/L		<0.00200	0.00228	0.00161	<0.00100
Zr-T	mg/L		<0.00200	0.00252	0.00232	<0.00100

YCSR Sch3 - Yukon Contaminated Site Regulation – Schedule 3 – Protection of Aquatic Life

Numbers in red indicate values above the corresponding CSR standard.

1 Guideline contingent on Hardness

2 Guideline contingent on pH

3 Guideline contingent on [Cl-]

Several exceedances of the Yukon CSR Schedule 3 were observed at the monitoring locations at Onek 400 including; As-D, Cd-D, Co-D, Sulphide and Zn-D. The adit discharge water (KV-45) exceeded guidelines for Cd-D, Co-D and Zn-T. ON-MW-1 exceeded the Yukon CSR for As-D, and sulphide. ON-MW-2 exceeded the Yukon CSR for Co-D and Sulphide. KC-MW-3 exceeded the Yukon CSR for Cd-D, Co-D and Zn-D.

6.4 Galkeno 300 - summary of results

The sampling program at Galkeno 300 consisted of a sample from the adit water at the portal (KV-27) and from the monitoring well downgradient of the adit and WTP (G300-MW-1.). Figure 3 summarizes the sampling locations at Galkeno 300. Sampling was completed in the afternoon of Aug 30, 2022. Results are summarized in Table 13, below. Full laboratory analytical results are presented in Appendix A.

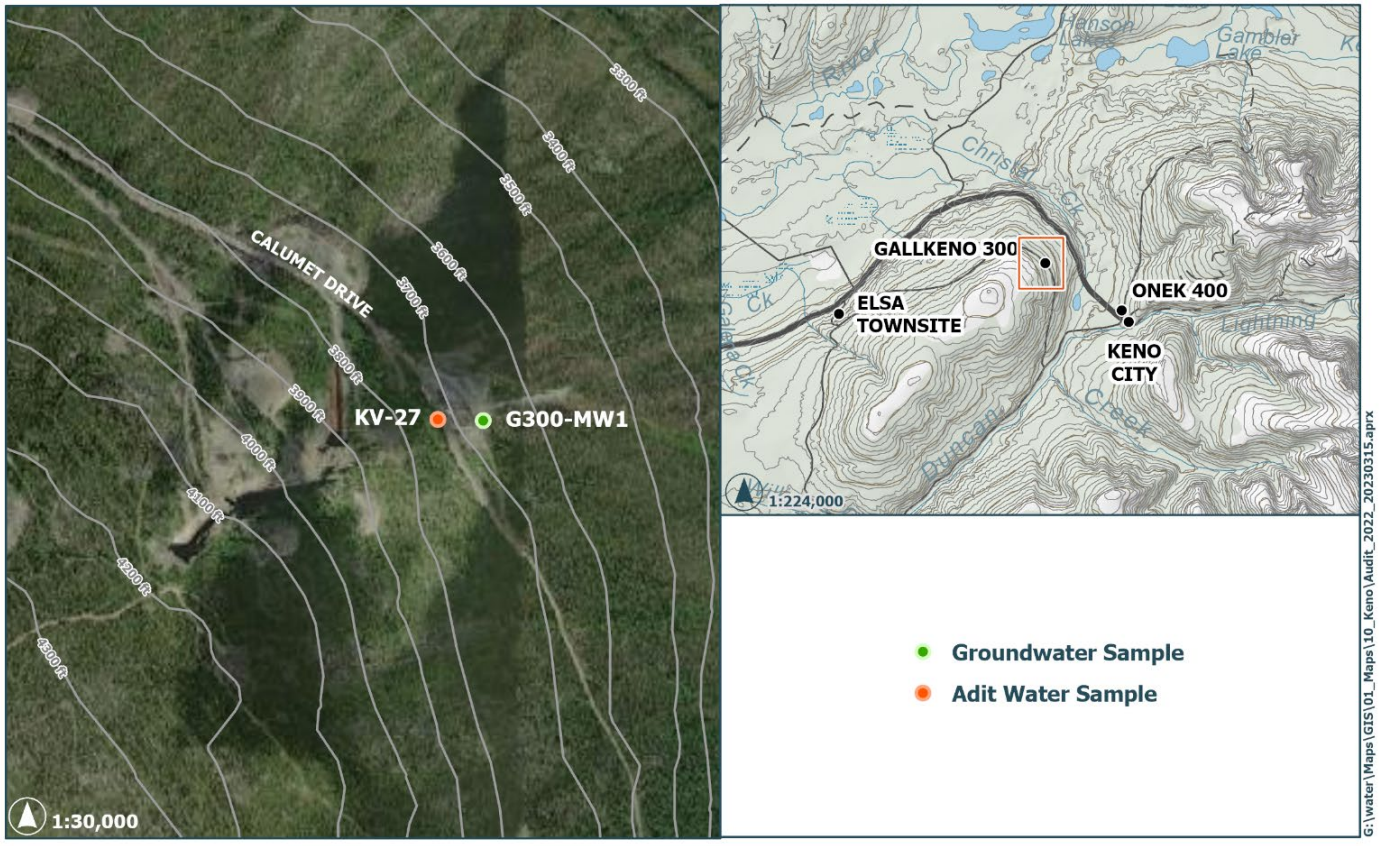

Figure 3 -Galkeno 300 sample locations

Table 13. Galkeno 300 Analytical Results – August 2022

Parameter	Units	YCSR Sch3	KV-27	G300-MW-1
			2022-08-30	2022-08-30
Ag-D	mg/L	0.015[1]	<0.000200	<0.000200
Ag-T	mg/L		<0.000200	<0.000200
Al-D	mg/L		0.0696	0.0213
Al-T	mg/L		0.0969	<0.0600
Alk-T	mg/L		44.3	93.1
As-D	mg/L	0.05	0.0794	<0.00200
As-T	mg/L		0.126	<0.00200
B-D	mg/L		<0.200	<0.200
B-T	mg/L		<0.200	<0.200
Ba-D	mg/L	10	0.0122	0.0105
Ba-T	mg/L		0.00806	0.0108
Be-D	mg/L	0.053	<0.000400	<0.000400
Be-T	mg/L		<0.000400	<0.000400
Bi-D	mg/L		<0.00100	<0.00100
Bi-T	mg/L		<0.00100	<0.00100
C-DOC	mg/L		<0.50	<0.50
Ca-D	mg/L		172	484
Ca-T	mg/L		165	443
Cd-D	mg/L	0.0006[1]	0.289	0.0878
Cd-T	mg/L		0.279	0.0879
Chloride	mg/L		<2.50	<10.0
CN-CNO	mg/L		<1.00	<1.00
CN-T	mg/L		<0.0050	<0.0050
CN-WAD	mg/L	0.05	<0.0050	<0.0050
Co-D	mg/L	0.009	0.0719	0.0774
Co-T	mg/L		0.0676	0.0745
Cond-F	µS/cm		1474	2445
Cond-L	µS/cm		1420	2380
Cr-D	mg/L		<0.00200	<0.00200
Cr-T	mg/L		<0.00200	<0.00200
Cs-D	mg/L		0.000288	0.000673
Cs-T	mg/L		0.000308	0.000728
Cu-D	mg/L	0.09[1]	<0.00400	0.00560
Cu-T	mg/L		<0.0100	<0.0100
d18O-water	‰ VSMOW		-22.45	-22.13

Parameter	Units	YCSR Sch3	KV-27	G300-MW-1
			2022-08-30	2022-08-30
d2H-water	‰ VSMOW		-172.22	-172.09
d180-SO_4	‰ VSMOW		-16.70	-19.07
d34S –SO_4	‰ VSMOW		-1.98	-3.15
Fe-D	mg/L		14.9	<0.200
Fe-T	mg/L		17.6	<0.200
H2S	mg/L		<0.0080	<0.0040
Hard-D	mg/L		579	1550
Hard-T	mg/L		547	1430
Hg-D	mg/L	0.001	<0.0000050	<0.0000050
Hg-T	mg/L		<0.0000050	<0.0000050
K-D	mg/L		<1.00	2.96
K-T	mg/L		<1.00	2.65
Li-D	mg/L		0.0341	0.118
Li-T	mg/L		0.0245	0.109
Mg-D	mg/L		36.4	82.9
Mg-T	mg/L		32.8	78.5
Mn-D	mg/L		124	78.2
Mn-T	mg/L		112	72.1
Mo-D	mg/L	10	<0.00100	0.00127
Mo-T	mg/L		0.00115	<0.00100
N-NH4	mg/L	18.4[2]	0.0193	0.0907
N-NO2	mg/L	0.2[3]	<0.0050	<0.0200
N-NO3	mg/L	400	0.0348	0.147
N-TN	mg/L		0.067	0.259
Na-D	mg/L		1.54	3.28
Na-T	mg/L		1.79	3.32
Ni-D	mg/L	1.5[1]	0.302	0.426
Ni-T	mg/L		0.287	0.408
O-DO-F	mg/L		9.77	-0.24
ORP	mV		63.8	136.9
P-D	mg/L		<1.00	<1.00
P-T	mg/L		<1.00	<1.00
Pb-D	mg/L	0.16[1]	<0.00100	0.00433
Pb-T	mg/L		0.0244	0.00551
pH-F	pH units		6.34	6.07
pH-L	pH units		6.94	7.47

Parameter	Units	YCSR Sch3	KV-27	G300-MW-1
			2022-08-30	2022-08-30
PurgeVol	L		-	100
Rb-D	mg/L		<0.00400	0.00833
Rb-T	mg/L		<0.00400	0.00849
S-D	mg/L		284	556
S-T	mg/L		290	541
Sb-D	mg/L	0.2	<0.00200	<0.00200
Sb-T	mg/L		<0.00200	<0.00200
Se-D	mg/L	0.01	<0.00100	<0.00100
Se-T	mg/L		<0.00100	<0.00100
Si-D	mg/L		4.58	3.14
Si-T	mg/L		4.36	3.42
Sn-D	mg/L		<0.00200	<0.00200
Sn-T	mg/L		<0.00200	<0.00200
SO_4	mg/L	1000	870	1640
Sr-D	mg/L		0.234	1.36
Sr-T	mg/L		0.241	1.28
Sulphd	mg/L	0.02	<0.0075	<0.0038
TDS	mg/L		1280	2350
Te-D	mg/L		<0.00400	<0.00400
Te-T	mg/L		<0.00400	<0.00400
Temp-F	C		3.3	2.6
Th-D	mg/L		<0.00200	<0.00200
Th-T	mg/L		<0.00200	<0.00200
Ti-D	mg/L	1	<0.00600	<0.00600
Ti-T	mg/L		<0.00600	<0.00600
Tl-D	mg/L	0.003	0.000864	<0.000200
Tl-T	mg/L		0.000848	<0.000200
TSS	mg/L		16.0	5.8
Turb-F	NTU		20.25	226
U-D	mg/L	3	0.000302	0.00209
U-T	mg/L		0.000422	0.00220
V-D	mg/L		<0.0100	<0.0100
V-T	mg/L		<0.0100	<0.0100
W-D	mg/L		<0.00200	<0.00200
W-T	mg/L		<0.00200	<0.00200
Water Level	m		-	13.45

Parameter	Units	YCSR Sch3	KV-27	G300-MW-1
			2022-08-30	2022-08-30
Zn-D	mg/L	2.4[1]	90.7	35.3
Zn-T	mg/L		83.4	30.7
Zr-D	mg/L		<0.00400	<0.00400
Zr-T	mg/L		<0.00400	<0.00400

YCSR Sch3 - Yukon Contaminated Site Regulation – Schedule 3 – Protection of Aquatic Life

Numbers in red indicate values above the corresponding CSR standard.

[1] *Guideline contingent on Hardness*

[2] *Guideline contingent on pH*

[3] *Guideline contingent on [Cl^-]*

Several exceedances of the Yukon CSR Schedule 3 were observed at Galkeno 300 including As-D, Cd-D, Co-D & Zn-D at KV-27 and Cd-D, Co-D, SO_4 and Zn-D in G300-MW1. Of all the exceedances reported at Galkeno 300, Zn and Cd showed the largest exceedance of the Yukon CSR. Zn-D and Cd-D concentrations at KV-27 were ~38 times and ~482 times higher than the guideline, respectively. Zn-D and Cd-D concentrations at G300-MW1 were ~15 times and ~146 times higher than the guideline, respectively.

Most of the parameters analyzed were notably similar between the adit water (KV-27) and the water in G300-MW-1. Some exceptions included As, Cd, conductivity, Fe, Li, Mg, S, SO_4 and Zn (metals include both total and dissolved phases). Conductivity, Li, Mg, S and SO_4 concentrations were reported approximately twice as high in G300-MW-1 when compared to the adit discharge water (KV-27). Inversely As, Cd and Zn concentrations at KV-27 were approximately twice as high as those reported in G300-MW-1. Iron (dissolved and total) were not detected at G300-MW-1 but were detected at 14.9mg/L and 17.6mg/L in the adit discharge water.

6.5 No Cash Creek - summary of results

WRB completed aerial reconnaissance of the first 2km (horizontal limit of the drone) of the No Cash Creek flow path on August 29th. Aerial imagery is presented in Appendix C. From the aerial photos and video, it appears that the flow path of No Cash Creek becomes indiscernible approximately 2km north of the highway. At this point the creek enters a densely vegetated area. There was no obvious connection between No Cash Creek and the South McQuesten River (Et'o Nyäk Tagé) during the August 2023 site audit.

7 Discussion & analysis

7.1 Silver King - analysis

Mine discharge water from Silver King 100 and Silver King 75 adits are treated through soluble carbon injection (molasses or glycerol) into the underground workings. Soluble carbon promotes the growth of sulphate-reducing bacteria and in turn reduces sulphide minerals before they seep from the adits. Discharge from the adit flows through a gravity-based lime-addition treatment facility and is decanted from the settling pond to a point approximately 100 m west of Galena Creek. The discharge flows overland through semi-bog conditions for approximately 100m where it returns to ground and presumably flows just underneath the surface until it reaches Galena and/or Flat Creek.

Injection of soluble organic carbon (molasses or glycerol) is performed by recirculating a portion of the flow from the dewatering pump (approximately 2 to 4 L/s) back to the mine workings via either a borehole or the Silver King open pit, which infiltrates to the workings below. Four molasses injection events occurred between December 2014 and December 2015 to create sulphate-reducing conditions within the mine workings under which cadmium and zinc are removed via reaction with sulphide to precipitate out of the water column as metal sulphide minerals. Since then, periodic injections of methanol have occurred approximately every two years to maintain the treatment process. The most recent methanol injection occurred between August 16 and October 15, 2021 (Alexco, 2021). Discharge from the Silver King 100 adit is directed to the existing active WTP for pH adjustment and total suspended solids control to ensure discharged water meets the EQS for those parameters. Figure 4 illustrates Dissolved Organic Carbon concentrations in the stations in Galena Creek along with markers indicating when carbon injection was occurring into the underground workings.

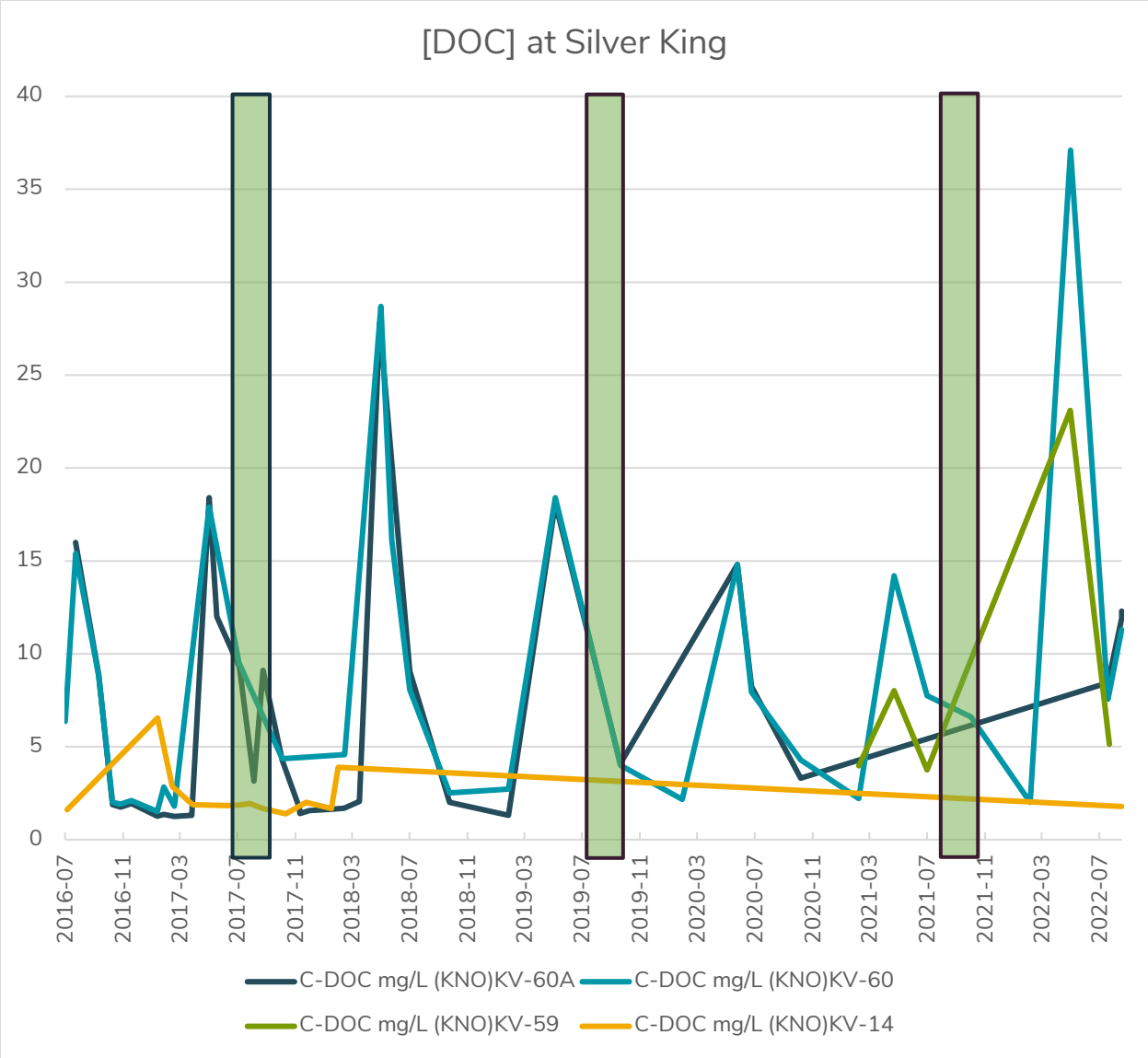

Figure 4 - DOC Concentrations at Silver King stations, period of carbon injection to Silver King underground workings is highlighted in green.

As apparent from the above graph, there is no visible correlation between the addition of carbon injection into the underground and the DOC concentrations along the reach of Galena Creek to the Confluence with Flat Creek. KV-60A is ~0.75km upstream of the Silver King site, KV-60 is ~25m downstream of Silver King 100 adit and KV-59 is ~1.5km downstream of the Silver King site (just prior to the confluence with Flat Creek). It is worth noting that DOC concentrations at KV-59 started in 2021 and therefore only

capture one period of carbon addition into the underground workings. The largest driver of DOC concentrations in Galena Creek appears to be spring freshet with concentrations spiking in all stations annually around May. It would be anticipated that if excess carbon was present in the WTP effluent and is causing algae blooms in Galena Creek, DOC concentrations would increase following carbon injections to the underground, which is not the case. This is further supported by Figure 5 below which illustrates dissolved oxygen in Galena Creek's reach. As with DOC, DO concentrations show no apparent correlation to carbon injection to the underground workings. If excess carbon from the WTP process was released in Galena or Flat Creek, DO concentrations would presumably drop as DO would be consumed by microorganisms to degrade the organic matter in the creeks. DO concentrations have not dropped in response to carbon addition suggesting that there was not excess carbon in the creek, and it is unlikely that excess carbon could have caused algae blooms.

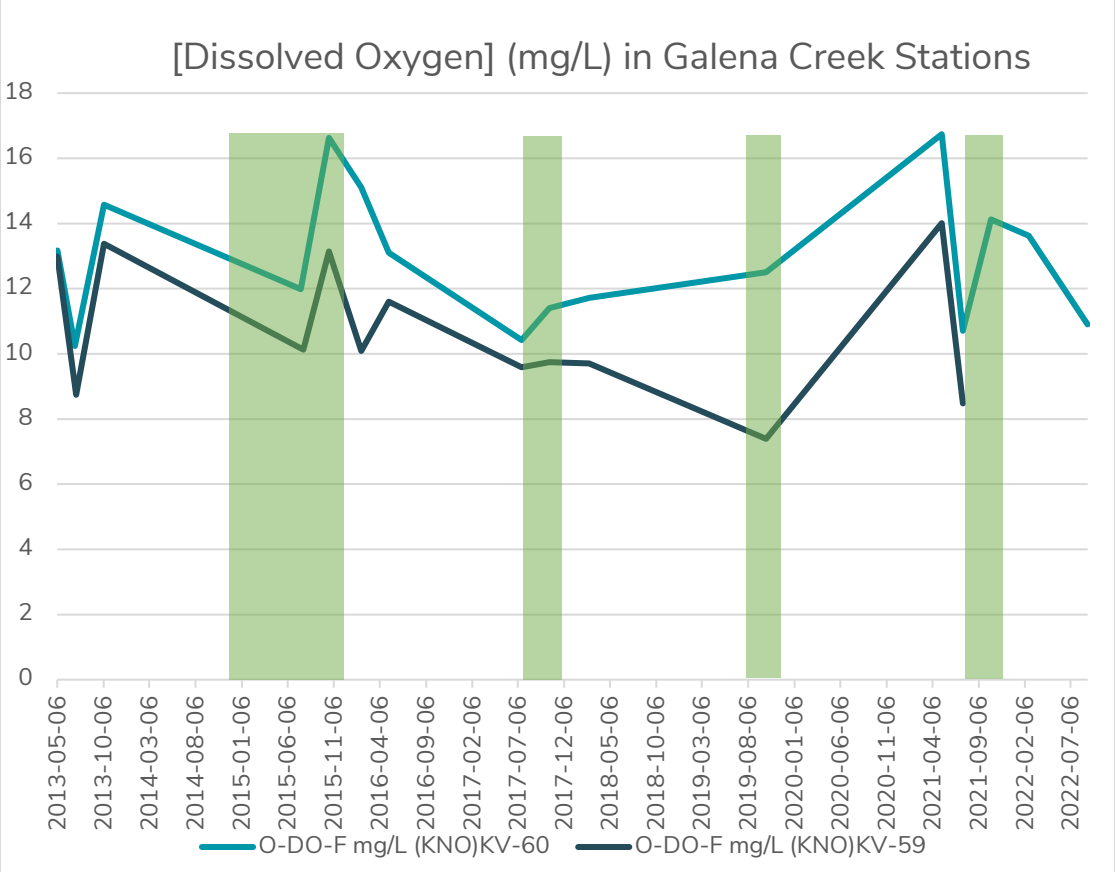

Figure 5 - DO concentrations in Galena Creek stations – August 2022, period of carbon injection to Silver King underground workings is highlighted in green.

It should be noted no algae blooms were observed in Galena Creek or the WTP process during the 2022 audit. Chlorophyll-a concentrations were also measured as part of the 2022 audit as another tool to detect the presence of algae in the creek. Chlorophyll-a is one of the predominant chlorophyll types involved in organic photosynthesis in algae and would therefore be found in higher concentrations where algae grow. Concentrations of chlorophyll-a were relatively low across Silver King site, (see Table 14 below), with the highest concentrations found up-gradient of underground treatment, at KV-60A. The lowest concentrations were found in the effluent down-gradient of the WTP (WRB-SK), suggesting little algae growth is occurring in the effluent water. The effluent water also does not have a direct surface connection with Galena or Flat Creek. It was found dispersing to ground shortly after discharge from the water treatment. This water likely eventually connects with the creeks but due to the disperse nature of the water and the attenuation zone present (200-1000m to Galena or Flat Creek) there is likely little impact from the WTP process in these creeks.

Table 14. Silver King Nutrient Concentrations – August 2022

Station		KV-13 (SK-100)	KV-14 (WTP-Eff)	WRB-SK	KV-60A (U/S)	KV-60
Parameter	**Units**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**	**2022-Aug-31**
DO	mg/L	8.56	11.24	7.51	11.01	10.9
C-DOC	mg/L	1.72	1.78	1.68	12.3	11.3
Chlorophyll-a	µg/L	<0.040	0.16	0.072	0.664	0.524

7.2 Onek 400 - analysis

Chemistry data collected during the 2022 Keno Audit is appended to WRB historical data from Onek 400. Several plots were created with this data to analyze trends in groundwater and adit water. SO_4, As-D, Co-D and Fe-D trend graphs are presented below. These parameters were chosen as they are contaminants of potential concern for this project. They were also chosen as they are increasing in concentration at Onek 400, triggering further investigation.

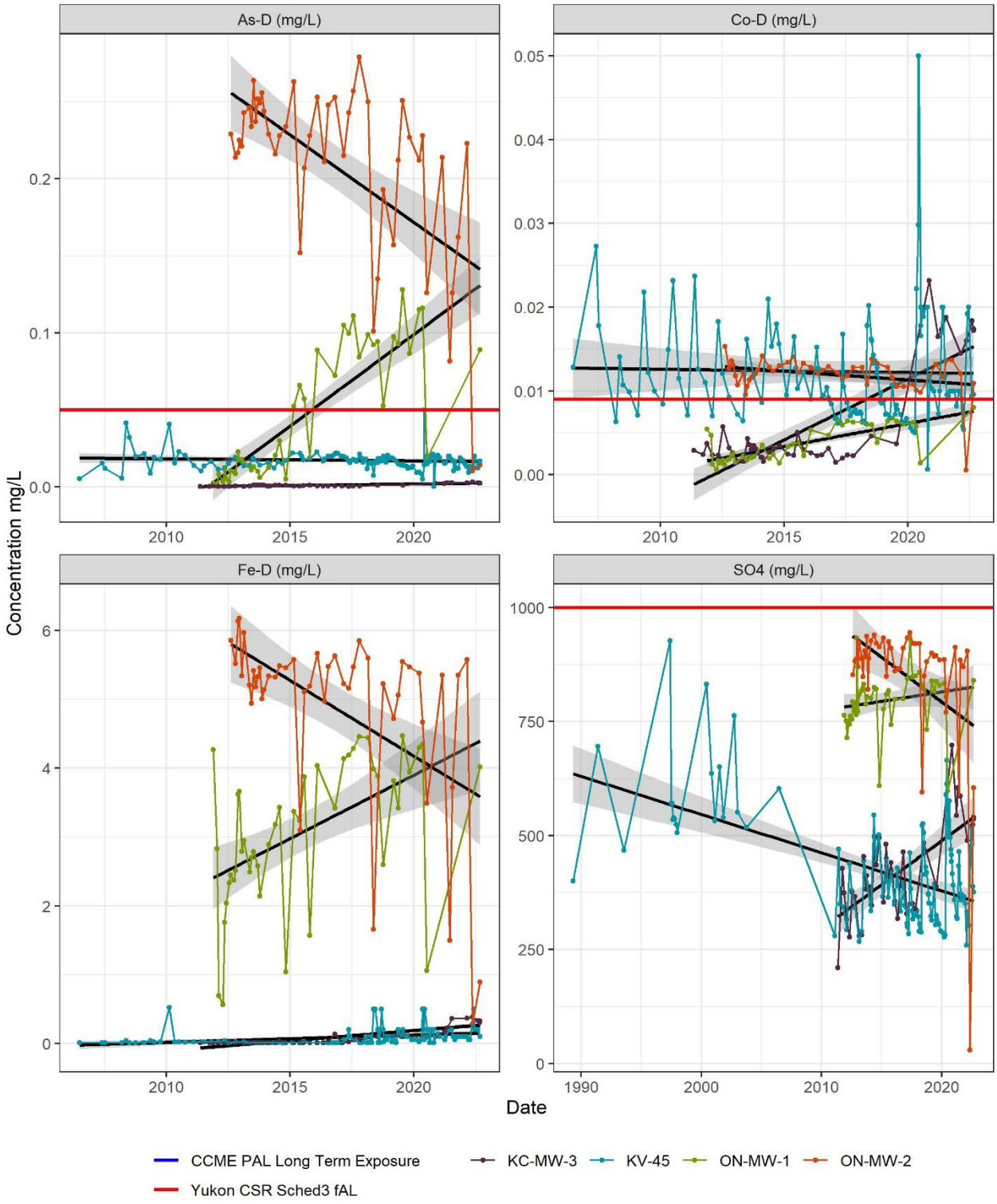

Figure 6 - Onek Adit & Monitoring Well water concentrations – August 2022. Trend line applied with linear regression and a confidence interval of 95% (grey bars). Non-detects were reported as the laboratory detection limits.

The adit seepage water (KV-45) and groundwater in KC-MW-3 have comparable concentrations of most parameters. Similarly, groundwater in ON-MW-1 and ON-MW-2 have comparable concentrations of most parameters but are distinct from KV-45 and KC-MW-3. This disparity is most evident when comparing Cd-D, Sulphide, SO_4, and Zn-D. Sulphide and SO_4 concentrations in ON-MW-1 & -2 (from audit samples) were nearly twice that of the adit discharge water and KC-MW-3. Conversely, Cd-D and Zn-D concentrations in the adit discharge water and KC-MW-3 (from audit samples) were orders of magnitude greater than those concentrations in ON-MW-1 & -2.

Concentrations of Co-D and Fe-D in ON-MW-1 are increasing and As-D is exceeding the Yukon CSR-AW. SO4 concentrations in ON-MW-1 appear relatively stable, ranging between 620mg/L and 825mg/L. Inversely, concentrations of As-D, Co-D and Fe-D in ON-MW-2 are decreasing. Cobalt is an exception and does not appear to be increasing or decreasing. Figure 8 below presents a conceptual cross-section of the three Onek 400 monitoring wells. In the conceptual cross-section, the adit and monitoring wells are projected onto the transect shown on the map below the cross-section. ON-MW-2 is screened in shallow quartzite bedrock (Table 9). Borehole logs are not available for the other two wells, but they are likely screened in a similar bedrock unit to ON-MW-1. The extent of fracturing within the screened zones is not specified. Fractured rock aquifers are typically highly heterogeneous and anisotropic and so the degree of hydraulic connection between any of these wells cannot be assumed. The fact that ON-MW-1 comprises several screens throughout the length of the well further complicates interpretation.

Figure 7 shows groundwater equipotential contours for Onek 400 and the surrounding area based on groundwater levels observed by ERDC in November 2019. Wellhead elevations, known wellhead stick-up and surveyed elevations were not available to WRB. Groundwater levels in several wells were considered when calculating groundwater contours (ON-MW-4, KV-84ND, KC-MW-2, FM-MW-01, FM-MW-02, FM-MW-03, KV-88 and KV-109) that were not monitored as part of the 2022 audit. The equipotential surface depicted on Figure 7 shows groundwater flowing west from Onek 400 underground workings towards Keno City, eventually reaching the valley bottom near Christal Lake and Christal Creek.

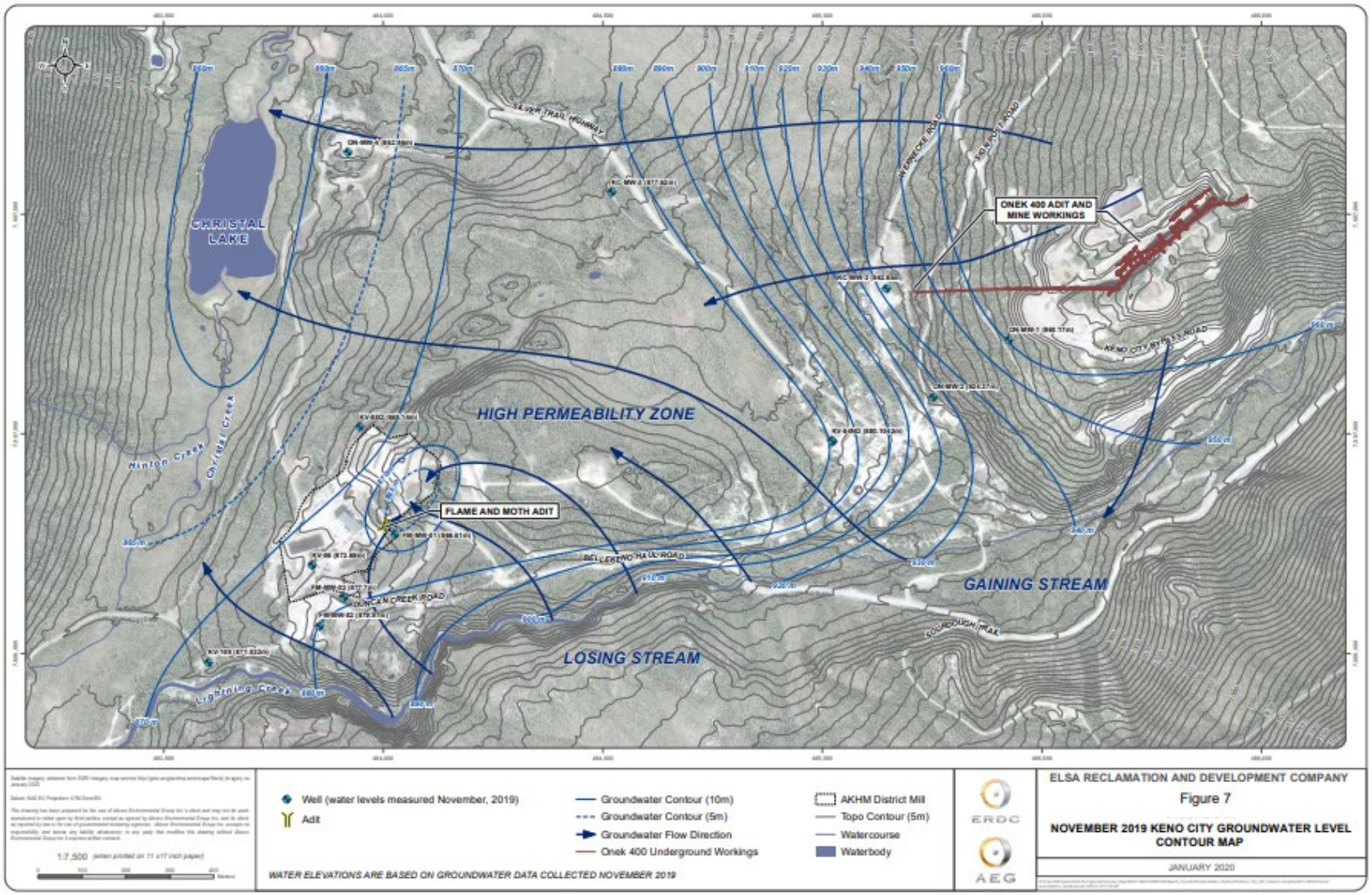

Figure 7 – Onek Equipotential Contours (ERDC Nov 2019)

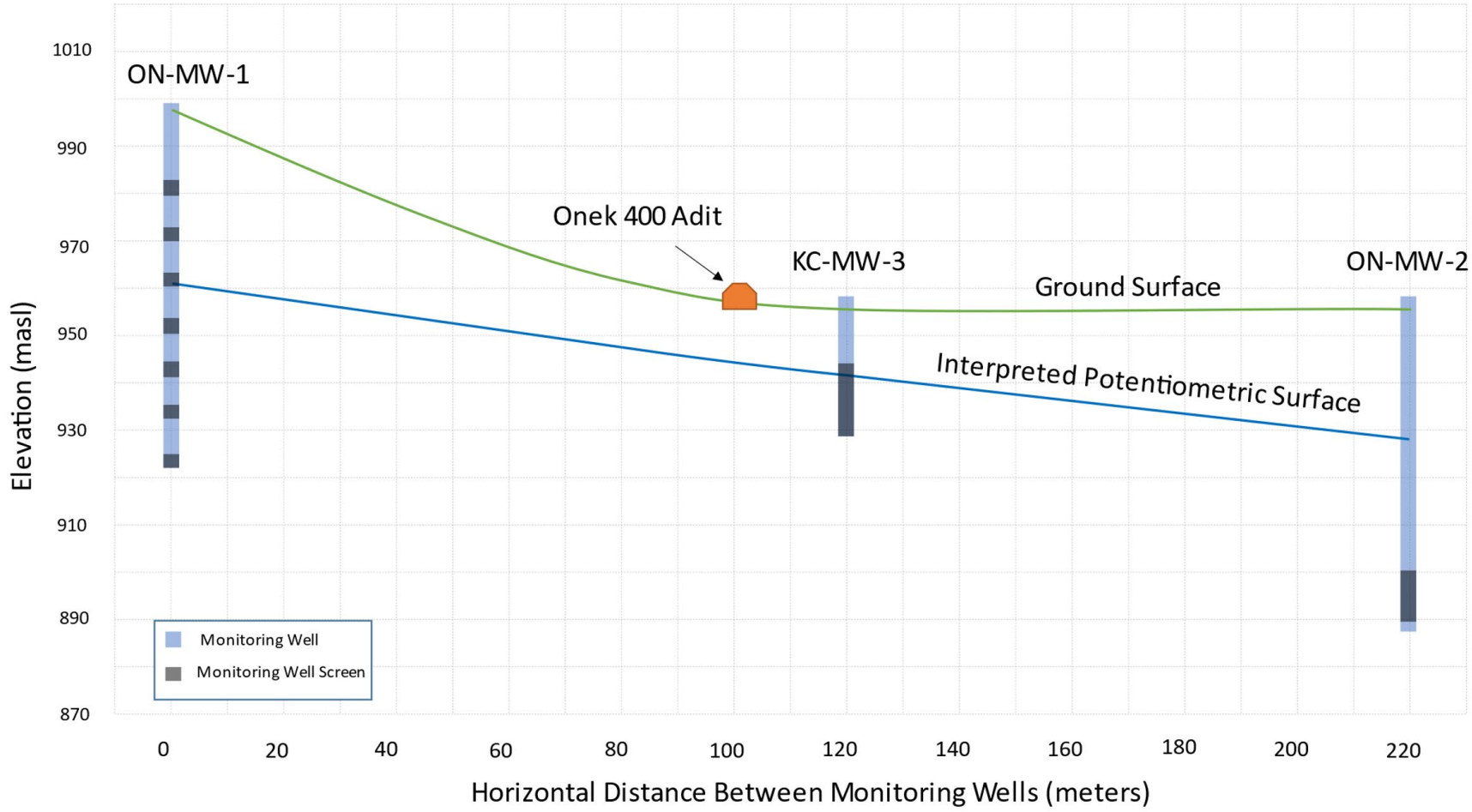

Figure 8 - Onek 400 Monitoring Wells Cross Section

Figure 9 - Onek 400 plan view

Groundwater and adit water at Onek 400 are Ca-HCO_3 type waters as these two components dominate the ionic balance. Sulphate represents a secondarily dominant constituent that would be expected as the monitoring wells are situated in an area rich in sulphide minerals. Figure 11 below illustrates the relative degree of dominance of the major cations and anions.

The stable water isotope compositions of KV-45 and ON-MW1 are indistinguishable (Figure 11). However, the stable water isotope compositions of ON-MW2 and KC-MW3 are distinct. This difference in isotopic signatures provides evidence of different sources or influence on these waters. All samples show an isotopic signature typical of groundwater, namely significantly lower $\delta^{18}O$ and $\delta^{2}H$ than the amount-weighted average precipitation calculated from the Mayo LMWL, see Figure 12 below.

A simple conservative mixing model was used to test the hypothesis that KC-MW3 is the result of mixing between KV-45 (ON-400 adit discharge water) and ON-MW2 (potentially representative of background groundwater quality). The relative fractions of the two end members (i.e. KV-45 and ON-MW2) that potentially compose KC-MW3 are defined as:

$$f_{ON\text{-}MW2} + f_{KV\text{-}45} = 1$$

To solve for $f_{ON\text{-}MW2}$ and $f_{KV\text{-}45}$ a conservative parameter is used in a solute mass-balance equation. Here we use $\delta^{18}O$; however, another non-reactive solute could also be used. The mass-balance equation looks like:

$$\delta^{18}O_{KC\text{-}MW3} = f_{ON\text{-}MW2} \times \delta^{18}O_{ON\text{-}MW2} + f_{KV\text{-}45} \times \delta^{18}O_{KV\text{-}45}$$

For this model, we set $f_{ON\text{-}MW2}$ and $f_{KV\text{-}45}$ to minimize the relative percent difference (RPD) between the $\delta^{18}O$ value of KC-MW3 and our modeled mixture. We then apply the relative fractions ($f_{ON\text{-}MW2} = 0.45$ and $f_{KV\text{-}45} = 0.55$) to model values of other parameters (in this case $\delta^{2}H$, specific conductance, dissolved sulphate, and dissolved zinc) in our mixture. We evaluate the strength of this simple model by comparing (via RPDs) the modeled values to the values observed in KC-MW3.

Table 15 shows the values of relevant parameters observed in the presumed end members (KV-45 and ON-MW2), the modeled mixture, and KC-MW3 and the RPDs when comparing the modeled mixture and KC-MW3 (noting that the RPD for $\delta^{18}O$ is zero by design):

Table 15. Relative percent difference between ON-400 samples and the modeled mixture

	$\delta^{18}O$ [‰ VSMOW]	**$\delta^{2}H$ [‰ VSMOW]**	**Specific conductance [µS/cm]**	**SO_4 [mg/L]**	**Zn-D [mg/L]**
KV-45	-21.80	-170.17	969	376	47.0
ON-MW2	-22.69	-177.47	1607	605	1.4
Modeled mixture	-22.20	-173.46	1256	479	26.4
KC-MW3	-22.20	-172.85	1213	536	30.8
RPD	0%	0%	4%	11%	15%

The RPDs for the modeled parameters are relatively low (less than 15%). Therefore, this simple conservative mixing model supports the hypothesis that the sample collected from KC-MW3 may represent a mixture of background groundwater (as represented by ON-MW2) and adit water (as represented by KV-45) at a near 1:1 ratio.

All SO_4 isotope samples show apparently distinct signatures except for ON-MW1 and KC-MW3 whose margins of error overlap. ON-MW2 and KV-45 have likely significantly greater $\delta^{34}S_{SO4}$ while having similar SO_4 concentrations to KC-MW3 and less than ON-MW-1 (375 to 625 mg/L vs. 850 mg/L) which may be indicative of similar fractionation processes to the Galkeno samples. Lower SO_4 concentrations at ON-MW2 and KV-45 may decrease $\delta^{34}S_{SO4}$ measurements, as biologically mediated uptake of $^{34}S_{SO4}$ would be increased where SO_4 availability is decreased.

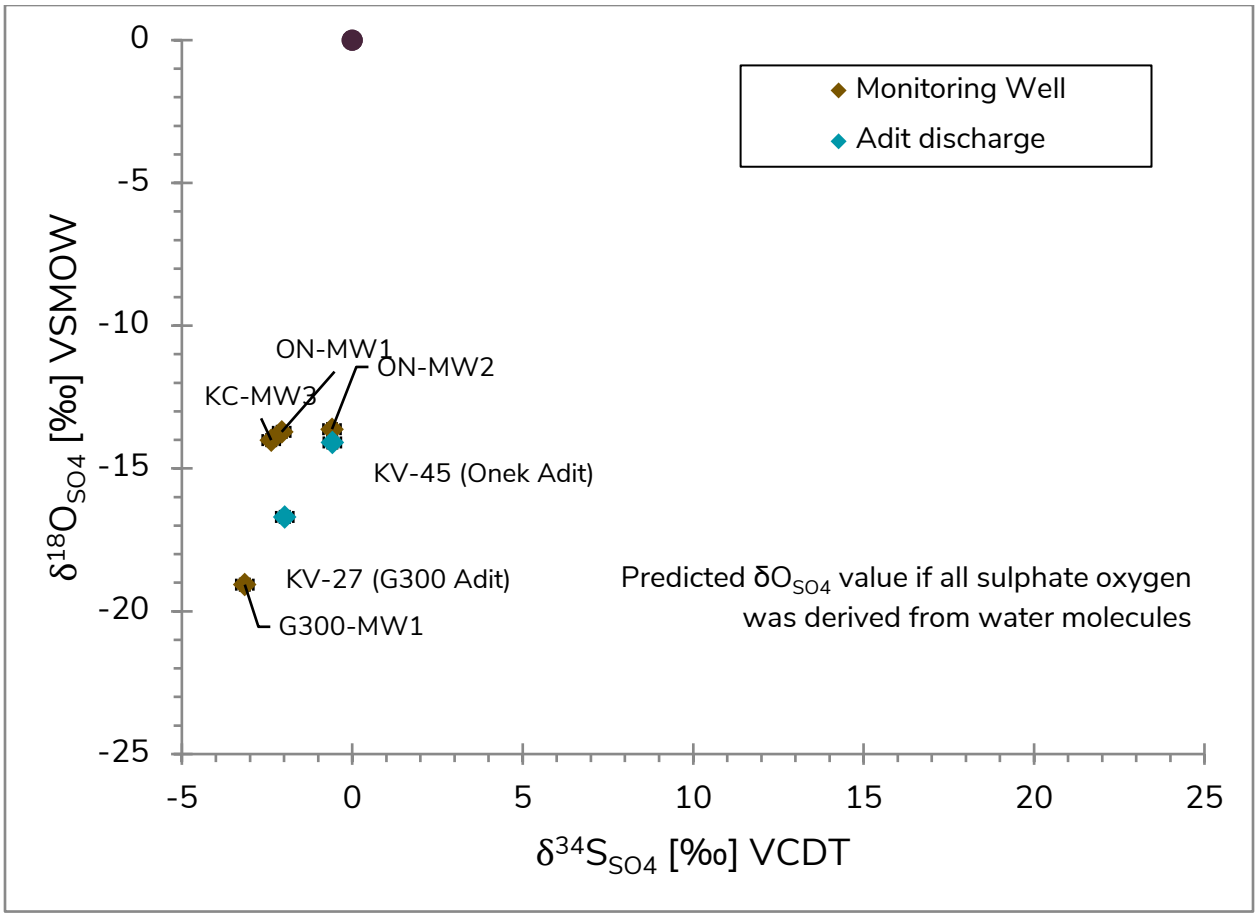

Figure 10 - Sulphate isotope results - August 2022

Though exact connections between monitoring wells and Onek 400 Adit could not be conclusively determined, a case to keeping all three Onek 400 wells in the monitoring program can still be made. Stable water and SO_4 isotope data indicate the three monitoring wells in the Onek 400 area and the adit water are distinct, but likely subject to a common influence or source. ON-MW-1 exceeded the Yukon CSR for As-D, and sulphide and ON-MW-2 exceeded the Yukon CSR for Co-D and sulphide. These parameters are associated with areas of rich sulphide minerals. Concentrations of SO_4, As-D, Co-D and Fe-D are also increasing in ON-MW-1 and as such sampling of this well should continue to monitor the trends currently occurring in groundwater. Concentrations of the aforementioned parameters are decreasing in ON-MW-2, but Yukon CSR exceedances are still being detected in this well. Although ON-MW-2 is experiencing decreasing concentrations it is downgradient of ON-MW-1 and this trend could reverse as the groundwater continues downgradient towards ON-MW-2. Keeping this well in the monitoring program will allow it to function as a sentinel well to monitor

Yukon CSR exceedances at this location and track the movement of the concentrations of the CPOC's the above mentioned detected at ON-MW-1.

7.3 Galkeno 300 - analysis

Groundwater and adit water at Galkeno 300 are Ca-HCO_3 type waters as these two major ions dominate the ionic balance, as per the Piper Plot below. Sulphate represents a secondarily dominant constituent, to be expected as the monitoring wells are situated in an area rich in sulphide minerals. Figure 11 below illustrates the relative degree of dominance of the major cations and anions.

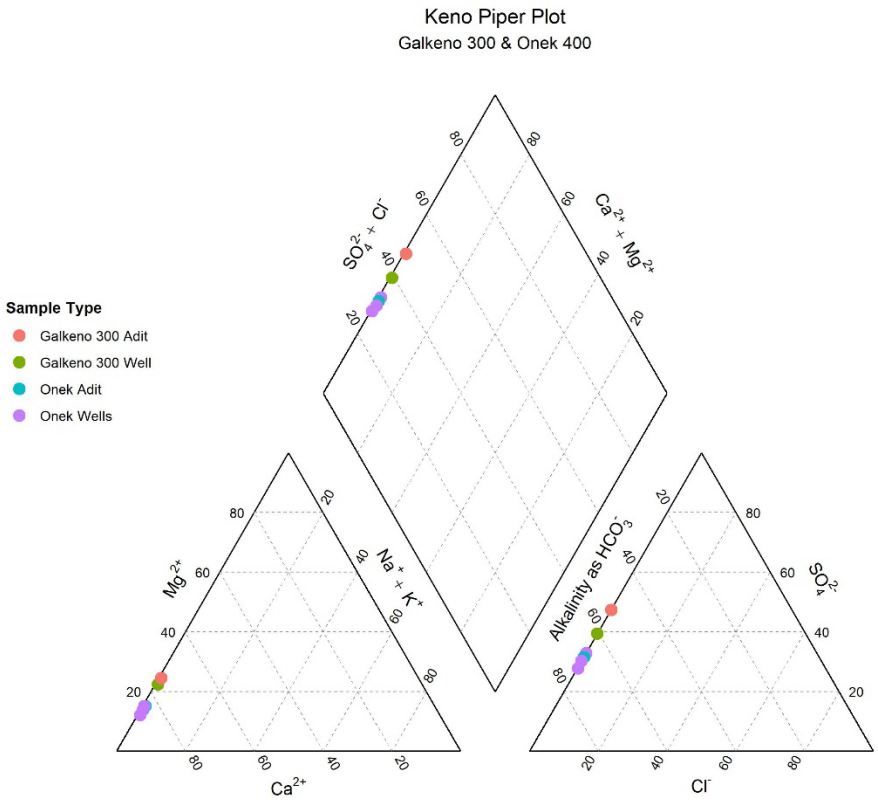

Figure 11 - Keno Piper Plot Galkeno 300 & Onek 400

Samples KV-27 and G300-MW-1 are isotopically similar, indicative of a common source or influence. However, due to the lack of an upgradient monitoring well, it is unclear if the sample results are representative of background GW in this vicinity or if KV-27 is distinct from background and G300MW-1 resembles KV-27 because it is influenced by

adit water. Both samples show an isotopic signature typical of groundwater dominated by snowmelt recharge, namely significantly lower $\delta^{18}O$ and $\delta^{2}H$ than the amount-weighted average precipitation calculated from the Mayo Local Meteoric Water Line (LMWL).

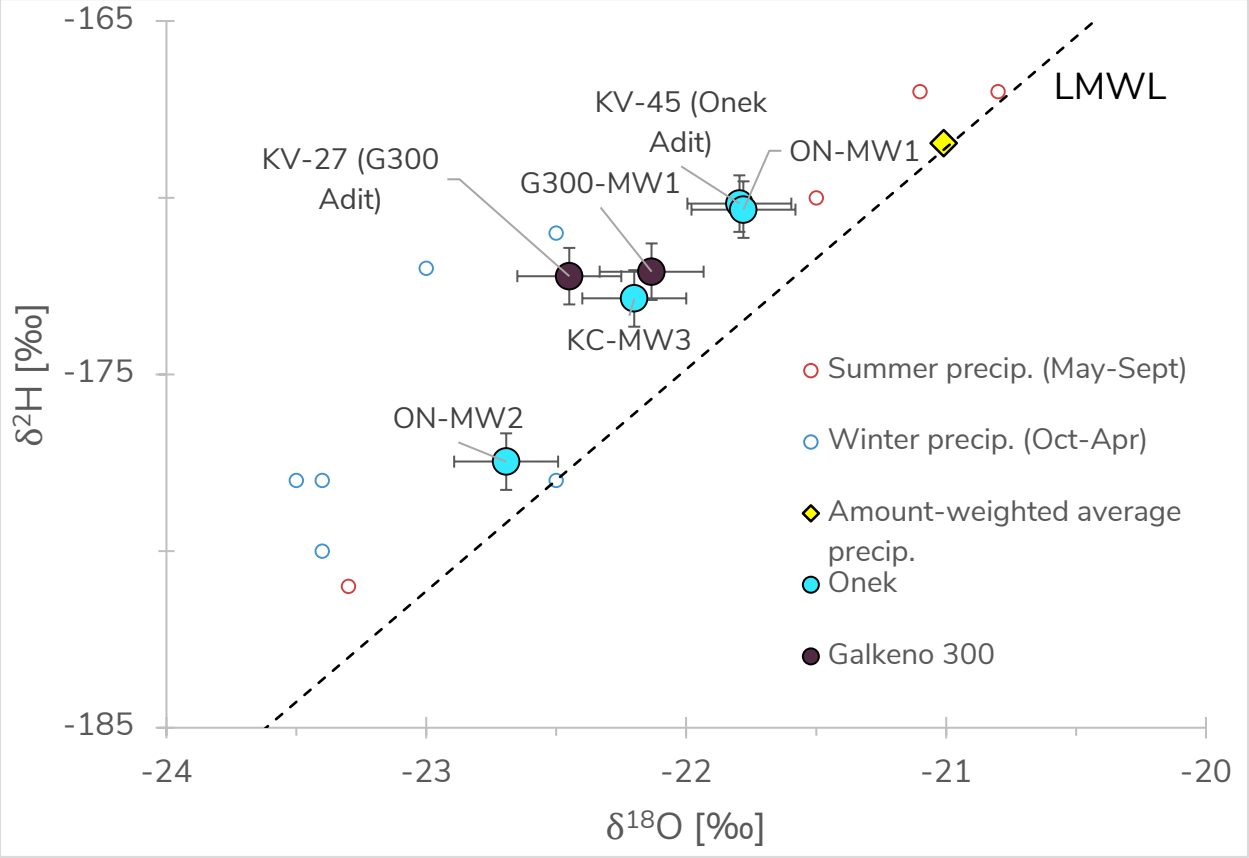

Figure 12 - Stable Water Isotopes Results - August 2022. Amount-weighted average precipitation is the average of the isotopic weights of the amount of precipitation falling a given area. LMWL – Local Meteoric Water Line from Mayo.

The sulphate isotope signature of KV-27 shows an apparent higher proportion of the heavier S^{34} isotope in sulphate than G300-MW-1, as well as approximately 800 mg/L less SO_4. The two factors likely affecting isotope fractionation in the Galkeno 300 area are geomicrobial sulphate reduction and abiotic transitions between sulfide phases (Hoefs 2009). Geomicrobial sulphate reduction preferentially removes lighter S isotopes from solution due to metabolic favourability, resulting in greater proportion of heavier S isotopes remaining in the water. The greater proportion of S^{34} at KV-27 suggest that

these waters are more subject to one of these two fractionation processes, but the degree of influence of each cannot be determined.

Sample G300-MW1 shows the highest SO_4 concentrations and lowest $\delta^{18}O_{SO4}$ of all samples, suggesting elevated oxidation rates by Fe (III) involving O_{H2O} rather than molecular oxygen, to be expected in an anaerobic environment (Kim et. al., 2019). This process may also be subject to modification by geomicrobial activity. The $\delta^{18}O_{SO4}$ at KV-27 is greater than would be expected if all O_{SO4} was derived from water molecules. This is likely the result of oxidation of primary sulfide phases which would be expected to incorporate dissolved molecular oxygen containing higher $\delta^{18}O$ values into the altered and mobilized SO_4. The inverse is true of $\delta^{18}O_{SO4}$ values at G300-MW-1, as the isotope fractionation processes would be expected to be more strongly dominated by oxidation by Fe (III) where water O is the sole O source, and anaerobic biological sulphate reduction would be expected to further increase rates (Balci et. al., 2007).

The sulphate isotope results suggest groundwater is the main source of water in both sample locations, subject to different oxidation processes depending on local rock chemistry and availability of atmospheric O_2. Analysis of Fe speciation and geomicrobial composition would further inform specific processes contributing to SO_4 fractionation processes.

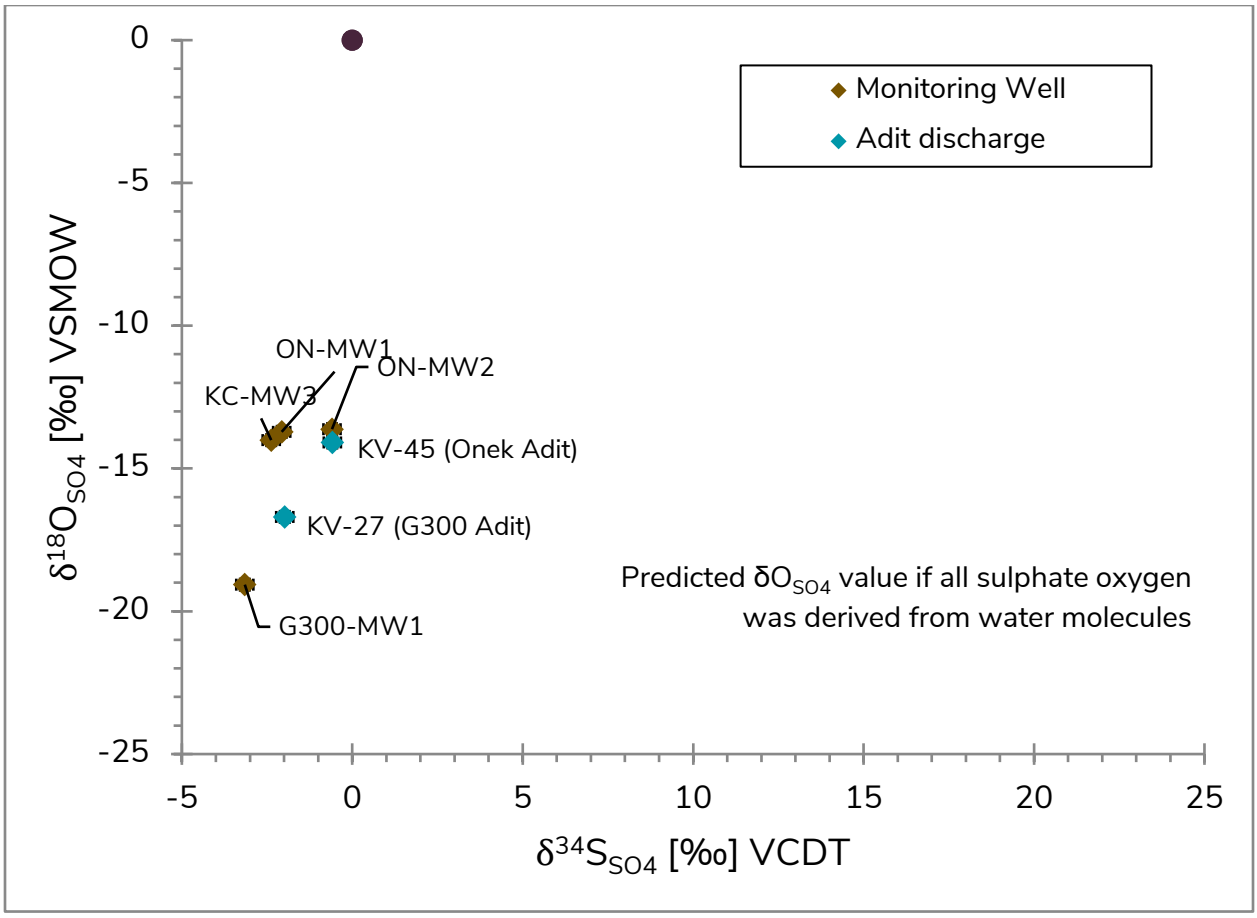

Figure 13 - Sulphate Isotope Results - August 2022. Chemistry data collected during the 2022 Keno Audit was appended to the historical data from Galkeno 300 available to WRB. Several plots were created with this data to analyze trends in groundwater (G300-MW-1) and adit water (KV-27). SO_4, Cd-D and Zn-D trend graphs are presented in Figure 1

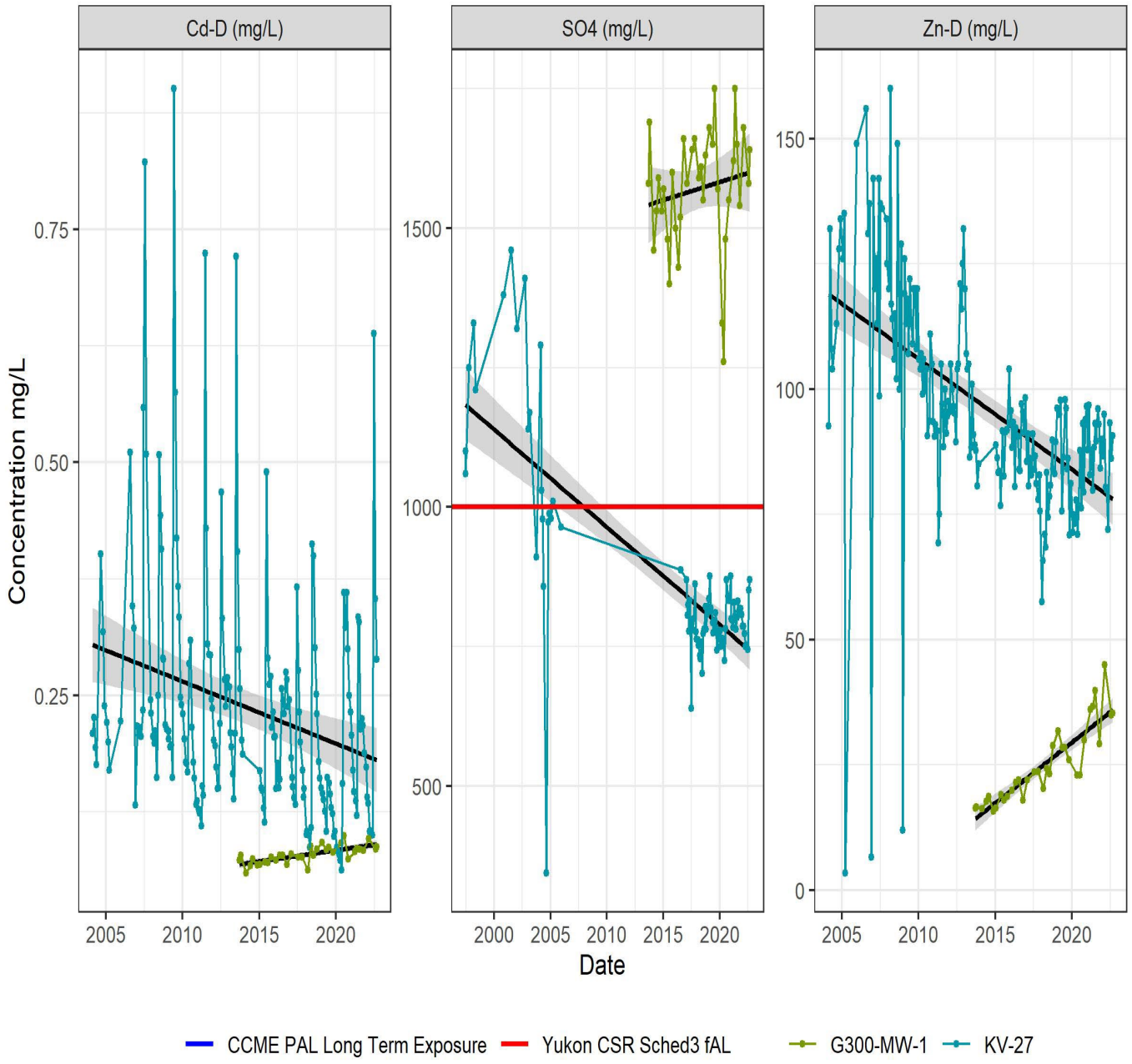

Figure 14 - Galkeno 300 Concentrations. Trend line applied with linear regression and a confidence interval of 95% (grey bars). Non-detects were reported as the laboratory detection limits.

As presented above, concentrations of SO4, Cd-D, and Zn-D appear to be increasing in the monitoring well downgradient of the Galkeno 300 Adit (G300-MW-1). Conversely, concentrations of these parameters have been decreasing in the adit water itself. There is currently no upgradient monitoring well above the Galkeno 300 Adit. Installing an upgradient well is important to provide background water quality data for the area.

There are mining-related structures above Galkeno 300, including the Sime Pit, which is currently being used to store sludge from the water treatment plant. The Sime Pit further complicates water quality understanding in the Galkeno 300 area because this pit is not lined and its contents may be influencing the chemistry of local groundwater. This further supports the need for an upgradient monitoring well, above mining-related influences, to aid in providing a more thorough understanding of water quality in the Galkeno 300 area.

Isotopically, the water in KV-27 and G300-MW-1 appear similar, but their respective chemistries at each location indicate opposite directions of change. The cause of this finding remains uncertain; nevertheless, it is evident that groundwater concentrations of various parameters, namely SO4, Cd-D, and Zn-D, are increasing in G300-MW-1. Determining the drivers behind these changes, whether related to mining or some other factors, is crucial for a comprehensive understanding. To gain a deeper insight into the origins of these trends, WRB recommends that the licensee conduct a thorough investigation comprising the following steps:

- Installation, testing, sampling and ongoing monitoring of a monitoring well upgradient of the adit and a minimum of one monitoring well downgradient of G300-MW-1
- Determination of the direction and rate of groundwater flow
- Assessment of travel times for potential contaminants to be transported from this area to Christal Creek
- Assessment of the potential for natural attenuation between Galkeno 300 and Christal Creek

7.4 No Cash Creek - analysis

The drone reconnaissance completed on Aug 29, 2022, provided visual evidence of the location of the No Cash Creek flow path. No Cash Creek is clearly channelized from the highway for approximately 2km at which point the creek becomes undiscernible as it enters a densely vegetation area. From the drone's vantage point there was no visual evidence past this point that shows No Cash Creek connecting to the South McQuesten River (Et'o Nyäk Tagé). The creek at this location appears to return to ground, running throughout the tussock present in the area. The creek may remerge from ground further

along its flow path, but this could not be determined due to the range limit of the drone. As there was no surface connection visible, this supports previous findings that No Cash Creek is considered non-fish bearing. It should be noted that these were the conditions during this site visit in August. Creek conditions can vary through the season. For example, spring freshet and frozen ground may lead to the No Cash connecting to the South McQuesten in April or May, but this could not be determined during this audit.

7.5 QA/QC results summary

All QA/QC samples analyzed with August 2022 samples returned results within expected range as indicated in Table 16. These results confirm that both field sampling and analysis were correct and adequate. Detailed analytical results for QA/QC samples can be found in Appendix A.

Table 16. QAQC Results – Keno Audit – August 2022

<table>
<tr><th>QA/QC Sample</th><th colspan="5">Results</th></tr>
<tr><td>Field Blank</td><td colspan="5">All parameters analyzed in Field Blank resulted in values below detection limit. There are no suspected contaminants introduced into the samples from the atmosphere at the sampling location or from sampling staff handling protocols and procedures.</td></tr>
<tr><td rowspan="5">Duplicate 1</td><td colspan="5">KV-60A</td></tr>
<tr><td colspan="5">Average RPD for all analysis was found to be 21. This means a small absolute difference in concentration may translate to a high RPD due to the low background concentrations. CCME* recommends using 20% RPD to assess the data quality of duplicate sampling procedures and analytical practices. Individual parameters with RPDs >20% have been listed below. Only two samples were found with RPDs above 20% and as such, these results are interpreted as being representative of good sampling and analytical practices.</td></tr>
<tr><td>Parameter</td><td>Detection Limit (mg/L)</td><td>Parent (mg/L)</td><td>Replicate (mg/L)</td><td>RPD (%)</td></tr>
<tr><td>TSS</td><td>3</td><td>25.8</td><td>33.0</td><td>24</td></tr>
<tr><td>Chlorophyll-a</td><td>0.001</td><td>0.664</td><td>3.38</td><td>79</td></tr>
<tr><td rowspan="2">Duplicate 2</td><td colspan="5">KC-MW-3</td></tr>
<tr><td colspan="5">Average RPD for all analysis was found to be 8%, with one parameter having a RPD above 20%. CCME* recommends using 20% RPD to assess the data quality of duplicate sampling procedures and analytical practices. As such, these results are interpreted as being representative of good sampling and analytical practices. Individual parameters with RPDs >20% have been listed below.</td></tr>
</table>

QA/QC Sample	Results				
	Parameter	Detection Limit (mg/L)	Parent (mg/L)	Replicate (mg/L)	RPD (%)
	Total Aluminum	0.003	0.0216	0.0435	24

**CCME Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment*

8 Conclusions & recommendations

Based on the analysis and discussion findings, WRB has made the following conclusions and recommendations; all monitoring recommendations are intended for the licence proponents as suggestions for revisions to existing monitoring plans:

Silver King

The audit did not find indications that the Silver King Water Treatment Plant contributes to excess dissolved organic carbon concentrations to Galena or Flat Creek. Algae blooms were not present during the 2022 audit and the analytical results suggest algae blooms are not occurring at the monitoring stations in Galena and Flat Creek.

Recommendation #1: The proponent should continue monitoring all stations around Silver King, including for nutrients.

Onek 400

Isotopic evidence (stable water and SO4) and chemistry data illustrates that the three monitoring wells in the Onek 400 area, and the adit water, are distinct but likely subject to a common influence or source. KC-MW-3 is most closely related to groundwater discharging from the adit, while ON-MW-2 is most closely related to groundwater that has not come into contact with underground workings.

Recommendation #2: The proponent should continue monitoring groundwater wells ON-MW-1, ON-MW-2 and KC-MW-3.

Galkeno 300

G300-MW-1 was observed with increasing trends of zinc and cadmium as well as cobalt and sulphate concentrations exceeding the Yukon CSR. Chemistry results and isotopic results suggest that G300-MW-1 and the Galkeno 300 Adit are subject to a common source. G300-MW-1 is currently the only monitoring well in the vicinity.

Recommendation #3: The proponent should continue monitoring of G300-MW-1 and the adit discharge.

Recommendation #4: The proponent should install additional monitoring wells in the vicinity of Galkeno 300 to monitor and delineate increasing concentrations of several parameters and Yukon CSR exceedances observed in G300-MW-1. If feasible, this should include a background well above mining infrastructure to provide background water quality.

Recommendation #5: The proponent should investigate groundwater flows and natural attenuation potential to understand when groundwater from the Galkeno area may be noticed in Christal Creek.

No Cash Creek

No surface connection was observed via drone between No Cash Creek and the South McQuesten River (Et'o Nyäk Tagé). This supports previous conclusions that No Cash Creek is non-fish bearing.

No Cash Creek would benefit from being inspected during spring months to see if frozen ground and spring freshet cause the creek to connect to the South McQuesten River.

Contact information

For more information about this report contact:

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- Tyler Williams, Water Resources Scientist (Tyler.Williams@yukon.ca)

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Yukon Water Board, 2021. Else Reclamation and Development Company Ltd., QZ21-012 License Conditions.

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Appendix A – Analytical Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2200977**	Page	: 1 of 10
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2022 09:38
PO	: ----	Date Analysis Commenced	: 02-Sep-2022
C-O-C number	: ----	Issue Date	: 21-Sep-2022 13:33
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Brieanna Allen	Production/Validation Manager	Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Sam Silveira	Lab Assistant	Metals, Burnaby, British Columbia
Sukhman Khosa	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*
DTSE	*Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ON-MW-1	ON-MW-2	KC-MW-3	GW-DUP	G300-MW-01
					Client sampling date / time	30-Aug-2022 16:30	30-Aug-2022 15:00	30-Aug-2022 13:30	30-Aug-2022	30-Aug-2022 18:00
						WR2200977-001	WR2200977-002	WR2200977-003	WR2200977-004	WR2200977-005
						Result	Result	Result	Result	Result
Physical Tests										
conductivity	----	E100	2.0	µS/cm		1740	1410	1170	1180	2380
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		1150	808	683	656	1550
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		1100	892	654	626	1430
pH	----	E108	0.10	pH units		8.05	8.06	7.73	7.72	7.47
solids, total dissolved [TDS]	----	E162	10	mg/L		1510	1160	960	924	2350
solids, total suspended [TSS]	----	E160	3.0	mg/L		12.0	12.4	<3.0	<3.0	5.8
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L		328	313	185	189	93.1
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0204	0.0259	0.0150	0.0105	0.0907
chloride	16887-00-6	E235.Cl	0.50	mg/L		<5.00 DLDS	3.36	<2.50 DLDS	<2.50 DLDS	<10.0 DLDS
cyanate	88402-73-7	E343	0.20	mg/L		<0.20	<0.20	<0.20	<0.20	<1.00 DLM
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0500 DLDS	0.0766	<0.0250 DLDS	<0.0250 DLDS	0.147
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0100 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0050 DLDS	<0.0200 DLDS
nitrogen, total	7727-37-9	E366	0.030	mg/L		0.070	0.155	0.034	<0.030	0.259
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		840	605	536	540	1640
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		0.75	6.38	0.51	<0.50	<0.50
Total Sulfides										
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L		0.0428	0.0207	0.0107	0.0072	<0.0038 DLM
sulfide, total (as H2S)	7783-06-4	E395	0.0016	mg/L		0.0455	0.0220	0.0114	0.0076	<0.0040
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.102	0.135	0.0435	0.0216	<0.0600 DLA
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00105	0.00199	0.00078	0.00074	<0.00200 DLA
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.0958	0.0488	0.00326	0.00278	<0.00200 DLA
barium, total	7440-39-3	E420	0.00010	mg/L		0.0162	0.0438	0.0140	0.0108	0.0108
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000400 DLA
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000250 DLA	<0.000250 DLA	<0.00100 DLA

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ON-MW-1	ON-MW-2	KC-MW-3	GW-DUP	G300-MW-01
					Client sampling date / time	30-Aug-2022 16:30	30-Aug-2022 15:00	30-Aug-2022 13:30	30-Aug-2022	30-Aug-2022 18:00
						WR2200977-001	WR2200977-002	WR2200977-003	WR2200977-004	WR2200977-005
						Result	Result	Result	Result	Result
Total Metals										
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.050 DLA	<0.050 DLA	<0.200 DLA
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.000285	0.000388	0.150	0.148	0.0879
calcium, total	7440-70-2	E420	0.050	mg/L		386	303	226	216	443
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000856	0.000321	0.000480	0.000511	0.000728
chromium, total	7440-47-3	E420	0.00050	mg/L		0.00065	<0.00050	<0.00050	<0.00050	<0.00200 DLA
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00788	0.0125	0.0179	0.0175	0.0745
copper, total	7440-50-8	E420	0.00050	mg/L		0.00174	0.00118	<0.00250 DLA	<0.00250 DLA	<0.0100 DLA
iron, total	7439-89-6	E420	0.010	mg/L		4.13	2.01	0.580	0.434	<0.200 DLA
lead, total	7439-92-1	E420	0.000050	mg/L		0.00431	0.00180	0.00508	0.000361	0.00551
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0301	0.0191	0.0329	0.0325	0.109
magnesium, total	7439-95-4	E420	0.0050	mg/L		32.8	32.8	21.8	21.1	78.5
manganese, total	7439-96-5	E420	0.00010	mg/L		1.14	1.92	0.773	0.740	72.1
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00214	0.000854	0.00111	0.00103	<0.00100 DLA
nickel, total	7440-02-0	E420	0.00050	mg/L		0.0105	0.0397	0.0507	0.0498	0.408
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.250 DLA	<0.250 DLA	<1.00 DLA
potassium, total	7440-09-7	E420	0.050	mg/L		0.495	0.640	0.639	0.638	2.65
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00143	0.00148	0.00115	0.00102	0.00849
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000340	0.000837	<0.000250 DLA	<0.000250 DLA	<0.00100 DLA
silicon, total	7440-21-3	E420	0.10	mg/L		6.77	5.54	5.19	5.22	3.42
silver, total	7440-22-4	E420	0.000010	mg/L		0.000165	0.000044	<0.000050 DLA	<0.000050 DLA	<0.000200 DLA
sodium, total	7440-23-5	E420	0.050	mg/L		3.80	1.48	1.77	1.59	3.32
strontium, total	7440-24-6	E420	0.00020	mg/L		0.780	0.592	0.382	0.385	1.28
sulfur, total	7704-34-9	E420	0.50	mg/L		296	226	168	182	541
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	0.00020	<0.00100 DLA	<0.00100 DLA	<0.00400 DLA
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000061	0.000016	<0.000050 DLA	<0.000050 DLA	<0.000200 DLA
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	0.00019	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
tin, total	7440-31-5	E420	0.00010	mg/L		0.00012	<0.00010	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00439	0.00293	<0.00150 DLA	<0.00150 DLA	<0.00600 DLA
tungsten, total	7440-33-7	E420	0.00010	mg/L		0.00050	<0.00010	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
uranium, total	7440-61-1	E420	0.000010	mg/L		0.0104	0.00900	0.00268	0.00258	0.00220

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ON-MW-1	ON-MW-2	KC-MW-3	GW-DUP	G300-MW-01
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						WR2200977-001	WR2200977-002	WR2200977-003	WR2200977-004	WR2200977-005
						Result	Result	Result	Result	Result
Total Metals										
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00250 DLA	<0.00250 DLA	<0.0100 DLA
zinc, total	7440-66-6	E420	0.0030	mg/L		0.116	1.55	31.0	29.8	30.7
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00252	0.00232	<0.00100 DLA	<0.00100 DLA	<0.00400 DLA
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0134	0.0149	0.0088	0.0147	0.0213
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	0.00163	0.00062	0.00057	<0.00200 DLA
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.0890	0.0140	0.00232	0.00244	<0.00200 DLA
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0114	0.0432	0.00997	0.0113	0.0105
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100 DLA	<0.000400 DLA
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000250 DLA	<0.000250 DLA	<0.00100 DLA
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.020 DLA	<0.010	<0.050 DLA	<0.050 DLA	<0.200 DLA
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000403	0.000309	0.128	0.126	0.0878
calcium, dissolved	7440-70-2	E421	0.050	mg/L		399	271	237	228	484
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000666	0.000202	0.000474	0.000475	0.000673
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050 DLA	<0.00200 DLA
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00805	0.0109	0.0174	0.0172	0.0774
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	0.00108	<0.00100 DLA	<0.00100 DLA	0.00560
iron, dissolved	7439-89-6	E421	0.010	mg/L		4.02	0.891	0.326	0.303	<0.200 DLA
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	<0.000050	<0.000250 DLA	<0.000250 DLA	0.00433
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0316	0.0184	0.0345	0.0330	0.118
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		36.4	31.8	22.1	21.0	82.9
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		1.20	1.70	0.756	0.742	78.2
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00204	0.000728	0.00108	0.00101	0.00127
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0106	0.0343	0.0491	0.0496	0.426
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.100 DLA	<0.050	<0.250 DLA	<0.250 DLA	<1.00 DLA
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.484	0.602	0.546	0.603	2.96
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00139	0.00123	0.00116	0.00110	0.00833
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000350	0.00124 DTSE	<0.000250 DLA	<0.000250 DLA	<0.00100 DLA
silicon, dissolved	7440-21-3	E421	0.050	mg/L		7.33	5.32	5.62	4.82	3.14
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	<0.000010	<0.000050 DLA	<0.000050 DLA	<0.000200 DLA

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	ON-MW-1	ON-MW-2	KC-MW-3	GW-DUP	G300-MW-01
					Client sampling date / time	30-Aug-2022 16:30	30-Aug-2022 15:00	30-Aug-2022 13:30	30-Aug-2022	30-Aug-2022 18:00
						WR2200977-001	WR2200977-002	WR2200977-003	WR2200977-004	WR2200977-005
						Result	Result	Result	Result	Result
Dissolved Metals										
sodium, dissolved	7440-23-5	E421	0.050	mg/L		1.44	1.54	1.43	1.46	3.28
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.787	0.509	0.388	0.368	1.36
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		306	198	184	174	556
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00040 DLA	<0.00020	<0.00100 DLA	<0.00100 DLA	<0.00400 DLA
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	0.000010	<0.000050 DLA	<0.000050 DLA	<0.000200 DLA
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	<0.00010	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	<0.00030	<0.00150 DLA	<0.00150 DLA	<0.00600 DLA
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		0.00022	<0.00010	<0.00050 DLA	<0.00050 DLA	<0.00200 DLA
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00988	0.00750	0.00273	0.00242	0.00209
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	<0.00050	<0.00250 DLA	<0.00250 DLA	<0.0100 DLA
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0231	1.37	30.8	31.8	35.3
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00228	0.00161	<0.00100 DLA	<0.00100 DLA	<0.00400 DLA
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	FB	GK-300	ON-400	----	----
					Client sampling date / time	30-Aug-2022	30-Aug-2022 18:00	30-Aug-2022 14:30	----	----
						WR2200977-006	WR2200977-007	WR2200977-008	--------	--------
						Result	Result	Result	----	----
Physical Tests										
conductivity	----	E100	2.0	µS/cm		<2.0	1420	901	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		<0.60	579	477	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		<0.60	547	463	----	----
pH	----	E108	0.10	pH units		5.49	6.94	7.53	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		<10	1280	664	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	16.0	13.0	----	----
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L		<2.0	44.3	150	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0193	0.0060	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<2.50 DLDS	<2.50 DLDS	----	----
cyanate	88402-73-7	E343	0.20	mg/L		<0.20	<1.00 DLM	<0.20	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	0.0348	<0.0250 DLDS	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0050 DLDS	<0.0050 DLDS	----	----
nitrogen, total	7727-37-9	E366	0.030	mg/L		<0.030	0.067	<0.030	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		<0.30	870	376	----	----
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	<0.0050	<0.0050	----	----
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		<0.50	<0.50	<0.50	----	----
Total Sulfides										
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L		<0.0015	<0.0075 DLM	<0.0038 DLM	----	----
sulfide, total (as H2S)	7783-06-4	E395	0.0016	mg/L		<0.0016	<0.0080	<0.0040	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0117 RRV	0.0969	<0.0300 DLA	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00200 DLA	0.00581	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		<0.00010	0.126	0.0286	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.00649 RRV	0.00806	0.00698	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000400 DLA	<0.000200 DLA	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.200 DLA	<0.100 DLA	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	FB	GK-300	ON-400	----	----
					Client sampling date / time	30-Aug-2022	30-Aug-2022 18:00	30-Aug-2022 14:30	----	----
						WR2200977-006	WR2200977-007	WR2200977-008	--------	--------
						Result	Result	Result	----	----
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.279	0.619	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		<0.050	165	157	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	0.000308	0.000333	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L		0.00061 RRV	<0.00200 DLA	<0.00100 DLA	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.0676	0.00957	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.0100 DLA	<0.00500 DLA	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	17.6	0.364	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.0244	0.00102	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	0.0245	0.0192	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		<0.0050	32.8	17.2	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00015 RRV	112	5.86	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		<0.000050	0.00115	<0.000500 DLA	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.287	0.0192	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<1.00 DLA	<0.500 DLA	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		<0.050	<1.00 DLA	<0.500 DLA	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L		<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		<0.10	4.36	5.23	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000200 DLA	<0.000100 DLA	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		<0.050	1.79	1.54	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		<0.00020	0.241	0.203	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		<0.50	290	123	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	0.000848	<0.000100 DLA	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00600 DLA	<0.00300 DLA	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		<0.000010	0.000422	0.00133	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.0100 DLA	<0.00500 DLA	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	FB	GK-300	ON-400	----	----
					Client sampling date / time	30-Aug-2022	30-Aug-2022 18:00	30-Aug-2022 14:30	----	----
						WR2200977-006	WR2200977-007	WR2200977-008	--------	--------
						Result	Result	Result	----	----
Total Metals										
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	83.4	45.4	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0160 DTC, RRV	0.0696	0.0120	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00200 DLA	0.00580	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.0794	0.0166	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00418 RRV	0.0122 DTMF	0.00725	----	----
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000400 DLA	<0.000200 DLA	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.200 DLA	<0.100 DLA	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	0.289	0.607	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		<0.050	172	161	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	0.000288	0.000306	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00200 DLA	<0.00100 DLA	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.0719	0.00959	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	14.9	<0.100 DLA	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	0.0341 DTMF	0.0243	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		<0.0050	36.4	18.3	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		<0.00010	124	6.21	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.302	0.0205	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<1.00 DLA	<0.500 DLA	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		<0.050	<1.00 DLA	<0.500 DLA	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.00100 DLA	<0.000500 DLA	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		<0.050	4.58	5.66	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000200 DLA	<0.000100 DLA	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		<0.050	1.54	1.35	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: FB	GK-300	ON-400	----	----
Client sampling date / time					30-Aug-2022	30-Aug-2022 18:00	30-Aug-2022 14:30	----	----
					WR2200977-006	WR2200977-007	WR2200977-008	--------	--------
					Result	Result	Result	----	----
Dissolved Metals									
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	0.234	0.202	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	284	132	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	0.000864	<0.000100 DLA	----	----
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00600 DLA	<0.00300 DLA	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00200 DLA	<0.00100 DLA	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	0.000302	0.00131	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.0100 DLA	<0.00500 DLA	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	90.7	47.0	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00400 DLA	<0.00200 DLA	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2200977**	Page	: 1 of 27
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2022 09:38
PO	: ----	Issue Date	: 21-Sep-2022 13:33
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-6315840 01	----	alkalinity, total (as CaCO3)	----	E290	1.7 mg/L [B]	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
G300-MW-01	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
GK-300	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
KC-MW-3	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
ON-400	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
ON-MW-1	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
ON-MW-2	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
FB	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
GW-DUP	E298	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
G300-MW-01	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
GK-300	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
KC-MW-3	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
ON-400	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
ON-MW-1	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
ON-MW-2	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
FB	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
GW-DUP	E235.Cl	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
FB	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
G300-MW-01	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
GK-300	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
GW-DUP	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
KC-MW-3	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-400	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-1	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Cyanate by Ion Selective Electrode										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-2	E343	30-Aug-2022	----	----	----		16-Sep-2022	----	----	
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
G300-MW-01	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE GK-300	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KC-MW-3	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE ON-400	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE ON-MW-1	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE ON-MW-2	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	3 days	✓	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE FB	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	4 days	× EHT	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE GW-DUP	E235.NO3-L	30-Aug-2022	02-Sep-2022	3 days	4 days	× EHT	02-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KC-MW-3	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE ON-400	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	× EHT

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE ON-MW-1	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE ON-MW-2	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE G300-MW-01	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE GK-300	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE FB	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE GW-DUP	E235.NO2-L	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	3 days	4 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE G300-MW-01	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE GK-300	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE KC-MW-3	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
ON-400	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
ON-MW-1	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
ON-MW-2	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
FB	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
GW-DUP	E235.SO4	30-Aug-2022	02-Sep-2022	----	----		02-Sep-2022	28 days	4 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
G300-MW-01	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
GK-300	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
KC-MW-3	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
ON-400	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
ON-MW-1	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
ON-MW-2	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
FB	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
GW-DUP	E366	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
GW-DUP	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	10 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
FB	E333	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
G300-MW-01	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
GK-300	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
KC-MW-3	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-400	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-1	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-2	E333	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
GW-DUP	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	10 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
FB	E336	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
G300-MW-01	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
GK-300	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
KC-MW-3	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-400	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-1	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
ON-MW-2	E336	30-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	14 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
G300-MW-01	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
GK-300	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
KC-MW-3	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
ON-400	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
ON-MW-1	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
ON-MW-2	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
FB	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
GW-DUP	E509	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
FB	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
G300-MW-01	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
GK-300	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
GW-DUP	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
KC-MW-3	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
ON-400	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
ON-MW-1	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
ON-MW-2	E421	30-Aug-2022	07-Sep-2022	----	----		09-Sep-2022	180 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) G300-MW-01	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) GK-300	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KC-MW-3	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) ON-400	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) ON-MW-1	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) ON-MW-2	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) FB	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) GW-DUP	E358-L	30-Aug-2022	07-Sep-2022	----	----		07-Sep-2022	28 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE G300-MW-01	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE GK-300	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE KC-MW-3	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE ON-400	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE ON-MW-1	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE ON-MW-2	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE FB	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE GW-DUP	E290	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	14 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE G300-MW-01	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE GK-300	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE KC-MW-3	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE ON-400	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE ON-MW-1	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE ON-MW-2	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE FB	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE GW-DUP	E100	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE FB	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE G300-MW-01	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE GK-300	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE GW-DUP	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE KC-MW-3	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE ON-400	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE ON-MW-1	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE ON-MW-2	E108	30-Aug-2022	02-Sep-2022	----	----		03-Sep-2022	0.25 hrs	13.25 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE FB	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE G300-MW-01	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE GK-300	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE GW-DUP	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE KC-MW-3	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE ON-400	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE ON-MW-1	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE ON-MW-2	E162	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE FB	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE G300-MW-01	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE GK-300	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE GW-DUP	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KC-MW-3	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE										
ON-400	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
ON-MW-1	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE										
ON-MW-2	E160	30-Aug-2022	----	----	----		03-Sep-2022	7 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
FB	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
G300-MW-01	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
GK-300	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
GW-DUP	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
KC-MW-3	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
ON-400	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
ON-MW-1	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
ON-MW-2	E508	30-Aug-2022	09-Sep-2022	----	----		09-Sep-2022	28 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
FB	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
GW-DUP	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
G300-MW-01	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
GK-300	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
KC-MW-3	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
ON-400	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
ON-MW-1	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
ON-MW-2	E420	30-Aug-2022	07-Sep-2022	----	----		08-Sep-2022	180 days	9 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
G300-MW-01	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
GK-300	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
KC-MW-3	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
ON-400	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
ON-MW-1	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
ON-MW-2	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	3 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
FB	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	4 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
GW-DUP	E395	30-Aug-2022	----	----	----		02-Sep-2022	7 days	4 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	635898	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Cyanate by Ion Selective Electrode	E343	650760	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	640677	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	634414	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	635899	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
pH by Meter	E108	631585	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	632366	1	11	9.0	5.0	✓
Total Cyanide	E333	636376	2	31	6.4	5.0	✓
Total Mercury in Water by CVAAS	E508	639788	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	631819	2	20	10.0	5.0	✓
Total Nitrogen by Colourimetry	E366	635896	1	19	5.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	631556	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	632364	1	11	9.0	5.0	✓
WAD Cyanide	E336	636375	2	27	7.4	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	635898	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Cyanate by Ion Selective Electrode	E343	650760	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	640677	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	634414	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	635899	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
pH by Meter	E108	631585	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	632366	1	11	9.0	5.0	✓
Total Cyanide	E333	636376	2	31	6.4	5.0	✓
Total Mercury in Water by CVAAS	E508	639788	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	631819	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Total Nitrogen by Colourimetry	E366	635896	1	19	5.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	631556	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	632364	1	11	9.0	5.0	✓
WAD Cyanide	E336	636375	2	27	7.4	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	631586	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	635898	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Conductivity in Water	E100	631584	1	14	7.1	5.0	✓
Cyanate by Ion Selective Electrode	E343	650760	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	640677	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	634414	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	635899	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	632366	1	11	9.0	5.0	✓
Total Cyanide	E333	636376	2	31	6.4	5.0	✓
Total Mercury in Water by CVAAS	E508	639788	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	631819	2	20	10.0	5.0	✓
Total Nitrogen by Colourimetry	E366	635896	1	19	5.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	631556	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	632364	1	11	9.0	5.0	✓
WAD Cyanide	E336	636375	2	27	7.4	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	635898	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	631582	1	10	10.0	5.0	✓
Cyanate by Ion Selective Electrode	E343	650760	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	640677	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	634414	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	635899	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	631579	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	631580	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	631578	1	19	5.2	5.0	✓
Total Cyanide	E333	636376	2	31	6.4	5.0	✓
Total Mercury in Water by CVAAS	E508	639788	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	631819	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	635896	1	19	5.2	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	631556	1	18	5.5	5.0	✓
WAD Cyanide	E336	636375	2	27	7.4	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Cyanide	E333 Vancouver - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 Vancouver - Environmental	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Cyanate by Ion Selective Electrode	E343 Waterloo - Environmental	Water	APHA 4500-CN L (mod)	This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Nitrogen by Colourimetry	E366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Sulfide by Colourimetry (Automated Flow)	E395 Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methlyene blue colourimetric method. Results expressed "as H2S" if reported represent the maximum possible H2S concentration based on the total sulfide concentration in the sample. The H2S calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S)
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Nitrogen in water	EP366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **WR2200977**	Page	: 1 of 18
Client	: Government of Yukon	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: ----	Date Samples Received	: 01-Sep-2022 09:38
PO	: ----	Date Analysis Commenced	: 02-Sep-2022
C-O-C number	: ----	Issue Date	: 21-Sep-2022 13:30
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Brieanna Allen	Production/Validation Manager	Vancouver Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Vancouver Metals, Burnaby, British Columbia
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Owen Cheng		Vancouver Metals, Burnaby, British Columbia
Sam Silveira	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Sukhman Khosa	Lab Assistant	Vancouver Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 631584)											
VA22C0788-006	Anonymous	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 631585)											
VA22C0788-006	Anonymous	pH	----	E108	0.10	pH units	5.43	5.44	0.184%	4%	----
Physical Tests (QC Lot: 631586)											
VA22C0792-003	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	1.0	1.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 632364)											
VA22C0596-006	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	14400 µg/L	14.2	0.2	Diff <2x LOR	----
Physical Tests (QC Lot: 632366)											
VA22C0596-006	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	18000 µg/L	18	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 631578)											
VA22C0792-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	4.34	4.27	0.07	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 631579)											
VA22C0792-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	37.2	37.2	0.190%	20%	----
Anions and Nutrients (QC Lot: 631580)											
VA22C0792-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.141	0.141	0.164%	20%	----
Anions and Nutrients (QC Lot: 631582)											
VA22C0792-001	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	120	120	0.0861%	20%	----
Anions and Nutrients (QC Lot: 635896)											
VA22C0615-001	Anonymous	nitrogen, total	7727-37-9	E366	0.030	mg/L	0.063	0.062	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 635898)											
VA22C0615-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0316	0.0310	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 650760)											
WT2212504-005	Anonymous	cyanate	88402-73-7	E343	2.00	mg/L	11.7	10.8	0.90	Diff <2x LOR	----
Cyanides (QC Lot: 636375)											
WR2200984-003	Anonymous	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 636376)											
WR2200984-003	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 638439)											
VA22C1020-001	Anonymous	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	0.0108	0.0117	0.0009	Diff <2x LOR	----
Cyanides (QC Lot: 638440)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Cyanides (QC Lot: 638440) - continued											
VA22C1020-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	0.0106	0.0114	0.0008	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 635899)											
WR2200977-001	ON-MW-1	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.75	0.77	0.02	Diff <2x LOR	----
Total Sulfides (QC Lot: 631556)											
CG2211710-001	Anonymous	sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	<0.0015	<0.0015	0	Diff <2x LOR	----
Total Metals (QC Lot: 631819)											
KS2203268-001	Anonymous	chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
KS2203268-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	0.0264	0.0294	0.0030	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00074	0.00075	0.000009	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	0.0158	0.0159	1.17%	20%	----
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0424	0.0430	1.46%	20%	----
		beryllium, total	7440-41-7	E420	0.000040	mg/L	<0.000040	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	1.57	1.62	3.37%	20%	----
		cadmium, total	7440-43-9	E420	0.0000350	mg/L	<0.0000350	<0.0000350	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.100	mg/L	3.81	3.83	0.708%	20%	----
		cesium, total	7440-46-2	E420	0.000020	mg/L	0.000176	0.000175	0.0000004	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	0.028	0.024	0.004	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0020	mg/L	0.0156	0.0159	0.0003	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0100	mg/L	0.486	0.490	0.759%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.0423	0.0426	0.674%	20%	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.192	0.196	2.20%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.100	mg/L	0.648	0.717	0.069	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	1.15	1.20	3.45%	20%	----
		rubidium, total	7440-17-7	E420	0.00040	mg/L	0.00154	0.00165	0.00010	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.20	mg/L	5.40	5.47	1.38%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.100	mg/L	310	317	2.34%	20%	----
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.218	0.218	0.0178%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	4.45	4.69	0.24	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 631819) - continued											
KS2203268-001	Anonymous	tellurium, total	13494-80-9	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00020	mg/L	0.00036	0.00037	0.000008	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00020	mg/L	0.00324	0.00323	0.511%	20%	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.000121	0.000121	0.0000002	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
Total Metals (QC Lot: 639788)											
VA22C0905-005	Anonymous	mercury, total	7439-97-6	E508	0.0000250	mg/L	0.0000390	0.0000340	0.0000050	Diff <2x LOR	----
Dissolved Metals (QC Lot: 634414)											
VA22C0957-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0173	0.0176	1.45%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00329	0.00329	0.0631%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.0123	0.0128	3.72%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0366	0.0373	1.73%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000170	0.0000159	0.0000011	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	33.7	35.2	4.49%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	0.000021	0.000022	0.000001	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00079	0.00075	0.00004	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00262	0.00264	1.06%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.058	0.059	0.001	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0077	0.0079	0.0002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	12.2	12.9	5.71%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0305	0.0315	3.14%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000981	0.000996	1.43%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00181	0.00188	0.00006	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	1.48	1.55	4.29%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 634414) - continued											
VA22C0957-002	Anonymous	rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00125	0.00136	0.00011	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000368	0.000374	0.000006	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.46	4.47	0.117%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	0.000011	0.000001	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.11	2.25	6.17%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.254	0.263	3.32%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	20.7	19.7	4.98%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00293	0.00305	3.81%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0014	0.0013	0.00006	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 640677)											
VA22C0905-009	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 631584)						
conductivity	----	E100	1	µS/cm	1.2	----
Physical Tests (QCLot: 631586)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.7	B
Physical Tests (QCLot: 632364)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 632366)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 631578)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 631579)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 631580)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 631582)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 635896)						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
Anions and Nutrients (QCLot: 635898)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 650760)						
cyanate	88402-73-7	E343	0.2	mg/L	<0.20	----
Cyanides (QCLot: 636375)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 636376)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 638439)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 638440)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 635899)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Sulfides (QCLot: 631556)						
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	<0.0015	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 631819)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	MBRR
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 631819) - continued						
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Total Metals (QCLot: 639788)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 634414)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 634414) - continued						
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 640677)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*
MBRR	*Initial MB for this submission had positive results for flagged analyte (data not shown). Low level samples were repeated with new QC (2nd MB results shown). High level results (>5x initial MB level) and non-detect results were reported and are defensible*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 631584)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.2	90.0	110	----
Physical Tests (QCLot: 631585)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 631586)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	107	85.0	115	----
Physical Tests (QCLot: 632364)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	94.3	85.0	115	----
Physical Tests (QCLot: 632366)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	93.2	85.0	115	----
Anions and Nutrients (QCLot: 631578)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 631579)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 631580)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	96.5	90.0	110	----
Anions and Nutrients (QCLot: 631582)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 635896)									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 635898)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 650760)									
cyanate	88402-73-7	E343	0.2	mg/L	1 mg/L	98.0	85.0	115	----
Cyanides (QCLot: 636375)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	100	80.0	120	----
Cyanides (QCLot: 636376)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	94.4	80.0	120	----
Cyanides (QCLot: 638439)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	97.6	80.0	120	----
Cyanides (QCLot: 638440)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	92.3	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Organic / Inorganic Carbon (QCLot: 635899)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	103	80.0	120	----
Total Sulfides (QCLot: 631556)									
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	0.08 mg/L	86.0	80.0	120	----
Total Metals (QCLot: 631819)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.1	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	99.2	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	103	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	97.9	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	98.1	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.5	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	106	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	99.7	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	97.5	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	108	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	93.8	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 631819) - continued									
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	96.0	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	96.9	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	98.1	80.0	120	----
Total Metals (QCLot: 639788)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 634414)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	103	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	100.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.9	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	98.3	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	103	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	111	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	107	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	113	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 634414) - continued									
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	111	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	105	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	106	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	96.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	97.6	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	101	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	97.3	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.4	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 631578)										
VA22C0792-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	498 mg/L	500 mg/L	99.6	75.0	125	----
Anions and Nutrients (QCLot: 631579)										
VA22C0792-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	12.5 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 631580)										
VA22C0792-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.35 mg/L	2.5 mg/L	93.9	75.0	125	----
Anions and Nutrients (QCLot: 631582)										
VA22C0792-002	Anonymous	chloride	16887-00-6	E235.Cl	495 mg/L	500 mg/L	99.1	75.0	125	----
Anions and Nutrients (QCLot: 635896)										
VA22C0615-002	Anonymous	nitrogen, total	7727-37-9	E366	0.404 mg/L	0.4 mg/L	101	70.0	130	----
Anions and Nutrients (QCLot: 635898)										
VA22C0615-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.100 mg/L	0.1 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 650760)										
WT2212504-005	Anonymous	cyanate	88402-73-7	E343	ND mg/L	2 mg/L	ND	70.0	130	----
Cyanides (QCLot: 636375)										
WR2200984-022	Anonymous	cyanide, weak acid dissociable	----	E336	0.119 mg/L	0.125 mg/L	94.9	75.0	125	----
Cyanides (QCLot: 636376)										
WR2200984-022	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.223 mg/L	0.25 mg/L	89.1	75.0	125	----
Cyanides (QCLot: 638439)										
VA22C1020-002	Anonymous	cyanide, weak acid dissociable	----	E336	0.125 mg/L	0.125 mg/L	100	75.0	125	----
Cyanides (QCLot: 638440)										
VA22C1020-002	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.226 mg/L	0.25 mg/L	90.2	75.0	125	----
Organic / Inorganic Carbon (QCLot: 635899)										
WR2200977-002	ON-MW-2	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Sulfides (QCLot: 631556)										
CG2211710-002	Anonymous	sulfide, total (as S)	18496-25-8	E395	0.213 mg/L	0.2 mg/L	107	75.0	125	----
Total Metals (QCLot: 631819)										
KS2203268-002	Anonymous	aluminum, total	7429-90-5	E420	0.366 mg/L	0.4 mg/L	91.5	70.0	130	----
		antimony, total	7440-36-0	E420	0.0398 mg/L	0.04 mg/L	99.5	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 631819) - continued										
KS2203268-002	Anonymous	arsenic, total	7440-38-2	E420	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0721 mg/L	0.08 mg/L	90.2	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0176 mg/L	0.02 mg/L	88.1	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00789 mg/L	0.008 mg/L	98.7	70.0	130	----
		calcium, total	7440-70-2	E420	7.12 mg/L	8 mg/L	89.0	70.0	130	----
		cesium, total	7440-46-2	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		chromium, total	7440-47-3	E420	0.0709 mg/L	0.08 mg/L	88.7	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0354 mg/L	0.04 mg/L	88.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0350 mg/L	0.04 mg/L	87.5	70.0	130	----
		iron, total	7439-89-6	E420	3.59 mg/L	4 mg/L	89.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0363 mg/L	0.04 mg/L	90.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.178 mg/L	0.2 mg/L	89.2	70.0	130	----
		magnesium, total	7439-95-4	E420	1.73 mg/L	2 mg/L	86.3	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		nickel, total	7440-02-0	E420	0.0710 mg/L	0.08 mg/L	88.7	70.0	130	----
		phosphorus, total	7723-14-0	E420	17.4 mg/L	20 mg/L	87.2	70.0	130	----
		potassium, total	7440-09-7	E420	7.33 mg/L	8 mg/L	91.6	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0353 mg/L	0.04 mg/L	88.2	70.0	130	----
		selenium, total	7782-49-2	E420	0.0744 mg/L	0.08 mg/L	93.0	70.0	130	----
		silicon, total	7440-21-3	E420	18.0 mg/L	20 mg/L	90.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00780 mg/L	0.008 mg/L	97.5	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	38.7 mg/L	40 mg/L	96.8	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0750 mg/L	0.08 mg/L	93.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.00742 mg/L	0.008 mg/L	92.8	70.0	130	----
		thorium, total	7440-29-1	E420	0.0391 mg/L	0.04 mg/L	97.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		titanium, total	7440-32-6	E420	0.0712 mg/L	0.08 mg/L	89.0	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		uranium, total	7440-61-1	E420	0.00754 mg/L	0.008 mg/L	94.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.184 mg/L	0.2 mg/L	91.8	70.0	130	----
		zinc, total	7440-66-6	E420	0.694 mg/L	0.8 mg/L	86.8	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0775 mg/L	0.08 mg/L	96.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 639788)										
VA22C0905-008	Anonymous	mercury, total	7439-97-6	E508	0.000444 mg/L	0.0005 mg/L	88.7	70.0	130	----
Dissolved Metals (QCLot: 634414)										
VA22C0957-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.213 mg/L	0.2 mg/L	106	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00886 mg/L	0.01 mg/L	88.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	98.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00414 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00989 mg/L	0.01 mg/L	98.9	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0201 mg/L	0.02 mg/L	101	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.04 mg/L	2 mg/L	102	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0982 mg/L	0.1 mg/L	98.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.2 mg/L	10 mg/L	102	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.35 mg/L	4 mg/L	109	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	10.7 mg/L	10 mg/L	107	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00430 mg/L	0.004 mg/L	107	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0414 mg/L	0.04 mg/L	103	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0198 mg/L	0.02 mg/L	99.0	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0199 mg/L	0.02 mg/L	99.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0408 mg/L	0.04 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 634414) - continued										
VA22C0957-003	Anonymous	tungsten, dissolved	7440-33-7	E421	0.0192 mg/L	0.02 mg/L	96.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00410 mg/L	0.004 mg/L	102	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.420 mg/L	0.4 mg/L	105	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
Dissolved Metals (QCLot: 640677)										
VA22C0905-010	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000814 mg/L	0.0001 mg/L	81.4	70.0	130	----

GW

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

COC Number: 22 -

Affix ALS barcode label here
(lab use only)

Environmental Division
Whitehorse
Work Order Reference
WR2200977

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your A
Company:	YTG - Environment - Water Resources Branch	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received b
Contact:	Aaron Barker	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Busi / Same I / (Labor
Phone:	867-332-3863	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	419 Range Road	Email 1 or Fax aaron.barker@yukon.ca	Date and Time Required for all E&P TATs:
City/Province:	Whitehorse, YT	Email 2 Water.resources@yukon.ca	For tests that can not be performed according to the service le
Postal Code:	Y1A 3V1	Email 3	Analy
Invoice To	Same as Report To ☐ YES ☐ NO	**Invoice Distribution**	Indicate Filtered (F), Preserved (P) or Filter
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	YG	Email 1 or Fax nicole.novodvorsky@yukon.ca	
Contact:	Aaron Barker	Email 2 aaron.barker@yukon.ca	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	GPYT100	AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	EC, pH, Total Alk, TSS reg, TDS	nitrite, nitrate, sulphate, chloride, Total Nitrog	Total Metals & Hg	D Metals & Hg (Hardness)	DOC	Ammonia	Sulphide	Cyanide SAD & WAD	Cyanate	SAMPLES ON HOLD	Sample is hazardous (please provi	NUMBER OF CONTAINERS
	(eg. source name, location, address)	~~30-AUG-22~~	~~16:30~~	~~GW~~	X	X	X	X	X	X	X	X	X			
	ON-MW-1	30-AUG-22	16:30	GW	X	X	X	X	X	X	X	X	X			12
	ON-MW-2	30-AUG-22	~~16:30~~ 15:30	GW	X	X	X	X	X	X	X	X	X			12
	KC-MW-3	30-AUG-22	13:30	GW	X	X	X	X	X	X	X	X	X			12
	GW-DUP	30-AUG-22		GW	X	X	X	X	X	X	X	X	X			12
	G300-MW-01	30-AUG-22	18:00	GW	X	X	X	X	X	X	X	X	X			12
	~~FIELD~~ FB	30-AUG-22		GW	X	X	X	X	X	X	X	X	X			12
	GK-300	30-AUG-22	18:00	GW	X	X	X	X	X	X	X	X	X			12
	ON-400	30-AUG-22	14:30	GW	X	X	X	X	X	X	X	X	X			12

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	[redacted]
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☑ Ice Cubes ☐	Custody seal intact	Yes ☐	No	☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
4	6	6					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
			[redacted]	Sept 1/22	9:38			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

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

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 22 -

Page 1 of 1

Environmental Division Whitehorse

Work Order Reference

WR2200977

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report
Company:	YTG - Environment - Water Resources Branch
Contact:	Aaron Barker
Phone:	867-332-3863
	Company address below will appear on the final report
Street:	419 Range Road
City/Province:	Whitehorse, YT
Postal Code:	Y1A 3V1
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	YG
Contact:	Aaron Barker

Report Format / Distribution	
Select Report Format:	☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)
Quality Control (QC) Report with Report	☒ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	aaron.barker@yukon.ca
Email 2	Water.resources@yukon.ca
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	nicole.novodvorsky@gov.yk.ca
Email 2	aaron.barker@yukon.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	GPYT100	AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact:	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs

Regular [R] ☒ Standard TAT if received by

PRIORITY (Business Days): 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%] ☐

EMERGENCY: 1 Busi ☐ Same (☐ (Labor ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service lo

Analy

Indicate Filtered (F), Preserved (P) or Filte

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	EC, pH, Total Alk, TSS reg, TDS	nitrite, nitrate, sulphate, chloride, Total Nitrog	Total Metals & Hg	D Metals & Hg (Hardness)	DOC	Ammonia	Sulphide	Cyanide SAD & WAD	Cyanate	SAMPLES ON HOLD	Sample is hazardous (please provi	NUMBER OF CONTAINERS
	(eg. source name, location, address)	~~30-AUG-22~~	~~16:30~~	~~GW~~	X	X	X	X	X	X	X	X	X			
	ON-MW-1	30-AUG-22	16:30	GW	X	X	X	X	X	X	X	X	X			12
	ON-MW-2	30-AUG-22	[illegible]	GW	X	X	X	X	X	X	X	X	X			12
	KC-MW-3	30-AUG-22	13:30	GW	X	X	X	X	X	X	X	X	X			12
	GW-DUP	30-AUG-22		GW	X	X	X	X	X	X	X	X	X			12
	G300-MW-01	30-AUG-22	12:00	GW	X	X	X	X	X	X	X	X	X			12
	~~FB~~ FB	30-AUG-22		GW	X	X	X	X	X	X	X	X	X			12
	GK-300	30-AUG-22	18:00	GW	X	X	X	X	X	X	X	X	X			12
	ON-400	30-AUG-22	14:30	GW	X	X	X	X	X	X	X	X	X			12

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	[redacted]
Are samples for human consumption/ use? ☐ YES ☒ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
4	6	6		8	6		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date: Sept 1/22	Time: 9:38	Received by: CW	Date: Sep 2	Time: 1235

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

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

ice packs

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **WR2200980**	Page	: 1 of 4
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse YT Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Keno Audit	Date Samples Received	: 01-Sep-2022 13:55
PO	: ----	Date Analysis Commenced	: 06-Sep-2022
C-O-C number	: ----	Issue Date	: 20-Sep-2022 09:43
Sampler	: AB/CF		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Administration, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
µg/L	micrograms per litre
µg/sample	micrograms per sample
µS/cm	Microsiemens per centimetre
L	litres
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	KV-60	KV-60A	KV-14	SK-01	KV-DUP
					Client sampling date / time	31-Aug-2022 14:15	31-Aug-2022 14:30	31-Aug-2022 13:00	31-Aug-2022 12:15	31-Aug-2022
						WR2200980-001	WR2200980-002	WR2200980-003	WR2200980-004	WR2200980-005
						Result	Result	Result	Result	Result
Field Tests										
sampling volume, field	----	EF003	0.010	L		0.250	0.250	0.250	0.250	0.250
Physical Tests										
conductivity	----	E100	2.0	µS/cm		272	258	1120	1070	256
pH	----	E108	0.10	pH units		8.09	8.18	8.01	7.77	8.18
solids, total dissolved [TDS]	----	E162	10	mg/L		173	170	820	797	181
solids, total suspended [TSS]	----	E160	3.0	mg/L		19.8	25.8	21.2	<3.0	33.0
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L		124	118	230	209	118
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0081	0.0093	0.211	<0.0050	0.0085
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0250 DLDS	0.0572	<0.0050
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0050 DLDS	<0.0050 DLDS	<0.0010
nitrogen, total	7727-37-9	E366	0.030	mg/L		0.395	0.437	0.281	0.146	0.418
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0176	0.0254	0.0152	<0.0020	0.0239
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		22.9	18.5	402	397	18.4
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		11.3	12.3	1.78	1.68	11.9
Total Sulfides										
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L		0.0034	0.0034	<0.0015	<0.0015	0.0042
sulfide, total (as H2S)	7783-06-4	E395	0.0016	mg/L		0.0036	0.0036	<0.0016	<0.0016	0.0045
Plant Pigments										
chlorophyll a	479-61-8	EC870A	0.010	µg/L		0.524	0.664	0.160	0.072	3.38
chlorophyll a	479-61-8	E870A	0.0100	µg/sample		0.131	0.166	0.0400	0.0180	0.845

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: KV-100	----	----	----	----
					Client sampling date / time: 31-Aug-2022 13:45	----	----	----	----
					WR2200980-006	--------	--------	--------	--------
					Result	----	----	----	----
Field Tests									
sampling volume, field	----	EF003	0.010	L	0.250	----	----	----	----
Physical Tests									
conductivity	----	E100	2.0	µS/cm	998	----	----	----	----
pH	----	E108	0.10	pH units	6.85	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	740	----	----	----	----
solids, total suspended [TSS]	----	E160	3.0	mg/L	29.4	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	147	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.227	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0250 DLDS	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS	----	----	----	----
nitrogen, total	7727-37-9	E366	0.030	mg/L	0.302	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.141	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	404	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.72	----	----	----	----
Total Sulfides									
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	0.0027	----	----	----	----
sulfide, total (as H2S)	7783-06-4	E395	0.0016	mg/L	0.0029	----	----	----	----
Plant Pigments									
chlorophyll a	479-61-8	EC870A	0.010	µg/L	<0.040	----	----	----	----
chlorophyll a	479-61-8	E870A	0.0100	µg/sample	<0.0100	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WR2200980**	Page	: 1 of 18
Client	: **Government of Yukon**	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Keno Audit	Date Samples Received	: 01-Sep-2022 13:55
PO	: ----	Issue Date	: 20-Sep-2022 09:42
C-O-C number	: ----		
Sampler	: AB/CF		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) KV-100	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) KV-14	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) KV-60	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) KV-60A	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) KV-DUP	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SK-01	E298	31-Aug-2022	08-Sep-2022	----	----		11-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KV-100	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KV-14	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KV-60	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KV-60A	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE KV-DUP	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE SK-01	E235.NO3-L	31-Aug-2022	06-Sep-2022	3 days	6 days	× EHT	07-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KV-100	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KV-14	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KV-60	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KV-60A	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE KV-DUP	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE SK-01	E235.NO2-L	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	3 days	6 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE KV-100	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE KV-14	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE KV-60	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE KV-60A	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE KV-DUP	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE SK-01	E235.SO4	31-Aug-2022	06-Sep-2022	----	----		07-Sep-2022	28 days	6 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) KV-100	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) KV-14	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) KV-60	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) KV-60A	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) KV-DUP	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) SK-01	E366	31-Aug-2022	08-Sep-2022	----	----		09-Sep-2022	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) KV-100	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) KV-14	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) KV-60	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) KV-60A	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) KV-DUP	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) SK-01	E372-U	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Field Tests : Field Volume (L)										
Opaque HDPE tube KV-100	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Field Tests : Field Volume (L)										
Opaque HDPE tube KV-14	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Field Tests : Field Volume (L)										
Opaque HDPE tube KV-60	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Field Tests : Field Volume (L)										
Opaque HDPE tube KV-60A	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Field Tests : Field Volume (L)										
Opaque HDPE tube KV-DUP	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Field Tests : Field Volume (L)										
Opaque HDPE tube SK-01	EF003	31-Aug-2022	----	----	----		08-Sep-2022	----	----	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KV-100	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KV-14	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KV-60	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KV-60A	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) KV-DUP	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) SK-01	E358-L	31-Aug-2022	08-Sep-2022	----	----		08-Sep-2022	28 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE KV-100	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE KV-14	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE KV-60	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE KV-60A	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE KV-DUP	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SK-01	E290	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE KV-100	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE KV-14	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE KV-60	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE KV-60A	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE KV-DUP	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE SK-01	E100	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE KV-100	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE KV-14	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE KV-60	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE KV-60A	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE KV-DUP	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SK-01	E108	31-Aug-2022	06-Sep-2022	----	----		06-Sep-2022	0.25 hrs	0.67 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE KV-100	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE KV-14	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE KV-60	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE KV-60A	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE KV-DUP	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE SK-01	E162	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KV-100	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KV-14	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KV-60	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KV-60A	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE KV-DUP	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SK-01	E160	31-Aug-2022	----	----	----		07-Sep-2022	7 days	7 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube KV-100	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube KV-14	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube KV-60	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube KV-60A	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube KV-DUP	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓
Plant Pigments : Chlorophyll-a by Fluorometry (Field Filtered µg)										
Opaque HDPE tube SK-01	E870A	31-Aug-2022	09-Sep-2022	28 days	9 days	✓	09-Sep-2022	28 days	0 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) KV-100	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) KV-14	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) KV-60	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide) KV-60A	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
KV-DUP	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
SK-01	E395	31-Aug-2022	----	----	----		06-Sep-2022	7 days	6 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	634191	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	637212	1	20	5.0	5.0	✓
Conductivity in Water	E100	634190	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	637213	1	6	16.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	634183	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	634185	1	13	7.6	5.0	✓
pH by Meter	E108	634189	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	634184	1	13	7.6	5.0	✓
TDS by Gravimetry	E162	636124	1	14	7.1	5.0	✓
Total Nitrogen by Colourimetry	E366	637209	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	637210	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	634856	1	11	9.0	5.0	✓
TSS by Gravimetry	E160	636128	1	7	14.2	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	634191	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	637212	1	20	5.0	5.0	✓
Chlorophyll-a by Fluorometry (Field Filtered µg)	E870A	639272	1	12	8.3	5.0	✓
Conductivity in Water	E100	634190	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	637213	1	6	16.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	634183	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	634185	1	13	7.6	5.0	✓
pH by Meter	E108	634189	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	634184	1	13	7.6	5.0	✓
TDS by Gravimetry	E162	636124	1	14	7.1	5.0	✓
Total Nitrogen by Colourimetry	E366	637209	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	637210	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	634856	1	11	9.0	5.0	✓
TSS by Gravimetry	E160	636128	1	7	14.2	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	634191	1	13	7.6	5.0	✓
Ammonia by Fluorescence	E298	637212	1	20	5.0	5.0	✓
Chlorophyll-a by Fluorometry (Field Filtered µg)	E870A	639272	1	12	8.3	5.0	✓
Conductivity in Water	E100	634190	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	637213	1	6	16.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	634183	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	634185	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	634184	1	13	7.6	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
TDS by Gravimetry	E162	636124	1	14	7.1	5.0	✓
Total Nitrogen by Colourimetry	E366	637209	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	637210	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	634856	1	11	9.0	5.0	✓
TSS by Gravimetry	E160	636128	1	7	14.2	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	637212	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	637213	1	6	16.6	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	634183	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	634185	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	634184	1	13	7.6	5.0	✓
Total Nitrogen by Colourimetry	E366	637209	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	637210	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395	634856	1	11	9.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Nitrogen by Colourimetry	E366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Sulfide by Colourimetry (Automated Flow)	E395 Vancouver - Environmental	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methlyene blue colourimetric method. Results expressed "as H2S" if reported represent the maximum possible H2S concentration based on the total sulfide concentration in the sample. The H2S calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S)
Chlorophyll-a by Fluorometry (Field Filtered µg)	E870A Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll-a is determined by solvent extraction followed with analysis by fluorometry using the non-acidification procedure. Sampling volume not provided by client.
Chlorophyll-a by Fluorometry (Field Filtered µg/L)	EC870A Vancouver - Environmental	Water	CALC	Convert results to sample concentration based on field information.
Field Volume (L)	EF003 Vancouver - Environmental	Water		Field measurement of sampling volume provided by client and recorded on ALS report may affect the validity of results.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Nitrogen in water	EP366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Chlorophyll-a Extraction (Field Filtered)	EP870A Vancouver - Environmental	Water	EPA 445.0 (mod)	Chlorophyll-a solvent extraction.

QUALITY CONTROL REPORT

Work Order	: **WR2200980**	Page	: 1 of 7
Client	: Government of Yukon	Laboratory	: Whitehorse - Environmental
Contact	: Aaron Barker	Account Manager	: Tasnia Tarannum
Address	: Department of Environment, Environmental Protection and Assessment Branch 10 Burns Road Whitehorse YT Canada	Address	: #12 151 Industrial Road Whitehorse, Yukon Canada Y1A 2V3
Telephone	: ----	Telephone	: +1 867 668 6689
Project	: Keno Audit	Date Samples Received	: 01-Sep-2022 13:55
PO	: ----	Date Analysis Commenced	: 06-Sep-2022
C-O-C number	: ----	Issue Date	: 20-Sep-2022 09:42
Sampler	: AB/CF		
Site	: ----		
Quote number	: Standing Offer		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Vancouver Administration, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 634189)											
WR2200980-003	KV-14	pH	----	E108	0.10	pH units	8.01	8.01	0.00%	4%	----
Physical Tests (QC Lot: 634190)											
WR2200980-003	KV-14	conductivity	----	E100	2.0	µS/cm	1120	1100	0.991%	10%	----
Physical Tests (QC Lot: 634191)											
WR2200980-003	KV-14	alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	230	230	0.130%	20%	----
Physical Tests (QC Lot: 636124)											
VA22C1064-012	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	2660	2710	1.81%	20%	----
Physical Tests (QC Lot: 636128)											
VA22C1064-020	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 634183)											
WR2200981-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	2.28	2.27	0.582%	20%	----
Anions and Nutrients (QC Lot: 634184)											
WR2200981-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	21.9	21.8	0.540%	20%	----
Anions and Nutrients (QC Lot: 634185)											
WR2200981-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 637209)											
VA22C0798-001	Anonymous	nitrogen, total	7727-37-9	E366	0.030	mg/L	0.190	0.189	0.001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 637210)											
VA22C0798-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	0.0031	0.0011	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 637212)											
VA22C0798-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0078	0.0083	0.0005	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 637213)											
WR2200980-001	KV-60	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	11.3	11.8	4.80%	20%	----
Total Sulfides (QC Lot: 634856)											
SK2204799-001	Anonymous	sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	<0.0015	<0.0015	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 634190)						
conductivity	----	E100	1	µS/cm	1.1	----
Physical Tests (QCLot: 634191)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 636124)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 636128)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 634183)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 634184)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 634185)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 637209)						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
Anions and Nutrients (QCLot: 637210)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 637212)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 637213)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Sulfides (QCLot: 634856)						
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	<0.0015	----
Plant Pigments (QCLot: 639272)						
chlorophyll a	479-61-8	E870A	0.002	µg/sample	<0.0020	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 634189)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 634190)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 634191)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	108	85.0	115	----
Physical Tests (QCLot: 636124)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	102	85.0	115	----
Physical Tests (QCLot: 636128)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	92.3	85.0	115	----
Anions and Nutrients (QCLot: 634183)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 634184)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 634185)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	96.1	90.0	110	----
Anions and Nutrients (QCLot: 637209)									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 637210)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	92.8	80.0	120	----
Anions and Nutrients (QCLot: 637212)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	100	85.0	115	----
Organic / Inorganic Carbon (QCLot: 637213)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	95.8	80.0	120	----
Total Sulfides (QCLot: 634856)									
sulfide, total (as S)	18496-25-8	E395	0.0015	mg/L	0.08 mg/L	96.8	80.0	120	----
Plant Pigments (QCLot: 639272)									
chlorophyll a	479-61-8	E870A	0.002	µg/sample	1 µg/sample	94.0	80.0	120	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 634183)										
WR2200981-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.50 mg/L	2.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 634184)										
WR2200981-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	99.5 mg/L	100 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 634185)										
WR2200981-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.479 mg/L	0.5 mg/L	95.7	75.0	125	----
Anions and Nutrients (QCLot: 637209)										
VA22C0798-002	Anonymous	nitrogen, total	7727-37-9	E366	0.392 mg/L	0.4 mg/L	98.0	70.0	130	----
Anions and Nutrients (QCLot: 637210)										
VA22C0798-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0479 mg/L	0.05 mg/L	95.8	70.0	130	----
Anions and Nutrients (QCLot: 637212)										
VA22C0798-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0976 mg/L	0.1 mg/L	97.6	75.0	125	----
Organic / Inorganic Carbon (QCLot: 637213)										
WR2200980-002	KV-60A	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Sulfides (QCLot: 634856)										
SK2204799-002	Anonymous	sulfide, total (as S)	18496-25-8	E395	0.484 mg/L	0.5 mg/L	96.8	75.0	125	----

SW

Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Affix ALS barcode label here (lab use only)

Page

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Environmental Division Whitehorse

Work Order Reference WR2200980

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to
Company:	YTG - Environment - Water Resources Branch	Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm
Contact:	Aaron Barker	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business / Same Day, / (Laboratory
Phone:	867-332-3563	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
Street:	419 Range Rd	Email 1 or Fax aaron.barker@yukon.ca	Date and Time Required for all E&P TATs:
City/Province:	Whitehorse, YT	Email 2 water.resources@	For tests that can not be performed according to the service level selec
Postal Code:	Y1A 0L4	Email 3	Analysis R
Invoice To	Same as Report To ☒ YES ☐ NO	**Invoice Distribution**	Indicate Filtered (F), Preserved (P) or Filtered and
	Copy of Invoice with Report ☒ YES ☐ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax aaron.barker@yukon.ca	
Contact:		Email 2 water.resources@yukon.ca	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	GPYT100	AFE/Cost Center:	PO#
Job #:	Kent Audit	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Jesse M	Sampler: AB/CF

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	EC, pH, Total Alk, TSS reg, TDS	nitrite, nitrate, Total Nitrogen	Phosphorus	Chlorophyll-A	DOC	Ammonia	Sulphide	Sulphate	SAMPLES ON HOLD	Sample is hazardous (please provide further de	NUMBER OF CONTAINERS
	(eg. source name, location, address)	31-Aug-22			✓										
	KV-60		14:15	SW	✓	✓	✓	✓	✓	✓	✓	✓			5
	KV-60A		14:30												
	KV-14		13:00												
	SK-01		12:15												
	[redacted] KV-Dup		-												
	[redacted] KV-100		13:45												

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)	SAMPLE CONDI
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	Chl A Samples were filtered w 250mL each	Frozen ☐ SIF Obs
Are samples for human consumption/ use? ☐ YES ☐ NO	[redacted] Drinking Water Guidelines	Ice Packs ☑ Ice Cubes ☐ Custody
		Cooling Initiated ☑
		INITIAL COOLER TEMPERATURES °C: 5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SH
Released by: Aaron Barker	Date: 8 Sept 1/2022	Time:	Received by:	Date: Sept 1/22	Time: 13:55	Received by:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

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

SW

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 22 -

Environmental Division
Whitehorse
Work Order Reference
WR200980

Telephone : +1 867 668 6689

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to
Company:	YTG - Environment - Water Resources Branch	Select Report Format: ☑ PDF ☑ EXCEL ☒ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm
Contact:	Aaron Barker	Quality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business / Same Day, / (Laboratory
Phone:	867-332-3863	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs:
Street:	419 Range Rd	Email 1 or Fax aaron.barker@yukon.ca	For tests that can not be performed according to the service level sele
City/Province:	Whitehorse, YT	Email 2 water.resources@	Analysis R
Postal Code:	Y1A 0L4	Email 3	
Invoice To	Same as Report To ☒ YES ☐ NO	Invoice Distribution	Indicate Filtered (F), Preserved (P) or Filtered and
	Copy of Invoice with Report ☒ YES ☐ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
Company:		Email 1 or Fax aaron.barker@yukon.ca	
Contact:		Email 2 water.resources@yukon.ca	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	GPYT100	AFE/Cost Center:	PO#
Job #:	Kena Audit	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Jesse M	Sampler: AB/CF

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	EC, pH, Total Alk, TSS reg, TDS	nitrite, nitrate, Total Nitrogen	Phosphorus	Chlorophyll-A	DOC	Ammonia	Sulphide	Sulphate	SAMPLES ON HOLD	Sample is hazardous (please provide further de	NUMBER OF CONTAINERS
	(eg. source name, location, address)	31-Aug-22			✓										
	KV-60		14:15	SW	✓	✓	✓	✓	✓	✓	✓	✓			5
	KV-60A		14:30												
	KV-14		13:00												
	SK-01		12:15												
	[redacted] KV-Dup		-												
	[redacted] KV-100		13:45												

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)	SAMPLE CONDI
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	Chl A Samples were filtered w 250mL each	Frozen ☐ SIF Obs
Are samples for human consumption/ use? ☐ YES ☐ NO	[redacted]	Ice Packs ☑ Ice Cubes ☐ Custody
		Cooling Initiated ☑
		INITIAL COOLER TEMPERATURES °C
		5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SH	
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	
Aaron Barker	1 Sept 1/2022			Sept 1/22	13:53	CW	

1
7, 7
Sept 2 12:35
ice packs

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

Appendix B – Isotopic Results

Client: O'Connor/Yukon Water Resources Branch

Project: Lobird, Mayo Sewage Lagoon, Keno audits

ISO# 2022523
Location: Freezer, A6
24 for 18O+2H, 6 for 18O+34S-SO4

Environmental Isotope Lab
2023-01-27

#	Sample	Date	Lab#	$\delta^{18}O$	Result	Repeat	$\delta^{2}H$	Result	Repeat	$\delta^{18}O$	Result	Repeat	$\delta^{34}S$	Result	Repeat		pH	EC	Cl	SO4	AZD
				H_2O	VSMOW ± 0.2‰		H_2O	VSMOW ± 0.8‰		SO_4	VSMOW ± 0.3‰		SO_4	VCDT ± 0.3‰				µS/cm	mg/L	mg/L	
1	ON-400	2022-08-30	489107	x	-21.80	-21.72	x	-170.17	-169.91	x	-14.09		x	-0.59		3x15ml	7.6	969	<2.50	376	
2	ON-MW2	2022-08-30	489108	x	-22.69		x	-177.47		x	-13.62	-13.90	x	-0.60	-1.02	3x15ml	7.5	1607	3.36	605	
3	ON-MW1	2022-08-30	489109	x	-21.78		x	-170.34		x	-13.72		x	-2.07		3x15ml	6.9	1784	<5.00	840	
4	G300-MW1	2022-08-30	489110	x	-22.13		x	-172.09		x	-19.07	-19.02	x	-3.15		3x15ml	6.1	2445	<10.0	1640	
5	GK-300	2022-08-30	489111	x	-22.45	-22.51	x	-172.22	-172.68	x	-16.70		x	-1.98	-1.95	3x15ml	6.3	1474	<2.50	870	
6	KC-MW3	2022-08-30	489112	x	-22.20		x	-172.85		x	-14.01	-14.55	x	-2.38		3x15ml	6.8	1213	<2.50	536	
7	LB-GW-4	2022-09-06	489113	x	-21.40		x	-168.06								15ml	7.3	709			
8	LB-GW-4 40L	2022-09-06	489114	x	-21.41		x	-168.38								15ml	7.3	706			
9	LB-GW-5	2022-09-06	489115	x	NSL		x	NSL								15ml, *empty	7.6	680			
10	LB-GW-5 40L	2022-09-06	489116	x	-21.49		x	-169.19								15ml	7.6	681			
11	LB-GW-6	2022-09-06	489117	x	-21.97	-22.01	x	-171.31	-171.23							15ml	7.3	510			
12	LB-GW-6 40L	2022-09-06	489118	x	-21.80		x	-170.91								15ml	7.4	510			
13	LB-GW-8	2022-09-06	489119	x	-21.92		x	-170.88								15ml	7.2	932			
14	LB-GW-8 40L	2022-09-06	489120	x	-21.66		x	-169.87								15ml	7.2	977			
15	LB-IL-1	2022-09-13	489121	x	-21.03		x	-164.97								15ml	7.2	839			
16	MW-1	2022-09-08	489122	x	-21.68	-21.49	x	-167.97	-167.92							15ml	6.8	266.8			
17	MW-2	2022-09-08	489123	x	-21.66		x	-170.34								15ml	6.7	389.4			
18	IC2	2022-09-08	489124	x	-20.43		x	-163.65								15ml					
19	SEP	2022-09-08	489125	x	-21.58		x	-168.40								15ml					
20	WP2	2022-09-08	489126	x	-14.41		x	-138.22								15ml					
21	SWP	2022-09-08	489127	x	-18.73	-18.71	x	-158.68	-157.88							15ml					
22	EP	2022-09-08	489128	x	-19.46		x	-162.26								15ml					
23	IC1	2022-09-08	489129	x	-20.20		x	-163.21								15ml					
24	ACX	2022-09-08	489130	x	-21.06	-21.07	x	-166.10	-166.50							15ml					

SS22K29A-SO4
CO23A16A-SO4
CO23A19A-SO4

Ave Ref Area ~14.6
Std +/- ~ 0.20

Std Area ~ 8.8E-8
Std +/- < 0.25

NSL= No sample left, bottle arrived empty

ENVIRONMENTAL ISOTOPE LABORATORY

Appendix C – Photo Log

Photo 1 – Silver King 100 Adit Seepage (KV-13)

Photo 2 – Silver King 100 Adit Seepage Collection

Photo 3 – Silver King Water Treatment Plants

Photo 4 – Silver King Water Treatment Plant Discharge (KV-14)

Photo 5 – Silver King Water Treatment Plant Effluent

Photo 6 – Silver King Adit Effluent to Ground (WRB-SK)

Photo 7 – Galena Creek Upstream (KV-60A)

Photo 8 – Drums Upstream of Silver King 75, Galena Creek

Photo 9 – Silver King 75 Adit

Photo 10 – Galena Creek Downstream of Silver King 75

Photo 11 – Onek 400 Adit Seepage

Photo 12 – KC-MW-3

Photo 13 – ON-MW-2

Photo 14 – ON-MW-1

Photo 15 – Galkeno 300 Adit

Photo 16 – Galkeno 300 Adit Seepage Collection

Photo 17 – Galkeno 300 Adit Seepage

Photo 18 – Galkeno 300 Water Treatment Plant

Photo 19 – Galkeno 300 Water Treatment Plant Settling Pond

Photo 20 – G300-MW-1 above Christal Valley

Photo 21 – No Cash 500 Adit

Photo 22 – No Cash 500 Adit – Facing North

Photo 23 – No Cash Creek at Highway

Photo 24 – No Cash Creek – Facing SE

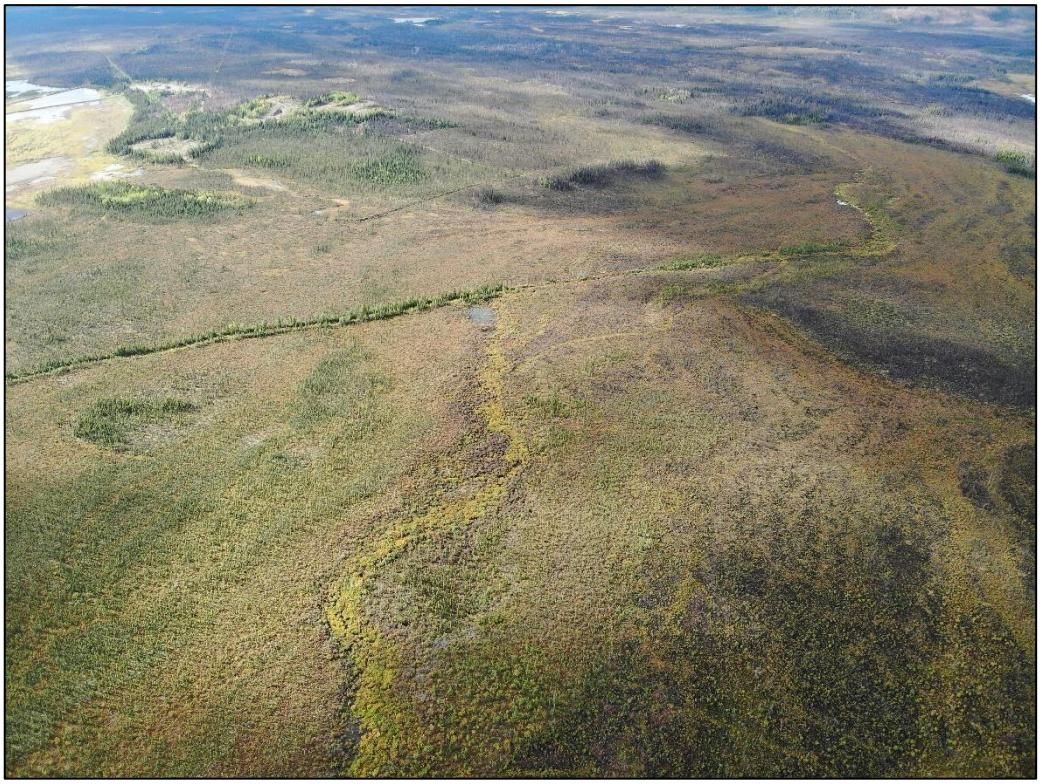

Photo 25 – No Cash Creek – Facing NW

Photo 26 – No Cash Creek – 300m North of Highway

Photo 27 – No Cash Creek & South McQuesten River – Facing NW

Photo 28 – No Cash Creek Last Observable Location – Facing NW

Appendix D – Field Notes

Ther

Yukon

Environment Yukon
Water Resources Branch

Groundwater Well Purging and Sampling Record

Well ID: KC-MW-3
Location: Keno
Project Name: Keno Audit

Fieldtrip Tracking #:
Date: 2022/08/30
Weather: Overcast
Sampler: CF, AB

WELL INFORMATION

Well Cover Type: Flush ☐ Lock ☐ Well Casing Diam.: 6-inch (15 cm) ☐
Stick-up ☒ 0.825 m above grade No-lock ☒ 2-inch (5 cm) ☒
Active Drinking Water Well ☐ Other: _____
Screened Interval (m bTOC): _____

PURGING INFORMATION AND OBSERVATIONS

DGW m bTOC (X) 15.770 m Time: 13:00
DTB m bTOC (Y) 30.032 m

Length of Water Column (X-Y) 14.262 m
Volume of Water in 2" Well = (X - Y) x 2 28.5 L
Volume of Water in 6" Well = (17.7L/m) _____ L

Purging Method

Grundfos Pump ☐
Hydralift Pump ☐
Peristaltic (Tubing set to: _____m bTOC) ☐
Flow-through cell ☐
HydraSleeve 2.5 L (sampled at: _____ m bTOC) ☐
Other (specify) SS Geosub ☒

LOGGER INFORMATION

Current LTC Serial #: —
New LTC Serial #: —
BL Serial #: —

LTC downloaded at: —
BL downloaded at: —
Notes: —

UTM coordinates

Zone
E 63.912620a
N -135.3025978

Photos Taken Y / N

Volume Purged (L)	T°C	DO mg/L	SPC uS-mS/cm	pH	Turbidity FNU/NTU	ORP mV	Time	DTW m bTOC	Rate L/min
4L	3.3	1.46	1176	6.75	62.00	145.7	13:05	16.342	
20L	3.0	0.85	1188	6.75	107.30	117.9	13:13	16.419	
40L	3.0	0.05	1207	6.76	71.20	98.3	13:22	16.440	
60L	2.9	-0.17	1210	6.76	327.0	88.7	13:33	16.450	
80L	2.9	-0.22	1211	6.77	5000~	83.2	13:45	16.545	
90L	3.0	-0.21	1213	6.77	69.5	80.7	13:51	16.480	
			Sampled		13:50				

Odour Yes ☐ No ☒ Description: _____ Colour (initial) clear (stable) clear
Recovery* Slow ☐ Moderate ☐ Fast ☒

NOTES: Field Parameter and Stability Guidance: pH (±0.2 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±20mV); and if applicable: Dissolved Oxygen (±10% or ±0.2 mg/L – whichever is greater)
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown*

Address: 419 Range Road, Whitehorse, YT Y1A 3V1; Phone: 867-667-3171

★ FB collected @ KC-MW3 @ 14:00 + GW-DUP

Yukon

Environment Yukon
Water Resources Branch

Groundwater Well Purging and Sampling Record

Well ID: ON-MW-2
Location: Keno
Project Name: Keno Audit

Fieldtrip Tracking #:
Date: 2022/08/30
Weather: Overcast
Sampler: CF, AB

WELL INFORMATION

Well Cover Type Flush ☐ Lock ☐ Well Casing Diam.: 6-inch (15 cm) ☐
Stick-up ☒ _____m above grade No-lock ☒ 2-inch (5 cm) ☐
Active Drinking Water Well ☐ Other: 4"
Screened Interval (m bTOC): _____

PURGING INFORMATION AND OBSERVATIONS

DGW m bTOC (X) 29.730 m Time: 14:33
DTB m bTOC (Y) 70.848 m

Length of Water Column (X-Y) _____ m
Volume of Water in 2" Well = (X - Y) x 2 _____ L
Volume of Water in 6" Well = (17.7L/m) _____ L

Purging Method

Grundfos Pump ☐
Hydralift Pump ☐
Peristaltic (Tubing set to: _____m bTOC) ☐
Flow-through cell ☐
HydraSleeve 2.5 L (sampled at: ~55 m bTOC) ☒
Other (specify) _____ ☐

LOGGER INFORMATION

Current LTC Serial #: –
New LTC Serial #: –
BL Serial #: –

LTC downloaded at: –
BL downloaded at: –
Notes: –

UTM coordinates
Zone
E
N

Photos Taken Y / N

Volume *Purged (L)*	T°C	DO *mg/L*	SPC *uS-mS/cm*	pH	Turbidity *FNU/NTU*	ORP *mV*	Time	DTW *m bTOC*	Rate *L/min*
0	2.6	7.48	1607	6.90	5.92	513	15:30		

Odour Yes ☐ No ☐ Description: _____ Colour (initial) _____ (stable) _____
Recovery* Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.2 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±20mV); and if applicable: Dissolved Oxygen (±10% or ±0.2 mg/L – whichever is greater)
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown*

Yukon

Environment Yukon
Water Resources Branch

Groundwater Well Purging and Sampling Record

Well ID: ON-MW-1
Location: Keno
Project Name: Keno Audit

Fieldtrip Tracking #: _____
Date: 2022
Weather: Overcast
Sampler: CF, AB

WELL INFORMATION

Well Cover Type Flush ☐ Lock ☐ Well Casing Diam.: 6-inch (15 cm) ☐
Stick-up ☑ _____m above grade No-lock ☑ 2-inch (5 cm) ☑
Active Drinking Water Well ☐ Other: _____
Screened Interval (m bTOC): _____

PURGING INFORMATION AND OBSERVATIONS

DGW m bTOC (X) 36.348 m Time: 16:11
DTB m bTOC (Y) ~76m m

Length of Water Column (X-Y) _____ m
Volume of Water in 2" Well = (X - Y) x 2 _____ L
Volume of Water in 6" Well = (17.7L/m) _____ L

Purging Method

Grundfos Pump ☐
Hydralift Pump ☐
Peristaltic (Tubing set to: _____m bTOC) ☐
Flow-through cell ☐
HydraSleeve 2.5 L (sampled at: 45 m bTOC) ☑
Other (specify) _____ ☐

LOGGER INFORMATION

Current LTC Serial #: _____
New LTC Serial #: _____
BL Serial #: _____

LTC downloaded at: _____
BL downloaded at: _____
Notes:

UTM coordinates
Zone
E
N

Photos Taken Y / N

Volume *Purged (L)*	T°C	DO *mg/L*	SPC *uS-mS/cm*	pH	Turbidity *FNU/NTU*	ORP *mV*	Time	DTW *m bTOC*	Rate *L/min*
OL	3.3	6.80	1784	6.88	7.10	5.1	16:45		

Odour Yes ☐ No ☐ Description: _____ Colour (initial) _____ (stable) _____
Recovery* Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.2 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±20mV); and if applicable: Dissolved Oxygen (±10% or ±0.2 mg/L – whichever is greater)
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown*

Yukon

Environment Yukon
Water Resources Branch

Groundwater Well Purging and Sampling Record

Well ID: G300-MW01
Location: Galkeno 300 - Keno
Project Name: Keno Audit

Fieldtrip Tracking #:
Date: Aug 30/2022
Weather: Overcast, light breeze
Sampler: AB/CF

WELL INFORMATION

Well Cover Type: Flush ☐ Lock ☐
Stick-up ☒ 0.83 m above grade No-lock ☒
Active Drinking Water Well ☐

Well Casing Diam.: 6-inch (15 cm) ☐ 2-inch (5 cm) ☒ Other:

Screened Interval (m bTOC):

PURGING INFORMATION AND OBSERVATIONS

DGW m bTOC (X) 13.450 m Time: 17:30
DTB m bTOC (Y) 29.165 m

Length of Water Column (X-Y) 15.715 m
Volume of Water in 2" Well = (X - Y) x 2 31.4 L
Volume of Water in 6" Well = (17.7L/m) L

Purging Method

Grundfos Pump ☒
Hydralift Pump ☐
Peristaltic (Tubing set to: m bTOC) ☐
Flow-through cell ☐
HydraSleeve 2.5 L (sampled at: m bTOC) ☐
Other (specify) ☐

LOGGER INFORMATION

Current LTC Serial #:
New LTC Serial #:
BL Serial #:

LTC downloaded at:
BL downloaded at:
Notes:

UTM coordinates
Zone
E
N

Photos Taken (Y) N

Volume Purged (L)	T°C	DO mg/L	SPC uS-mS/cm	pH	Turbidity FNU/NTU	ORP mV	Time	DTW m bTOC	Rate L/min
10	2.7	0.45	2391	6.14	175	106.3	1740	14.175	
20	2.6	0.09	2436	6.10	169	116.4	1743	14.170	
40	2.4	-0.10	2445	6.08	198	125.5	1749	14.415	
60	2.5	-0.17	2447	6.08	182	126.3	1757	14.240	
80	2.6	-0.22	2420	6.07	248	134.2	1806	14.240	
100	2.6	-0.24	2445	6.07	226	136.9	1814		
			Sampled 0830						

Odour Yes ☐ No ☐ Description: Colour (initial) (stable)
Recovery* Slow ☐ Moderate ☐ Fast ☐

NOTES: Field Parameter and Stability Guidance: pH (±0.2 standard units); Temperature (±0.2 °C); Specific Conductance (±3%); Oxidation-Reduction Potential (±20mV); and if applicable: Dissolved Oxygen (±10% or ±0.2 mg/L – whichever is greater)
**Recovery Estimate - Slow: greater than 10 cm drawdown Moderate: slightly lower than 10 cm drawdown Fast: within 10 cm drawdown*

7-Sept-2022 Keno Audit DO/NB

16:15 - arrive @ Km 92, look for seep
16:45 - located, head to sample
17:00 - "ADS" collected approx. 20m D/S of adit (GPS collected) moderate smell of engine oil / diesel

YSI

°C	4.1
DO%	90.7
DO mg/L	11.85
SPC	279.2
pH	8.32
ORP	222.9
~~t~~ FNU	1.25

17:10 - "AUS" collected approx. 30m U/S of adit. No discernable odours. (GPS collected)

YSI

°C	4.0
DO%	91.4
DO mg/L	11.96
SPC	279.2
pH	8.29
ORP	223.3
FNU	0.19

17:15 – strong engine oil / diesel fuel smell from inside adit, small amount of pooled water visible inside (smells most like WD-40)

Aug 30/2022 Keno Adit

Arrived @ Flat Creek @ 8:30am
↳ Cory Schmidt (Alexco)
↳ Cameron Robertson (ERDC)
↳ Amelie Janin
↳ Cole Fischer (WRB)
↳ Aeron Barker

Site Tour 8:30 - 12:30pm
↳ Silver King
↳ Galkeno 300
↳ No Cash Adit
↳ Onek 400

GW Sampling @ Onek (CF/AB)
↳ 13:00pm

Amelie offsite

See Field notes for GW notes

GW-Dup collected @ KC-MW3

FB collected @ KC-MW3

Aug 30/2022 Keno Audit

DN-400
↳ Sample collected @ 14:30
↳ flowing out of adit into weir directing flow to WTP
↳ Collected @ weir

Temp	(°C)	2.2
Baro	(mmHg)	671.5
Do	(mg/L)	11.72
SPC	(µS/cm)	969
pH		7.62
ORP	(mv)	127.6
Turb	(NTU)	1.72

Clear, colourless, odourless
minor orange precipitate

DN-MW2
↳ Sampled @ 15:00
↳ w Hydrasleeve
↳ 4" well
↳ 12 bottles + 3 Isotope bottles Collected

Aug 30/2022 Keno Audit

DN-MW1
↳ Sampled @ 16:30
↳ w Hydrasleeve
↳ 2" well, no casing
↳ floating debris (organics) in water
↳ 12 bottles + 3 isotope bottles
↳ water was clear w iron & Sulphur odour

G300-MW01
↳ Sampled @ 18:00
↳ w Grundfos Pump
↳ 2" well, 6" casing
↳ 12 bottles + 3 isotope bottles

Aug 30/2022 — Kano Audit

GK-300 → Galkano 300 Adit
↳ sampled before WTP
↳ sampled @ 18:00

Temp	(°C)	3.3
Baro	(mmHg)	659.5
DO	(mg/L)	9.77
SPC	(µs/cm)	1474
pH		6.34
ORP	(mv)	63.8
Turb	(NTU	20.25

↳ Lots of red (orange) percipates
↳ Clear water, no odour
↳ ~10 L/s

Offsite @ 18:50

Cache Creek Visit — Aug 31/2022

WRB
↳ Aaron Barker
↳ Amelie Jamin
↳ Cole Fischer

Arrived @ 9:30am

YSI Readings

Temp	(°C)	4.1
Baro	(mmHg)	696.4
DO	(mg/L)	12.05
SPC	(µs/cm)	265.2
pH		4.86
ORP	(mv)	259.8
NTU		16.27

Cache Creek 04 @ Culvert

Temp	(°C)	14.0
Baro	(mmHg)	697.9
DO	(mg/L)	9.44
SPC	(µs/cm)	257.1
pH		8.22
ORP	(mv)	138.2
NTU		0.15

S. McQuesten Lake before Confluence w Cache Creek

GPS?

Rite in the Rain

Cache Creek Visit — Aug 31/22

Temp	(°C)	4.4
Baro	(mmHg)	697.8
DO	(mg/L)	11.81
SPC	(us/cm)	441.0
pH		4.90
ORP	(mv)	275.8
NTU		17.97

Cache Creek just before Confluence w/ S. McQuesten

GPS: 64.066336, -135.364165

Keno Audit — Aug 31/2022

Silver King

- CF/AB followed discharge from SK-WTP
- Water began clear w/ orange precipates
- Eventually mixing w/ small GW seeps and becoming fully clear
- water is coming in and out of ground along the flow path
- SK-01 collected ~ 25m downstream of the last evidence of orange precipitates

SK-01

Temp	(°C)	4.8
Baro	(mmHg)	693.1
DO	(mg/L)	7.51
SPC	(us/cm)	1058
pH		7.38
ORP	(mv)	114.2
NTU		1.38

4 Bottles + filter
↳ filtered 250 mL through chl A filter

GPS: 63.90005° N, 135.57687° W

Rite in the Rain

Keno Audit Aug 31/2022

KV-14 → Discharge from Silver King WTP
↳ Sampled @ 13:00
↳ lots of reddish orange precipitates
↳ No odour, clear water

Temp	(°C)	4.3
Baro	(mmHg)	691.6
DO	(mg/L)	11.24
SPC	(us/cm)	1086
pH		8.00
ORP	(mv)	125.0
NTU		12.31

GPS: N°63.89857° W135.57507°

filtered 250ml for chlA sample
4 Bottles + 1 filter collected

Keno Audit Aug 31/2022

Silver King 100 - Adit Water
↳ Sampled @ 13:45
↳ directly from adit
↳ lots of orange precipitates
↳ No odour, colourless
↳ slightly turbid

Temp	(°C)	1.4
Baro	(mmHg)	690.9
DO	(mg/L)	8.56
SPC	(us/cm)	1019
pH		6.58
ORP	(MV)	21.0
NTU		24.18

GPS Get from map

↳ 250ml filtered for chlA sample
↳ 4 Bottles + chla filter

Keno Audit — Aug 31/2022

KV-60
↳ adjacent to Silver King 100
↳ Sampled @ 14:15
↳ slighty brown turbit water
↳ no odour
↳ Slight orange staining on creek rocks
↳ Galena Creek

Temp	(°C)	7.6	
Baro	(mmHg)	691.3	
SPC	(us/cm)	260.7	
Do	(mg/L)	10.90	
pH		8.09	
ORP	(mv)	66.3	* Still climbing
NTU		9.40	

GPS: N 63.89793° W 135.57231

250 mL filtered for Chl A @ sample

-4 Bottles + ChlA filter

Keno Audit — Aug 31/2022

KV60A
↳ Sampled @ 14:30
↳ right below small waterfall in canyon
↳ light brown, slightly turbit, no odour
↳ ≈ 200m above Silver King 75

Temp	(°C)	7.6
Baro	(mmHg)	688.3
Do	(mg/L)	11.01
SPC	(us/cm)	244.3
pH		8.26
ORP	(mv)	96.3
NTU		13.53

GPS: N 63.89429° W135.57216°

250 mL filtered for chl A sample

-4 Bottles + 1 filter for Chl A

KV-Dup collected here

*Strong PHC odour by Silver King 75 adit (Diesel?)
-Lots of barrells along Galena Creek