Wetland 06 Water Monitoring Report
Southwest Calgary Ring Road Project
Calgary, Alberta

Prepared for:

KGL Constructors
18 Seven Chiefs Road SW
Calgary, Alberta T2W 3C4

Project No. 102604-01

Prepared by:

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List of Acronyms and Abbreviations

Acronym / Abbreviation	Definition
the Approval	*Water Act* Approval No.: 00388473-00-00
Ausenco	Ausenco Sustainability
BOD	Biochemical Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
DO	Dissolved Oxygen
ESC	Erosion and Sediment Control
GOA	Government of Alberta
GPS	Global Positioning System
Hemmera	Hemmera Envirochem Inc.
KGL	KGL Constructors
Monitoring Plan	Long-Term Monitoring Plan
the Order	Ministerial Order 06/2018
the Project	Southwest Calgary Ring Road Project
QEP	Qualified Environmental Professional
SCC	Standards Council of Canada
SWCRR	Southwest Calgary Ring Road
TUC	Transportation Utility Corridor
TSS	Total Suspended Solids
WAIR	Wetland Assessment and Impact Report

List of Symbols and Units of Measure

Symbol / Unit of Measure	Definition
km	Kilometre
m	Metre
mg/L	Milligrams per litre
µg/L	Microgram per litre
m/sec	Metres per second
m^3/sec	Metres cubed per second

1.0 Background

Wetland 06 is located in the Weaselhead Natural Area, a natural environmental park that borders the west end of Glenmore Reservoir (**Figure 1**) within the City of Calgary. A small portion of Wetland 06 is located within the Transportation Utility Corridor (TUC) running north to south through the Weaselhead Natural Area. Wetland 06 is an historical oxbow channel to the Elbow River that is over 500 metres (m) in length with wetted widths that are generally less than 30 m. Wetland 06 collects surface water from several other wetlands (Wetland 07, 08, and 09, **Figure 1**) located upslope. Wetland 06 drains generally east through the Weaselhead Natural Area and eventually discharges into the Glenmore Reservoir, which provides approximately half of the City of Calgary's drinking water supply.

The TUC containing the western portion of Wetland 06 was incorporated into the proposed design of the Southwest Calgary Ring Road (SWCRR) Project (the Project). The SWCRR Project was awarded by Alberta Transportation to Mountain View Partnership, which in turn engaged KGL Constructors (KGL) to develop the Project. The scope of the Project encompasses the design and construction of approximately 31 kilometres (km) of new six and eight lane divided freeway, 14 interchanges, as well as three watercourse realignments and associated crossing structures. The Project corridor is located along the western limit of the City of Calgary south of Highway 8 and includes sections of Highways 8 and 22.

On August 11, 2017, the Project received *Water Act* Approval No.: 00388473-00-00 (the Approval) to impact twenty-four wetlands, including Wetland 06. Subsequently, an Environmental Appeal was filed (*Brockman and Tulick v. Director, South Saskatchewan Region, AEP*; Appeal No.: 17-047 and 17-050-R. 2017) affecting KGL's ability to impact the wetlands, as described in the Approval.

As a result of the Environmental Appeal, the Minister of Environment and Parks issued a Ministerial Order 06/2018 (the Order), on January 29, 2018, that amended the previously received Approval to include additional conditions to address water quality and quantity impacts to Wetland 06. In June 2018 a Long-Term Monitoring Plan (Monitoring Plan) developed by Hemmera Envirochem (Hemmera) on behalf of KGL to fulfil requirements of the Order (see conditions 6.2 and 6.6) was approved by the Director of Alberta Environment and Parks.

The Monitoring Plan outlined the following obligations:

- The Monitoring Plan will come into effect as soon as approved by the Director and shall remain in effect for a period of five years after the road is officially opened to the public.
- Monitoring of the flow of water into Wetland 06 shall occur in the spring and fall of each year that the plan is in effect.
- Monitoring of water quality in Wetland 06 shall occur in the spring and fall of each year that the plan is in effect, including total dissolved solids, salts, dissolved metals, and other parameters consistent with a stormwater sampling program.
- The monitoring data shall be provided to the Director within one month from the date the data were collected.
- The results of the monitoring and analysis of the monitoring shall be provided to the Director in an annual report by March 31 of the year following the calendar year in which the data were collected.

2.0 Introduction

This monitoring report has been prepared by Ausenco (formerly Hemmera Envirochem Inc) on behalf of KGL. Monitoring of surface water flow and surface water quality in 2022 occurred with reference to the Project's Monitoring Plan (Hemmera 2018). Monitoring in 2022 represented Year 5 of the Monitoring Plan, which will remain in effect throughout construction, and for the first five years of operation of the SWCRR. The construction phase was completed in October 2020 initiating the operational phase. The Monitoring Plan is presented in **Appendix A**.

The objective of Year 5 of monitoring was to follow monitoring protocols established during Year 1, collect surface water quality and surface water flow measurements from sample sites located within Wetland 06, and other waterbodies/drainages providing surface flow to Wetland 06. Consistent with previous years monitoring, surface water quality and surface water flow were monitored in a nearby reference wetland, located outside of the potential impact area of construction, to determine naturally occurring variation affecting wetlands in the Weaselhead Natural Area.

Additional sampling locations and events were added to the Wetland 06 scope in 2020. The additions to the sampling protocol were followed during Year 5 (2022) monitoring:

- Following an Enforcement Order and recommendations provided in the Wetland 06 Sediment Release Remediation Memorandum (Hemmera 2019) in response to two sediment releases from the SWCRR Project area into Wetland 06 in August of 2019, sampling of total dissolved sediment levels and turbidity was conducted at two additional locations within the west end of Wetland 06 near the location of the sediment releases[1].
- Supplemental water quality sampling and sediment sampling along Pathway 1 was conducted during spring and fall monitoring following the occurrence of high zinc concentrations exceeding the regulatory guidelines during the fall 2020 and 2021 sampling event.

In July 2021, a sediment release occurred into Wetland 06 following a significant precipitation event (i.e., 24.6 mm on July 2, 2021, and 12.5 mm on July 4, 2021). Following this event, a Wetland Assessment and Impact Report (WAIR) was submitted to AEP which proposed monitoring as per the methodology outlined in the 2020 Enforcement Order be continued in 2021, 2022, and 2023.

Information collected during Year 5 monitoring will facilitate comparative analysis with data collected during previous monitoring years regarding potential influences or lack thereof of the Project on surface water quality and flow in Wetland 06. Additionally, Year 5 information will contribute to future data collected by Ausenco facilitating long term analysis of potential Project influences on surface water quality and flow in Wetland 06.

[1] Monitoring requirements under the Enforcement Order include water quality monitoring as well as the local amphibian population, vegetation regeneration and weed growth. Monitoring was implemented in 2021 with results provided under separate cover in a Monitoring Report following two years of growing seasons, and a Verification Report following three years of growing seasons as conditioned in the Order. Water quality results collected under the Enforcement Order will be included in this report to supplement the surface water quality results collected annually in wetland 06.

3.0 Site Description

Several adjacent wetlands within the Weaselhead Natural Area contribute surface flow to Wetland 06 (see **Figure 1**). The Monitoring Plan identified two pathways in which Project-influenced water could potentially flow into Wetland 06.

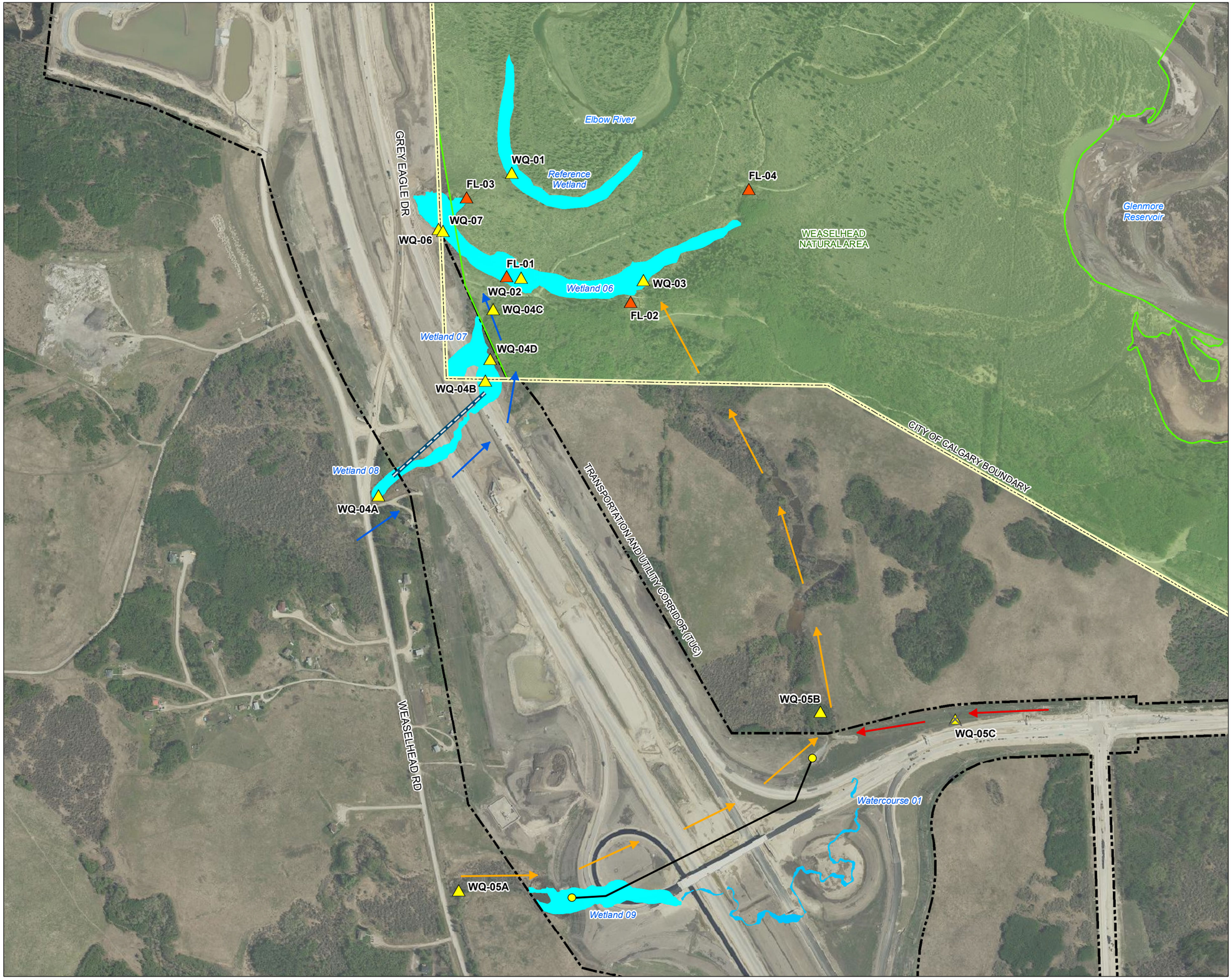
Pathway 1 - conveys flow from Wetland 08 and Wetland 07 which are located to the southwest of Wetland 06. This pathway is an undefined channel that diagonally bisects the Project footprint. From the west side of the TUC boundary, a bypass drainage culvert installed as part of the Project carries water from Wetland 08 and Wetland 07 northeast through the Project area. Water then flows past the east side of the TUC boundary and into a defined channel (approximately 400 m) which ultimately drains into Wetland 06.

Pathway 2 - conveys flow from Wetland 09, located to the south of Wetland 06. This pathway originates as an undefined channel that flows east through Wetland 09 and through a bypass drainage system installed as part of the Project to maintain flow from Wetland 09 to Wetland 06. The drainage system outlets to a constructed riprap lined drainage ditch which flows north towards the eastern TUC boundary. Previously, a constructed drainage ditch channeled water west where it converged with flows from the aforementioned constructed riprap lined drainage ditch. It was noted during 2019 (i.e., Year 2) monitoring visits this constructed drainage ditch had been encompassed by the Project's active construction area and no longer facilitated flow to the west. From the northern edge of the TUC, water meanders north through a defined channel (approximately 1,000 m) eventually draining into Wetland 06.

Throughout the construction phase of the Project, surface run-off from the work area was managed through temporary erosion and sediment control (ESC) measures and redirected away from Wetland 06. During the operational phase of the Project, the natural flow of surface water (i.e., from the west side of the TUC) into Wetland 06 will be maintained via the bypass drainage systems described above. Further, during the operational phase, Project-impacted water will not be discharged into Wetland 06. All Project-impacted water in the vicinity of wetland 06 has been designed to flow northwest into a stormwater pond. The construction phase was completed in October 2020 initiating the operational phase.

Wetland 06 Water Monitoring Report
Southwest Calgary Ring Road Project, Calgary AB

Wetland 06 Supplemental Sampling Stations
November 2020



Legend

- Water Flow Sample Location (Hemmera, 2020)
- Water Quality Sample Location (Hemmera, 2020)
- Decommissioned Water Quality Location (Hemmera, 2019)
- Bypass Culvert
- Pathway #1 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow (Decommissioned)
- Stormwater Drainage Line
- City of Calgary Boundary
- Natural Area
- Transportation and Utility Corridor (TUC)
- Watercourse
- Wetland

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.
3. Sample site WQ-02 was frozen to bottom and could not be sampled.
4. WQ-04A was not sampled as permission to access Weaselhead Road was not received prior to sampling visit.

Sources

- Contains information licensed under the Open Government Licence: Alberta
- Aerial Image: City of Calgary, 2020

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102604-01	Production Date: Dec 17, 2020	Figure 1

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4.0 Methods

Site visits of Wetland 06 and surrounding wetlands during Year 5 were conducted by a crew of two, led by a Qualified Environmental Professional (QEP) from Ausenco. Site visits were conducted during the spring and the fall in order to capture seasonal variability of the wetlands. The timing of each site visit was influenced by environmental conditions, including ambient air temperatures, snow/ice cover, and precipitation events. In order to reduce temporal variation no sampling was conducted within 72 hours of a substantial precipitation event. Site visits followed the schedule outlined by the Monitoring Plan (Appendix A). Site visits were completed on the following dates:

- Spring – May 26, 2022; and
- Fall – October 27 - 28, 2022.

4.1 Sample Locations

The original locations for surface water quality and flow monitoring are provided in **Figure 2**. Sites were originally selected during Year 1 (i.e., 2018) monitoring strategically to provide appropriate reference and comparison site considerations, in order to facilitate comparative analysis. Since year 1, the following adjustments to sampling locations have occurred:

- In 2019, it was noted that a sample site (WQ-05c) located in Pathway 2 had been encompassed by active construction and surface water was no longer accessible for sampling. This sampling point was eliminated from the monitoring plan, and it was determined no additional sampling points were required as sample site WQ-05b located downstream of sample site WQ-05c would reflect water quality and flow changes associated with Pathway 2.
- An additional four sample sites were added to the Monitoring Plan in 2020 to facilitate additional data collection. Two sites were established at the west end of Wetland 06 (i.e., WQ-06 and WQ-07 sampled during spring and fall), with another two sites established along Pathway 1 (i.e., WQ-04c and WQ-04d sampled during spring and fall).

Current locations sampled in 2022 are provided in an enhanced view in **Figure 3**.

4.1.1 Water Quality Monitoring

Eleven surface water quality monitoring sites were sampled during Year 5 monitoring (**Table 4-a**, **Figure 3**), including seven surface water quality monitoring sites originally established during Year 1 (i.e., 2018) and four additional surface water quality monitoring sites established during Year 3 (i.e., 2020).

One surface water quality reference site (WQ-01) is located north of Wetland 06, in an adjacent wetland outside the TUC. This location serves as a reference site as there are no identified or known pathways from the Project that could direct Project-affected water into the adjacent wetland.

Three surface water quality reference sites were originally established along the pathway of flow from Wetland 08 and Wetland 07 into Wetland 06 (i.e., Pathway 1). The three sample sites along this pathway are WQ-04a, WQ-04b, and WQ-02. Site WQ-04a is located upstream of any potential influences from the Project and was selected to serve as a background site for this pathway. Two additional supplementary surface water quality sample sites were added along Pathway 1 in late fall of 2020, following repeated exceedances of zinc concentrations detected along the Pathway 1 sites in Fall 2020. The WQ-04d sample

point is located at 11U 699123, 5652000 UTM and the WQ-04c sample point is located at 11U 699129, 5652100 UTM. These sites were sampled once during Year 3 monitoring, and during both spring and fall sampling during Year 4 and 5 monitoring.

Three surface water quality reference sites are located along the pathway of flow from Wetland 09 to Wetland 06 (i.e., Pathway 2). The sample sites along this pathway during Year 2 monitoring are WQ-05a, WQ-05b, and WQ-03. Site WQ-05a was located upstream of any potential influences from the Project and was selected to serve as a background site for this pathway. In 2019, water quality reference site WQ-05c was no longer accessible for sampling and eliminated from the monitoring plan.

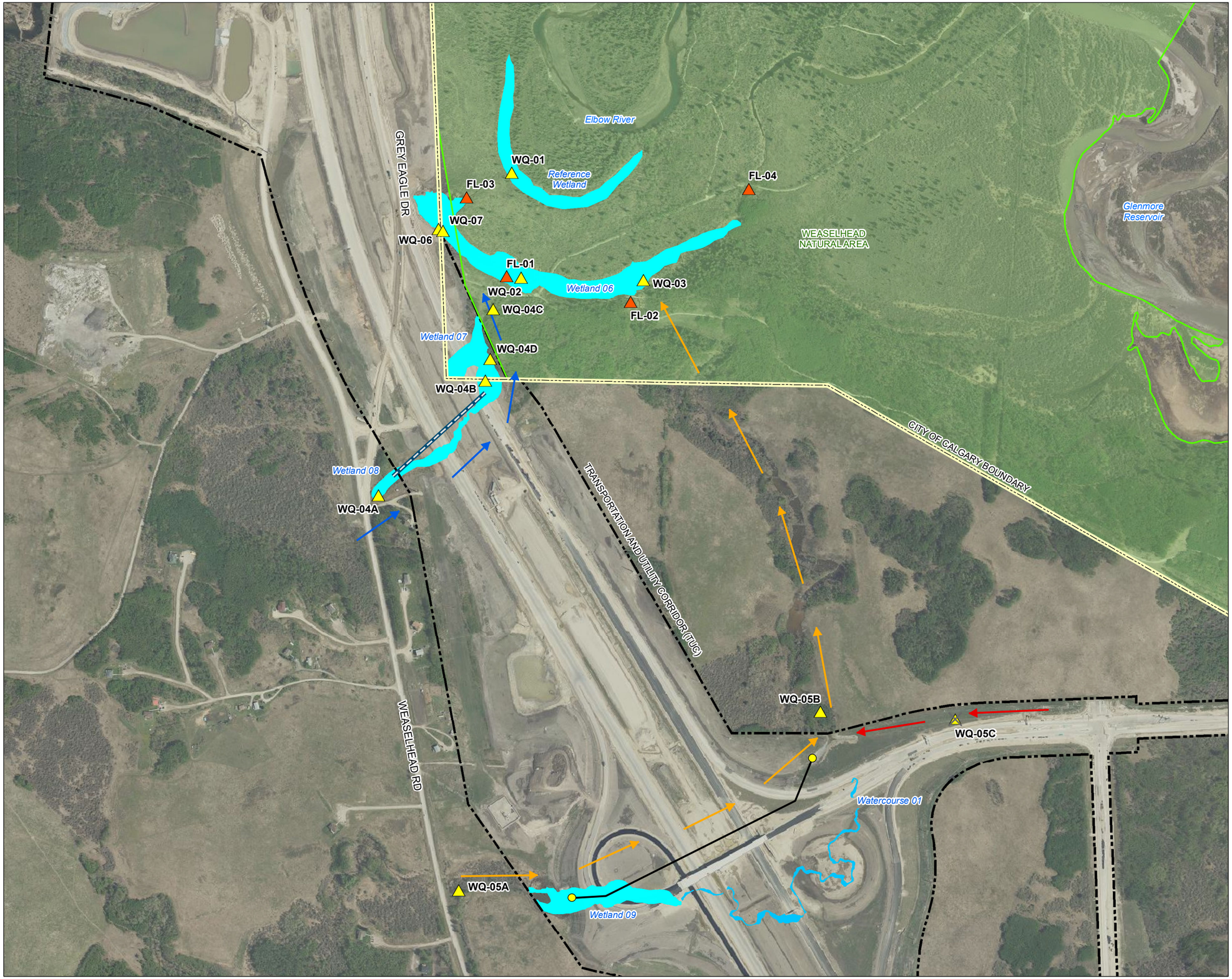
Following the monitoring recommendations of the 2019 Wetland 06 Sediment Release Remediation Memorandum (Hemmera 2020), two new water sample sites (i.e., WQ-06 and WQ-07) were added along a manually vegetated bank (i.e., the green wall) on the west side of Wetland 06. The WQ-06 sample point is located at 11U 699028E, 5652251 N UTM and the WQ-07 sample point is located at 11U 699027, 5652284 UTM.

4.1.2 Sediment Sampling

Sediment sampling was conducted at seven monitoring sites during Year 5 monitoring during both spring and fall sampling (**Table 4-a**). Sediment sampling was originally conducted during Year 3 monitoring following repeated exceedances of zinc concentrations detected along the Pathway 1 sites (i.e., WQ-02, WQ-04a, WQ-04b) in Fall 2020. Sediment sample sites were co-located with five of the originally established surface water quality monitoring sites (i.e., WQ-02, WQ-03, WQ-04a, WQ-04b, and WQ-06), and two additional sites established along Pathway 1 (i.e., WQ-04c and WQ-04d; **Figure 3**).

Wetland 06 Water Monitoring Report
Southwest Calgary Ring Road Project, Calgary AB

Water Flow and Quality Sampling Locations



Legend

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- Water Quality Sample Location (Hemmera, 2020)
- Decommissioned Water Quality Location (Hemmera, 2019)
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102604-01	Production Date: Mar 3, 2021	Figure 2

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Wetland 06 Water Monitoring Report
Southwest Calgary Ring Road Project, Calgary AB

Water Flow and Quality Sampling Location Details

GREY EAGLE DR

WQ-01
T2-1
T2-2
T2-3
T2-4
Reference Wetland
FL-04
FL-03
WQ-06
WQ-07
WQ-05
T1-1
FL-01
WQ-02
T1-2
T1-3
Wetland 06
T1-4
WQ-03
FL-02
WQ-04C
WEASELHEAD NATURAL AREA
Wetland 07
WQ-04D
CITY OF CALGARY BOUNDARY
WQ-04B
TRANSPORTATION AND UTILITY CORRIDOR (TUC)
Wetland 08
WQ-04A

Legend

- Water Flow Sample Location (Hemmera, 2020)
- Water Quality Sample Location (Hemmera, 2020)
- Transect Location (Hemmera, 2019)
- Bypass Culvert
- Pathway #1 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow
- City of Calgary Boundary
- Natural Area
- Transportation and Utility Corridor (TUC)
- Wetland

Notes

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2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: ESRI World Imagery, 2016

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102604-01	Production Date: Mar 3, 2021	Figure 3

Hemmera An Ausenco Company

KGL

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Table 4-a Year 5 (i.e., 2022) Sample Locations

Site Name	Universal Transverse Mercator (Zone 11U)		Site Description	Site Type[1]	Sampling Component	
	Easting	Northing			In-situ and Analytical Water Quality	Sediment Sampling
WQ-01	699168	5652375	Reference wetland to the north of Wetland 06	Reference	X	-
WQ-02	699186	5652164	West (upslope) side of Wetland 06	Comparison	X	X
WQ-03	699432	5652159	East (downslope) side of Wetland 06	Comparison	X	X
WQ-04a	698898	5651725	Wetland 08, upslope of SWCRR Project	Background	X	X
WQ-04b	699113	5651956	Wetland 07, downslope of SWCRR Project and Wetland 08	Comparison	X	X
WQ-04c2	699129	5652100	Wetland 07, downslope of SWCRR Project and WQ-04b	Comparison	X	X
WQ-04d2	699123	5652000	Wetland 07, downslope of SWCRR Project and WQ-04b	Comparison	X	X
WQ-05a	699060	5650929	Upslope of Wetland 09 and SWCRR Project	Background	X	-
WQ-05b	699788	5651289	Watercourse 01 downslope of Wetland 09 and SWCRR Project	Comparison	X	-
WQ-063	699028	5652251	Northwest (upslope) side of Wetland 06 down gradient of the Green Wall	Comparison	X	X
WQ-073	699027	5652284	Northwest (upslope) side of Wetland 06 down gradient of the Green Wall	Comparison	X	-
WQ-05c	700061	5651274	WQ-05c was no longer accessible for sampling and eliminated from the monitoring plan in 2019	Comparison	N/A	N/A

Notes:

[1] The reference site is an adjacent wetland outside the TUC with no identified or known pathways that could direct Project-affected water into the wetland. Background sites are located upstream of potential Project-affected. Comparison sites are located downstream of potential Project affected water.

[2] WQ-4c and WQ4d are two supplemental sample sites added in fall 2020 following repeated exceedances of zinc concentrations detected along the Pathway 1.

[3] WQ-06 and WQ-07 are new sample sites added in spring 2020 following the monitoring recommendations of the 2019 Wetland 06 Sediment Release Remediation Report (Hemmera 2019).

4.1.3 Water Flow Monitoring

Surface water flow monitoring sample sites were established at four locations within Wetland 06 (**Table 4-b**) during Year 1 (i.e., 2018). Sampling locations were selected based on the expectation they would provide conveyance of surface flow (inflow or outflow) year-round during normal surface flow conditions. Locations with defined channels were selected for monitoring sites, as monitoring the flow of undefined channels could result in reduced accuracy (**Figure 3**).

Three sampling locations were identified to measure surface water inflows into Wetland 06. Site FL-01 was located at the inflow of surface water from Wetland 07 and 08 along drainage Pathway 1. Site FL-02 was located where the surface water inflow was conveyed from Wetland 09 along drainage Pathway 2. Site FL-03 was located where the surface water inflow from the reference wetland drained into Wetland 06. One site was established to monitor surface water outflow from Wetland 06; site FL-04 was located 75 m downstream of Wetland 06 at the Glenmore Pathway bridge crossing.

No supplementary surface water monitoring sites were required throughout Year 5 monitoring, as no additional inflow or outflow locations were identified during field sampling visits.

Table 4-b Surface Water Flow Sample Locations

Site Name	Universal Transverse Mercator (Zone 11U)		Inflow or Outflow
	Easting	Northing	
FL-01	699156	5652166	Inflow
FL-02	699406	5652115	Inflow
FL-03	699075	5652326	Inflow
FL-04	699644	5652343	Outflow

4.2 Water Quality Monitoring

Surface water quality sampling was conducted from the banks of the sample sites provided in **Table 4-a** and described in **Section 4.1.1**. Site conditions (e.g., weather) were recorded, and photos documenting current conditions were taken at each location.

Sampling was conducted following the shore sampling protocol provided by Canadian Council of Ministers of Environment (CCME 2011). The crew wore unpowdered nitrile disposable gloves during sample collection. At each sample site, the crew collected water samples using an extension pole to avoid site disturbance. The extension pole and clamp were rinsed upon arrival at each site, before samples were collected, in order to reduce contamination between sites. Laboratory protocols for sample bottle rinsing were followed by the crew; all rinsing of bottles or collection equipment was conducted slightly downslope of the sample site to prevent cross contamination.

Water samples were collected at approximately 60% depth if site conditions allowed and facing upstream if flow was present. During fall sampling several of the sample sites were extremely shallow (i.e., less than 0.10 m of water present), which resulted in samples being collected from the entire water depth. Algae, sediment, organic matter, scum, and film were avoided in order to ensure the sample was representative.

All water samples were collected one at a time, capped immediately to prevent contamination and labelled with a water-proof marker to facilitate accurate identification. After collection, samples were kept at approximately 4°C within a cooler using ice packs. Before transport from site, all samples were packed and sealed to prevent spillage and breakage. Samples were collected and delivered to a laboratory within the same day to allow sample analysis within appropriate holding times.

Bureau Veritas, a laboratory certified by the Standard Council of Canada (SCC), completed the analysis of water samples. A chain of custody form was completed, indicating the transfer of custody from the authorized crew member to the accredited laboratory.

Water quality parameters with a holding time of less than 7-days (i.e., biological oxygen demand, nitrate, nitrite, sulfate, total dissolved solids, and total suspended solids) were immediately analyzed in all samples. Samples collected from the reference wetland (WQ-01) and Wetland 06 (WQ-02 and WQ-03) were immediately analysed for the parameters listed in **Table 4-c**. These parameters are reflective of the City of Calgary Stormwater Management and Design Manual (2011) and likely to facilitate the detection of any potential impacts of the construction and operation phases of the Project. The remaining samples (WQ-04a, WQ-04b, WQ-05a, and WQ-05b) were held by the laboratory and tested if exceedances in Wetland 06 samples were detected in water quality parameters under the Environmental Quality Guidelines for Alberta Surface Water (GOA; Government of Alberta 2018). This testing protocol facilitated the potential determination of source pathway of water quality exceedances in Wetland 06.

Table 4-c Water Quality Parameters

Sediment and Physical	
· Total Suspended Solids (TSS) · Total Dissolved Solids (TDS) · Turbidity	· Specific conductivity (EC) · pH · Dissolved Oxygen (DO)
Nutrients and Others (mg/L)	
· Biochemical Oxygen Demand (BOD) · Chemical Oxygen Demand (COD) · Nitrate (NO_3) · Nitrite (NO_2)	· Total Kjelahl Nitrogen (TKN) · Ammonia-Nitrogen (NH_3-N) · Total Phosphorus (TP) · Dissolved Reactive Phosphorus (TDP) · Ortho-Phosphate
Metals (mg/L)	
· Silver (Ag) · Aluminum (Al) · Arsenic (As) · Boron (B) · Barium (Ba) · Beryllium (Be) · Calcium (Ca) · Cadmium (Cd)	· Cobalt (Co) · Chromium (Cr) · Copper (Cu · Iron (Fe) · Potassium (K) · Lithium (Li) · Magnesium (Mg) · Manganese (Mn)
· Molybdenum (Mo) · Nickel (Ni) · Lead (Pb) · Sulfur (S) · Antimony (Sb) · Selenium (Se) · Silicon (Si)	· Tin (Sn) · Strontium (Sr) · Sodium (Na) · Titanium (Ti) · Thallium (Tl) · Uranium (U) · Vanadium (V) · Zinc (Zn)

Major Ions and Salts	
· Sodium (Na^{2+})	· Calcium (Ca^{2+})
· Potassium (K^{+})	· Chloride (Cl^{-})
· Potassium (K^{+})	· Sulfate (SO^{4-})

In-situ measurements were also collected at all water quality sample sites; sediment and physical parameters were recorded (i.e., turbidity, specific conductivity, dissolved oxygen, pH, and water temperature). Measurements were taken at approximately 60% water depth using an Aquatroll 600 as per the manufacturer's instructions, following calibration.

Year 5 water quality parameters were compared to previous monitoring years (i.e., Year 1, Year 2, Year 3, and Year 4) surface water data. Additionally, select water quality parameters were compared to surface water quality parameters collected from proximate sites in Wetland 06 in 2016 and 2017 by the Weaselhead / Glenmore Preservation Society and presented in their 2017 Environmental Monitoring Report (Porto 2018).

4.3 Sediment Sampling

During spring and fall sampling, sediment samples were collected from seven sites along Pathway 1 and within Wetland 06. Samples were collected from the water-sediment interface at all sites provided in **Table 4-a** and described in **Section 4.1.1**. Site conditions (e.g., water levels) were recorded, and photos documenting current conditions were taken at each location.

Sampling was conducted in alignment with contaminated sediment sampling guidance provided by CCME (1993). Sediment samples were collected from downstream to upstream sites where flow was present to reduce alteration of site conditions prior to sample collection. The crew wore unpowdered nitrile disposable gloves during sample collection. At each sample site, the crew collected sediment samples at the interface of the water and sediments, using a stainless steel trowel and bowl. The trowel and bowl were cleaned with alconox and rinsed with metal free deionized water between each site in order to reduce contamination between sites; all rinsing of collection equipment was conducted downslope and away from the shoreline of the sample site to prevent cross contamination.

The collected sediment was mixed until homogenous; algae, woody debris, organic matter, and rocks were removed from the sample to ensure the sample was representative. All sediment samples were collected one at a time, capped immediately to prevent contamination, and were labelled with a water-proof marker to facilitate accurate future identification. After collection, samples were kept at approximately 4^{o}C within a cooler using ice packs. Before transport from site, all samples were packed and sealed to prevent spillage and breakage. Samples were collected and delivered to a laboratory within the same day to allow sample analysis within appropriate holding times.

Bureau Veritas, a laboratory certified by SCC, completed the analysis of sediment samples. A chain of custody form was completed, indicating the transfer of custody from the authorized crew member to the laboratory. Sediment monitoring parameters are presented in **Table 4-d**.

Table 4-d Sediment Parameters

Field Parameter			
· Percent saturation			
Inorganics			
· Boron Sat Paste (mg/L)	· Moisture (%)		
Metals (mg/kg)			
· Arsenic (As)	· Chromium (Cr)	· Lead (Pb)	· Uranium (U)
· Boron (B)	· Chromium, hexavalent	· Antimony (Sb)	· Vanadium (V)
· Barium (Ba)	· Copper (Cu)	· Selenium (Se)	· Zinc (Zn)
· Beryllium (Be)	· Molybdenum (Mo)	· Silver (Ag)	
· Cadmium (Cd)	· Mercury (Mg)	· Tin (Sn)	
· Cobalt (Co)	· Nickel (Ni)	· Thallium (Tl)	

4.4 Water Flow Monitoring

Surface flow monitoring was conducted by the crew at the sample sites provided in **Table 4-b** and described in **Section 4.1.2**. Surface flow was determined using the velocity-area method (Government of Alberta 2009) and a HACH® velocity flow meter. During spring monitoring the outflow channel (FL-04) was dry at the time of survey. During the fall survey the inflow channel from the reference wetland (FL-03) and the outflow channel (FL-04) were dry, preventing the collection of flow measurements. Following each seasonal monitoring visit, the inflows and outflow of Wetland 06 were used to calculate a modified water balance within the wetland.

Water level measurements were taken at staff gauges located within Wetland 06 and the reference wetland during spring and fall monitoring visits. The water level staff gauges were originally deployed during spring 2018, during Year 1 monitoring.

Wetted width was measured at three transects in Wetland 06 and one transect in the reference wetland during the spring monitoring visit. Transect locations were established during Year 1 (i.e., 2018) monitoring (**Figure 3**). The location of each transect was recorded in reference to distinct local landmarks and using a global positioning system (GPS) device. Transect measurements of wetted widths of Wetland 06 were replicated by the crew during the fall sampling visit. There was no surface water present in the reference wetland during fall sampling, as a result the wetted width was not measured.

Water level and wetted width of Wetland 06 and the reference wetland were compared and used to assess if the wetted perimeter of Wetland 06 was impacted by Project activities, by accounting for seasonal variability resulting from natural fluctuations.

5.0 Results

5.1 Water Quality Monitoring and Sediment Sampling

5.1.1 2022 Water Quality and Sediment Results

Water quality parameters outlined in **Table 4-c** were collected from sample sites located within Wetland 06, the inflow pathways from Wetlands 07 and 08, and Wetland 09, as well as the reference wetland. During spring and fall monitoring, water quality samples could not be collected from WQ-05A and WQ-01 as these sites were dry during the monitoring visits.

Water quality sampling results between 2018 and 2022 from WQ-01, WQ-02, and WQ-03 are summarized in **Table 5-a1** and demonstrate the natural variability within Wetland 06 and the reference wetland during both spring and fall. Additionally, the 2022 results for water quality sampling within along Pathways 1 and 2 are shown in **Table 5-a2.** The certificate of analysis for surface water results and raw water quality data from all viable sample sites are provided in **Appendix B and C.** Photographs taken at each sample site are provided in **Appendix D.**

Following recommendations from the Year 3 (2020) and Year 4 (2023) Monitoring Reports, sediment sampling was repeated during Year 5 within Wetland 06 and along Pathway 1. Sediment samples were collected and tested for total metals. Sediment analytical results are presented in provided in **Table 5-b**. The certificate of analysis for sediment results and raw data is provided in **Appendix B and C**.

Water quality results from Year 5 sampling were compared to the Environmental Quality Guidelines (EQG) for Alberta Surface Water (GOA 2018). For parameters with no Alberta EQG, comparisons were made to the CCME Canadian Environmental Quality Guidelines (CCME 1999). In the text below, both Alberta and CCME water quality guidelines are referred to as the EQGs. Sediment analytical results were compared to the Canadian sediment quality guidelines. The following exceedances were observed:

Uranium: Marginally elevated uranium concentrations (above the EQG of 0.015 mg/L) were recorded at the Wetland 06 sample site WQ-03 in both the spring and fall (0.016 mg/L for both events). Additionally, within Wetland 06 at sample site WQ-02, the uranium concentrations were elevated compared to previous years but remained below the EQG. No uranium exceedances were recorded from the other samples collected.

Elevated uranium concentrations may be considered naturally occurring and background conditions given the surficial geology of the area. The geology can be characterized as either fluvial deposits (sedimentary) of the Holocene epoch, or morainal deposits (diamicton till) of the Pleistocene epoch (AGS 2015). Both sedimentary deposits and diamicton till within Alberta have been found to contain uranium (CCME 2007; AITF 2011). It is likely that the uranium is weathering out of deposits into the water. Exceedances of the long-term exposure guideline at WQ-03 is marginal (0.015 mg/L versus 0.016 mg/L during the sampling events) and may fall within natural variation. Therefore, it is unlikely that the uranium concentrations observed within the Project corridor are anthropogenic.

Zinc: In previous years elevated zinc concentrations (above EQG of 0.003 mg/L) were recorded in water samples at the Wetland 06 sample site WQ-02 and along Pathway 1 (WQ-04b, WQ-04d, and WQ-04c). In 2022, no zinc exceedances in surface water were observed within Wetland 06 sample sites (i.e., WQ-02, WQ-06, and WQ-07), however, zinc concentrations in water samples at WQ-04c and WQ-04d along Pathway 1 were in exceedance in both the spring and the fall. Zinc concentrations in sediment samples collected at

WQ-04b, WQ-04c and WQ-04d were also in exceedance in both spring and fall. No zinc exceedance was documented at WQ-04a (background, upslope of SWCRR Project) in spring or fall.

Elevated zinc concentrations at WQ-04b, WQ-04c and WQ-04d, but not at WQ-04a (i.e., upslope of the SWCRR Project influences) suggests that project activities may be contributing to elevated concentrations of total zinc present along Pathway 1. Zinc has previously been detected above EQG at WQ-02, and along various downstream Pathway 1 sample sites since 2018.

A galvanized culvert, under Tsuut'ina Trail, which conveys Pathway 1 flow from the background sample site WQ-04a to the upstream most comparison site WQ-04b has been identified as a possible source of zinc. Zinc is a common component of galvanized coatings which are used to inhibit corrosion. Other common adsorbents (cadmium, cobalt, copper, and lead) which may indicate more diverse sources of contamination were all less than the analytical detection limit or present in very low concentrations less than their applicable guideline, further supporting the interpretation that the culvert is the source of zinc.

Analytical results from sampling in 2022 indicate generally decreasing zinc concentrations compared with previous years in surface water along the Pathway 1. The decreasing concentration of dissolved zinc in water samples over sampling years in combination with the elevated total zinc concentrations in the sediment along the flow path support the interpretation that zinc is attenuating into the sediment from the surface water as it flows downstream. Water quality and sediment analytical results at Wetland 06 sites (i.e., WQ-03 and WQ-06) indicated zinc concentrations less than applicable guidelines also supporting the interpretation that the area of impact of elevated zinc is of limited spatial extent.

Other metals: Elevated concentrations of chromium, nickel, selenium, and arsenic were recorded in sediment samples during both spring and fall 2022 sampling (**Table 5-b**). These elevated concentrations are most likely naturally occurring and are representative of background conditions. Concentrations were similar across the Project. Increased diligence should be taken in regard to these metals in subsequent monitoring years.

Turbidity: Turbidity measurements were noted to be elevated throughout Wetland 06 sample sites (i.e., WQ-02, WQ-03, and WQ-06) during Year 4 (i.e., 2021) fall sampling. In Year 5 (i.e., 2022), during fall and spring sampling it was recorded that turbidity was elevated at only one site within Wetland 06 at WQ-02. Turbidity was elevated in the spring from 2, 1.17, and 9.7 NTU in 2019, 2020, and 2021, respectively, to 40 NTU in 2022 and in the fall from 5.4, 8.9, 7.7, and 110 NTU in 2018, 2019, 2020, and 2021 respectively, to 130 NTU in 2022. Turbidity is a measure of the amount of particulate matter (e.g., sediment, organic matter, algae, etc.) suspended in the water and can be elevated as a result of any disturbance in the water. Water levels were low during the fall and spring visit; as a result, sampling occurred within deeper channelized areas in the middle of the wetland. Although no disturbance was documented at the time of sampling, higher turbidity values may be attributed to low water levels and recent activity in these channels.

Total dissolved solids: TDS concentrations were elevated in spring 2022 at WQ-02. TDS refers to the concentration of dissolved substances in water and is directly related to the conductivity of water. TDS concentrations had returned to lower than historical concentrations by fall of 2022.

Total suspended solids: TSS concentrations were elevated in the spring and fall at WQ-02. TSS refers to the measure of the amount of particulate matter suspended the water. Similar to turbidity, TSS can be elevated as a result of any disturbance in the water. Water levels were low during the fall and spring visit;

as a result sampling occurred within deeper channelized areas in the middle of the wetland. Although no disturbance was documented at the time of sampling, higher TSS concentrations may be attributed to low water levels and recent activity in these channels.

Table 5-a1 Summary of 2018 to 2022 Water Quality Sampling Results

			WQ-01 (reference)										WQ-02									
			Summer	Spring				Fall					Summer	Spring				Fall				
	AB SW Fresh-water Aquatic Life (Long-term)	AB SW Fresh-water Aquatic Life (Short-term)	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	25/06/2022	11/10/2018*	16/10/2019	15/10/2020*	21/10/2021	28/10/2022	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	11/10/2018	16/10/2019	15/10/2020	21/10/2021	28/10/2022
Sediment and Physical																						
Total Suspended Solids (TSS) (mg/L)	Narr.	Narr.	18	3.1	1	14	-	-	8	-	-	-	17	2.1	2.5	15	110	9.7	17	23	100	220
Total Dissolved Solids (TDS) (mg/L)	N/A	N/A	530	520 - 570	560	570	-	-	490 - 510	-	-	-	470	430 - 450	380	430	830	490	450 - 460	490	490	340
Turbidity (NTU)	Narr.	Narr.	6.5	3.3	1.1	6.5	-	-	1.8	-	-	-	7	2	1.7	9.7	40	5.4	8.9	7.7	110	130
Conductivity (EC) (mS/cm)	N/A	N/A	950	970	1000	1000	-	-	900	-	-	-	850	780	680	760	1400	850	810	780	820	665
pH	6.50 – 9.00	N/A	8.13	7.97	7.91	7.82	-	-	8.12	-	-	-	8.25	8.26	8.34	8.32	7.64	8.25	8.22	8.3	8.14	8.15
Dissolved Oxygen (mg/L)	Nar.	5	2.2	5.1	3.2	2.8	-	-	3.7	-	-	-	10	7.7	11	7.6	10.94	11	10	10	7	11.25
Nutrients and Others (mg/L)																						
Biochemical Oxygen Demand (BOD)	N/A	N/A	3.2	<2	<2.0	<2.0	-	-	3.3	-	-	-	<2.0	<2	2.2	<2.0	<3.3	<2.0	<2.0	<2.0	<2.0	6.4
Chemical Oxygen Demand (COD)	N/A	N/A	36	30	28	27	-	-	34	-	-	-	35	30	27	34	21	15	18	<10	32	177
Nitrate (NO3)	3	124	<0.044	<0.044	<0.044	<0.044	-	-	<0.044	-	-	-	<0.044	<0.044	<0.044	<0.22	<0.044	0.6	0.079	0.71	0.19	0.11
Nitrite (NO2)	Narr	Narr	<0.033	<0.033	<0.033	<0.033	-	-	<0.033	-	-	-	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.033	<0.010	<0.006
Total Kjelahl Nitrogen (TKN)	N/A	N/A	1.5	0.58	0.58	0.834	-	-	0.72	-	-	-	0.81	0.55	0.9	1.05	0.427	0.44	0.37	0.31	0.58	0.414
Ammonia-Nitrogen (NH3-N)	Narr	Narr	0.043	0.03	0.066	0.045	-	-	0.058	-	-	-	0.045	0.027	0.075	0.02	-	<0.015	0.065	0.063	0.091	-
Ortho-Phosphate	N/A	N/A	0.008	0.013	0.0036	0.004	-	-	0.03	-	-	-	0.0068	0.0037	0.0033	<0.003	0.00045	0.0034	<0.003	0.0053	0.0034	0.0039
Total Metals (mg/L)																						
Silver (Ag)	N/A	0.0025 mg/L	<0.0001	<0.0001	<0.00010	<0.00010	-	-	<0.0001	-	-	-	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum (Al)	0.050 mg/L	0.1mg/L	<0.003	<0.003	<0.0030	<0.0030	-	-	0.0037	-	-	-	<0.003	<0.003	<0.0030	0.0059	0.003	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001
Arsenic (As)	0.005 mg/L	N/A	0.0013	0.00063	0.00095	0.0021	-	-	0.0035	-	-	-	0.0021	0.0008	0.0011	0.0017	0.0008	0.00061	0.00046	0.0004	0.00074	0.00042
Boron (B)	1.500 mg/L	29.000mg/L	0.032	0.032	0.036	0.041	-	-	0.025	-	-	-	0.032	0.046	0.041	0.064	0.069	0.04	0.033	0.03	0.051	0.022
Barium (Ba)	N/A	N/A	0.23	0.15	0.17	0.18	-	-	0.13	-	-	-	0.13	0.14	0.12	0.12	0.081	0.11	0.1	0.083	0.14	0.08
Beryllium (Be)	N/A	N/A	<0.001	<0.001	<0.0010	<0.0010	-	-	<0.001	-	-	-	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Calcium (Ca)	N/A	N/A	97	93	98	100	-	-	83	-	-	-	80	58	55	45	88	73	67	68	73	46
Cadmium (Cd)	Narr	Narr	<0.00002	<0.001	<0.000020	<0.000020	-	-	<0.001	-	-	-	<0.00002	<0.001	<0.000020	<0.000020	<0.000020	<0.00002	<0.001	<0.000020	<0.000020	<0.000020
Cobalt (Co)	Narr	Narr	0.00074	<0.0003	<0.00030	0.00088	-	-	0.00058	-	-	-	0.00041	<0.0003	<0.00030	<0.00030	0.00051	<0.0003	<0.0003	<0.00030	<0.00030	<0.00030
Chromium, hexavalent (Cr)	0.001	N/A	<0.001	<0.001	<0.0010	<0.0010	-	-	<0.001	-	-	-	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010

			WQ-01 (reference)										WQ-02									
			Summer	Spring				Fall					Summer	Spring				Fall				
	AB SW Fresh-water Aquatic Life (Long-term)	AB SW Fresh-water Aquatic Life (Short-term)	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	25/06/2022	11/10/2018*	16/10/2019	15/10/2020*	21/10/2021	28/10/2022	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	11/10/2018	16/10/2019	15/10/2020	21/10/2021	28/10/2022
Copper (Cu)	0.007	Narr	0.00021	0.00085	0.03	0.00038	-	-	0.0016	-	-	-	0.00025	0.00071	0.00067	0.0032	0.0012	0.00036	<0.0002	0.00054	0.014	<0.0010
Iron (Fe)	0.30mg/L	N/A	**1**	0.2	<0.060	0.072	-	-	0.09	-	-	-	<0.06	0.083	0.09	<0.060	<0.060	0.1	<0.06	0.083	<0.060	<0.060
Potassium (K)	N/A	N/A	1.7	3.7	4.7	4.7	-	-	13	-	-	-	4.1	4.7	4.2	4.6	1.8	2.3	3.6	4.3	5.2	2.9
Lithium (Li)	N/A	N/A	<0.02	<0.02	<0.020	0.022	-	-	<0.02	-	-	-	0.024	<0.02	<0.020	0.029	0.037	0.026	0.023	0.022	0.023	<0.022
Magnesium (Mg)	N/A	N/A	49	48	49	57	-	-	44	-	-	-	49	47	41	49	100	53	49	46	53	36
Manganese (Mn)	N/A	N/A	0.44	0.063	0.089	0.56	-	-	0.53	-	-	-	0.12	0.016	0.0063	0.02	0.072	0.065	0.02	0.022	0.069	0.079
Molybdenum (Mo)	0.073mg/L	N/A	0.00036	0.001	0.00082	0.00094	-	-	0.0013	-	-	-	0.0038	0.0025	0.0021	0.0028	0.0022	0.0019	0.0017	0.0016	0.0031	0.00075
Nickel (Ni)	Narr	Narr	0.0011	0.00079	0.0017	0.0017	-	-	0.0016	-	-	-	0.0014	0.0008	0.0011	0.0015	0.0013	0.00066	0.00063	<0.00050	0.00073	<0.00050
Lead (Pb)	Narr	Narr	<0.0002	<0.0002	<0.00020	<0.00020	-	-	<0.0002	-	-	-	<0.0002	<0.0002	<0.00020	<0.00020	<0.060	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Sulfur (S)	N/A	N/A	3	6.9	14	6.1	-	-	14	-	-	-	7.7	17	15	17	61	20	21	18	25	22
Antimony (Sb)	N/A	N/A	<0.0006	<0.0006	<0.00060	<0.00060	-	-	<0.0006	-	-	-	<0.0006	<0.0006	<0.00060	<0.00060	<0.00060	<0.0006	<0.0006	<0.00060	<0.00060	<0.00060
Selenium (Se)	0.001 mg/L	N/A	<0.0002	<0.0002	<0.00020	<0.00020	-	-	<0.0002	-	-	-	**0.0011**	0.0006	0.00088	0.00082	0.0003	**0.0014**	**0.0011**	**0.0013**	**0.0014**	0.00044
Silicon (Si)	N/A	N/A	4.4	8.1	12	8.8	-	-	5.6	-	-	-	6	0.92	1.5	0.73	4.4	5.2	4.4	4.7	4.9	3.2
Tin (Sn)	N/A	N/A	<0.001	0.0013	<0.0010	<0.0010	-	-	<0.001	-	-	-	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Strontium (Sr)	N/A	N/A	0.63	0.58	0.61	0.66	-	-	0.53	-	-	-	0.85	0.64	0.55	0.56	1.1	0.74	0.72	0.68	0.71	0.5
Sodium (Na)	Narr	Narr	49	45	45	46	-	-	39	-	-	-	34	38	33	47	98	44	45	41	51	47
Titanium (Ti)	N/A	N/A	<0.001	<0.001	<0.0010	<0.0010	-	-	<0.001	-	-	-	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Thallium (Tl)	0.0008 mg/L	N/A	<0.0002	<0.0002	<0.00020	<0.00020	-	-	<0.0002	-	-	-	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Uranium (U)	0.015 mg/L	0.033 mg/L	0.00044	0.0018	0.0011	0.0015	-	-	0.0022	-	-	-	0.0031	0.0059	0.0035	0.0054	0.013	0.0048	0.0043	0.0032	0.0065	0.011
Vanadium (V)	N/A	N/A	<0.001	<0.001	<0.0010	<0.0010	-	-	<0.001	-	-	-	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Zinc (Zn)	0.003 mg/L	N/A	<0.003	<0.003	**0.0062**	**0.0045**	-	-	**0.0051**	-	-	-	<0.003	<0.003	<0.0030	**0.016**	<0.0030	**0.013**	**0.018**	**0.0071**	<0.0030	<0.0030
Major Ions and Salts																						
Chloride (Cl-)	120	640	12	17	16	15	-	-	27	-	-	-	41	13	12	15	22	12	7.3	11	11	9.6
Sulphate (SO4-)	Narr	Narr	6.6	21	44	18	-	-	40	-	-	-	24	56	50	59	230	59	65	62	66	63

Table 5-a1 Summary of 2018 to 2022 Water Quality Sampling Results (continued)

	WQ-03									
	Summer			Spring			Fall			
	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	11/10/2018	16/10/2019	15/10/2020	21/10/2021	28/10/2022
Total Suspended Solids (TSS) (mg/L)	3.5	14	7.1	43	31	25	8.4	26	82	22
Total Dissolved Solids (TDS) (mg/L)	270	370 - 390	340	450	31	390	440 - 450	460	460	540
Turbidity (NTU)	2.6	1.8	7.4	21	15	17	6.5	11	76	22
Conductivity (EC) (mS/cm)	500	690	620	800	950	710	800	750	760	893
pH	**9.1**	8.33	8.29	8.22	8.15	8.09	8.29	7.96	7.72	8.17
Dissolved Oxygen (mg/L)	14	7.9	9.4	8	11.35	**4.3**	8	8.2	**1.8**	10.62
Biochemical Oxygen Demand (BOD)	<2.0	<2	2.3	<2.0	<2.2	3.5	2.5	4.3	9.7	4.5
Chemical Oxygen Demand (COD)	27	40	42	42	35	37	44	41	83	70
Nitrate (NO3)	0.072	<0.044	**8**	<0.22	<0.044	<0.044	<0.044	<0.22	0.027	0.5
Nitrite (NO2)	<0.007	<0.008	<0.009	<0.010	<0.033	<0.012	<0.013	<0.014	<0.015	<0.016
Total Kjelahl Nitrogen (TKN)	0.86	0.64	1.6	1.52	1.1	0.9	1	1.9	2.3	2.89
Ammonia-Nitrogen (NH3-N)	0.024	<0.015	0.093	0.028	-	0.039	0.11	0.48	0.17	-
Ortho-Phosphate	0.0085	0.0039	0.004	0.0037	0.005	<0.003	<0.003	0.0053	0.0083	0.0064
Silver (Ag)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00021	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001
Aluminum (Al)	<0.0001	<0.0001	<0.00010	<0.00010	0.0052	0.0034	0.0051	0.0043	0.083	<0.0030
Arsenic (As)	0.0016	0.0011	0.0012	0.0021	0.0013	0.0012	0.0011	0.0023	0.0028	0.0021
Boron (B)	0.028	0.031	0.033	0.043	0.057	0.041	0.035	0.051	0.078	0.054
Barium (Ba)	0.069	0.15	0.14	0.19	0.14	0.21	0.18	0.23	0.27	0.28
Beryllium (Be)	0.069	0.15	0.14	0.19	<0.0010	0.21	0.18	0.23	0.27	<0.0010
Calcium (Ca)	30	57	54	65	90	52	67	60	69	70
Cadmium (Cd)	<0.00002	<0.001	<0.000020	<0.000020	<0.000020	<0.00002	<0.001	<0.000020	<0.000020	<0.000020
Cobalt (Co)	<0.0003	<0.0003	<0.00030	<0.00030	<0.00030	<0.0003	<0.0003	<0.00030	<0.00030	<0.00030
Chromium, hexavalent (Cr)	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Copper (Cu)	0.0004	0.00047	0.0012	0.00054	0.0031	<0.0002	0.00045	<0.00020	0.0017	0.0012
Iron (Fe)	<0.06	0.076	<0.060	0.068	<0.060	0.064	<0.06	0.1	0.25	<0.060

	WQ-03									
	Summer			Spring			Fall			
	05/06/2018	29/05/2019	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	11/10/2018	16/10/2019	15/10/2020	21/10/2021	28/10/2022
Potassium (K)	3.6	5.8	5.7	6.4	8	6.8	5.5	8.6	10	10
Lithium (Li)	<0.02	<0.02	<0.020	0.021	<0.020	<0.02	<0.02	0.021	0.023	0.02
Magnesium (Mg)	35	42	33	48	60	43	52	43	47	52
Manganese (Mn)	0.0083	0.0098	0.0053	0.037	0.04	0.025	0.012	0.12	0.29	0.012
Molybdenum (Mo)	0.0028	0.0025	0.0029	0.0052	0.0083	0.0057	0.0027	0.0064	0.0098	0.0094
Nickel (Ni)	0.00098	0.0011	0.0021	0.0023	0.0021	0.0014	0.0027	0.001	0.0017	0.0016
Lead (Pb)	<0.0002	<0.0002	<0.00020	<0.00020	<0.060	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Sulfur (S)	10	8.1	18	17	61	14	6.4	13	30	43
Antimony (Sb)	<0.0006	<0.0006	<0.00060	<0.00060	<0.00060	<0.0006	<0.0006	<0.00060	<0.00060	<0.00060
Selenium (Se)	0.0006	0.00033	0.00073	0.00056	0.00071	0.0004	0.00036	0.00049	0.00037	0.00058
Silicon (Si)	1.2	1.3	3.1	0.9	0.9	1.4	4	3.1	4.1	0.81
Tin (Sn)	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Strontium (Sr)	0.37	0.51	0.4	0.54	0.69	0.52	0.62	0.55	0.58	0.6
Sodium (Na)	23	26	26	34	38	34	34	37	47	36
Titanium (Ti)	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.001	<0.0010	0.0018	<0.0010
Thallium (Tl)	<0.001	<0.001	<0.0010	<0.0010	<0.00020	<0.001	<0.001	<0.0010	0.0018	<0.00020
Uranium (U)	0.0023	0.0052	0.003	0.0085	**0.016**	0.0083	0.0056	0.0071	0.0075	**0.016**
Vanadium (V)	<0.001	<0.001	<0.0010	<0.0010	0.0011	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Zinc (Zn)	<0.003	<0.003	<0.0030	<0.0030	<0.0030	<0.003	<0.003	<0.0030	**0.0043**	<0.0030
Major Ions and Salts										
Chloride (Cl-)	51	12	18	23	18	29	12	15	24	25
Sulphate (SO4-)	34	24	55	58	180	40	20	49	74	120

Note: * WQ01 was dry during fall sampling visit.

Bold = Indicates exceedance of CCME water quality guidelines
(-) = null result.

Narr = Narrative guidelines.
N/A = CCME data regarding water quality limits for specified parameter is unavailable.

Table 5-a2 Summary of 2022 Water Quality Sampling Results along Pathways 1 and 2

	AB SW Fresh-water Aquatic Life (Long-term)	AB SW Fresh-water Aquatic Life (Short-term)	WQ-04a	WQ-04B		WQ-04C		WQ-04D		WQ-05B	
			27/10/2022	25/05/2022	27/10/2022	25/05/2022	28/10/2022	25/05/2022	27/10/2022	25/05/2022	27/10/2022
Sediment and Physical											
Total Suspended Solids (TSS) (mg/L)	Narr.	Narr.	-	470	-	480	-	460	-	620	-
Total Dissolved Solids (TDS) (mg/L)	N/A	N/A	-	580	-	430	-	420	-	550	-
Turbidity (NTU)	Narr.	Narr.	-	12	-	18	-	18	-	8	-
Conductivity (EC) (mS/cm)	N/A	N/A	2	-	880	-	860	-	820	-	1100
pH	6.50 – 9.00	N/A	-	-	8.08	-	8.34	-	8.41	-	8.13
Dissolved Oxygen (mg/L)	Nar.	5	-	-	-	-	-	-	-	-	-
Nutrients and Others (mg/L)											
Biochemical Oxygen Demand (BOD)	N/A	N/A	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	N/A	N/A	-	-	-	-	-	-	-	-	-
Nitrate (NO3)	3	124	-	<0.044	-	<0.044	-	<0.22	-	0.058	-
Nitrite (NO2)	Narr	Narr	-	<0.010	-	<0.010	-	<0.050*	-	0.013	-
Total Kjelahl Nitrogen (TKN)	N/A	N/A	-	-	0.651	-	0.402	-	0.142	-	0.549
Ammonia-Nitrogen (NH3-N)	Narr	Narr	-	-	-	-	-	-	-	-	-
Ortho-Phosphate	N/A	N/A	-	<0.0030	-	<0.0030	-	0.0031	-	<0.0030	-
Dissolved Metals (mg/L)											
Silver (Ag)	N/A	0.0025 mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Aluminum (Al)	0.050 mg/L	0.1 mg/L	0.003	<0.0030	<0.0030	0.014	<0.0030	<0.0030	<0.0030	0.006	<0.0030
Arsenic (As)	0.005 mg/L	N/A	<0.00020	0.001	<0.00020	0.0007	0.00026	0.00063	<0.00020	0.0015	0.00086
Boron (B)	1.500 mg/L	29.000 mg/L	0.045	0.078	0.053	0.073	0.04	0.067	0.037	0.045	0.025
Barium (Ba)	N/A	N/A	0.062	0.19	0.059	0.094	0.078	0.099	0.069	0.14	0.13
Beryllium (Be)	N/A	N/A	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Calcium (Ca)	N/A	N/A	70	85	74	70	69	67	69	78	88
Cadmium (Cd)	Narr	Narr	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Cobalt (Co)	Narr	Narr	<0.00030	0.00056	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.00034	<0.00030
Chromium (Cr)	0.001	N/A	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Copper (Cu)	0.007	Narr	0.0022	<0.0010	<0.0010	0.0012	0.0017	0.0024	<0.0010	0.0028	0.0026
Iron (Fe)	0.30 mg/L	N/A	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
Potassium (K)	N/A	N/A	3.8	2.1	4.1	4.2	4.8	4	4.8	5.8	3.8
Lithium (Li)	N/A	N/A	0.025	0.033	0.022	0.021	0.022	0.022	0.021	0.022	<0.020
Magnesium (Mg)	N/A	N/A	39	100	43	50	47	48	42	75	67

	AB SW Fresh-water Aquatic Life (Long-term)	AB SW Fresh-water Aquatic Life (Short-term)	WQ-04a	WQ-04B		WQ-04C		WQ-04D		WQ-05B	
			27/10/2022	25/05/2022	27/10/2022	25/05/2022	28/10/2022	25/05/2022	27/10/2022	25/05/2022	27/10/2022
Manganese (Mn)	N/A	N/A	<0.0040	0.12	0.0046	0.035	0.008	0.036	0.012	0.055	0.27
Molybdenum (Mo)	0.073 mg/L	N/A	0.0024	0.0011	0.0015	0.0018	0.0019	0.0019	0.0019	0.0039	0.002
Nickel (Ni)	Narr	Narr	<0.00050	0.0018	<0.00050	0.001	<0.00050	0.0007	<0.00050	0.0018	0.00098
Lead (Pb)	Narr	Narr	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Sulfur (S)	N/A	N/A	16	19	18	17	27	16	23	48	48
Antimony (Sb)	N/A	N/A	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060
Selenium (Se)	0.001 mg/L	N/A	0.0028	0.00038	0.0028	0.0011	0.0014	0.0012	0.0015	0.0024	0.0018
Silicon (Si)	N/A	N/A	4	7.8	3.8	4.3	4.6	4.1	4.5	1.4	3.7
Tin (Sn)	N/A	N/A	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Strontium (Sr)	N/A	N/A	0.66	1.1	0.77	0.73	0.69	0.72	0.66	0.67	0.7
Sodium (Na)	Narr	Narr	41	46	41	47	43	45	42	41	37
Titanium (Ti)	N/A	N/A	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Thallium (Tl)	0.0008 mg/L	N/A	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Uranium (U)	0.015 mg/L	0.033 mg/L	0.0044	0.0058	0.0042	0.0042	0.0042	0.0045	0.0035	0.014	0.0091
Vanadium (V)	N/A	N/A	<0.0010	0.0011	<0.0010	0.001	<0.0010	0.0011	<0.0010	0.0012	<0.0010
Zinc (Zn)	0.003 mg/L	N/A	<0.0030	<0.0030	<0.0030	0.015	0.0073	0.015	0.029	<0.0030	<0.0030
Major Ions and Salts											
Chloride (Cl-)	120	640	1	-	36	-	11	-	9.8	-	17
Sulphate (SO4-)	Narr	Narr	1	-	54	-	81	-	69	-	140

Note: * WQ01 was dry during fall sampling visit.

Bold = Indicates exceedance of CCME water quality guidelines
(-) = null result.

Narr = Narrative guidelines.
N/A = CCME data regarding water quality limits for specified parameter is unavailable.
Location 5a was dry during both the spring and fall sampling.

Table 5-b Summary of Sediment Sampling Results from 2020 to 2022

		Canadian ISQG	AB Sediment Probable Effects Level	AB Sediment Lowest Effects Level	Units	WQ-04A			WQ-04B					WQ-04D					WQ-04C				
						04/06/2021	21/10/2021	28/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022
Regulated Metals - Sediment																							
Field Parameter	Percent Saturation	N/A	N/A	N/A	%	110	120	-	62	63	70	100	-	60	64	42	56	-	65	56	54	65	-
Inorganics	Boron Sat Paste	N/A	N/A	N/A	mg/L	0.13	0.21	-	0.18	0.12	0.12	0.11	-	<0.1	0.11	0.18	<0.010	-	0.18	0.12	0.18	<0.10	-
	Moisture	N/A	N/A	N/A	%	68	-	-	40	43	-	73	-	48	53	-	34	-	48	36	-	47	-
Metals	Antimony	N/A	N/A	N/A	mg/kg	<0.5	<0.5	<1.0	<0.5	<0.5	<0.50	<0.50	<0.50	<0.5	<0.5	0.52	<0.50	<0.50	<0.5	<0.5	<0.50	<0.50	-
	Arsenic	5.9	17	N/A	mg/kg	3.1	4.5	<2.0	**5.9**	4.5	5.4	4.8	4.4	2.9	3	**6.7**	3.5	3.6	4.6	3.4	5.3	3.3	-
	Barium	N/A	N/A	N/A	mg/kg	190	230	94	290	200	250	200	190	170	220	330	170	200	290	210	250	160	-
	Beryllium	N/A	N/A	N/A	mg/kg	0.45	0.55	<0.80	0.57	0.56	0.6	0.54	0.56	0.41	0.4	0.49	0.62	0.47	0.45	0.43	0.44	0.64	-
	Boron	N/A	N/A	N/A	mg/kg	0.15	0.26	<0.080	0.11	0.074	0.18	0.11	0.88	<0.06	0.069	0.063	<0.08	0.15	0.12	0.069	0.097	<0.056	-
	Cadmium	N/A	N/A	N/A	mg/kg	0.38	0.53	0.43	0.43	0.41	0.44	0.45	0.36	0.35	0.39	0.44	0.4	0.37	0.4	0.33	0.37	0.41	-
	Chromium	37.3	90	N/A	mg/kg	11	14	9.7	16	12	16	13	19	11	8.6	17	**40**	14	19	9.1	16	19	-
	Chromium, hexavalent	N/A	N/A	N/A	mg/kg	<0.25	<0.32*	<0.18*	<0.08	<0.08	<0.17*	<0.30*	<0.080	<0.08	<0.17	<0.08	<0.080	0.08	<0.08	<0.08	<0.080	<0.080	-
	Cobalt	N/A	N/A	N/A	mg/kg	5.2	5.3	3.2	7	5.9	6.5	5.9	6.2	4.5	4.9	6.9	6.3	5.1	5.8	5	5.4	6.2	-
	Copper	35.7	197	N/A	mg/kg	13	17	11	16	14	16	16	15	11	12	21	15	12	13	11	12	14	-
	Lead	35	91.3	N/A	mg/kg	7.7	8.8	7.2	9.6	9	9.4	9	9	6.7	7.3	9.6	9.4	7.3	7.9	7	7.1	9.9	-
	Mercury	0.17	0.486	N/A	mg/kg	<0.05	0.075	<0.10	<0.05	<0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	-
	Molybdenum	N/A	N/A	N/A	mg/kg	0.57	0.7	1.2	0.86	0.5	0.56	0.68	0.76	0.48	0.46	1.1	0.9	0.78	0.86	0.57	0.88	0.57	-
	Nickel	N/A	N/A	16	mg/kg	15	**17**	11	**21**	**18**	**19**	**17**	**18**	14	15	**24**	**30**	**16**	**19**	14	**17**	**21**	**-**
	Selenium	2	N/A	N/A	mg/kg	**4**	**5.9**	**4.5**	1.4	1	1.6	**2.7**	0.94	**2.5**	**2.8**	1.1	**2**	**3**	**2.6**	1.6	**2.1**	1.8	**-**
	Silver	N/A	N/A	N/A	mg/kg	<0.2	1.3	<0.40	<0.2	<0.2	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20	<0.20	-
	Thallium	N/A	N/A	N/A	mg/kg	0.1	0.14	<0.20	0.16	0.14	0.14	0.14	0.16	0.11	0.11	0.15	0.16	0.15	0.13	0.1	0.11	0.18	-
	Tin	N/A	N/A	N/A	mg/kg	<1	<1.0	<2.0	<1	<1	<1.0	<1.0	<1.0	<1	<1	<1.0	<1.0	1.4	<1	<1	<1.0	<1.0	-
	Uranium	N/A	N/A	N/A	mg/kg	0.95	1.4	1.6	1	0.81	0.75	0.8	0.83	0.91	0.97	1.4	0.83	1.4	1.1	0.82	0.85	0.84	-
	Vanadium	N/A	N/A	N/A	mg/kg	14	21	14	25	15	26	22	27	15	12	25	27	21	20	12	21	28	-
	Zinc	123	315	N/A	mg/kg	54	86	37	**340**	**480**	**360**	**420**	71	**230**	**290**	85	**180**	**270**	**330**	**240**	78	**140**	-

Note: **Bold** = Indicates exceedance of Alberta Sediment Quality Guidelines (GOA 2018)
N/A = Guidelines for sediment quality limits for specified parameter is unavailable
(-) = Null results
(*) Detection limits raised due to high moisture content, samples contain > 50% moisture.

Table 5-b Summary of Sediment Sampling Results from 2020 to 2022 (continued)

		Canadian ISQG	AB Sediment Probable Effects Level	AB Sediment Lowest Effects Level	Units	WQ-04A			WQ-04B					WQ-04D					WQ-04C				
						04/06/2021	21/10/2021	28/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022	20/11/2020	04/06/2021	21/10/2021	26/05/2022	27/10/2022
Regulated Metals - Sediment																							
Field Parameter	Percent Saturation	N/A	N/A	N/A	%	110	120	-	62	63	70	100	-	60	64	42	56	-	65	56	54	65	-
Inorganics	Boron Sat Paste	N/A	N/A	N/A	mg/L	0.13	0.21	-	0.18	0.12	0.12	0.11	-	<0.1	0.11	0.18	<0.010	-	0.18	0.12	0.18	<0.10	-
	Moisture	N/A	N/A	N/A	%	68	-	-	40	43	-	73	-	48	53	-	34	-	48	36	-	47	-
Metals	Antimony	N/A	N/A	N/A	mg/kg	<0.5	<0.5	<1.0	<0.5	<0.5	<0.50	<0.50	<0.50	<0.5	<0.5	0.52	<0.50	<0.50	<0.5	<0.5	<0.50	<0.50	-
	Arsenic	5.9	17	N/A	mg/kg	3.1	4.5	<2.0	**5.9**	4.5	5.4	4.8	4.4	2.9	3	**6.7**	3.5	3.6	4.6	3.4	5.3	3.3	-
	Barium	N/A	N/A	N/A	mg/kg	190	230	94	290	200	250	200	190	170	220	330	170	200	290	210	250	160	-
	Beryllium	N/A	N/A	N/A	mg/kg	0.45	0.55	<0.80	0.57	0.56	0.6	0.54	0.56	0.41	0.4	0.49	0.62	0.47	0.45	0.43	0.44	0.64	-
	Boron	N/A	N/A	N/A	mg/kg	0.15	0.26	<0.080	0.11	0.074	0.18	0.11	0.88	<0.06	0.069	0.063	<0.08	0.15	0.12	0.069	0.097	<0.056	-
	Cadmium	N/A	N/A	N/A	mg/kg	0.38	0.53	0.43	0.43	0.41	0.44	0.45	0.36	0.35	0.39	0.44	0.4	0.37	0.4	0.33	0.37	0.41	-
	Chromium	37.3	90	N/A	mg/kg	11	14	9.7	16	12	16	13	19	11	8.6	17	**40**	14	19	9.1	16	19	-
	Chromium, hexavalent	N/A	N/A	N/A	mg/kg	<0.25	<0.32*	<0.18*	<0.08	<0.08	<0.17*	<0.30*	<0.080	<0.08	<0.17	<0.08	<0.080	0.08	<0.08	<0.08	<0.080	<0.080	-
	Cobalt	N/A	N/A	N/A	mg/kg	5.2	5.3	3.2	7	5.9	6.5	5.9	6.2	4.5	4.9	6.9	6.3	5.1	5.8	5	5.4	6.2	-
	Copper	35.7	197	N/A	mg/kg	13	17	11	16	14	16	16	15	11	12	21	15	12	13	11	12	14	-
	Lead	35	91.3	N/A	mg/kg	7.7	8.8	7.2	9.6	9	9.4	9	9	6.7	7.3	9.6	9.4	7.3	7.9	7	7.1	9.9	-
	Mercury	0.17	0.486	N/A	mg/kg	<0.05	0.075	<0.10	<0.05	<0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	-
	Molybdenum	N/A	N/A	N/A	mg/kg	0.57	0.7	1.2	0.86	0.5	0.56	0.68	0.76	0.48	0.46	1.1	0.9	0.78	0.86	0.57	0.88	0.57	-
	Nickel	N/A	N/A	16	mg/kg	15	**17**	11	**21**	**18**	**19**	**17**	**18**	14	15	**24**	**30**	**16**	**19**	14	**17**	**21**	**-**
	Selenium	2	N/A	N/A	mg/kg	**4**	**5.9**	**4.5**	1.4	1	1.6	**2.7**	0.94	**2.5**	**2.8**	1.1	**2**	**3**	**2.6**	1.6	**2.1**	1.8	**-**
	Silver	N/A	N/A	N/A	mg/kg	<0.2	1.3	<0.40	<0.2	<0.2	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20	<0.20	<0.20	<0.2	<0.2	<0.20	<0.20	-
	Thallium	N/A	N/A	N/A	mg/kg	0.1	0.14	<0.20	0.16	0.14	0.14	0.14	0.16	0.11	0.11	0.15	0.16	0.15	0.13	0.1	0.11	0.18	-
	Tin	N/A	N/A	N/A	mg/kg	<1	<1.0	<2.0	<1	<1	<1.0	<1.0	<1.0	<1	<1	<1.0	<1.0	1.4	<1	<1	<1.0	<1.0	-
	Uranium	N/A	N/A	N/A	mg/kg	0.95	1.4	1.6	1	0.81	0.75	0.8	0.83	0.91	0.97	1.4	0.83	1.4	1.1	0.82	0.85	0.84	-
	Vanadium	N/A	N/A	N/A	mg/kg	14	21	14	25	15	26	22	27	15	12	25	27	21	20	12	21	28	-
	Zinc	123	315	N/A	mg/kg	54	86	37	**340**	**480**	**360**	**420**	71	**230**	**290**	85	**180**	**270**	**330**	**240**	78	**140**	-

Note: **Bold** = Indicates exceedance of Alberta Sediment Quality Guidelines (GOA 2018)
N/A = Guidelines for sediment quality limits for specified parameter is unavailable
(-) = Null results
(*) Detection limits raised due to high moisture content, samples contain > 50% moisture.

Additional Wetland 06 Sampling Following 2019 Sediment Release

During Year 3 monitoring, two additional water quality sample sites (i.e., WQ-06 and WQ-07) were added along a manually vegetated bank (i.e., the green wall) on the west side of Wetland 06. Additional sampling of turbidity and TDS was proposed as part of recommendations developed following two sediment release events which occurred in 2019. Additional water quality parameters consistent with the other Wetland 06 sample sites were also collected. Site locations are shown on **Figure 3**; surface water and sediment quality analytical results are presented in provided in **Table 5-c**. Sampling of the WQ-06 and WQ-07 sites in 2021 and continuing in 2022 and 2023 was included as part of measures outlined in a WAIR submitted to AEP following a July 2021 sediment release into Wetland 06. Sampling was repeated at WQ-06 and WQ-07 during Year 4 (i.e., 2021 monitoring) and the results were recorded in the 2021 monitoring report.

Sampling was repeated again at WQ-06 and WQ-07 during Year 5 (i.e., 2022 Monitoring). The certificates of analysis and raw data for surface water and sediment results are provided in **Appendix B** and **Appendix C**, respectively. Photographs taken during monitoring visits are provided in **Appendix D.**

All parameters from *in-situ* and analytical water sampling conducted in spring and fall in Year 5 (i.e., 2022) were within the EQG.

Table 5-c Summary of Water Quality Sampling Results from 2020 to 2022 at WQ-06 and WQ-07

			WQ-06						WQ-07					
			Spring			Fall			Spring			Fall		
	AB SW Freshwater Aquatic Life (Long-term)	AB SW Freshwater Aquatic Life (Short-term)	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	15/10/2020	21/10/2021	28/10/2022	28/05/2020	02/06/2021 04/06/2021	26/05/2022	15/10/2020	21/10/2021	28/10/2022
Sediment and Physical														
Total Suspended Solids (TSS) (mg/L)	Narr.	Narr.	6	6.5	590	28	39	180	6.8	42	460	-	-	3.4
Total Dissolved Solids (TDS) (mg/L)	N/A	N/A	330 – 380	450	660	380	470	470	350 – 380	480	660	-	-	600
Turbidity (NTU)	Narr.	Narr.	1.9	2.4	3.6	4.5	32	130	2	17	4	-	-	5.8
Conductivity (EC) (mS/cm)	N/A	N/A	680	750	874	750	760	830	710	820	856	-	-	990
pH (*In-situ*)	6.50 – 9.00	N/A	**9.09**	**-**	8.66	8.42	-	8.32	8.65		8.54	-	-	8.64
pH (Lab)	Nar.	5	8.29	8.72		8.26	8.31	8.23	8.18	8.56	-	-	-	8.27
Dissolved Oxygen (mg/L)	Narr.	Narr.	11	10	9.3	9.4	11	9.46	7	10	9.35	-	-	11.31
Nutrients and Others (mg/L)														
Biochemical Oxygen Demand (BOD)	N/A	N/A	2.8	<2.00	-	<2.00	<2.00	<2.0	3.2	<2.00	-	-	-	<2.0
Chemical Oxygen Demand (COD)	N/A	N/A	32	31	-	12	27	56	33	33	-	-	-	35
Nitrate (NO3)	3	124	<0.04	<0.044	<0.044	<0.22	0.13	<0.089	<0.04	<0.044	<0.044	-	-	0.13
Nitrite (NO2)	Narr	Narr	<0.03	<0.033	-	<0.03	<0.033	<0.016	<0.03	<0.033	-	-	-	<0.016
Total Kjelahl Nitrogen (TKN)	N/A	N/A	0.77	0.9	-	0.5	0.875	0.555	0.98	0.982	-	-	-	0.495
Ammonia-Nitrogen (NH3-N)	Narr	Narr	0.058	0.018	-	<0.015	0.026	-	0.068	0.036	-	-	-	-
Ortho-Phosphate	N/A	N/A	<0.003	<0.0030	<0.0035	<0.003	0.0042	0.005	0.007	<0.0030	<0.0030	-	-	0.0051
Dissolved Metals and Metals (mg/L)														
Silver (Ag)	N/A	0.0025 mg/L	<0.0001	<0.00010	-	<0.0001	<0.00010	<0.00010	<0.0001	<0.00010	<0.00010	-	-	<0.00010
Aluminum (Al)	0.050 mg/L	0.1 mg/L	<0.003	0.013	0.012	0.003	0.0065	<0.0030	<0.003	0.012	0.009	-	-	<0.0030
Arsenic (As)	0.005 mg/L	N/A	0.0011	0.0021	0.0014	0.0012	0.0013	0.00093	0.0012	0.0023	0.0015	-	-	0.0008
Boron (B)	1.500 mg/L	29.000 mg/L	0.034	0.081	0.084	0.044	0.059	0.041	0.035	0.083	0.085	-	-	0.044
Barium (Ba)	N/A	N/A	0.11	0.12	0.14	0.15	0.2	0.14	0.12	0.12	0.14	-	-	0.095
Beryllium (Be)	N/A	N/A	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	-	-	<0.0010
Calcium (Ca)	N/A	N/A	49	34	56	48	51	54	51	40	58	-	-	78
Cadmium (Cd)	Narr	Narr	<0.00002	<0.000020	<0.000020	<0.00002	<0.000020	<0.000020	<0.00002	<0.00002	<0.000020	-	-	<0.000020
Colbalt (Co)	Narr	Narr	<0.0003	<0.00030	0.00031	<0.0003	<0.00030	<0.00030	<0.0003	<0.00030	0.00031	-	-	<0.00030
Chromium (Cr)	0.001	N/A	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	-	-	<0.0010
Copper (Cu)	0.007	Narr	0.0006	0.00091	0.0029	0.004	<0.00020	<0.0010	0.0005	0.0011	0.0011	-	-	<0.0010
Iron (Fe)	0.30 mg/L	N/A	<0.06	0.12	0.074	0.11	<0.060	<0.060	0.083	0.075	0.17	-	-	<0.060
Potassium (K)	N/A	N/A	4.8	4.8	7.1	4.5	6.3	5	5.7	4.9	7.1	-	-	5.9
Lithium (Li)	N/A	N/A	<0.020	0.031	0.025	0.024	0.024	0.023	<0.020	0.028	0.027	-	-	0.022
Magnesium (Mg)	N/A	N/A	40	58	84	50	59	51	42	57	82	-	-	56

			WQ-06						WQ-07					
			Spring			Fall			Spring			Fall		
	AB SW Freshwater Aquatic Life (Long-term)	AB SW Freshwater Aquatic Life (Short-term)	28/05/2020	02/06/2021 & 04/06/2021	26/05/2022	15/10/2020	21/10/2021	28/10/2022	28/05/2020	02/06/2021 04/06/2021	26/05/2022	15/10/2020	21/10/2021	28/10/2022
Manganese (Mn)	N/A	N/A	0.0082	0.01	0.042	0.0099	0.024	0.039	0.021	0.026	0.073	-	-	0.019
Molybdenum (Mo)	0.073 mg/L	N/A	0.0019	0.0029	0.0052	0.002	0.0051	0.0028	0.0021	0.0035	0.0053	-	-	0.0028
Nickel (Ni)	Narr	Narr	0.001	0.0015	0.0023	<0.0005	0.0015	0.00074	0.0012	0.002	0.0021	-	-	0.008
Lead (Pb)	Narr	Narr	<0.0002	<0.00020	<0.10	<0.0002	<0.00020	<0.00020	<0.0002	<0.00020	<0.10	-	-	<0.00020
Sulfur (S)	N/A	N/A	15	25	100	15	33	29	17	27	110	-	-	70
Antimony (Sb)	N/A	N/A	<0.0006	<0.00060	<0.00060	<0.0006	<0.00060	<0.00060	<0.0006	<0.00060	<0.00060	-	-	<0.00060
Selenium (Se)	0.001 mg/L	N/A	0.0007	<0.00020	0.00057	0.00032	0.00046	0.00089	0.00057	<0.00020	0.00058	-	-	0.00086
Silicon (Si)	N/A	N/A	0.67	<0.10	0.23	1.6	0.33	1.8	1.4	0.12	0.22	-	-	1.2
Tin (Sn)	N/A	N/A	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	-	-	<0.0010
Strontium (Sr)	N/A	N/A	0.51	0.57	0.81	0.65	0.66	0.65	0.51	0.6	0.81	-	-	0.77
Sodium (Na)	Narr	Narr	34	55	66	46	62	46	35	55	66	-	-	44
Titanium (Ti)	N/A	N/A	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	-	-	<0.0010
Thallium (Tl)	0.0008 mg/L	N/A	<0.0002	<0.00020	<0.00020	<0.0002	<0.00020	<0.00020	<0.0002	<0.00020	<0.00020	-	-	<0.00020
Uranium (U)	0.015 mg/L	0.033 mg/L	0.0035	0.0044	0.0099	0.0032	0.0071	0.0055	0.0034	0.0052	0.0098	-	-	0.0064
Vanadium (V)	N/A	N/A	<0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.001	<0.0010	0.001	-	-	<0.0010
Zinc (Zn)	0.003 mg/L	N/A	<0.003	<0.0030	<0.0030	0.004	<0.0030	<0.0030	<0.003	<0.0030	<0.0030	-	-	<0.0030
Major Ions and Salts (mg/L)														
Chloride (Cl-)	120	640	13	15	-	9.5	13	13	13	17	-	-	-	12
Sulfate (SO4-)	N/A	N/A	52	61	-	54	75	83	57	70	-	-	-	220

Bold = Indicates exceedance of CCME water quality guidelines

(-) = null result.

Narr = Narrative guidelines.

N/A = CCME data regarding water quality limits for specified parameter is unavailable.

5.1.2 Comparison with Year 1, Year 2, Year 3, and Year 4 Results

After five years of spring and fall water quality monitoring, the following observations have been made:

- In the previous four years water quality sampling, DO has been measured slightly lower than the CCME threshold limits at single locations within Wetland 06. These exceedances were limited in duration (i.e., were observed during a single season within the monitoring year) and are often associated with biological processes. In 2022, there were no recorded exceedances of low DO in Wetland 06.
- In-situ pH which has previously exceeded EQG at single locations within Wetland 06 during Years 1 through Year 3 of monitoring was within EQG in 2021 and 2022 within Wetland 06 and the reference wetland.
- Dissolved iron was previously identified in exceedance of EQG during Year 1 (i.e., 2018); high concentrations of dissolved iron were identified at the reference wetland site (i.e., WQ-01) in summer. All subsequent sampling within Wetland 06 and the reference wetland has resulted in iron concentrations within EQG.
- Following elevated zinc concentrations documented at WQ-02 during fall 2020 sampling and recommendations from the Year 2 (2019) Monitoring Report, additional sampling along Pathway 1 has been ongoing to help identify potential project-related sources of elevated zinc concentrations and verify results. During Year 4 and Year 5, sediment and surface water sampling was conducted within Wetland 06 and along Pathway 1. Elevated zinc concentrations observed at sample sites along Pathway 1 suggest a potential Project-related input source of the zinc exceedances observed in from 2019 to 2022. Similar to the results of Year 4 monitoring, sampling results from the other Wetland 06 sites (i.e., WQ-03, WQ-06, and WQ-07) do not indicate zinc exceedances; suggesting the area of potential impact of elevated zinc is limited.
- Nickel, selenium, and uranium were all documented as in exceedance of sediment guidelines. Although these concentrations were higher than previously recorded, it is likely that they are related to the local geology. These values should be continued to be monitored in future years.
- All other Wetland 06 parameters remain within the CCME and Alberta EQG.

5.1.3 Multi-year Sampling Comparison of Measurements

Select surface water quality parameters (i.e., turbidity, temperature, pH, specific conductivity, DO, phosphate and chloride) collected at WQ-02 and WQ-03 during Year 5 post construction monitoring were compared to data collected in 2016 and 2017 by the Weaselhead / Glenmore Preservation Society (Porto 2018) at two sample sites in close proximity to WQ-02 and WQ-03. Water quality data collected by the Weaselhead / Glenmore Preservation Society in 2016 was collected prior to the initiation of construction activities on the Project. A comparison of surface water quality parameters is presented in **Table 5-c** and demonstrates the natural variability in water quality between sites and season in Wetland 06.

Turbidity: In-situ spring and fall water quality sampling of WQ-02 and WQ-03 in 2021 and 2022 measured higher turbidity compared to water quality data collected by the Weaselhead / Glenmore Preservation Society in 2016 and 2017 (i.e., prior to construction); documented turbidity ranged from 0.8 NTU to 19.6 NTU (Porto 2018). Spring 2021 samples measured in-situ turbidity of 92.42 NTU and 21.00 NTU at the WQ-02 and WQ-03 sample locations, respectively. Fall 2021 samples measured in-situ turbidity of 129.1 NTU

and 105.4 NTU at the WQ-02 and WQ-03 sample locations, respectively. Spring 2022 samples measured in-situ turbidity of 40 NTU and 15 NTU at the WQ-02 and WQ-03 sample locations, respectively. Fall 2022 samples measured in-situ turbidity of 130 NTU and 12 NTU at the WQ-02 and WQ-03 sample locations, respectively. Lab analysed water samples collected concurrently with in-situ measurements also resulted in high turbidity compared to previous years, although the lab analysed results were consistently lower during both spring and fall sampling at both WQ-02 and WQ-03 sample locations than in-situ measurements (**Table 5-a1**).

Turbidity measures the amount of particulate matter (e.g., sediment, organic matter, algae, etc.) suspended in the water. Turbidity is a point measurement specific to conditions at the time of sampling; as such, it is difficult to compare point measurements from year to year. There are a number of potential causes of increased turbidity in 2022 including, but not limited to, site conditions, localized animal activity in the vicinity of the sample location, and sampling procedures.

Water levels were low during the fall visit; as a result, sampling occurred within deeper channelized areas in the middle of the wetland. Although no disturbance was documented at the time of sampling, higher turbidity values may be attributed to low water levels and recent activity in these channels. Low water levels may also have affected the effectiveness of sampling collection resulting in elevated turbidity.

Chloride: In 2022, the wetland 06 samples were higher in chloride concentrations than the samples collected by the Weaselhead / Glenmore Preservation Society in 2016 and 2017 (i.e., prior to construction). Samples collected during the 2022 spring site visit measured a chloride concentration of 22.0 mg/L and 5 mg/L at the WQ-02 and WQ-03 sample locations, respectively. Chloride concentrations during fall 2022 were 63.0 mg/L and 25.0 mg/L at the WQ-02 and WQ-03 sample locations, respectively. Elevated chloride, compared to pre-construction concentrations has been documented during previous monitoring years.

Elevated chloride concentrations may result from a variety of sources including road salt runoff and herbicides (Kelly et al. 2012). The increase in chloride concentrations identified within Wetland 06 may be a result sediment releases from the SWCRR construction area into the west side of Wetland 06 which occurred in August of 2019 and July 2021 following heavy rainfall events.

A comparison between post construction sampling years shows that although chloride remains elevated from pre-construction concentrations, the chloride concentration at both Wetland 06 sample sites has decreased compared to 2018. As chloride has limited reactivity with the environment and is highly soluble in water, its residence time within a water body is greatly influenced by the rate of water flow; limited flow will result in a longer persistence time. The CCME guidelines for water quality recommend a maximum chloride concentration of 120 mg/L for the long-term protection of aquatic life (CCME 1999); the concentration of chloride identified at Wetland 06 sample sites remained below this limit. Although current concentrations of chloride are below CCME EQG and reduced from 2018 concentrations, this parameter will continue to be closely monitored throughout subsequent monitoring years to detect any long-term trends.

Conductivity: In-situ water quality sampling of Wetland 06 in 2022 measured elevated specific conductivity when compared to previous water quality data collected by the Weaselhead / Glenmore Preservation Society in 2016 and 2017 (i.e., prior to construction). Samples collected during the 2022 spring site visit had a conductivity of 867 mS/cm and 712 mS/cm at the WQ-02 and WQ-03 sample locations, respectively. During the 2022 fall site visit, specific conductivity was 665 mS/cm and 893 mS/cm at the WQ-02 and WQ-03 sample locations, respectively. A comparison between post-construction sampling years shows that

specific conductivity remains elevated from pre-construction levels, the specific conductivity sampled from WQ-02 has decreased since 2018. The specific conductivity measured at WQ-03 has gradually increased each monitoring year; however, specific conductivity at WQ-03 remains lower than WQ-02.

Specific conductivity in surface water is affected by the presence of a variety of inorganic cations and anions, including chloride. There are no EQG specific to conductivity due to its high natural variability and because it is a numerical indicator of water quality and not an independent parameter of water, however natural waters can vary between 50 mS/cm and 1,500 mS/cm (BC Ministry of Environment 2013). Variation in specific conductivity measured in Wetland 06 falls within this range.

Table 5-d Surface Water Quality Parameters Collected from Wetland 06 Sites from 2016 to 2022

Surface Water Quality Parameters of Wetland 06															
		2016		2017		2018[1,2]		2019[3]		2020[4]		2021[6]		2022[7]	
		Summer	Fall	Summer	Fall	Summer	Fall	Spring	Fall	Spring	Fall	Spring	Fall[5]	Spring	Fall
Sample site 1 (close proximity to WQ-02)	Turbidity (NTU)	30.8	0.8	20	18.7	6.5	5.4	2	8.9	6.4	60.4	92.42	129.1	40	130
	Temperature C	11.9	4	14.6	4.2	19.1	1.1	12.3	3.25	14.58	3.12	19.79	3.7	17.85	6.55
	pH	7.6	7.9	7.53	8.07	7.6	6.5	8	8.2	9	8.5	8.28	7.56	7.69	7.88
	Conductivity (mS/cm)	470	444	589	500	882	833	712	698	662	760	756.36	782.85	867	665
	DO (mg/L)	5.2	10.48	2.03	9.12	10.5	9.8	7.2	10	9.67	11.01	5.86	7.8	10.94	11.25
	Phosphate (mg/L)	0	0	0.01	0.01	0.0068	0.0034	0.0037	<0.003	0.003	0.004	<0.003	0.0034	-	-
	Chloride (mg/L)	2.88	5.26	3.68	5.25	41	12	13	7.3	12	15	15	11	22	9.6
Sample site 2 (close proximity to WQ-03)	Turbidity (NTU)	3.3	10	36	19.6	7	7	1.8	6.5	22.2	33.2	21	105.4	15	12
	Temperature C	12.2	4.1	10.7	2.4	20.6	0.5	16.06	3.87	12.68	5.34	19.27	3.9	12.22	2.73
	pH	8	8	7.95	8.15	8.9	6.8	8.27	8.19	8.89	7.96	8.28	6.95	8.08	8.41
	Conductivity (mS/cm)	469	449	523	491	509	688	575	766	590.97	737.36	706.36	455.2	712	893
	DO (mg/L)	5.3	5.1	2.65	9.99	14.4	5.8	8.68	7.31	9.72	4.86	5.86	2.6	11.35	10.62
	Phosphate (mg/L)	0.16	0.01	0	0	0.0085	0.0085	0.0039	<0.003	0.004	0.004	0.0037	0.0083	-	-
	Chloride (mg/L)	4.18	5.85	7.7	4.68	51	29	12	12	18	7.9	23	24	18	25

Note:
[1] Porto 2018
[2] Data collected at WQ-02 and WQ-03 in 2018 as part of the Monitoring Plan.
[3] Data collected at WQ-02 and WQ-03 in 2019 as part of the Monitoring Plan.
[4] Data collected at WQ-02 and WQ-03 in 2020 as part of the Monitoring Plan.
[5] Water samples collected during fall 2020 following the removal of approximately 2 mm of surface ice from sample sites WQ-02 and WQ-03
[6] Data collected at WQ-02 and WQ-03 in 2021 as part of the Monitoring Plan
[7] Data collected at WQ-02 and WQ-03 in 2022 as part of the Monitoring Plan
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5.2 Water Flow Monitoring

Surface water flow monitoring was conducted during the spring and fall at three inflow sites and one outflow site located within Wetland 06 (**Table 4-b**). Information on channel width, channel depth, velocity and discharge were collected during each monitoring visit; the results are summarized in **Table 5-e**, **Table 5-f** and **Table 5-g.**

Following procedures specified in the Monitoring Plan, and recommendations made following Year 1 surface water flow monitoring, the initial 2022 site visit was conducted earlier in the year (i.e., late May) to capture higher periods of flow within the Project area; enabling calculations of velocity and discharge at all inflow and outflow locations. However, during the spring monitoring visit water levels remained low. Depth and velocity measurements were able to be recorded at FL-01 and FL-02 during the spring. The outflow channel at sites Fl-03 and FL-04 was dry during both spring monitoring.

During the fall monitoring the inflow channel at FL-01 had minimal water but was sufficient to collect depth and flow. FL-02. FL-03 and FL-04 were all dry at the time of the fall sampling and thus no flow data was collected. There was not sufficient surface water or velocity during spring and fall monitoring to calculate discharge at any of the sites. These results were consistent with the results of Year 1 (i.e., 2018), Year 2 (i.e., 2019) Year 3 (i.e., 2020) and Year 4 (i.e., 2021) monitoring.

All inflow sites showed a reduction in channel depth and wetted widths during the fall monitoring visit when compared to spring measurements. Site FL-02 showed the greatest seasonal change, with a spring wetted width of 18 m to dry conditions being present at the site during the fall. These results were consistent with the results of previous years monitoring.

Table 5-e Summary of Water Flow Monitoring Site Channel Width and Depth

Site	Inflow or Outflow	Channel Width (m)	Depth*(m)		
			RMID	MID	LMID
Summer 2018					
FL-01	**Inflow**	0.42	0.3	0.27	0.28
FL-02	**Inflow**	2.5	0.68	0.58	0.39
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-
Fall 2018					
FL-01	**Inflow**	0.49	0.07	0.07	0.07
FL-02	**Inflow**	1.15	0.14	0.23	0.28
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-
Spring 2019					
FL-01	**Inflow**	0.55	-	0.04	-
FL-02	**Inflow**	1.58	0.26	0.55	0.66
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-

Site	Inflow or Outflow	Channel Width (m)	Depth*(m)		
			RMID	MID	LMID
Fall 2019					
FL-01	**Inflow**	0.25	-	0.12	-
FL-02	**Inflow**	1.3	0.26	0.42	0.66
FL-03	**Inflow**	5	-	0.4	-
FL-04	**Outflow**	-	-	-	-
Spring 2020					
FL-01	**Inflow**	0.55	0.03	0.08	0.05
FL-02	**Inflow**	1.62	0.62	0.65	0.64
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-
Fall 2020					
FL-01	**Inflow**	0.82	0.01	0.08	0.02
FL-02	**Inflow**	1.32	0.22	0.32	0.44
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-
Spring 2021					
FL-01	**Inflow**	0.6	0.02	0.03	0.02
FL-02	**Inflow**	1.4	0.36	0.5	0.41
FL-03	**Inflow**	1.2	0.13	0.16	0.1
FL-04	**Outflow**	-	-	-	-
Fall 2021					
FL-01	**Inflow**	0.4	0.1	0.1	0.1
FL-02	**Inflow**	1.2	0.28	0.3	0.26
FL-03	**Inflow**	-	-	-	-
FL-04	**Outflow**	-	-	-	-
Spring 2022					
FL-01	**Inflow**	0.6	0.05	0.05	0.05
FL-02	**Inflow**	17	1.25	2	2
FL-03	**Inflow**	0	-	-	-
FL-04	**Outflow**	0	-	-	-
Fall 2022					
FL-01	**Inflow**	0.75	0.03	0.01	0.01
FL-02	**Inflow**	1.5	-	-	-
FL-03	**Inflow**	0	-	-	-
FL-04	**Outflow**	0	-	-	-

Note: * RMID= right mid channel, MID= mid channel, LMID= left mid channel
(-) = null result

Table 5-f Summary of Water Flow Monitoring Site Velocity and Discharge

Site	Inflow or Outflow	Velocity* (m/sec)			Discharge (m^3/sec)
		RMID	MID	LMID	
Summer 2018					
FL-01	**Inflow**	**-**	**-**	**-**	**-**
FL-02	**Inflow**	**-**	**-**	**-**	**-**
FL-03	**Inflow**	**-**	**-**	**-**	**-**
FL-04	**Outflow**	**-**	**-**	**-**	**-**
Fall 2018					
FL-01	**Inflow**	0	0.15	0	**-**
FL-02	**Inflow**	**-**	**-**	**-**	**-**
FL-03	**Inflow**	**-**	**-**	**-**	**-**
FL-04	**Outflow**	**-**	**-**	**-**	**-**
Spring 2019					
FL-01	Inflow	-	0.2	-	-
FL-02	Inflow	0	0	0	-
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-
Fall 2019					
FL-01	Inflow	-	0.1	-	-
FL-02	Inflow	0	0	0	-
FL-03	Inflow	0	0	0	-
FL-04	Outflow	-	-	-	-
Spring 2020					
FL-01	Inflow	0	0.1	0	-
FL-02	Inflow	0	0	0	-
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-
Fall 2020					
FL-01	Inflow	0	0.11	0	0
FL-02	Inflow	0	0	0	0
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-
Spring 2021					
FL-01	Inflow	0	0	0	0
FL-02	Inflow	0	0	0	0
FL-03	Inflow	0	0	0	0
FL-04	Outflow	-	-	-	-

Site	Inflow or Outflow	Velocity* (m/sec)			Discharge (m^3/sec)
		RMID	MID	LMID	
Fall 2021					
FL-01	Inflow	0	0	0	0
FL-02	Inflow	0	0	0	0
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-
Spring 2022					
FL-01	Inflow	0.02	0.05	0.05	-
FL-02	Inflow	0	0	0	-
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-
Fall 2022					
FL-01	Inflow	0.01	0.01	0.01	-
FL-02	Inflow	-	-	-	-
FL-03	Inflow	-	-	-	-
FL-04	Outflow	-	-	-	-

Note: * RMID= right mid channel, MID= mid channel, LMID= left mid channel
(-) = null result

Wetted widths measured at four transects in Wetland 06 and four transects in the reference wetland are summarized in **Table 5-g**. In Wetland 06, wetted widths were longer in the spring than in the fall, indicating a reduction in the quantity of surface water within the wetland. Fall 2022 transects indicated the lowest water levels within Wetland 06 since the start of the monitoring program; during fall monitoring surface water was limited to narrow channels within the center of the wetland area. Photos taking during the fall monitoring visit are presented in Appendix D. The reference wetland was dry during the spring and fall monitoring visit and wetted width transects could not be conducted. These results were consistent with the wetted widths results of Year 1 (i.e., 2018), Year 2 (i.e., 2019), Year 3 (i.e., 2020), Year 4 (i.e., 2021) monitoring.

In the previous years of monitoring a staff gauge located within wetland has been monitored and provided measurements of water depth. During Year 5 monitoring, the staff gauge installed in Wetland 06 was no longer present at site. This area was dry in both the spring and fall sampling. Previously this section of the wetland has been previously heavily impacted by beaver activity.

Table 5-g Summary of Wetted Width Measurements from 2018 to 2022

Site	Transect	Wetted Width(m)		Percent Change of Wetted Width (%)	Wetted Width(m)		Percent Change of Wetted Width (%)	Wetted Width(m)		Percent Change of Wetted Width (%)
		Summer 2018	Fall 2018		Spring 2019	Fall 2019		**Spring 2020**	**Fall 2020**	
Wetland 06	T1-1	28	1	96.4	*	*	*	34	1.8	94.7
	T1-2	26	22	15.4	45	2	95.6	14	25	44
	T1-3	52	51	1.9	35	29	17.1	24	22	8.3
	T1-4	37	35	5.4	40	32	20	28	27	3.6
Reference Wetland	T2-1	25	-	100	13	-	100	19	-	100
	T2-2	32	-	100	15	-	100	22	-	100
	T2-3	28	-	100	13	-	100	22	-	100
	T2-4	28	-	100	7	-	100	13	-	100

Site	Transect	Wetted Width(m)		Percent Change of Wetted Width (%)	Wetted Width(m)		Percent Change of Wetted Width (%)
		Spring 2021	Fall 2021		Spring 2022	Fall 2022	
Wetland 06	T1-1	15	1	93.3	10.5	0.5	96
	T1-2	20	2	90	18	0	100
	T1-3	32	3	90.6	31	1.5	95
	T1-4	24	2	91.6	30	1	91.6
Reference Wetland	T2-1	-	-	0	-	-	0
	T2-2	6	-	100	-	-	0
	T2-3	3	-	100	-	-	0
	T2-4	-	-	0	-	-	0

Note: (-) = wetland was dry during monitoring visit, **(*) = data not available**

6.0 Summary

Monitoring effort conducted in 2022 represents Year 5 of the Wetland 06 monitoring program. This report presents the 2022 results which will add to the sampling record within the Project area and facilitate additional comparison in subsequent monitoring years. Year 5 of the monitoring program was completed according to the criteria specified in the Monitoring Plan, with the addition of supplemental monitoring sites.

During Year 5 of monitoring, the following key observations were noted:

- Water quality results show variation in water quality parameters among sampling locations within Wetland 06, as well between spring and fall sampling visits.
- The majority of surface water quality parameters measured were consistent with EQG for the protection of aquatic life. Within Wetland 06 zinc and uranium did not meet guidelines for the protection of aquatic life during 2022 sampling.
- Following elevated zinc concentrations documented at WQ-02 during fall 2020 sampling and recommendations from the Year 2 (2019) Monitoring Report, supplemental sampling was conducted to verify results and attempt to identify potential project-related sources of elevated concentrations. Sediment and surface water sampling was conducted within Wetland 06 and along Pathway 1. Elevated zinc concentrations observed at sample sites along Pathway 1 suggests a Project related input source of the zinc. Sampling results from the available Wetland 06 sites (i.e., WQ-02, WQ-03 and WQ-06) did not show zinc exceedances of EQG; indicating the area of impact of elevated zinc is limited.
- Turbidity, chloride, and specific conductivity concentrations measured in Wetland 06 in 2022 were higher than historical measurements taken in 2016 and 2017.
- The spring site visit was conducted in early May to capture higher periods of flow within the Project area to enable calculations of velocity and discharge, however inflow and outflow channel measurements found limited to no surface water flow into or out of Wetland 06 during the two monitoring visits.
- Wetted widths recorded during the fall site visit at all transects in Wetland 06 indicated a reduction in surface water quantity. Lower water levels in fall are consistent with all previous years of post-construction monitoring, however 2022 results indicate the lowest observed water level since the start of the monitoring program. During the fall and spring site visits the reference wetland was dry.

7.0 Recommendations

Based on the results of the Year 5 (i.e., 2022) monitoring program, the following recommendations are suggested for monitoring in 2023:

- Monitoring of water quality and quantity should be continued in 2023 using similar methods and effort as employed in 2022 and outlined in the Monitoring Plan.
- Water quality monitoring efforts will continue in Year 6 to better facilitate detection of any changes to surface water quality as a result of SWCRR Project impacts.
  - Increased diligence should be taken in regard to water quality parameters (i.e., zinc) which have been measured in exceedance of EQG during post-construction monitoring periods (i.e., Year 1, Year 2, Year 3, and Year 4). Subsequent years of monitoring will provide greater understanding of trends in water quality parameters following initial exceedances and determine if changes were the result of natural variation within the wetlands or part of an ongoing change in environmental conditions.
  - Analytical results of water quality sampling will continue to be reviewed by a Senior Aquatic Scientist as soon as received. If anomalies or exceedances in results are detected, resampling and additional sampling will be conducted within 45 days of the original date of sample collection to verify results and attempt to identify potential project-related sources of elevated levels.
  - Sediment samples should be collected along Pathway 1 during spring and fall site visits to collect supplemental data as zinc concentrations were in exceedance of EQG occur during the Year 5 monitoring period.
  - Trends in changing water quality parameters noted in Wetland 06 when compared to historical data (i.e., specific conductivity and chloride) should continue to be investigated throughout subsequent monitoring to confirm potential long-term trends identified during post-construction monitoring.
- Water flow monitoring will continue in Year 6 to determine if surface water quantity within Wetland 06 has been influenced by activities related to the SWCRR Project.

8.0 Closure

The results of Year 5 monitoring provide an additional year of surface water quality comparison for Wetland 06 following the initiation of construction phase of the SWCRR. This report addresses water quality and quantity impacts to Wetland 06, fulfilling the requirements of the Order which amended the initial *Water Act* Approval received by the Project No.: 00388473-00-00.

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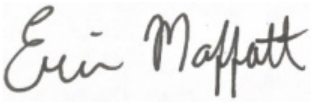

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Appendix A

Monitoring Report

Wetland 06 Water Monitoring Plan
Southwest Calgary Ring Road Project
Calgary, Alberta

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1.0 INTRODUCTION

The Southwest Calgary Ring Road (SWCRR) Project (the Project) includes the design and construction of approximately 31 kilometers of new six and eight lane divided freeway, 14 interchanges, as well as three watercourse realignments and associated crossing structures. The Project corridor is located along the western limit of the City of Calgary south of Highway 8 and includes sections of Highways 8 and 22. The Project has been awarded by Alberta Transportation to Mountain View Partnership, which in turn has engaged KGL Constructors (KGL) to develop the Project.

On August 11, 2017, the Project received *Water Act* Approval No.: 00388473-00-00 (the Approval) to impact twenty-four (24) wetlands, including Wetland 06. Subsequently, an Environmental Appeal was filed (*Brockman and Tulick v. Director, South Saskatchewan Region, AEP*; Appeal Nos.: 17-047 and 17-050-R. 2017) affecting KGL's ability to impact the wetlands, as described in the Approval.

As a result of the Environmental Appeal, the Minister of Environment and Parks issued a Ministerial Order 06/2018 (the Order), on January 29, 2018, that amended the previously received Approval to include conditions to address water quality and quantity impacts to Wetland 06 (see conditions 6.2 to 6.6). To address these conditions, KGL Constructors retained Hemmera Envirochem Inc. (Hemmera) to develop a monitoring plan (the Plan) that includes:

- monitoring of the flow of water flow into Wetland 06 in the spring and fall of each year that the plan is in effect;
- monitoring of the water quality in Wetland 06 in the spring and fall of each year that the plan is in effect, including total dissolved solids, salts, dissolved metals, and other parameters consistent with a stormwater sampling program;
- the monitoring data shall be provided to the Director within one month from the date the data were collected;
- the results of the monitoring and an analysis of the monitoring shall be provided to the Director in an annual report by March 31 of the year following the calendar year in which the data were collected; and
- the monitoring plan shall come into effect as soon as the Director approves the plan and shall remain in effect for a period of five years after the road is officially opened to the public.

1.1 Monitoring Objectives

Wetlands consist of land that has been saturated for sufficient time to promote the formation of water altered soils, growth of water tolerant vegetation, and various kinds of biological activity, adapted to wet environments (ESRD 2013). They play an important role on the landscape and are ecologically and economically significant by maintaining water quality and supply in watersheds, providing flood protection and erosion control, as well as providing habitat for various fish and wildlife species. Wetland health is reflective of numerous physical, chemical, and biological components. We acknowledge that there are numerous indicators of wetland health; however, the monitoring plan has been developed specifically to reflect requirements of the Order. As a result, monitoring elements of this Plan were prioritized to surface water quality and flow exclusively.

The objectives of the Plan include:

- monitoring surface water quality in Wetland 06 and flow into Wetland 06,
- monitoring surface water flow out of Wetland 06,
- monitoring surface water quality in waterbodies/drainages that provide surface water flow into Wetland 06, and
- monitoring surface water quality in an adjacent reference wetland.

It is expected that by monitoring Wetland 06 as well as other nearby wetlands and waterbodies, the Plan will result in a suitable comparative analysis about the potential influences or lack thereof of the Project on surface water quality and flow in Wetland 06.

2.0 DESCRIPTION OF WETLAND 06

Wetland 06 is located in the Weaselhead Natural Area, a natural environmental park that borders the west end of Glenmore Reservoir (**Figure 1**) within the City of Calgary. A small portion of Wetland 06 is located within the Transportation Utility Corridor (TUC). Wetland 06 is a historical oxbow channel to the Elbow River that is over 500 m in length with wetted widths that are generally less than 30 m. A pedestrian/bike bridge associated with the Glenmore Reservoir Regional Pathway network crosses Wetland 06. Wetland 06 drains generally east through the Weaselhead Natural Area and eventually discharges into the Glenmore Reservoir, which provides approximately half of the City of Calgary's drinking water supply.

Wetlands 07, 08, and 09 are located upslope of Wetland 06 and are the source of surface water flow into Wetland 06 (**Figure 1**). Wetland 08 and 07 are located to the southwest of Wetland 06. Surface flow from Wetland 08 and 07 are conveyed into Wetland 06 by an undefined channel that becomes defined downstream of the TUC near Wetland 06 as the slope gradient increases. A bypass drainage culvert will be installed during the construction phase of the Project to convey water from Wetland 07 and 08 through the Project area. Wetland 09 is located south of Wetland 06. Surface flow from Wetland 09 is conveyed by an undefined channel first flowing easterly through the Project and then northerly from the TUC boundary through a defined channel to Wetland 06. A bypass drainage system has been installed as part of the Project to maintain flow from Wetland 09 to Wetland 06.

During the construction phase of the Project, surface run-off from the work area will be managed through temporary erosion and sediment control (ESC) measures and will be redirected away from Wetland 06. During the operational phase of the Project, the natural flow of surface water (i.e., from the west side of the TUC) into Wetland 06 will be maintained via the bypass drainage systems described above. Further, during the operational phase, Project-impacted water will not be discharged into Wetland 06. All Project-impacted water in the vicinity of Wetland 06 has been designed to flow north into a stormwater pond.

3.0 MONITORING SCHEDULE

The monitoring schedule, including field sampling visits, seasonal data summaries, and annual reports is provided in **Table 1.** Field sampling visits to monitor surface water quality and flow will occur during the spring and fall of each year of the Plan. Additional details on sampling frequency are provided in **Section 4.2.**

Following each season of monitoring, data summaries (i.e., surface water quality and flow) will be made publicly available by KGL within one month of the seasonal field sampling visits. The annual report will be made publicly available by March 31 of the year following the field sampling visits.

Table 1 Monitoring Schedule

Task	Monitoring Year[a]											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Water Quality Monitoring[b]												
2. Water Flow Monitoring[b]												
3. Seasonal Data Summary[c]												
4. Annual Report[d]												

[a] Plan year includes construction phase and first five years of the operational phase.

[b] Surface water quality and flow field sampling visits are proposed in May and October of each year of the Plan; however, annual variability in ambient air temperature, snow/ice cover, and precipitation events may impact the exact date of sampling.

[c] Surface water quality and flow data summaries will be made publicly available within one month of each seasonal monitoring visit.

[d]The Annual Report will be made publicly available by March 31 of the year following the field sampling visits (e.g., the 2018 Annual Report will be posted by March 30, 2019).

4.0 METHODOLOGY

4.1 Sample locations

The locations for surface water quality and flow monitoring are provided in **Figure 2.** The sites have been selected strategically for appropriate reference and comparison site considerations, in order to allow for a comparative analysis. An enhanced view of the sampling sites in and near Wetland 06 is provided in **Figure 3**. Suitability of these locations has been field verified during a reconnaissance survey in early spring 2018, however, the locations of these sites are subject to change pending potential subsequent annual and seasonal variability in site conditions.

4.1.1 Surface Water Quality

Surface water quality will be monitored at eight site locations (**Table 2**).

One surface water quality reference site (WQ-01) is identified for the Plan. The reference site is located north of Wetland 06 in an adjacent wetland that is outside the TUC. This site was selected as there are no identified or known pathways from the Project that could potentially direct Project-effected water into the adjacent wetland.

Based on a desktop assessment and a field reconnaissance, Hemmera identified two pathways in which Project-influenced water could potentially flow into Wetland 06 (see **Figure 1**). The two identified pathways are described below. For each of the respective pathways, comparison samples will be collected from a series of sample sites (i.e., background vs. comparison) (see **Figure 2**).

- Pathway 1 is an undefined channel that diagonally bisects the Project footprint. From the west side of the TUC boundary, water flows northeast through Wetland 08 into Wetland 07 where it then flows past the east side of the TUC boundary and then into a defined channel (approximately 400 m) that ultimately drains into Wetland 06 (see **Figure 1**). The sample sites associated with Pathway 1 are; WQ-04a, WQ-04b, and WQ-02 (see **Figure 2**). WQ-04a has been selected as a background site, as it is located upstream of potential influences from the Project.
- Pathway 2 is an undefined channel that flows east through Wetland 09 where it then enters a recently construction stormwater drainage system (see **Figure 1**). The drainage system outlets into a constructed riprap lined drainage ditch that flows north towards the eastern TUC boundary. In addition, a constructed drainage ditches channels water west where it converges with flows in the aforementioned constructed riprap lined drainage ditch. From the eastern TUC water meanders north through a defined channel (approximately 1,000 m) that eventually drains into Wetland 06 (see **Figure 1**). The samples sites associated with Pathway 2 are; WQ-05a, WQ-05b, WQ-05c, and WQ-03 (see **Figure 2**).

Surface water quality monitoring sites are subject to change due to seasonality and site conditions. Additional or alternative surface water quality monitoring sites may be identified if field crews observe abnormal site conditions or contaminant indicators, more information is provided in **Section 4.3.**

Table 2 Surface Water Quality Sample Locations

Site Name	Universal Transverse Mercator (Zone 11U)		Site Description	Reference or Comparison Site
	Easting	Northing		
WQ-01	699168	5652375	Reference wetland to the north of Wetland 06	Reference
WQ-02	699186	5652164	West (upslope) side of Wetland 06	Comparison
WQ-03	699432	5652159	East (downslope) side of Wetland 06	Comparison
WQ-04a	698898	5651725	Wetland 08, upslope of SWCRR Project	Background
WQ-04b	699113	5651956	Wetland 07, downslope of SWCRR Project and Wetland 08	Comparison
WQ-05a	699060	5650929	Upslope of Wetland 09 and SWCRR Project	Background
WQ-5b	699788	5651289	Watercourse 01 downslope of Wetland 09 and SWCRR Project	Comparison
WQ-05c	700061	5651274	Catchment basin to the east of SWCRR Project and upslope of the confluence with Watercourse 01	Comparison

4.1.2 Surface Water Flow

Surface water flow will be monitored at four locations around Wetland 06 (**Table 3**). Each of these locations are expected to provide conveyance of surface flow (inflow or outflow) year-round during normal surface flow conditions. Given the higher than average snowfall and later than normal lowland melt in 2018, sampling locations for surface water flow may need to be reconsidered in subsequent sampling visits.

Surface water inflows have been identified at FL-01, FL-02, and FL-03. The sampling location FL-01 occurs where surface water inflow is associated with drainage from Wetland 07 and 08. Site FL-02 is where the surface water inflow is conveyed from Wetland 09. Site FL-03 is where the surface water inflow associated with drainage from the reference wetland to the north of Wetland 06. Surface water outflow monitoring will occur at FL-04 at the Glenmore Pathway bridge crossing approximately 75 m downslope from Wetland 06.

Table 3 Surface Water Flow Sample Locations

Site Name	Universal Transverse Mercator (Zone 11U)		Inflow or Outflow
	Easting	Northing	
FL-01	699156	5652166	Inflow
FL-02	699406	5652115	Inflow
FL-03	699075	5652326	Inflow
FL-04	699644	5652343	Outlfow

Surface flow in undefined channels (i.e., lacking defined bed and banks) may be present at the surface water flow monitoring locations pending flow conditions during each field sampling visit and are expected be influenced by natural events (e.g., precipitation levels) within and between monitoring years. Monitoring flow in waterbodies lacking defined bed and banks can also have reduced accuracy as compared to a defined channel. Therefore, field crews may be required to adjust the surface water flow monitoring sites

during each field sampling visit to a location where channel characteristics are most appropriate for flow measurements. If additional surface water inflow or outflow locations are identified during the field sampling visits due to variability in hydrological connectivity, contingency surface water flow monitoring sites will be added.

4.2 Frequency of sampling

Surface water quality and flow monitoring will occur twice annually, once in the spring and once in the fall. The spring field sampling visit is proposed to occur in May and the fall field sampling visit is proposed to occur in October of each year of the Plan. The exact timing of the spring and fall field sampling visits are dependent on environmental conditions including ambient air temperatures, snow/ice cover, and precipitation events. Sampling will not occur during or within 72 hours of a substantial precipitation event to reduce any temporal variation (short-term pulse response) associated with extreme disturbances resulting in water and flow sampling that is more representative of the wetland conditions.

4.3 Water Quality Monitoring

Surface water quality samples will be taken from the banks of at the sample sites provided in **Tables 2** and discussed in **Section 4.1.1**. Site conditions (e.g., weather) will be recorded y the field crew. At each sampling site, five photos will be taken in a north, south, east, west, and ground direction.

Discrete profile lake water sampling and composite integrated water sampling methodologies (Alberta Environment 2006) have been determined to be inappropriate sampling methodologies for this Plan as water depths at the sampling sites are not deep enough to require spatial characterization over a horizontal or depth profile. The protocol provided by Canadian Council of Ministers of the Environment (CCME) (2011) for shore sampling will be followed and is summarized below. A certified Canadian Association for Laboratory Accreditation (CALA) laboratory will complete the laboratory analysis of water samples.

Samples will be labeled using a water-proof marker for accurate identification by the field crews and the laboratory. A chain of custody form will be completed, and any transfers of custody will be noted on the form by the authorized personnel including transfer to the CALA laboratory. Field crews will wear unpowdered latex or polyethylene disposable gloves and refrain from smoking or eating while collecting water samples (Alberta Government 2006).

An extension pole will be used to collect a “grab sample” from each sampling site and to avoid disturbing the site during collection of the water samples (CCME 2011). At each sampling location, the extension pole and clamp will be rinsed prior to collecting the water samples to reduce possible contamination between sites. Laboratory protocols for sample bottle rinsing will be followed and any rinsing of sample bottles or collection equipment will be completed slightly downslope of the sampling location to prevent cross contamination.

Water samples will be collected facing upstream if flow is present (CCME 2011). Water bottles will be uncapped immediately prior to filling. Water samples will be collected one at a time ensuring the lid is immediately capped once the bottle is filled. Water samples will be collected at approximately 60% water depth to avoid surface scum and film, and to collect a representative water sample. Algae, sediment, and organic matter will be avoided in the water sample.

Laboratory protocols for preservatives, storage, and transportation of water samples will be followed. Water samples will be kept in coolers containing enough ice packs or warm water bottles to keep the samples at approximately 4°C. All water samples will be sealed and packed in the coolers as to prevent spillage or breakage. Water samples will be delivered to the laboratory as soon as possible after collection, preferably the same day and hold times will be followed so analysis will occur within the appropriate hold periods.

Water sample parameters to be monitored during the Plan include those identified as potential sources or indicators of sources of pollutants or contaminants that may result from the construction and operations phases of the Project. Previous studies have shown sediment transport and deposition pose the greatest risk to the construction phase of highway projects, resulting from excavation and earthworks (Barrett et. al., 1995). Eroded soil can also transport nutrients, ions, and metals (Barrett et. al., 1995). During the operations phase of highway projects, sedimentation remains a concern along with transportation of pollutants from vehicles operating on the highway through run-off (Barrett et. al., 1995).

Water samples will be collected at all eight sampling (**Table 2**) for the parameters provided in **Table 4**. All samples collected from Wetland 06 and the reference wetland (i.e., WQ-01, WQ-02, and WQ-03) will be submitted for analysis for all parameters immediately after collection, with regular turn around time of 7-days requested. For remaining sample locations (i.e., WQ-04a,b; WQ-05a,b,c), all samples will be submitted, however, only those samples which have a holding time of less than 7 days will be immediately analysed (i.e., biological oxygen demand, nitrate, nitrite, sulfate, total dissolved solids, and total suspended solids. Samples not immediately analysed will be kept at the laboratory, pending the results from WQ-01 to WQ-03, and will be stored at the laboratory in accordance with CALA standards. If an exceedance value is identified at WQ- 01, WQ-02, or WQ-03, additional laboratory analysis for the exceedance parameter(s) will be conducted for the remaining sample sites (i.e., WQ-04a,b; WQ-05a,b,c), to determine if the exceedance is Project related or generated offsite.

The parameters provided in **Table 4** are reflective of those included in the City of Calgary Stormwater Management and Design Manual (2011). Project activities associated with the construction and operations phase of the Project are unlikely to have effects on microbiological indicators; as such they have been excluded from the Plan.

Table 4 Water Quality Parameters Monitored During the Plan

Sediment & Physical	
• Total Suspended Solids (TSS) • Total Dissolved Solids (TDS) • Turbidity	• Conductivity (EC) • pH • Dissolved Oxygen (DO)
Nutrients and Others (mg/L)	
• Biochemical Oxygen Demand (BOD) • Chemical Oxygen Demand (COD) • Nitrate (NO_3) • Nitrite (NO_2)	• Total Kjelahl Nitrogen (TKN) • Ammonia-Nitrogen (NH_3-N) • Total Phosphorus (TP) • Dissolved Reactive Phosphorus (TDP) • Ortho-Phosphate

Dissolved Metals & Metals (mg/L)			
• Silver (Ag)	• Cobalt (Co)	• Molybdenum (Mo)	• Tin (Sn)
• Aluminum (Al)	• Chromium (Cr)	• Nickel (Ni)	• Strontium (Sr)
• Arsenic (As)	• Copper (Cu	• Lead (P)	• Sodium (Na)
• Boron (B)	• Iron (Fe)	• Lead (Pb)	• Titanium (Ti)
• Barium (Ba)	• Potassium (K)	• Sulfur (S)	• Thallium (Tl)
• Beryllium (Be)	• Lithium (Li)	• Antimony (Sb)	• Uranium (U)
• Calcium (Ca)	• Magnesium (Mg)	• Selenium (Se)	• Vanadium (V)
• Cadmium (Cd)	• Manganese (Mn)	• Silicon (Si)	• Zinc (Zn)
Major Ions& Salts			
• Sodium (Na^{2+})		• Calcium (Ca^{2+})	
• Potassium (K^{+})		• Chloride (Cl^{-})	
• Potassium (K^{+})		• Sulfate (SO^{4-})	

Sediment and physical parameters provided in the first section of **Table 4** (i.e., TSS, TDS, turbidity, conductivity, dissolved oxygen, and pH) will be measured at all water quality monitoring sites listed in **Table 2**. In addition, water temperature, conductivity, pH, and dissolved oxygen which will be measured in-situ at all water quality monitoring sites provided in **Table 2.** These measurements will be taken below the water surface at approximately 60% water depth. Manufacturers instructions for calibration and measuring parameters will be followed.

In-situ measurements will be used as field indicators for any supplemental water quality sampling, if required. Field crews may collect additional water samples for analysis at the existing water sampling locations or at additional locations not included in **Table 2** if abnormal site conditions are observed or in-situ measurements indicate potential water quality abnormalities. Field indicators of potential hydrocarbons (e.g., oil sheen, odor) will be noted by field crews and a potential observation will trigger further water quality analysis for hydrocarbons.

4.4 Water Flow Monitoring

The proposed locations for surface water flow monitoring have been discussed in **Section 4.1**. Surface flow will be measured at each monitoring site using a HACH® velocity flow meter (or comparable model) and using the velocity-area method (Government of Alberta 2009). Using the surface water inflows and outflows of Wetland 06, a modified water balance will be completed. The sum of all surface water inflow and sum of all outflows will be compared for each seasonal sampling visit and between years of the Plan.

In addition to flow monitoring, field crews will deploy a water level staff gauge in both Wetland 06 and the reference wetland. Water depths will be recorded during each field sampling visit. Wetted widths will also be measured at four transects across Wetland 06 and the reference wetland. Transect locations will be recorded using a global positioning system (GPS) devise and natural landmarks will be recorded for replicability in the transect location from each seasonal field sampling visit during the Plan.

A comparison of the wetted widths and water depths of Wetland 06 and the reference wetland will be used to assess if the wetted perimeter of Wetland 06 is being reduced while accounting for natural fluctuations resulting in annual variability through comparison to the reference wetland.

4.5 Reporting

Surface water quality and flow results for each monitoring field visit will be made publicly available by KGL within one month of the seasonal field sampling event. The annual report, incorporating both seasonal field sampling visits will be made publicly available by KGL by March 31 of the year following the seasonal field sampling visits.

The annual report will include analysis of the surface water quality and flow results for both seasonal field visits. Surface water quality results will be compared relative the Environmental Quality Guidelines for Alberta Surface Waters (Government of Alberta 2014). Select surface water quality parameters (i.e., turbidity, temperature, pH, conductivity, dissolved oxygen, phosphate, and chloride) will also be compared to water quality parameters collected by the Weaselhead /Glenmore Park Preservation Society in 2016 within Wetland 06 as part of a baseline conditions environmental monitoring study (Porto 2017). This study will provide baseline conditions (i.e., prior to construction activities on the Project) in Wetland 06 with the limitation that not all water quality parameters measured in this Plan were included in the 2016 baseline study.

The annual report will also compare wetted width measurements and water depths in Wetland 06 versus the reference wetland to the north. Any change in wetted width or water depth recorded during prescribed sampling times (i.e., May and October) will be compared in the reference wetland to identify if changes in the wetland are due to Project effects or natural environmental conditions (e.g., drought). Following the first annual report, subsequent annual reports will also include a trend analysis through comparison of surface water quality and flow between years of the Plan.

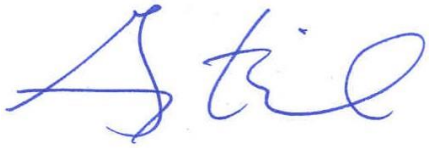
5.0 CLOSURE

This Monitoring Plan has been developed to meet the monitoring requirements described in Condition 6.2 and other additional monitoring components that will enable identification of potential impacts to the surface water quality and flow of Wetland 06. Alternatively, the Plan may also identify and inform on other potential impacts that are not related to the Project.

In developing this Plan, Hemmera has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This Plan was developed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale, but with specific reference to the Order. The Plan presented herein should be considered within the context of the scope of work and project terms of reference; further, the Plan is time sensitive and should considered valid only during the timeline included in this Plan. This Plan is based upon the applicable guidelines, regulations, and legislation existing at the time the Plan was produced.

Prepared by:
Hemmera Envirochem Inc.

per: Caitlin Gifford B.Sc., P.Biol.
Aquatic Biologist



Greg Eisler, B.Sc., P.Biol., R.P.Bio.
Senior Aquatic Biologist

6.0 REFERENCES

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Barrett, Michael E., Jospeh F. Malina, Randall J. harbeneau, and George H. Ward. 1995. Effects of Highway Construction and Operation on Water Quality and Quantity in an Ephemeral Stream in the Austin, Texas Area. Available at: https://repositories.lib.utexas.edu/bitstream/handle/2152/6739/crwr_onlinereport95-7.pdf.

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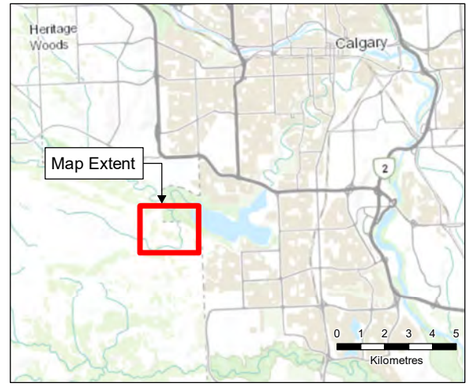
Government of Alberta. 2014. Environmental Quality Guidelines for Alberta Surface Waters. Alberta Environment and Sustainable Resource Development, Water Policy Branch, Policy Division. Edmonton, 48 pp.

Porto, Cassiano. 2017. Weaselhead/Glenmore Park SWCRR Impact Study Environmental Monitoring Report 2016: baseline conditions. Wetland Monitoring Component.

FIGURES

2018 Wetland Monitoring Program
Weaselhead Rd, Calgary AB

Wetland Locations



Elbow River
GREY EAGLE DR
WEASELHEAD NATURAL AREA
Glenmore Reservoir
Wetland 06
Wetland 07
Wetland 08
CITY OF CALGARY BOUNDARY
TRANSPORTATION AND UTILITY CORRIDOR (TUC)
WEASELHEAD RD
Watercourse 01
Wetland 09

Legend

- Bypass Culvert
- Pathway #1 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow
- Stormwater Drainage Line
- City of Calgary Boundary
- Natural Area
- Transportation and Utility Corridor (TUC)
- Watercourse
- Wetland

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: ESRI World Imagery, 2016
- Inset Basemap: ESRI World Topographic Map

N

1:7,500

0 100 200 300 400 500

Metres

NAD 1983 UTM Zone 11N

Page Size: 11" x 17"

102604-01	Production Date: May 17, 2018	Figure 1

Hemmera
An Ausenco Company

KGL

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2018 Wetland Monitoring Program
Weaselhead Rd, Calgary AB

Water Flow and Quality Sampling Locations

Legend

- Water Flow Sample Location (Hemmera, 2018)
- Water Quality Sample Location (Hemmera, 2018)
- Bypass Culvert
- Pathway #1 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow
- Stormwater Drainage Line
- City of Calgary Boundary
- Natural Area
- Transportation and Utility Corridor (TUC)
- Watercourse
- Wetland

Notes

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2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Aerial Image: ESRI World Imagery, 2016

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Metres

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Page Size: 11" x 17"

102604-01	Production Date: May 17, 2018	Figure 2

Hemmera
An Ausenco Company

KGL

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2018 Wetland Monitoring Program
Weaselhead Rd, Calgary AB

Water Flow and Quality Sampling Location Details

Legend

- Water Flow Sample Location (Hemmera, 2018)
- Water Quality Sample Location (Hemmera, 2018)
- Bypass Culvert
- Pathway #1 Approximate Direction of Flow
- Pathway #2 Approximate Direction of Flow
- City of Calgary Boundary
- Natural Area
- Transportation and Utility Corridor (TUC)
- Wetland

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
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Sources

- Aerial Image: ESRI World Imagery, 2016

N

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0 25 50 75 100 125

Metres

NAD 1983 UTM Zone 11N

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102604-01	Production Date: May 17, 2018	Figure 3

Hemmera
An Ausenco Company

KGL

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Appendix B

Raw Spring Monitoring Report

Your Project #: 102604-01
Your C.O.C. #: 664716-01-01

Attention: Cameron Davis

HEMMERA ENVIROCHEM INC.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/06/07
Report #: R3182105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C235498
Received: 2022/05/26, 17:15

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	2	N/A	2022/05/30	AB SOP-00005	SM 23 2320 B m
Biochemical Oxygen Demand	2	2022/05/29	2022/06/03	AB SOP-00017	SM 23 5210B m
Cadmium - low level CCME - Dissolved	8	N/A	2022/06/04		Auto Calc
Chloride/Sulphate by Auto Colourimetry	2	N/A	2022/06/02	AB SOP-00020	SM23-4500-Cl/SO4-E m
COD by Colorimeter	2	N/A	2022/05/30	AB SOP-00016	SM 23 5220D m
Oxygen (Dissolved) (1)	2	N/A	2022/05/27	AB SOP-00058	SM 23 4500-O C m
Conductivity @25C	2	N/A	2022/05/30	AB SOP-00005	SM 23 2510 B m
Hardness	2	N/A	2022/06/02		Auto Calc
Elements by ICP - Dissolved (2)	1	N/A	2022/05/30	AB SOP-00042	EPA 6010d R5 m
Elements by ICP - Dissolved (2)	7	N/A	2022/06/01	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (2)	8	N/A	2022/06/04	AB SOP-00043	EPA 6020b R2 m
Ion Balance	2	N/A	2022/06/02		Auto Calc
Sum of cations, anions	2	N/A	2022/06/02		Auto Calc
Ammonia-N (Total)	2	N/A	2022/06/03	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate and Nitrite	6	N/A	2022/06/01		Auto Calc
Nitrate and Nitrite	2	N/A	2022/06/07		Auto Calc
NO2 (N); NO2 (N) + NO3 (N) in Water	5	N/A	2022/05/31	AB SOP-00091	SM 23 4500 NO3m
NO2 (N); NO2 (N) + NO3 (N) in Water	1	N/A	2022/06/01	AB SOP-00091	SM 23 4500 NO3m
NO2 (N); NO2 (N) + NO3 (N) in Water	2	N/A	2022/06/07	AB SOP-00091	SM 23 4500 NO3m
Nitrate (as N)	6	2022/05/29	2022/06/01		Auto Calc
Nitrate (as N)	2	2022/05/29	2022/06/07		Auto Calc
pH @25°C (3)	2	N/A	2022/05/30	AB SOP-00005	SM 23 4500-H+B m
Orthophosphate by Konelab (4)	6	N/A	2022/05/30	AB SOP-00025	SM 23 4500-P A,F m
Orthophosphate by Konelab (4)	2	N/A	2022/06/02	AB SOP-00025	SM 23 4500-P A,F m
Total Dissolved Solids (Filt. Residue)	8	2022/05/30	2022/05/30	AB SOP-00065	SM 23 2540 C m
Total Dissolved Solids (Calculated)	2	N/A	2022/06/02		Auto Calc
Total Kjeldahl Nitrogen (Total)	2	N/A	2022/06/07	BBY WI-00033	Auto Calc
Nitrogen (Total)	2	2022/06/01	2022/06/03	AB SOP-00093	SM 23 4500-N C m
Phosphorus -P (Total, Dissolved) (5)	2	2022/05/31	2022/06/02	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus	2	2022/06/01	2022/06/02	AB SOP-00024	SM 23 4500-P A,B,F m
Total Suspended Solids (NFR)	2	2022/05/30	2022/05/30	AB SOP-00061	SM 23 2540 D m
Turbidity	8	N/A	2022/05/29	CAL SOP-00081	SM 23 2130 B m

Your Project #: 102604-01
Your C.O.C. #: 664716-01-01

Attention: Cameron Davis

HEMMERA ENVIROCHEM INC.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/06/07
Report #: R3182105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C235498
Received: 2022/05/26, 17:15

Remarks:

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

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

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

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

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) The APHA Standard Method requires dissolved oxygen to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory dissolved oxygen analyses in this report are reported past the APHA Standard Method holding time. Bureau Veritas endeavors to analyze samples as soon as possible after receipt.
(2) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(4) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) Dissolved Phosphorus > Total Phosphorus Imbalance: When applicable, Dissolved Phosphorus and Total Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.

Bureau Veritas Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your Project #: 102604-01
Your C.O.C. #: 664716-01-01

Attention: Cameron Davis

HEMMERA ENVIROCHEM INC.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/06/07
Report #: R3182105
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C235498
Received: 2022/05/26, 17:15

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Geraldlyn Gouthro, Key Account Specialist
Email: geraldlyn.gouthro@bureauveritas.com
Phone# (780)577-7173
==========
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		ATS352			ATS353		
Sampling Date		2022/05/26 10:30			2022/05/26 09:50		
COC Number		664716-01-01			664716-01-01		
	UNITS	WQ2	RDL	QC Batch	WQ3	RDL	QC Batch
Calculated Parameters							
Anion Sum	meq/L	17	N/A	A590803	11	N/A	A590803
Cation Sum	meq/L	17	N/A	A590803	11	N/A	A590803
Hardness (CaCO3)	mg/L	630	0.50	A590664	470	0.50	A590664
Ion Balance (% Difference)	%	0.41	N/A	A590802	0.96	N/A	A590802
Nitrate (N)	mg/L	<0.010	0.010	A590668	<0.050	0.050	A590668
Nitrate (NO3)	mg/L	<0.044	0.044	A590667	<0.044	0.044	A590667
Nitrite (NO2)	mg/L	<0.033	0.033	A590667	<0.033	0.033	A590667
Calculated Total Dissolved Solids	mg/L	890	10	A590804	600	10	A590804
Elements							
Dissolved Cadmium (Cd)	mg/L	<0.000020	0.000020	A590663	<0.000020	0.000020	A590663
Misc. Inorganics							
Conductivity	uS/cm	1400	2.0	A591076	950	2.0	A591076
pH	pH	7.64	N/A	A591071	8.15	N/A	A591071
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	A591069	<1.0	1.0	A591069
Alkalinity (Total as CaCO3)	mg/L	580	1.0	A591069	340	1.0	A591069
Bicarbonate (HCO3)	mg/L	710	1.0	A591069	420	1.0	A591069
Carbonate (CO3)	mg/L	<1.0	1.0	A591069	<1.0	1.0	A591069
Hydroxide (OH)	mg/L	<1.0	1.0	A591069	<1.0	1.0	A591069
Chloride (Cl)	mg/L	22	1.0	A595051	18	1.0	A595051
Sulphate (SO4)	mg/L	230	5.0	A595051	180	5.0	A595051
Nutrients							
Nitrite (N)	mg/L	<0.010	0.010	A599916	<0.010	0.010	A599916
Nitrate plus Nitrite (N)	mg/L	<0.010	0.010	A599916	<0.050 (1)	0.050	A599916
Elements							
Dissolved Aluminum (Al)	mg/L	0.0030	0.0030	A597450	0.0052	0.0030	A597450
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	A597450	<0.00060	0.00060	A597450
Dissolved Arsenic (As)	mg/L	0.00080	0.00020	A597450	0.0013	0.00020	A597450
Dissolved Barium (Ba)	mg/L	0.081	0.010	A594451	0.14	0.010	A594453
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	A597450	<0.0010	0.0010	A597450
Dissolved Boron (B)	mg/L	0.069	0.020	A594451	0.057	0.020	A594453

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to matrix interference.

Bureau Veritas Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		ATS352			ATS353		
Sampling Date		2022/05/26 10:30			2022/05/26 09:50		
COC Number		664716-01-01			664716-01-01		
	UNITS	WQ2	RDL	QC Batch	WQ3	RDL	QC Batch
Dissolved Calcium (Ca)	mg/L	88	0.30	A594451	90	0.30	A594453
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	A597450	<0.0010	0.0010	A597450
Dissolved Cobalt (Co)	mg/L	0.00051	0.00030	A597450	<0.00030	0.00030	A597450
Dissolved Copper (Cu)	mg/L	0.0012	0.0010	A597450	0.0031	0.0010	A597450
Dissolved Iron (Fe)	mg/L	<0.060	0.060	A594451	<0.060	0.060	A594453
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	A597450	<0.00020	0.00020	A597450
Dissolved Lithium (Li)	mg/L	0.037	0.020	A594451	<0.020	0.020	A594453
Dissolved Magnesium (Mg)	mg/L	100	0.20	A594451	60	0.20	A594453
Dissolved Manganese (Mn)	mg/L	0.072	0.0040	A594451	0.040	0.0040	A594453
Dissolved Molybdenum (Mo)	mg/L	0.0022	0.00020	A597450	0.0083	0.00020	A597450
Dissolved Nickel (Ni)	mg/L	0.0013	0.00050	A597450	0.0021	0.00050	A597450
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	A594451	<0.10	0.10	A594453
Dissolved Potassium (K)	mg/L	1.8	0.30	A594451	8.0	0.30	A594453
Dissolved Selenium (Se)	mg/L	0.00030	0.00020	A597450	0.00071	0.00020	A597450
Dissolved Silicon (Si)	mg/L	4.4	0.10	A594451	0.90	0.10	A594453
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	A597450	<0.00010	0.00010	A597450
Dissolved Sodium (Na)	mg/L	98	0.50	A594451	38	0.50	A594453
Dissolved Strontium (Sr)	mg/L	1.1	0.020	A594451	0.69	0.020	A594453
Dissolved Sulphur (S)	mg/L	61	0.20	A594451	61	0.20	A594453
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	A597450	<0.00020	0.00020	A597450
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	A597450	<0.0010	0.0010	A597450
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	A597450	<0.0010	0.0010	A597450
Dissolved Uranium (U)	mg/L	0.013	0.00010	A597450	0.016	0.00010	A597450
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	A597450	0.0011	0.0010	A597450
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	A597450	<0.0030	0.0030	A597450
RDL = Reportable Detection Limit							

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TOTAL KJELDAHL NITROGEN (TOTAL)

Bureau Veritas ID		ATS352		ATS353		
Sampling Date		2022/05/26 10:30		2022/05/26 09:50		
COC Number		664716-01-01		664716-01-01		
	UNITS	WQ2	RDL	WQ3	RDL	QC Batch
Calculated Parameters						
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.427	0.020	1.10	0.050	A590708
Nutrients						
Total Nitrogen (N)	mg/L	0.43	0.020	1.1	0.020	A594000
RDL = Reportable Detection Limit						

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REGULATED METALS (CCME/AT1) - DISSOLVED

Bureau Veritas ID		ATS354		ATS355	ATS356	ATS357		
Sampling Date		2022/05/26 14:10		2022/05/26 14:40	2022/05/26 15:00	2022/05/26 13:50		
COC Number		664716-01-01		664716-01-01	664716-01-01	664716-01-01		
	UNITS	WQ4B	QC Batch	WQ4C	WQ4D	WQ5B	RDL	QC Batch
Elements								
Dissolved Cadmium (Cd)	mg/L	<0.000020	A590663	<0.000020	<0.000020	<0.000020	0.000020	A590663
Dissolved Aluminum (Al)	mg/L	<0.0030	A597450	0.014	<0.0030	0.0060	0.0030	A597450
Dissolved Antimony (Sb)	mg/L	<0.00060	A597450	<0.00060	<0.00060	<0.00060	0.00060	A597450
Dissolved Arsenic (As)	mg/L	0.0010	A597450	0.00070	0.00063	0.0015	0.00020	A597450
Dissolved Barium (Ba)	mg/L	0.19	A591379	0.094	0.099	0.14	0.010	A594453
Dissolved Beryllium (Be)	mg/L	<0.0010	A597450	<0.0010	<0.0010	<0.0010	0.0010	A597450
Dissolved Boron (B)	mg/L	0.078	A591379	0.073	0.067	0.045	0.020	A594453
Dissolved Calcium (Ca)	mg/L	85	A591379	70	67	78	0.30	A594453
Dissolved Chromium (Cr)	mg/L	<0.0010	A597450	<0.0010	<0.0010	<0.0010	0.0010	A597450
Dissolved Cobalt (Co)	mg/L	0.00056	A597450	<0.00030	<0.00030	0.00034	0.00030	A597450
Dissolved Copper (Cu)	mg/L	<0.0010	A597450	0.0012	0.0024	0.0028	0.0010	A597450
Dissolved Iron (Fe)	mg/L	<0.060	A591379	<0.060	<0.060	<0.060	0.060	A594453
Dissolved Lead (Pb)	mg/L	<0.00020	A597450	<0.00020	<0.00020	<0.00020	0.00020	A597450
Dissolved Lithium (Li)	mg/L	0.033	A591379	0.021	0.022	0.022	0.020	A594453
Dissolved Magnesium (Mg)	mg/L	100	A591379	50	48	75	0.20	A594453
Dissolved Manganese (Mn)	mg/L	0.12	A591379	0.035	0.036	0.055	0.0040	A594453
Dissolved Molybdenum (Mo)	mg/L	0.0011	A597450	0.0018	0.0019	0.0039	0.00020	A597450
Dissolved Nickel (Ni)	mg/L	0.0018	A597450	0.0010	0.00070	0.0018	0.00050	A597450
Dissolved Phosphorus (P)	mg/L	<0.10	A591379	<0.10	<0.10	<0.10	0.10	A594453
Dissolved Potassium (K)	mg/L	2.1	A591379	4.2	4.0	5.8	0.30	A594453
Dissolved Selenium (Se)	mg/L	0.00038	A597450	0.0011	0.0012	0.0024	0.00020	A597450
Dissolved Silicon (Si)	mg/L	7.8	A591379	4.3	4.1	1.4	0.10	A594453
Dissolved Silver (Ag)	mg/L	<0.00010	A597450	<0.00010	<0.00010	<0.00010	0.00010	A597450
Dissolved Sodium (Na)	mg/L	46	A591379	47	45	41	0.50	A594453
Dissolved Strontium (Sr)	mg/L	1.1	A591379	0.73	0.72	0.67	0.020	A594453
Dissolved Sulphur (S)	mg/L	19	A591379	17	16	48	0.20	A594453
Dissolved Thallium (Tl)	mg/L	<0.00020	A597450	<0.00020	<0.00020	<0.00020	0.00020	A597450
Dissolved Tin (Sn)	mg/L	<0.0010	A597450	<0.0010	<0.0010	<0.0010	0.0010	A597450
Dissolved Titanium (Ti)	mg/L	<0.0010	A597450	<0.0010	<0.0010	<0.0010	0.0010	A597450
Dissolved Uranium (U)	mg/L	0.0058	A597450	0.0042	0.0045	0.014	0.00010	A597450
Dissolved Vanadium (V)	mg/L	0.0011	A597450	0.0010	0.0011	0.0012	0.0010	A597450
Dissolved Zinc (Zn)	mg/L	<0.0030	A597450	0.015	0.015	<0.0030	0.0030	A597450

RDL = Reportable Detection Limit

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REGULATED METALS (CCME/AT1) - DISSOLVED

Bureau Veritas ID		ATS358	ATS359		
Sampling Date		2022/05/26 11:10	2022/05/26 11:30		
COC Number		664716-01-01	664716-01-01		
	UNITS	WQ6	WQ7	RDL	QC Batch
Elements					
Dissolved Cadmium (Cd)	mg/L	<0.000020	<0.000020	0.000020	A590663
Dissolved Aluminum (Al)	mg/L	0.012	0.0090	0.0030	A597450
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	A597450
Dissolved Arsenic (As)	mg/L	0.0014	0.0015	0.00020	A597450
Dissolved Barium (Ba)	mg/L	0.14	0.14	0.010	A594453
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	A597450
Dissolved Boron (B)	mg/L	0.084	0.085	0.020	A594453
Dissolved Calcium (Ca)	mg/L	56	58	0.30	A594453
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	A597450
Dissolved Cobalt (Co)	mg/L	0.00031	0.00031	0.00030	A597450
Dissolved Copper (Cu)	mg/L	0.0029	0.0011	0.0010	A597450
Dissolved Iron (Fe)	mg/L	0.074	0.17	0.060	A594453
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	A597450
Dissolved Lithium (Li)	mg/L	0.025	0.027	0.020	A594453
Dissolved Magnesium (Mg)	mg/L	84	82	0.20	A594453
Dissolved Manganese (Mn)	mg/L	0.042	0.073	0.0040	A594453
Dissolved Molybdenum (Mo)	mg/L	0.0052	0.0053	0.00020	A597450
Dissolved Nickel (Ni)	mg/L	0.0023	0.0021	0.00050	A597450
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	A594453
Dissolved Potassium (K)	mg/L	7.1	7.1	0.30	A594453
Dissolved Selenium (Se)	mg/L	0.00057	0.00058	0.00020	A597450
Dissolved Silicon (Si)	mg/L	0.23	0.22	0.10	A594453
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	A597450
Dissolved Sodium (Na)	mg/L	66	66	0.50	A594453
Dissolved Strontium (Sr)	mg/L	0.81	0.81	0.020	A594453
Dissolved Sulphur (S)	mg/L	100	110	0.20	A594453
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	A597450
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	A597450
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.0010	A597450
Dissolved Uranium (U)	mg/L	0.0099	0.0098	0.00010	A597450
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	0.0010	A597450
Dissolved Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0030	A597450

RDL = Reportable Detection Limit

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		ATS352	ATS353			ATS354		ATS355		
Sampling Date		2022/05/26 10:30	2022/05/26 09:50			2022/05/26 14:10		2022/05/26 14:40		
COC Number		664716-01-01	664716-01-01			664716-01-01		664716-01-01		
	UNITS	WQ2	WQ3	RDL	QC Batch	WQ4B	QC Batch	WQ4C	RDL	QC Batch
Calculated Parameters										
Nitrate (N)	mg/L					<0.010	A590668	<0.010	0.010	A590668
Nitrate (NO3)	mg/L					<0.044	A590667	<0.044	0.044	A590667
Demand Parameters										
Biochemical Oxygen Demand	mg/L	<3.3	<2.2	2.0	A590819					
Chemical Oxygen Demand	mg/L	21	35	10	A591335					
Misc. Inorganics										
Dissolved Oxygen (O2)	mg/L	12	8.0	0.10	A589940					
Total Dissolved Solids	mg/L	830	570	10	A591082	580	A591082	430	10	A591082
Total Suspended Solids	mg/L	110	31	1.0	A590996					
Nutrients										
Total Ammonia (N)	mg/L	<0.015	0.031	0.015	A597327					
Orthophosphate (P)	mg/L	0.0045	0.0050	0.0030	A596041	<0.0030	A591718	<0.0030	0.0030	A591718
Dissolved Phosphorus (P)	mg/L	0.0047	0.011	0.0030	A592765					
Total Phosphorus (P)	mg/L	0.013	0.027	0.0030	A593816					
Nitrate plus Nitrite (N)	mg/L					<0.010	A593159	<0.010	0.010	A593175
Physical Properties										
Turbidity	NTU	40	15	0.10	A590807	12	A590807	18	0.10	A590807

RDL = Reportable Detection Limit

Bureau Veritas ID		ATS356		ATS357	ATS358	ATS359		
Sampling Date		2022/05/26 15:00		2022/05/26 13:50	2022/05/26 11:10	2022/05/26 11:30		
COC Number		664716-01-01		664716-01-01	664716-01-01	664716-01-01		
	UNITS	WQ4D	RDL	WQ5B	WQ6	WQ7	RDL	QC Batch
Calculated Parameters								
Nitrate (N)	mg/L	<0.050	0.050	0.013	<0.010	<0.010	0.010	A590668
Nitrate (NO3)	mg/L	<0.22	0.22	0.058	<0.044	<0.044	0.044	A590667
Misc. Inorganics								
Total Dissolved Solids	mg/L	420	10	550	660	660	10	A591082
Nutrients								
Orthophosphate (P)	mg/L	0.0031	0.0030	<0.0030	0.0035	<0.0030	0.0030	A591718
Nitrate plus Nitrite (N)	mg/L	<0.050 (1)	0.050	0.013	<0.010	<0.010	0.010	A593174
Physical Properties								
Turbidity	NTU	18	0.10	8.0	3.6	4.0	0.10	A590807

RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

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GENERAL COMMENTS

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

Package 1	13.0°C
Package 2	15.0°C

Sample ATS352 [WQ2] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Orthophosphate by Konelab. Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time. Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water.

Sample ATS353 [WQ3] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Orthophosphate by Konelab. Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time. Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water.

Sample ATS354 [WQ4B] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. NO2 (N); NO2 (N) + NO3 (N) in Water completed within five days of sampling. Data is satisfactory for compliance purposes.

Sample ATS355 [WQ4C] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. NO2 (N); NO2 (N) + NO3 (N) in Water completed within five days of sampling. Data is satisfactory for compliance purposes.

Sample ATS356 [WQ4D] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for NO2 (N); NO2 (N) + NO3 (N) in Water. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised.

Sample ATS357 [WQ5B] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. NO2 (N); NO2 (N) + NO3 (N) in Water completed within five days of sampling. Data is satisfactory for compliance purposes.

Sample ATS358 [WQ6] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. NO2 (N); NO2 (N) + NO3 (N) in Water completed within five days of sampling. Data is satisfactory for compliance purposes.

Sample ATS359 [WQ7] : Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. NO2 (N); NO2 (N) + NO3 (N) in Water completed within five days of sampling. Data is satisfactory for compliance purposes.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A589940	PK8	Spiked Blank	Dissolved Oxygen (O2)	2022/05/27		95	%	80 - 120
A590807	GOC	Spiked Blank	Turbidity	2022/05/29		102	%	80 - 120
A590807	GOC	Method Blank	Turbidity	2022/05/29	<0.10		NTU	
A590807	GOC	RPD [ATS352-01]	Turbidity	2022/05/29	2.8		%	20
A590819	BYM	Spiked Blank	Biochemical Oxygen Demand	2022/06/03		96	%	85 - 115
A590819	BYM	Method Blank	Biochemical Oxygen Demand	2022/06/04	<2.0		mg/L	
A590819	BYM	RPD [ATS352-01]	Biochemical Oxygen Demand	2022/06/03	NC		%	20
A590996	AP1	Matrix Spike	Total Suspended Solids	2022/05/30		100	%	80 - 120
A590996	AP1	Spiked Blank	Total Suspended Solids	2022/05/30		102	%	80 - 120
A590996	AP1	Method Blank	Total Suspended Solids	2022/05/30	<1.0		mg/L	
A590996	AP1	RPD	Total Suspended Solids	2022/05/30	8.6		%	20
A591069	JLD	Spiked Blank	Alkalinity (Total as CaCO3)	2022/05/30		96	%	80 - 120
A591069	JLD	Method Blank	Alkalinity (PP as CaCO3)	2022/05/30	<1.0		mg/L	
			Alkalinity (Total as CaCO3)	2022/05/30	<1.0		mg/L	
			Bicarbonate (HCO3)	2022/05/30	<1.0		mg/L	
			Carbonate (CO3)	2022/05/30	<1.0		mg/L	
			Hydroxide (OH)	2022/05/30	<1.0		mg/L	
A591069	JLD	RPD	Alkalinity (PP as CaCO3)	2022/05/30	NC		%	20
			Alkalinity (Total as CaCO3)	2022/05/30	0.30		%	20
			Bicarbonate (HCO3)	2022/05/30	0.30		%	20
			Carbonate (CO3)	2022/05/30	NC		%	20
			Hydroxide (OH)	2022/05/30	NC		%	20
A591071	JLD	Spiked Blank	pH	2022/05/30		100	%	97 - 103
A591071	JLD	RPD	pH	2022/05/30	0.035		%	N/A
A591076	JLD	Spiked Blank	Conductivity	2022/05/30		101	%	90 - 110
A591076	JLD	Method Blank	Conductivity	2022/05/30	<2.0		uS/cm	
A591076	JLD	RPD	Conductivity	2022/05/30	1.1		%	10
A591082	LYV	Matrix Spike [ATS352-01]	Total Dissolved Solids	2022/05/30		NC	%	80 - 120
A591082	LYV	Spiked Blank	Total Dissolved Solids	2022/05/30		94	%	80 - 120
A591082	LYV	Method Blank	Total Dissolved Solids	2022/05/30	<10		mg/L	
A591082	LYV	RPD [ATS352-01]	Total Dissolved Solids	2022/05/30	0.97		%	20
A591335	PK8	Matrix Spike	Chemical Oxygen Demand	2022/05/30		106	%	80 - 120
A591335	PK8	Spiked Blank	Chemical Oxygen Demand	2022/05/30		102	%	80 - 120
A591335	PK8	Method Blank	Chemical Oxygen Demand	2022/05/30	<10		mg/L	
A591335	PK8	RPD	Chemical Oxygen Demand	2022/05/30	18		%	20
A591379	MPU	Matrix Spike	Dissolved Barium (Ba)	2022/05/30		97	%	80 - 120
			Dissolved Boron (B)	2022/05/30		97	%	80 - 120
			Dissolved Calcium (Ca)	2022/05/30		106	%	80 - 120
			Dissolved Iron (Fe)	2022/05/30		129 (1)	%	80 - 120
			Dissolved Lithium (Li)	2022/05/30		97	%	80 - 120
			Dissolved Magnesium (Mg)	2022/05/30		110	%	80 - 120
			Dissolved Manganese (Mn)	2022/05/30		110	%	80 - 120
			Dissolved Phosphorus (P)	2022/05/30		110	%	80 - 120
			Dissolved Potassium (K)	2022/05/30		104	%	80 - 120
			Dissolved Silicon (Si)	2022/05/30		150 (1)	%	80 - 120
			Dissolved Sodium (Na)	2022/05/30		NC	%	80 - 120
			Dissolved Strontium (Sr)	2022/05/30		95	%	80 - 120
			Dissolved Sulphur (S)	2022/05/30		114	%	80 - 120
A591379	MPU	Spiked Blank	Dissolved Barium (Ba)	2022/05/30		96	%	80 - 120
			Dissolved Boron (B)	2022/05/30		98	%	80 - 120
			Dissolved Calcium (Ca)	2022/05/30		100	%	80 - 120
			Dissolved Iron (Fe)	2022/05/30		108	%	80 - 120
			Dissolved Lithium (Li)	2022/05/30		93	%	80 - 120
			Dissolved Magnesium (Mg)	2022/05/30		103	%	80 - 120
			Dissolved Manganese (Mn)	2022/05/30		107	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Phosphorus (P)	2022/05/30		106	%	80 - 120
			Dissolved Potassium (K)	2022/05/30		100	%	80 - 120
			Dissolved Silicon (Si)	2022/05/30		106	%	80 - 120
			Dissolved Sodium (Na)	2022/05/30		98	%	80 - 120
			Dissolved Strontium (Sr)	2022/05/30		95	%	80 - 120
			Dissolved Sulphur (S)	2022/05/30		105	%	80 - 120
A591379	MPU	Method Blank	Dissolved Barium (Ba)	2022/05/30	<0.010		mg/L	
			Dissolved Boron (B)	2022/05/30	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/05/30	<0.30		mg/L	
			Dissolved Iron (Fe)	2022/05/30	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/05/30	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/05/30	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/05/30	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2022/05/30	<0.10		mg/L	
			Dissolved Potassium (K)	2022/05/30	<0.30		mg/L	
			Dissolved Silicon (Si)	2022/05/30	<0.10		mg/L	
			Dissolved Sodium (Na)	2022/05/30	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/05/30	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/05/30	<0.20		mg/L	
A591379	MPU	RPD	Dissolved Barium (Ba)	2022/05/30	0.41		%	20
			Dissolved Boron (B)	2022/05/30	0.30		%	20
			Dissolved Calcium (Ca)	2022/05/30	1.1		%	20
			Dissolved Iron (Fe)	2022/05/30	0.47		%	20
			Dissolved Lithium (Li)	2022/05/30	NC		%	20
			Dissolved Magnesium (Mg)	2022/05/30	3.1		%	20
			Dissolved Manganese (Mn)	2022/05/30	0.27		%	20
			Dissolved Phosphorus (P)	2022/05/30	NC		%	20
			Dissolved Potassium (K)	2022/05/30	0.80		%	20
			Dissolved Silicon (Si)	2022/05/30	0.36		%	20
			Dissolved Sodium (Na)	2022/05/30	1.3		%	20
			Dissolved Strontium (Sr)	2022/05/30	0.80		%	20
			Dissolved Sulphur (S)	2022/05/30	0.13		%	20
A591718	MAP	Matrix Spike [ATS358-01]	Orthophosphate (P)	2022/05/30		108	%	80 - 120
A591718	MAP	Spiked Blank	Orthophosphate (P)	2022/05/30		99	%	80 - 120
A591718	MAP	Method Blank	Orthophosphate (P)	2022/05/30	<0.0030		mg/L	
A591718	MAP	RPD [ATS358-01]	Orthophosphate (P)	2022/05/30	16		%	20
A592765	MAP	Matrix Spike	Dissolved Phosphorus (P)	2022/06/02		108	%	80 - 120
A592765	MAP	QC Standard	Dissolved Phosphorus (P)	2022/06/02		89	%	80 - 120
A592765	MAP	Spiked Blank	Dissolved Phosphorus (P)	2022/06/02		99	%	80 - 120
A592765	MAP	Method Blank	Dissolved Phosphorus (P)	2022/06/02	<0.0030		mg/L	
A592765	MAP	RPD	Dissolved Phosphorus (P)	2022/06/02	14		%	20
A593159	ACR	Matrix Spike	Nitrate plus Nitrite (N)	2022/05/31		NC	%	80 - 120
A593159	ACR	Spiked Blank	Nitrate plus Nitrite (N)	2022/05/31		102	%	80 - 120
A593159	ACR	Method Blank	Nitrate plus Nitrite (N)	2022/05/31	<0.010		mg/L	
A593159	ACR	RPD	Nitrate plus Nitrite (N)	2022/05/31	0.96		%	20
A593174	ACR	Matrix Spike	Nitrate plus Nitrite (N)	2022/05/31		NC	%	80 - 120
A593174	ACR	Spiked Blank	Nitrate plus Nitrite (N)	2022/05/31		97	%	80 - 120
A593174	ACR	Method Blank	Nitrate plus Nitrite (N)	2022/05/31	<0.010		mg/L	
A593174	ACR	RPD	Nitrate plus Nitrite (N)	2022/05/31	0.0090		%	20
A593175	ACR	Matrix Spike	Nitrate plus Nitrite (N)	2022/05/31		NC	%	80 - 120
A593175	ACR	Spiked Blank	Nitrate plus Nitrite (N)	2022/05/31		98	%	80 - 120
A593175	ACR	Method Blank	Nitrate plus Nitrite (N)	2022/05/31	<0.010		mg/L	
A593175	ACR	RPD	Nitrate plus Nitrite (N)	2022/06/01	9.9		%	20
A593816	MAP	Matrix Spike	Total Phosphorus (P)	2022/06/02		NC	%	80 - 120
A593816	MAP	QC Standard	Total Phosphorus (P)	2022/06/02		89	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A593816	MAP	Spiked Blank	Total Phosphorus (P)	2022/06/02		95	%	80 - 120
A593816	MAP	Method Blank	Total Phosphorus (P)	2022/06/02	<0.0030		mg/L	
A593816	MAP	RPD	Total Phosphorus (P)	2022/06/02	0.24		%	20
A594000	MAP	Matrix Spike	Total Nitrogen (N)	2022/06/03		NC	%	80 - 120
A594000	MAP	QC Standard	Total Nitrogen (N)	2022/06/03		102	%	80 - 120
A594000	MAP	Spiked Blank	Total Nitrogen (N)	2022/06/03		104	%	80 - 120
A594000	MAP	Method Blank	Total Nitrogen (N)	2022/06/03	<0.020		mg/L	
A594000	MAP	RPD	Total Nitrogen (N)	2022/06/03	0.38		%	20
A594451	MPU	Matrix Spike	Dissolved Barium (Ba)	2022/06/01		76 (1)	%	80 - 120
			Dissolved Boron (B)	2022/06/01		83	%	80 - 120
			Dissolved Calcium (Ca)	2022/06/01		NC	%	80 - 120
			Dissolved Iron (Fe)	2022/06/01		103	%	80 - 120
			Dissolved Lithium (Li)	2022/06/01		87	%	80 - 120
			Dissolved Magnesium (Mg)	2022/06/01		NC	%	80 - 120
			Dissolved Manganese (Mn)	2022/06/01		NC	%	80 - 120
			Dissolved Phosphorus (P)	2022/06/01		97	%	80 - 120
			Dissolved Potassium (K)	2022/06/01		NC	%	80 - 120
			Dissolved Silicon (Si)	2022/06/01		95	%	80 - 120
			Dissolved Sodium (Na)	2022/06/01		NC	%	80 - 120
			Dissolved Strontium (Sr)	2022/06/01		NC	%	80 - 120
			Dissolved Sulphur (S)	2022/06/01		NC	%	80 - 120
A594451	MPU	Spiked Blank	Dissolved Barium (Ba)	2022/06/01		93	%	80 - 120
			Dissolved Boron (B)	2022/06/01		96	%	80 - 120
			Dissolved Calcium (Ca)	2022/06/01		93	%	80 - 120
			Dissolved Iron (Fe)	2022/06/01		101	%	80 - 120
			Dissolved Lithium (Li)	2022/06/01		93	%	80 - 120
			Dissolved Magnesium (Mg)	2022/06/01		96	%	80 - 120
			Dissolved Manganese (Mn)	2022/06/01		102	%	80 - 120
			Dissolved Phosphorus (P)	2022/06/01		99	%	80 - 120
			Dissolved Potassium (K)	2022/06/01		98	%	80 - 120
			Dissolved Silicon (Si)	2022/06/01		95	%	80 - 120
			Dissolved Sodium (Na)	2022/06/01		93	%	80 - 120
			Dissolved Strontium (Sr)	2022/06/01		91	%	80 - 120
			Dissolved Sulphur (S)	2022/06/01		97	%	80 - 120
A594451	MPU	Method Blank	Dissolved Barium (Ba)	2022/06/01	<0.010		mg/L	
			Dissolved Boron (B)	2022/06/01	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/06/01	<0.30		mg/L	
			Dissolved Iron (Fe)	2022/06/01	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/06/01	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/06/01	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/06/01	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2022/06/01	<0.10		mg/L	
			Dissolved Potassium (K)	2022/06/01	<0.30		mg/L	
			Dissolved Silicon (Si)	2022/06/01	<0.10		mg/L	
			Dissolved Sodium (Na)	2022/06/01	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/06/01	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/06/01	<0.20		mg/L	
A594453	MPU	Matrix Spike	Dissolved Barium (Ba)	2022/06/01		92	%	80 - 120
			Dissolved Boron (B)	2022/06/01		98	%	80 - 120
			Dissolved Calcium (Ca)	2022/06/01		92	%	80 - 120
			Dissolved Iron (Fe)	2022/06/01		108	%	80 - 120
			Dissolved Lithium (Li)	2022/06/01		96	%	80 - 120
			Dissolved Magnesium (Mg)	2022/06/01		98	%	80 - 120
			Dissolved Manganese (Mn)	2022/06/01		108	%	80 - 120
			Dissolved Phosphorus (P)	2022/06/01		104	%	80 - 120

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Potassium (K)	2022/06/01		102	%	80 - 120
			Dissolved Silicon (Si)	2022/06/01		98	%	80 - 120
			Dissolved Sodium (Na)	2022/06/01		96	%	80 - 120
			Dissolved Strontium (Sr)	2022/06/01		89	%	80 - 120
			Dissolved Sulphur (S)	2022/06/01		106	%	80 - 120
A594453	MPU	Spiked Blank	Dissolved Barium (Ba)	2022/06/01		91	%	80 - 120
			Dissolved Boron (B)	2022/06/01		95	%	80 - 120
			Dissolved Calcium (Ca)	2022/06/01		93	%	80 - 120
			Dissolved Iron (Fe)	2022/06/01		102	%	80 - 120
			Dissolved Lithium (Li)	2022/06/01		93	%	80 - 120
			Dissolved Magnesium (Mg)	2022/06/01		95	%	80 - 120
			Dissolved Manganese (Mn)	2022/06/01		102	%	80 - 120
			Dissolved Phosphorus (P)	2022/06/01		98	%	80 - 120
			Dissolved Potassium (K)	2022/06/01		98	%	80 - 120
			Dissolved Silicon (Si)	2022/06/01		95	%	80 - 120
			Dissolved Sodium (Na)	2022/06/01		93	%	80 - 120
			Dissolved Strontium (Sr)	2022/06/01		90	%	80 - 120
			Dissolved Sulphur (S)	2022/06/01		96	%	80 - 120
A594453	MPU	Method Blank	Dissolved Barium (Ba)	2022/06/01	<0.010		mg/L	
			Dissolved Boron (B)	2022/06/01	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/06/01	<0.30		mg/L	
			Dissolved Iron (Fe)	2022/06/01	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/06/01	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/06/01	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/06/01	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2022/06/01	<0.10		mg/L	
			Dissolved Potassium (K)	2022/06/01	<0.30		mg/L	
			Dissolved Silicon (Si)	2022/06/01	<0.10		mg/L	
			Dissolved Sodium (Na)	2022/06/01	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/06/01	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/06/01	<0.20		mg/L	
A594453	MPU	RPD	Dissolved Calcium (Ca)	2022/06/01	7.5		%	20
			Dissolved Iron (Fe)	2022/06/01	NC		%	20
			Dissolved Magnesium (Mg)	2022/06/01	9.8		%	20
			Dissolved Manganese (Mn)	2022/06/01	1.3		%	20
			Dissolved Potassium (K)	2022/06/01	8.0		%	20
			Dissolved Sodium (Na)	2022/06/01	6.6		%	20
A595051	AFI	Matrix Spike	Chloride (Cl)	2022/06/02		NC	%	80 - 120
			Sulphate (SO4)	2022/06/02		NC	%	80 - 120
A595051	AFI	Spiked Blank	Chloride (Cl)	2022/06/02		98	%	80 - 120
			Sulphate (SO4)	2022/06/02		105	%	80 - 120
A595051	AFI	Method Blank	Chloride (Cl)	2022/06/02	<1.0		mg/L	
			Sulphate (SO4)	2022/06/02	<1.0		mg/L	
A595051	AFI	RPD	Chloride (Cl)	2022/06/02	1.2		%	20
			Sulphate (SO4)	2022/06/02	0.40		%	20
A596041	MAP	Matrix Spike [ATS353-01]	Orthophosphate (P)	2022/06/02		106	%	80 - 120
A596041	MAP	Spiked Blank	Orthophosphate (P)	2022/06/02		100	%	80 - 120
A596041	MAP	Method Blank	Orthophosphate (P)	2022/06/02	<0.0030		mg/L	
A596041	MAP	RPD [ATS353-01]	Orthophosphate (P)	2022/06/02	1.4		%	20
A597327	ACR	Matrix Spike	Total Ammonia (N)	2022/06/03		52 (1)	%	80 - 120
A597327	ACR	Spiked Blank	Total Ammonia (N)	2022/06/03		103	%	80 - 120
A597327	ACR	Method Blank	Total Ammonia (N)	2022/06/03	<0.015		mg/L	
A597327	ACR	RPD	Total Ammonia (N)	2022/06/03	6.0		%	20
A597450	KH2	Matrix Spike	Dissolved Aluminum (Al)	2022/06/04		110	%	80 - 120
			Dissolved Antimony (Sb)	2022/06/04		103	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2022/06/04		95	%	80 - 120
			Dissolved Beryllium (Be)	2022/06/04		102	%	80 - 120
			Dissolved Chromium (Cr)	2022/06/04		98	%	80 - 120
			Dissolved Cobalt (Co)	2022/06/04		94	%	80 - 120
			Dissolved Copper (Cu)	2022/06/04		95	%	80 - 120
			Dissolved Lead (Pb)	2022/06/04		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/06/04		104	%	80 - 120
			Dissolved Nickel (Ni)	2022/06/04		94	%	80 - 120
			Dissolved Selenium (Se)	2022/06/04		98	%	80 - 120
			Dissolved Silver (Ag)	2022/06/04		100	%	80 - 120
			Dissolved Thallium (Tl)	2022/06/04		95	%	80 - 120
			Dissolved Tin (Sn)	2022/06/04		103	%	80 - 120
			Dissolved Titanium (Ti)	2022/06/04		100	%	80 - 120
			Dissolved Uranium (U)	2022/06/04		99	%	80 - 120
			Dissolved Vanadium (V)	2022/06/04		98	%	80 - 120
			Dissolved Zinc (Zn)	2022/06/04		94	%	80 - 120
A597450	KH2	Spiked Blank	Dissolved Aluminum (Al)	2022/06/04		119	%	80 - 120
			Dissolved Antimony (Sb)	2022/06/04		102	%	80 - 120
			Dissolved Arsenic (As)	2022/06/04		93	%	80 - 120
			Dissolved Beryllium (Be)	2022/06/04		97	%	80 - 120
			Dissolved Chromium (Cr)	2022/06/04		98	%	80 - 120
			Dissolved Cobalt (Co)	2022/06/04		97	%	80 - 120
			Dissolved Copper (Cu)	2022/06/04		98	%	80 - 120
			Dissolved Lead (Pb)	2022/06/04		100	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/06/04		100	%	80 - 120
			Dissolved Nickel (Ni)	2022/06/04		99	%	80 - 120
			Dissolved Selenium (Se)	2022/06/04		98	%	80 - 120
			Dissolved Silver (Ag)	2022/06/04		99	%	80 - 120
			Dissolved Thallium (Tl)	2022/06/04		95	%	80 - 120
			Dissolved Tin (Sn)	2022/06/04		100	%	80 - 120
			Dissolved Titanium (Ti)	2022/06/04		103	%	80 - 120
			Dissolved Uranium (U)	2022/06/04		98	%	80 - 120
			Dissolved Vanadium (V)	2022/06/04		100	%	80 - 120
			Dissolved Zinc (Zn)	2022/06/04		97	%	80 - 120
A597450	KH2	Method Blank	Dissolved Aluminum (Al)	2022/06/04	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2022/06/04	<0.00060		mg/L	
			Dissolved Arsenic (As)	2022/06/04	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2022/06/04	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2022/06/04	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/06/04	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/06/04	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/06/04	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2022/06/04	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/06/04	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/06/04	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/06/04	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2022/06/04	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/06/04	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/06/04	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/06/04	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/06/04	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/06/04	<0.0030		mg/L	
A597450	KH2	RPD	Dissolved Aluminum (Al)	2022/06/04	2.7		%	20
			Dissolved Antimony (Sb)	2022/06/04	NC		%	20
			Dissolved Arsenic (As)	2022/06/04	15		%	20

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Beryllium (Be)	2022/06/04	NC		%	20
			Dissolved Chromium (Cr)	2022/06/04	NC		%	20
			Dissolved Cobalt (Co)	2022/06/04	NC		%	20
			Dissolved Copper (Cu)	2022/06/04	NC		%	20
			Dissolved Lead (Pb)	2022/06/04	NC		%	20
			Dissolved Molybdenum (Mo)	2022/06/04	0.91		%	20
			Dissolved Nickel (Ni)	2022/06/04	3.1		%	20
			Dissolved Selenium (Se)	2022/06/04	NC		%	20
			Dissolved Silver (Ag)	2022/06/04	NC		%	20
			Dissolved Thallium (Tl)	2022/06/04	NC		%	20
			Dissolved Tin (Sn)	2022/06/04	NC		%	20
			Dissolved Titanium (Ti)	2022/06/04	NC		%	20
			Dissolved Uranium (U)	2022/06/04	4.0		%	20
			Dissolved Vanadium (V)	2022/06/04	NC		%	20
			Dissolved Zinc (Zn)	2022/06/04	7.9		%	20
A599916	SKM	Matrix Spike	Nitrite (N)	2022/06/06		98	%	80 - 120
			Nitrate plus Nitrite (N)	2022/06/06		98	%	80 - 120
A599916	SKM	Spiked Blank	Nitrite (N)	2022/06/06		99	%	80 - 120
			Nitrate plus Nitrite (N)	2022/06/06		99	%	80 - 120
A599916	SKM	Method Blank	Nitrite (N)	2022/06/06	<0.010		mg/L	
			Nitrate plus Nitrite (N)	2022/06/06	<0.010		mg/L	
A599916	SKM	RPD	Nitrite (N)	2022/06/06	NC (2)		%	20
			Nitrate plus Nitrite (N)	2022/06/06	NC		%	20

N/A = Not Applicable

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

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

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

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

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

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

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

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

(2) Sample was originally processed within hold time. Data quality required investigation. Re-analysis was completed past recommended hold time.

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VALIDATION SIGNATURE PAGE

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

Sandy Yuan, M.Sc., QP, Scientific Specialist

Sze Yeung Fock, B.Sc., Scientific Specialist

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

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CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#10658 HEMMERA ENVIROCHEM INC.	Company Name:		Quotation #:	C11354	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Cameron Davis	P.O. #:		C235498	664716
Address:	SUITE 804, 322-11TH AVENUE SW CALGARY AB T2R 0C5	Address:		Project:	102604-01		
Tel:	(403) 264-0671 Fax:	Tel:	(587) 832-4864 Fax:	Project Name:		COC #:	Project Manager:
Email:	accounts-payable@Hemmera.com	Email:	cdavis@hemmera.com	Site #:		C#664716-01-01	Geraldlyn Gouthro
				Sampled By:			

Regulatory Criteria:
- [x] ATI
- [x] CCME
- [ ] Other

Special Instructions:

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	PO4, Turbidity, TDS	Ammonia-N (Total)	Total Kjeldahl Nitrogen (Total)	Total Phosphorus	Phosphorus -P (Total, Dissolved)	COD by Colorimeter	Oxygen (Dissolved)	Biochemical Oxygen Demand	Total Suspended Solids (NFR)	Routine Water & Diss. Regulated Metals.	# of Bottles	Comments
1	~~HD~~	WQ 2	26MAY22	1030	H20	Y	X	X	X	X	X	X	X	X	X	X	9	Call if any hits
2		WQ 3		0950		Y	X	X	X	X	X	X	X	X	X	X	9	Call if any hits
3		WQ 4b		1410		Y	X									X	9	Just nitrate from Routine DO NOT THROW AWAY WITHOUT OK
4		WQ 4C		1440		Y	X									X	9	~~Just Nitrate~~
5		WQ 4D		1500		Y	X									X	9	
6		WQ 5B		1350		Y	X									X	9	
7		WQ 6		1110		Y	X									X	9	
8		WQ 7	↓	1130	H20	Y	X									X	9	↓
9																		
10																		

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (ºC) on Receipt	Custody Seal Intact on Cooler?
	26MAY22		Andelson Torres	2022/05/26	17:15		☐	Ice: Y Seal: N	☐ Yes ☑ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** ALL SAMPLES ARE HELD FOR 60 DAYS AFTER SAMPLE RECEIPT, FOR SPECIAL REQUESTS CONTACT YOUR PROJECT MANAGER

White: Bureau Veritas Yellow: Client

13/13/13
15/15/15

Bureau Veritas Canada (2019) Inc.

Your Project #: 102604-01
Your C.O.C. #: 1 of 1

Attention: Cameron Davis

HEMMERA ENVIROCHEM INC.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/06/06
Report #: R3181125
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C235503
Received: 2022/05/26, 17:15

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hexavalent Chromium (1)	6	2022/05/31	2022/06/01	AB SOP-00063	SM 23 3500-Cr B m
Elements by ICPMS - Soils	4	2022/06/01	2022/06/01	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Soils	1	2022/06/01	2022/06/02	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Soils	1	2022/06/01	2022/06/03	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Moisture	6	N/A	2022/05/31	AB SOP-00002	CCME PHC-CWS m
Soluble Ions	5	2022/06/01	2022/06/02	AB SOP-00033 / AB SOP-00042	EPA 6010d R5 m
Soluble Ions	1	2022/06/02	2022/06/02	AB SOP-00033 / AB SOP-00042	EPA 6010d R5 m
Soluble Paste	5	2022/06/01	2022/06/01	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Paste	1	2022/06/02	2022/06/02	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Boron Calculation	5	N/A	2022/06/02		Auto Calc
Soluble Boron Calculation	1	N/A	2022/06/03		Auto Calc
Total Organic Carbon LECO Method	6	N/A	2022/06/01	CAL SOP-00243	LECO 203-821-498 m

Remarks:

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

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

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

Your Project #: 102604-01
Your C.O.C. #: 1 of 1

Attention: Cameron Davis

HEMMERA ENVIROCHEM INC.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/06/06
Report #: R3181125
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C235503

Received: 2022/05/26, 17:15

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

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

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

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

(1) Some soil samples may react with the Cr(VI) spike reducing it to Cr(III). These samples are highly unlikely to contain native hexavalent chromium. Thus a failed spike recovery does not invalidate a negative result on the native sample.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Geraldlyn Gouthro, Key Account Specialist
Email: geraldlyn.gouthro@bureauveritas.com
Phone# (780)577-7173

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This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

AT1 REGULATED METALS - SOILS (SOIL)

Bureau Veritas ID		ATS399			ATS400			ATS401		
Sampling Date		2022/05/26 10:30			2022/05/26 09:50			2022/05/26 11:10		
COC Number		1 of 1			1 of 1			1 of 1		
	UNITS	**WQ2**	**RDL**	**QC Batch**	**WQ3**	**RDL**	**QC Batch**	**WQ6**	**RDL**	**QC Batch**
Calculated Parameters										
Calculated Boron (B)	mg/kg	0.085	0.080	A591185	<0.060	0.060	A591185	<0.097	0.097	A591185
Elements										
Hex. Chromium (Cr 6+)	mg/kg	<0.080	0.080	A592841	<0.080	0.080	A592841	<0.18 (1)	0.18	A592841
Soluble Parameters										
Soluble Boron (B)	mg/L	0.11	0.10	A595345	<0.10	0.10	A595859	<0.10	0.10	A595345
Saturation %	%	79	N/A	A593463	60	N/A	A592720	97	N/A	A593463
Elements										
Total Antimony (Sb)	mg/kg	<0.50	0.50	A593632	<0.50	0.50	A593523	<0.50	0.50	A594284
Total Arsenic (As)	mg/kg	5.4	1.0	A593632	2.9	1.0	A593523	7.5	1.0	A594284
Total Barium (Ba)	mg/kg	230	1.0	A593632	160	1.0	A593523	220	1.0	A594284
Total Beryllium (Be)	mg/kg	0.63	0.40	A593632	<0.40	0.40	A593523	0.64	0.40	A594284
Total Cadmium (Cd)	mg/kg	0.49	0.050	A593632	0.36	0.050	A593523	0.47	0.050	A594284
Total Chromium (Cr)	mg/kg	15	1.0	A593632	10	1.0	A593523	14	1.0	A594284
Total Cobalt (Co)	mg/kg	6.6	0.50	A593632	4.3	0.50	A593523	6.6	0.50	A594284
Total Copper (Cu)	mg/kg	17	1.0	A593632	9.5	1.0	A593523	18	1.0	A594284
Total Lead (Pb)	mg/kg	10	0.50	A593632	7.0	0.50	A593523	11	0.50	A594284
Total Mercury (Hg)	mg/kg	<0.050	0.050	A593632	<0.050	0.050	A593523	<0.050	0.050	A594284
Total Molybdenum (Mo)	mg/kg	0.88	0.40	A593632	0.50	0.40	A593523	1.6	0.40	A594284
Total Nickel (Ni)	mg/kg	20	1.0	A593632	12	1.0	A593523	21	1.0	A594284
Total Selenium (Se)	mg/kg	2.3	0.50	A593632	1.2	0.50	A593523	1.7	0.50	A594284
Total Silver (Ag)	mg/kg	<0.20	0.20	A593632	<0.20	0.20	A593523	<0.20	0.20	A594284
Total Thallium (Tl)	mg/kg	0.17	0.10	A593632	<0.10	0.10	A593523	0.17	0.10	A594284
Total Tin (Sn)	mg/kg	<1.0	1.0	A593632	<1.0	1.0	A593523	<1.0	1.0	A594284
Total Uranium (U)	mg/kg	1.5	0.20	A593632	0.90	0.20	A593523	2.7	0.20	A594284
Total Vanadium (V)	mg/kg	25	1.0	A593632	14	1.0	A593523	24	1.0	A594284
Total Zinc (Zn)	mg/kg	80	10	A593632	50	10	A593523	82	10	A594284

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to high moisture content, samples contain => 50% moisture.

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AT1 REGULATED METALS - SOILS (SOIL)

Bureau Veritas ID		ATS402			ATS403		ATS404		
Sampling Date		2022/05/26 14:10			2022/05/26 14:40		2022/05/26 15:00		
COC Number		1 of 1			1 of 1		1 of 1		
	UNITS	WQ4B	RDL	QC Batch	WQ4C	QC Batch	WQ4D	RDL	QC Batch
Calculated Parameters									
Calculated Boron (B)	mg/kg	0.12	0.10	A591185	<0.056	A591185	<0.056	0.056	A591185
Elements									
Hex. Chromium (Cr 6+)	mg/kg	<0.30 (1)	0.30	A592841	<0.080	A592841	<0.080	0.080	A592841
Soluble Parameters									
Soluble Boron (B)	mg/L	0.11	0.10	A595345	<0.10	A595345	<0.10	0.10	A595345
Saturation %	%	100	N/A	A593463	56	A593463	56	N/A	A593463
Elements									
Total Antimony (Sb)	mg/kg	<0.50	0.50	A593632	<0.50	A595344	<0.50	0.50	A593632
Total Arsenic (As)	mg/kg	4.8	1.0	A593632	3.3	A595344	3.5	1.0	A593632
Total Barium (Ba)	mg/kg	200	1.0	A593632	160	A595344	170	1.0	A593632
Total Beryllium (Be)	mg/kg	0.54	0.40	A593632	0.64	A595344	0.62	0.40	A593632
Total Cadmium (Cd)	mg/kg	0.45	0.050	A593632	0.41	A595344	0.40	0.050	A593632
Total Chromium (Cr)	mg/kg	13	1.0	A593632	19	A595344	40	1.0	A593632
Total Cobalt (Co)	mg/kg	5.9	0.50	A593632	6.2	A595344	6.3	0.50	A593632
Total Copper (Cu)	mg/kg	16	1.0	A593632	14	A595344	15	1.0	A593632
Total Lead (Pb)	mg/kg	9.0	0.50	A593632	9.9	A595344	9.4	0.50	A593632
Total Mercury (Hg)	mg/kg	<0.050	0.050	A593632	<0.050	A595344	<0.050	0.050	A593632
Total Molybdenum (Mo)	mg/kg	0.68	0.40	A593632	0.57	A595344	0.90	0.40	A593632
Total Nickel (Ni)	mg/kg	17	1.0	A593632	21	A595344	30	1.0	A593632
Total Selenium (Se)	mg/kg	2.7	0.50	A593632	1.8	A595344	2.0	0.50	A593632
Total Silver (Ag)	mg/kg	<0.20	0.20	A593632	<0.20	A595344	<0.20	0.20	A593632
Total Thallium (Tl)	mg/kg	0.14	0.10	A593632	0.18	A595344	0.16	0.10	A593632
Total Tin (Sn)	mg/kg	<1.0	1.0	A593632	<1.0	A595344	<1.0	1.0	A593632
Total Uranium (U)	mg/kg	0.80	0.20	A593632	0.84	A595344	0.83	0.20	A593632
Total Vanadium (V)	mg/kg	22	1.0	A593632	28	A595344	27	1.0	A593632
Total Zinc (Zn)	mg/kg	420	10	A593632	140	A595344	180	10	A593632

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to high moisture content, samples contain => 50% moisture.

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PHYSICAL TESTING (SOIL)

Bureau Veritas ID		ATS399	ATS400	ATS401	ATS402	ATS403	ATS404		
Sampling Date		2022/05/26 10:30	2022/05/26 09:50	2022/05/26 11:10	2022/05/26 14:10	2022/05/26 14:40	2022/05/26 15:00		
COC Number		1 of 1	1 of 1	1 of 1	1 of 1	1 of 1	1 of 1		
	UNITS	**WQ2**	**WQ3**	**WQ6**	**WQ4B**	**WQ4C**	**WQ4D**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	47	33	56	73	47	34	0.30	A591828
RDL = Reportable Detection Limit									

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MISCELLANEOUS (SOIL)

Bureau Veritas ID		ATS399	ATS400	ATS401	ATS402	ATS403	ATS404		
Sampling Date		2022/05/26 10:30	2022/05/26 09:50	2022/05/26 11:10	2022/05/26 14:10	2022/05/26 14:40	2022/05/26 15:00		
COC Number		1 of 1	1 of 1	1 of 1	1 of 1	1 of 1	1 of 1		
	UNITS	**WQ2**	**WQ3**	**WQ6**	**WQ4B**	**WQ4C**	**WQ4D**	**RDL**	**QC Batch**
Misc. Inorganics									
Total Organic Carbon (C)	%	5.5	4.3	6.1	8.8	2.1	2.4	0.050	A593365
RDL = Reportable Detection Limit									

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GENERAL COMMENTS

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

Package 1	13.0°C
Package 2	15.0°C

Results relate only to the items tested.

Bureau Veritas Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A591828	ARV	Method Blank	Moisture	2022/05/31	<0.30		%	
A591828	ARV	RPD	Moisture	2022/05/31	0		%	20
A592720	JHC	QC Standard	Saturation %	2022/06/02		98	%	75 - 125
A592720	JHC	RPD	Saturation %	2022/06/02	3.5		%	12
A592841	FM0	Matrix Spike [ATS401-01]	Hex. Chromium (Cr 6+)	2022/06/01		93	%	75 - 125
A592841	FM0	Spiked Blank	Hex. Chromium (Cr 6+)	2022/06/01		99	%	80 - 120
A592841	FM0	Method Blank	Hex. Chromium (Cr 6+)	2022/06/01	<0.080		mg/kg	
A592841	FM0	RPD [ATS401-01]	Hex. Chromium (Cr 6+)	2022/06/01	NC		%	35
A593365	PL	QC Standard	Total Organic Carbon (C)	2022/06/01		103	%	75 - 125
A593365	PL	Spiked Blank	Total Organic Carbon (C)	2022/06/01		101	%	80 - 120
A593365	PL	Method Blank	Total Organic Carbon (C)	2022/06/01	<0.050		%	
A593365	PL	RPD [ATS400-01]	Total Organic Carbon (C)	2022/06/01	12		%	35
A593463	NQU	QC Standard	Saturation %	2022/06/01		105	%	75 - 125
A593463	NQU	RPD	Saturation %	2022/06/01	2.9		%	12
A593523	ABZ	Matrix Spike	Total Antimony (Sb)	2022/06/01		83	%	75 - 125
			Total Arsenic (As)	2022/06/01		86	%	75 - 125
			Total Barium (Ba)	2022/06/01		NC	%	75 - 125
			Total Beryllium (Be)	2022/06/01		88	%	75 - 125
			Total Cadmium (Cd)	2022/06/01		92	%	75 - 125
			Total Chromium (Cr)	2022/06/01		93	%	75 - 125
			Total Cobalt (Co)	2022/06/01		83	%	75 - 125
			Total Copper (Cu)	2022/06/01		79	%	75 - 125
			Total Lead (Pb)	2022/06/01		83	%	75 - 125
			Total Mercury (Hg)	2022/06/01		83	%	75 - 125
			Total Molybdenum (Mo)	2022/06/01		91	%	75 - 125
			Total Nickel (Ni)	2022/06/01		79	%	75 - 125
			Total Selenium (Se)	2022/06/01		90	%	75 - 125
			Total Silver (Ag)	2022/06/01		90	%	75 - 125
			Total Thallium (Tl)	2022/06/01		84	%	75 - 125
			Total Tin (Sn)	2022/06/01		94	%	75 - 125
			Total Uranium (U)	2022/06/01		79	%	75 - 125
			Total Vanadium (V)	2022/06/01		120	%	75 - 125
			Total Zinc (Zn)	2022/06/01		NC	%	75 - 125
A593523	ABZ	QC Standard	Total Antimony (Sb)	2022/06/01		116	%	15 - 182
			Total Arsenic (As)	2022/06/01		102	%	53 - 147
			Total Barium (Ba)	2022/06/01		101	%	80 - 119
			Total Cadmium (Cd)	2022/06/01		96	%	72 - 128
			Total Chromium (Cr)	2022/06/01		90	%	59 - 141
			Total Cobalt (Co)	2022/06/01		91	%	58 - 142
			Total Copper (Cu)	2022/06/01		97	%	83 - 117
			Total Lead (Pb)	2022/06/01		113	%	79 - 121
			Total Molybdenum (Mo)	2022/06/01		96	%	67 - 133
			Total Nickel (Ni)	2022/06/01		100	%	79 - 121
			Total Silver (Ag)	2022/06/01		99	%	47 - 153
			Total Tin (Sn)	2022/06/01		98	%	67 - 133
			Total Uranium (U)	2022/06/01		84	%	77 - 123
			Total Vanadium (V)	2022/06/01		97	%	79 - 121
			Total Zinc (Zn)	2022/06/01		102	%	79 - 121
A593523	ABZ	Spiked Blank	Total Antimony (Sb)	2022/06/01		114	%	80 - 120
			Total Arsenic (As)	2022/06/01		105	%	80 - 120
			Total Barium (Ba)	2022/06/01		109	%	80 - 120
			Total Beryllium (Be)	2022/06/01		103	%	80 - 120
			Total Cadmium (Cd)	2022/06/01		108	%	80 - 120
			Total Chromium (Cr)	2022/06/01		104	%	80 - 120
			Total Cobalt (Co)	2022/06/01		102	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2022/06/01		102	%	80 - 120
			Total Lead (Pb)	2022/06/01		105	%	80 - 120
			Total Mercury (Hg)	2022/06/01		113	%	80 - 120
			Total Molybdenum (Mo)	2022/06/01		105	%	80 - 120
			Total Nickel (Ni)	2022/06/01		101	%	80 - 120
			Total Selenium (Se)	2022/06/01		108	%	80 - 120
			Total Silver (Ag)	2022/06/01		105	%	80 - 120
			Total Thallium (Tl)	2022/06/01		104	%	80 - 120
			Total Tin (Sn)	2022/06/01		109	%	80 - 120
			Total Uranium (U)	2022/06/01		105	%	80 - 120
			Total Vanadium (V)	2022/06/01		105	%	80 - 120
			Total Zinc (Zn)	2022/06/01		105	%	80 - 120
A593523	ABZ	Method Blank	Total Antimony (Sb)	2022/06/01	<0.50		mg/kg	
			Total Arsenic (As)	2022/06/01	<1.0		mg/kg	
			Total Barium (Ba)	2022/06/01	<1.0		mg/kg	
			Total Beryllium (Be)	2022/06/01	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/06/01	<0.050		mg/kg	
			Total Chromium (Cr)	2022/06/01	<1.0		mg/kg	
			Total Cobalt (Co)	2022/06/01	<0.50		mg/kg	
			Total Copper (Cu)	2022/06/01	<1.0		mg/kg	
			Total Lead (Pb)	2022/06/01	<0.50		mg/kg	
			Total Mercury (Hg)	2022/06/01	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/06/01	<0.40		mg/kg	
			Total Nickel (Ni)	2022/06/01	<1.0		mg/kg	
			Total Selenium (Se)	2022/06/01	<0.50		mg/kg	
			Total Silver (Ag)	2022/06/01	<0.20		mg/kg	
			Total Thallium (Tl)	2022/06/01	<0.10		mg/kg	
			Total Tin (Sn)	2022/06/01	<1.0		mg/kg	
			Total Uranium (U)	2022/06/01	<0.20		mg/kg	
			Total Vanadium (V)	2022/06/01	<1.0		mg/kg	
			Total Zinc (Zn)	2022/06/01	<10		mg/kg	
A593523	ABZ	RPD	Total Antimony (Sb)	2022/06/01	0.61		%	30
			Total Arsenic (As)	2022/06/01	0.081		%	30
			Total Barium (Ba)	2022/06/01	4.5		%	35
			Total Beryllium (Be)	2022/06/01	3.1		%	30
			Total Cadmium (Cd)	2022/06/01	4.1		%	30
			Total Chromium (Cr)	2022/06/01	9.0		%	30
			Total Cobalt (Co)	2022/06/01	50 (1)		%	30
			Total Copper (Cu)	2022/06/01	0.76		%	30
			Total Lead (Pb)	2022/06/01	1.3		%	35
			Total Mercury (Hg)	2022/06/01	NC		%	35
			Total Molybdenum (Mo)	2022/06/01	0.85		%	35
			Total Nickel (Ni)	2022/06/01	5.0		%	30
			Total Selenium (Se)	2022/06/01	NC		%	30
			Total Silver (Ag)	2022/06/01	NC		%	35
			Total Thallium (Tl)	2022/06/01	0.94		%	30
			Total Tin (Sn)	2022/06/01	NC		%	35
			Total Uranium (U)	2022/06/01	2.9		%	30
			Total Vanadium (V)	2022/06/01	4.1		%	30
			Total Zinc (Zn)	2022/06/01	0.75		%	30
A593632	ABZ	Matrix Spike	Total Antimony (Sb)	2022/06/01		102	%	75 - 125
			Total Arsenic (As)	2022/06/01		99	%	75 - 125
			Total Barium (Ba)	2022/06/01		NC	%	75 - 125
			Total Beryllium (Be)	2022/06/01		98	%	75 - 125
			Total Cadmium (Cd)	2022/06/01		103	%	75 - 125

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QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Chromium (Cr)	2022/06/01		116	%	75 - 125
			Total Cobalt (Co)	2022/06/01		99	%	75 - 125
			Total Copper (Cu)	2022/06/01		99	%	75 - 125
			Total Lead (Pb)	2022/06/01		101	%	75 - 125
			Total Mercury (Hg)	2022/06/01		93	%	75 - 125
			Total Molybdenum (Mo)	2022/06/01		101	%	75 - 125
			Total Nickel (Ni)	2022/06/01		101	%	75 - 125
			Total Selenium (Se)	2022/06/01		104	%	75 - 125
			Total Silver (Ag)	2022/06/01		101	%	75 - 125
			Total Thallium (Tl)	2022/06/01		98	%	75 - 125
			Total Tin (Sn)	2022/06/01		106	%	75 - 125
			Total Uranium (U)	2022/06/01		90	%	75 - 125
			Total Vanadium (V)	2022/06/01		139 (1)	%	75 - 125
			Total Zinc (Zn)	2022/06/01		109	%	75 - 125
A593632	ABZ	QC Standard	Total Antimony (Sb)	2022/06/01		110	%	15 - 182
			Total Arsenic (As)	2022/06/01		104	%	53 - 147
			Total Barium (Ba)	2022/06/01		105	%	80 - 119
			Total Cadmium (Cd)	2022/06/01		100	%	72 - 128
			Total Chromium (Cr)	2022/06/01		99	%	59 - 141
			Total Cobalt (Co)	2022/06/01		96	%	58 - 142
			Total Copper (Cu)	2022/06/01		97	%	83 - 117
			Total Lead (Pb)	2022/06/01		111	%	79 - 121
			Total Molybdenum (Mo)	2022/06/01		98	%	67 - 133
			Total Nickel (Ni)	2022/06/01		102	%	79 - 121
			Total Silver (Ag)	2022/06/01		86	%	47 - 153
			Total Tin (Sn)	2022/06/01		102	%	67 - 133
			Total Uranium (U)	2022/06/01		88	%	77 - 123
			Total Vanadium (V)	2022/06/01		102	%	79 - 121
			Total Zinc (Zn)	2022/06/01		104	%	79 - 121
A593632	ABZ	Spiked Blank	Total Antimony (Sb)	2022/06/01		106	%	80 - 120
			Total Arsenic (As)	2022/06/01		95	%	80 - 120
			Total Barium (Ba)	2022/06/01		103	%	80 - 120
			Total Beryllium (Be)	2022/06/01		94	%	80 - 120
			Total Cadmium (Cd)	2022/06/01		101	%	80 - 120
			Total Chromium (Cr)	2022/06/01		94	%	80 - 120
			Total Cobalt (Co)	2022/06/01		93	%	80 - 120
			Total Copper (Cu)	2022/06/01		94	%	80 - 120
			Total Lead (Pb)	2022/06/01		96	%	80 - 120
			Total Mercury (Hg)	2022/06/01		100	%	80 - 120
			Total Molybdenum (Mo)	2022/06/01		99	%	80 - 120
			Total Nickel (Ni)	2022/06/01		93	%	80 - 120
			Total Selenium (Se)	2022/06/01		103	%	80 - 120
			Total Silver (Ag)	2022/06/01		98	%	80 - 120
			Total Thallium (Tl)	2022/06/01		96	%	80 - 120
			Total Tin (Sn)	2022/06/01		102	%	80 - 120
			Total Uranium (U)	2022/06/01		93	%	80 - 120
			Total Vanadium (V)	2022/06/01		95	%	80 - 120
			Total Zinc (Zn)	2022/06/01		97	%	80 - 120
A593632	ABZ	Method Blank	Total Antimony (Sb)	2022/06/01	<0.50		mg/kg	
			Total Arsenic (As)	2022/06/01	<1.0		mg/kg	
			Total Barium (Ba)	2022/06/01	<1.0		mg/kg	
			Total Beryllium (Be)	2022/06/01	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/06/01	<0.050		mg/kg	
			Total Chromium (Cr)	2022/06/01	<1.0		mg/kg	
			Total Cobalt (Co)	2022/06/01	<0.50		mg/kg	

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			Total Copper (Cu)	2022/06/01	<1.0		mg/kg	
			Total Lead (Pb)	2022/06/01	<0.50		mg/kg	
			Total Mercury (Hg)	2022/06/01	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/06/01	<0.40		mg/kg	
			Total Nickel (Ni)	2022/06/01	<1.0		mg/kg	
			Total Selenium (Se)	2022/06/01	<0.50		mg/kg	
			Total Silver (Ag)	2022/06/01	<0.20		mg/kg	
			Total Thallium (Tl)	2022/06/01	<0.10		mg/kg	
			Total Tin (Sn)	2022/06/01	<1.0		mg/kg	
			Total Uranium (U)	2022/06/01	<0.20		mg/kg	
			Total Vanadium (V)	2022/06/01	<1.0		mg/kg	
			Total Zinc (Zn)	2022/06/01	<10		mg/kg	
A593632	ABZ	RPD	Total Antimony (Sb)	2022/06/01	NC		%	30
			Total Arsenic (As)	2022/06/01	1.8		%	30
			Total Barium (Ba)	2022/06/01	1.1		%	35
			Total Beryllium (Be)	2022/06/01	4.6		%	30
			Total Cadmium (Cd)	2022/06/01	1.8		%	30
			Total Chromium (Cr)	2022/06/01	1.1		%	30
			Total Cobalt (Co)	2022/06/01	3.5		%	30
			Total Copper (Cu)	2022/06/01	0.71		%	30
			Total Lead (Pb)	2022/06/01	0.074		%	35
			Total Mercury (Hg)	2022/06/01	0.56		%	35
			Total Molybdenum (Mo)	2022/06/01	3.1		%	35
			Total Nickel (Ni)	2022/06/01	1.4		%	30
			Total Selenium (Se)	2022/06/01	NC		%	30
			Total Silver (Ag)	2022/06/01	NC		%	35
			Total Thallium (Tl)	2022/06/01	6.3		%	30
			Total Tin (Sn)	2022/06/01	NC		%	35
			Total Uranium (U)	2022/06/01	3.7		%	30
			Total Vanadium (V)	2022/06/01	2.5		%	30
			Total Zinc (Zn)	2022/06/01	0.46		%	30
A594284	KH2	Matrix Spike	Total Antimony (Sb)	2022/06/03		79	%	75 - 125
			Total Arsenic (As)	2022/06/03		89	%	75 - 125
			Total Barium (Ba)	2022/06/03		NC	%	75 - 125
			Total Beryllium (Be)	2022/06/03		97	%	75 - 125
			Total Cadmium (Cd)	2022/06/03		98	%	75 - 125
			Total Chromium (Cr)	2022/06/03		103	%	75 - 125
			Total Cobalt (Co)	2022/06/03		93	%	75 - 125
			Total Copper (Cu)	2022/06/03		92	%	75 - 125
			Total Lead (Pb)	2022/06/03		94	%	75 - 125
			Total Mercury (Hg)	2022/06/03		85	%	75 - 125
			Total Molybdenum (Mo)	2022/06/03		96	%	75 - 125
			Total Nickel (Ni)	2022/06/03		96	%	75 - 125
			Total Selenium (Se)	2022/06/03		94	%	75 - 125
			Total Silver (Ag)	2022/06/03		98	%	75 - 125
			Total Thallium (Tl)	2022/06/03		93	%	75 - 125
			Total Tin (Sn)	2022/06/03		99	%	75 - 125
			Total Uranium (U)	2022/06/03		83	%	75 - 125
			Total Vanadium (V)	2022/06/03		119	%	75 - 125
			Total Zinc (Zn)	2022/06/03		NC	%	75 - 125
A594284	KH2	QC Standard	Total Antimony (Sb)	2022/06/03		99	%	15 - 182
			Total Arsenic (As)	2022/06/03		87	%	53 - 147
			Total Barium (Ba)	2022/06/03		97	%	80 - 119
			Total Cadmium (Cd)	2022/06/03		92	%	72 - 128
			Total Chromium (Cr)	2022/06/03		95	%	59 - 141

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			Total Cobalt (Co)	2022/06/03		91	%	58 - 142
			Total Copper (Cu)	2022/06/03		96	%	83 - 117
			Total Lead (Pb)	2022/06/03		106	%	79 - 121
			Total Molybdenum (Mo)	2022/06/03		95	%	67 - 133
			Total Nickel (Ni)	2022/06/03		99	%	79 - 121
			Total Silver (Ag)	2022/06/03		106	%	47 - 153
			Total Tin (Sn)	2022/06/03		99	%	67 - 133
			Total Uranium (U)	2022/06/03		105	%	77 - 123
			Total Vanadium (V)	2022/06/03		96	%	79 - 121
			Total Zinc (Zn)	2022/06/03		96	%	79 - 121
A594284	KH2	Spiked Blank	Total Antimony (Sb)	2022/06/03		103	%	80 - 120
			Total Arsenic (As)	2022/06/03		93	%	80 - 120
			Total Barium (Ba)	2022/06/03		99	%	80 - 120
			Total Beryllium (Be)	2022/06/03		98	%	80 - 120
			Total Cadmium (Cd)	2022/06/03		96	%	80 - 120
			Total Chromium (Cr)	2022/06/03		94	%	80 - 120
			Total Cobalt (Co)	2022/06/03		95	%	80 - 120
			Total Copper (Cu)	2022/06/03		96	%	80 - 120
			Total Lead (Pb)	2022/06/03		97	%	80 - 120
			Total Mercury (Hg)	2022/06/03		106	%	80 - 120
			Total Molybdenum (Mo)	2022/06/03		98	%	80 - 120
			Total Nickel (Ni)	2022/06/03		95	%	80 - 120
			Total Selenium (Se)	2022/06/03		100	%	80 - 120
			Total Silver (Ag)	2022/06/03		98	%	80 - 120
			Total Thallium (Tl)	2022/06/03		97	%	80 - 120
			Total Tin (Sn)	2022/06/03		100	%	80 - 120
			Total Uranium (U)	2022/06/03		96	%	80 - 120
			Total Vanadium (V)	2022/06/03		94	%	80 - 120
			Total Zinc (Zn)	2022/06/03		96	%	80 - 120
A594284	KH2	Method Blank	Total Antimony (Sb)	2022/06/03	<0.50		mg/kg	
			Total Arsenic (As)	2022/06/03	<1.0		mg/kg	
			Total Barium (Ba)	2022/06/03	<1.0		mg/kg	
			Total Beryllium (Be)	2022/06/03	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/06/03	<0.050		mg/kg	
			Total Chromium (Cr)	2022/06/03	<1.0		mg/kg	
			Total Cobalt (Co)	2022/06/03	<0.50		mg/kg	
			Total Copper (Cu)	2022/06/03	<1.0		mg/kg	
			Total Lead (Pb)	2022/06/03	<0.50		mg/kg	
			Total Mercury (Hg)	2022/06/03	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/06/03	<0.40		mg/kg	
			Total Nickel (Ni)	2022/06/03	<1.0		mg/kg	
			Total Selenium (Se)	2022/06/03	<0.50		mg/kg	
			Total Silver (Ag)	2022/06/03	<0.20		mg/kg	
			Total Thallium (Tl)	2022/06/03	<0.10		mg/kg	
			Total Tin (Sn)	2022/06/03	<1.0		mg/kg	
			Total Uranium (U)	2022/06/03	<0.20		mg/kg	
			Total Vanadium (V)	2022/06/03	<1.0		mg/kg	
			Total Zinc (Zn)	2022/06/03	<10		mg/kg	
A594284	KH2	RPD	Total Antimony (Sb)	2022/06/03	7.7		%	30
			Total Arsenic (As)	2022/06/03	3.7		%	30
			Total Barium (Ba)	2022/06/03	13		%	35
			Total Beryllium (Be)	2022/06/03	0.86		%	30
			Total Cadmium (Cd)	2022/06/03	7.0		%	30
			Total Chromium (Cr)	2022/06/03	0.40		%	30
			Total Cobalt (Co)	2022/06/03	3.6		%	30

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			Total Copper (Cu)	2022/06/03	2.4		%	30
			Total Lead (Pb)	2022/06/03	1.0		%	35
			Total Mercury (Hg)	2022/06/03	0.49		%	35
			Total Molybdenum (Mo)	2022/06/03	19		%	35
			Total Nickel (Ni)	2022/06/03	2.1		%	30
			Total Selenium (Se)	2022/06/03	NC		%	30
			Total Silver (Ag)	2022/06/03	NC		%	35
			Total Thallium (Tl)	2022/06/03	1.8		%	30
			Total Tin (Sn)	2022/06/03	3.7		%	35
			Total Uranium (U)	2022/06/03	4.0		%	30
			Total Vanadium (V)	2022/06/03	2.2		%	30
			Total Zinc (Zn)	2022/06/03	1.4		%	30
A595344	MFP	Matrix Spike	Total Antimony (Sb)	2022/06/02		101	%	75 - 125
			Total Arsenic (As)	2022/06/02		94	%	75 - 125
			Total Barium (Ba)	2022/06/02		NC	%	75 - 125
			Total Beryllium (Be)	2022/06/02		96	%	75 - 125
			Total Cadmium (Cd)	2022/06/02		100	%	75 - 125
			Total Chromium (Cr)	2022/06/02		107	%	75 - 125
			Total Cobalt (Co)	2022/06/02		97	%	75 - 125
			Total Copper (Cu)	2022/06/02		96	%	75 - 125
			Total Lead (Pb)	2022/06/02		100	%	75 - 125
			Total Mercury (Hg)	2022/06/02		99	%	75 - 125
			Total Molybdenum (Mo)	2022/06/02		100	%	75 - 125
			Total Nickel (Ni)	2022/06/02		94	%	75 - 125
			Total Selenium (Se)	2022/06/02		120	%	75 - 125
			Total Silver (Ag)	2022/06/02		100	%	75 - 125
			Total Thallium (Tl)	2022/06/02		101	%	75 - 125
			Total Tin (Sn)	2022/06/02		100	%	75 - 125
			Total Uranium (U)	2022/06/02		92	%	75 - 125
			Total Vanadium (V)	2022/06/02		145 (1)	%	75 - 125
			Total Zinc (Zn)	2022/06/02		104	%	75 - 125
A595344	MFP	QC Standard	Total Antimony (Sb)	2022/06/03		125	%	15 - 182
			Total Arsenic (As)	2022/06/03		97	%	53 - 147
			Total Barium (Ba)	2022/06/03		103	%	80 - 119
			Total Cadmium (Cd)	2022/06/03		99	%	72 - 128
			Total Chromium (Cr)	2022/06/03		106	%	59 - 141
			Total Cobalt (Co)	2022/06/03		97	%	58 - 142
			Total Copper (Cu)	2022/06/03		100	%	83 - 117
			Total Lead (Pb)	2022/06/03		114	%	79 - 121
			Total Molybdenum (Mo)	2022/06/03		113	%	67 - 133
			Total Nickel (Ni)	2022/06/03		104	%	79 - 121
			Total Silver (Ag)	2022/06/03		112	%	47 - 153
			Total Tin (Sn)	2022/06/03		100	%	67 - 133
			Total Uranium (U)	2022/06/03		103	%	77 - 123
			Total Vanadium (V)	2022/06/03		105	%	79 - 121
			Total Zinc (Zn)	2022/06/03		104	%	79 - 121
A595344	MFP	Spiked Blank	Total Antimony (Sb)	2022/06/02		107	%	80 - 120
			Total Arsenic (As)	2022/06/02		96	%	80 - 120
			Total Barium (Ba)	2022/06/02		98	%	80 - 120
			Total Beryllium (Be)	2022/06/02		93	%	80 - 120
			Total Cadmium (Cd)	2022/06/02		98	%	80 - 120
			Total Chromium (Cr)	2022/06/02		98	%	80 - 120
			Total Cobalt (Co)	2022/06/02		96	%	80 - 120
			Total Copper (Cu)	2022/06/02		97	%	80 - 120
			Total Lead (Pb)	2022/06/02		99	%	80 - 120

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			Total Mercury (Hg)	2022/06/02		104	%	80 - 120
			Total Molybdenum (Mo)	2022/06/02		98	%	80 - 120
			Total Nickel (Ni)	2022/06/02		96	%	80 - 120
			Total Selenium (Se)	2022/06/02		118	%	80 - 120
			Total Silver (Ag)	2022/06/02		99	%	80 - 120
			Total Thallium (Tl)	2022/06/02		101	%	80 - 120
			Total Tin (Sn)	2022/06/02		98	%	80 - 120
			Total Uranium (U)	2022/06/02		96	%	80 - 120
			Total Vanadium (V)	2022/06/02		99	%	80 - 120
			Total Zinc (Zn)	2022/06/02		97	%	80 - 120
A595344	MFP	Method Blank	Total Antimony (Sb)	2022/06/02	<0.50		mg/kg	
			Total Arsenic (As)	2022/06/02	<1.0		mg/kg	
			Total Barium (Ba)	2022/06/02	<1.0		mg/kg	
			Total Beryllium (Be)	2022/06/02	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/06/02	<0.050		mg/kg	
			Total Chromium (Cr)	2022/06/02	<1.0		mg/kg	
			Total Cobalt (Co)	2022/06/02	<0.50		mg/kg	
			Total Copper (Cu)	2022/06/02	<1.0		mg/kg	
			Total Lead (Pb)	2022/06/02	<0.50		mg/kg	
			Total Mercury (Hg)	2022/06/02	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/06/02	<0.40		mg/kg	
			Total Nickel (Ni)	2022/06/02	<1.0		mg/kg	
			Total Selenium (Se)	2022/06/02	<0.50		mg/kg	
			Total Silver (Ag)	2022/06/02	<0.20		mg/kg	
			Total Thallium (Tl)	2022/06/02	<0.10		mg/kg	
			Total Tin (Sn)	2022/06/02	<1.0		mg/kg	
			Total Uranium (U)	2022/06/02	<0.20		mg/kg	
			Total Vanadium (V)	2022/06/02	<1.0		mg/kg	
			Total Zinc (Zn)	2022/06/02	<10		mg/kg	
A595344	MFP	RPD	Total Antimony (Sb)	2022/06/02	NC		%	30
			Total Arsenic (As)	2022/06/02	0.50		%	30
			Total Barium (Ba)	2022/06/02	12		%	35
			Total Beryllium (Be)	2022/06/02	2.0		%	30
			Total Cadmium (Cd)	2022/06/02	8.9		%	30
			Total Chromium (Cr)	2022/06/02	21		%	30
			Total Cobalt (Co)	2022/06/02	2.4		%	30
			Total Copper (Cu)	2022/06/02	1.8		%	30
			Total Lead (Pb)	2022/06/02	2.7		%	35
			Total Mercury (Hg)	2022/06/02	NC		%	35
			Total Molybdenum (Mo)	2022/06/02	4.5		%	35
			Total Nickel (Ni)	2022/06/02	11		%	30
			Total Selenium (Se)	2022/06/02	NC		%	30
			Total Silver (Ag)	2022/06/02	NC		%	35
			Total Thallium (Tl)	2022/06/02	1.3		%	30
			Total Tin (Sn)	2022/06/02	NC		%	35
			Total Uranium (U)	2022/06/02	1.3		%	30
			Total Vanadium (V)	2022/06/02	1.2		%	30
			Total Zinc (Zn)	2022/06/02	0.59		%	30
A595345	PL	Matrix Spike	Soluble Boron (B)	2022/06/02		97	%	75 - 125
A595345	PL	Spiked Blank	Soluble Boron (B)	2022/06/02		97	%	80 - 120
A595345	PL	Method Blank	Soluble Boron (B)	2022/06/02	<0.10		mg/L	
A595345	PL	RPD	Soluble Boron (B)	2022/06/02	20		%	30
A595859	PL	Matrix Spike	Soluble Boron (B)	2022/06/02		96	%	75 - 125
A595859	PL	Spiked Blank	Soluble Boron (B)	2022/06/02		96	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A595859	PL	Method Blank	Soluble Boron (B)	2022/06/02	<0.10		mg/L	

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

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

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

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

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

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

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

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

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VALIDATION SIGNATURE PAGE

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

Heather Groves, Dip.BioSci, QP, Senior Laboratory Manager - Inorganics

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Bureau Veritas Proprietary Software
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CHAIN OF CUSTODY RECORD

ENV COC - 00013v3

Invoice Information	Invoice to (requires report)	Report Information (if differs from invoice)		Project Information	
Company:	410658 Hemmer	Company:	Hemmer	Quotation #:	C11354
Contact Name:	Accounts Payable	Contact Name:	Cameron Davis	P.O. #/ AFE#:	
Street Address:	Suite 804, 322 11th Ave SW	Street Address:		Project #:	102604-01
City:	Calgary	Prov: AB	Postal Code: T2R 0E5	City:	Prov:	Postal Code:	Site #:	
Phone:	403 264 0671	Phone:	587 832 4864	Site Location:	
Email:		Email:	cdavis@hemmera.com	Site Location Province:	
Copies:		Copies:		Sampled By:	

LAB USE ONLY - PLACE STICKER HERE: C235503

Rush Confirmation #:

Regulatory Criteria

(AT1) (CCME) | Drinking Water - Canada | Drinking Water - Manitoba | Saskatchewan | Drinking Water - Alberta | _ Other _____

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

	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX F1	5 VOCs	6 BTEX F1-F2	7 BTEX F1-F4	8 Routine water	9 Regulated metals - total	10 Regulated metals - dissolved	11 Mercury - total	12 Mercury - dissolved	13 Salinity 4	14 Sieve (75 micron)	15 Texture (% sand, silt, clay)	16 Basic class II landfill	17 Soil (metals)	18 Soil (hydrocarbon)	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE	Comments
1	WC2	22	05	26	10	30	sed																	X	X			2		
2	WC3				09	50																		X	X			2		
3	WC6				11	10																		X	X			2		
4	WC43				14	10																		X	X			2		
5	WC4C				14	40																		X	X			2		
6	WC4D				15	00	"																	X	X			2		
7																														
8																														
9																														
10																														
11																														
12																														

Regular Turnaround Time (TAT)

_ 5 to 7 Day _ 10 Day

Rush Turnaround Time (TAT) Surcharges apply

Same Day | 1 Day | 2 Day | 3 Day | 4 Day

Date Required: YY MM DD

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

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

Temperature reading by:

	Relinquished by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Special instructions
1		22	05	26			1						
2							2						

Appendix C

Raw Fall sampling Data

Your Project #: 102604-01
Your C.O.C. #: 678814-02-01

Attention: Cameron Davis

Ausenco Sustainability Inc.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/11/17
Report #: R3265124
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C285489
Received: 2022/10/29, 09:53

Sample Matrix: Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH (1)	9	N/A	2022/11/03	BBY6SOP-00026	SM 23 2320 B m
Biochemical Oxygen Demand	9	2022/10/29	2022/11/03	AB SOP-00017	SM 23 5210B m
Cadmium - low level CCME - Dissolved	9	N/A	2022/11/03		Auto Calc
Chloride/Sulphate by Auto Colourimetry (1)	9	N/A	2022/11/02	BBY6SOP-00011 / BBY6SOP-00017	SM23-4500-Cl/SO4-E m
COD by Colorimeter	9	N/A	2022/11/03	AB SOP-00016	SM 23 5220D m
Oxygen (Dissolved) (2)	9	N/A	2022/10/29	AB SOP-00058	SM 23 4500-O C m
Conductivity @25C (1)	9	N/A	2022/11/03	BBY6SOP-00026	SM 23 2510 B m
Hardness	9	N/A	2022/11/02		Auto Calc
Elements by ICP - Dissolved (3)	9	N/A	2022/11/01	AB SOP-00042	EPA 6010d R5 m
Elements by ICPMS - Dissolved (3)	9	N/A	2022/11/02	AB SOP-00043	EPA 6020b R2 m
Ion Balance (1)	9	N/A	2022/11/04	BBY WI-00033	Auto Calc
Sum of cations, anions (1)	9	N/A	2022/11/02	BBY WI-00033	Auto Calc
Nitrogen (Total) (1)	7	N/A	2022/11/04	BBY6SOP-00016	SM 23 4500-N C m
Nitrogen (Total) (1)	1	N/A	2022/11/08	BBY6SOP-00016	SM 23 4500-N C m
Nitrogen (Total) (1)	1	N/A	2022/11/12	BBY6SOP-00016	SM 23 4500-N C m
Ammonia-N (Total)	9	N/A	2022/11/01	AB SOP-00007	SM 23 4500 NH3 A G m
Nitrate + Nitrite (N) - Preserved (1)	1	N/A	2022/11/13	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrate + Nitrite (N) - Preserved (1)	8	N/A	2022/11/16	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrate and Nitrite	1	N/A	2022/11/14		Auto Calc
Nitrate and Nitrite	8	N/A	2022/11/16		Auto Calc
Nitrite (N) by CFA (1)	1	N/A	2022/11/13	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrite (N) by CFA (1)	8	N/A	2022/11/16	BBY6SOP-00010	SM 23 4500-NO3- I m
Nitrate (as N)	9	2022/11/14	2022/11/16		Auto Calc
pH @25°C (1, 4)	9	N/A	2022/11/03	BBY6SOP-00026	SM 23 4500-H+ B m
Orthophosphate by Konelab (5)	9	N/A	2022/11/01	AB SOP-00025	SM 23 4500-P A,F m
Total Dissolved Solids (Filt. Residue)	4	2022/11/02	2022/11/02	AB SOP-00065	SM 23 2540 C m
Total Dissolved Solids (Filt. Residue)	5	2022/11/03	2022/11/03	AB SOP-00065	SM 23 2540 C m
Total Dissolved Solids (Calculated) (1)	9	N/A	2022/11/04	BBY WI-00033	Calculated Parameter
Total Kjeldahl Nitrogen (Total)	1	N/A	2022/11/14	BBY WI-00033	Auto Calc
Total Kjeldahl Nitrogen (Total)	8	N/A	2022/11/16	BBY WI-00033	Auto Calc
Total Phosphorus-Dissolved-Lab Filtered (6)	2	2022/11/02	2022/11/02	AB SOP-00024	SM 23 4500-P A,B,F m

Your Project #: 102604-01
Your C.O.C. #: 678814-02-01

Attention: Cameron Davis

Ausenco Sustainability Inc.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/11/17
Report #: R3265124
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C285489
Received: 2022/10/29, 09:53

Sample Matrix: Water
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Phosphorus-Dissolved-Lab Filtered (6)	5	2022/11/02	2022/11/03	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus-Dissolved-Lab Filtered (6)	1	2022/11/07	2022/11/07	AB SOP-00024	SM 23 4500-P A,B,F m
Phosphorus -P (Total, Dissolved) (6)	1	2022/11/02	2022/11/03	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus	2	2022/11/02	2022/11/02	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus	6	2022/11/02	2022/11/03	AB SOP-00024	SM 23 4500-P A,B,F m
Total Phosphorus	1	2022/11/07	2022/11/07	AB SOP-00024	SM 23 4500-P A,B,F m
Total Suspended Solids (NFR)	3	2022/11/01	2022/11/01	AB SOP-00061	SM 23 2540 D m
Total Suspended Solids (NFR)	6	2022/11/02	2022/11/02	AB SOP-00061	SM 23 2540 D m
Turbidity	9	N/A	2022/10/31	CAL SOP-00081	SM 23 2130 B m

Remarks:

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

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

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

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

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Vancouver, 4606 Canada Way , Burnaby, BC, V5G 1K5
(2) The APHA Standard Method requires dissolved oxygen to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory dissolved oxygen analyses in this report are reported past the APHA Standard Method holding time. Bureau Veritas endeavors to analyze samples as soon as possible after receipt.

Your Project #: 102604-01
Your C.O.C. #: 678814-02-01

Attention: Cameron Davis

Ausenco Sustainability Inc.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/11/17
Report #: R3265124
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C285489

Received: 2022/10/29, 09:53

(3) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(5) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(6) Dissolved Phosphorus > Total Phosphorus Imbalance: When applicable, Dissolved Phosphorus and Total Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Geraldlyn Gouthro, Key Account Specialist
Email: geraldlyn.gouthro@bureauveritas.com
Phone# (780)577-7173

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV210			BFV211	BFV212		
Sampling Date		2022/10/28 15:00			2022/10/28 14:45	2022/10/28 14:35		
COC Number		678814-02-01			678814-02-01	678814-02-01		
	UNITS	WQ-03	RDL	QC Batch	WQ-02	WQ-04C	RDL	QC Batch
Calculated Parameters								
Anion Sum	meq/L	9.8	N/A	A778861	6.9	9.5	N/A	A778861
Cation Sum	meq/L	10	N/A	A778861	6.8	9.3	N/A	A778861
Hardness (CaCO3)	mg/L	390	0.50	A779886	260	370	0.50	A779886
Ion Balance (% Difference)	%	1.9	N/A	A778860	0.43	1.3	N/A	A778860
Calculated Total Dissolved Solids	mg/L	530	5.0	A778852	350	480	1.0	A778852
Elements								
Dissolved Cadmium (Cd)	mg/L	<0.000020	0.000020	A779878	<0.000020	<0.000020	0.000020	A779878
Misc. Inorganics								
Conductivity	uS/cm	930	2.0	A786809	650	860	2.0	A786809
pH	pH	8.17	N/A	A786799	8.15	8.34	N/A	A786799
Anions								
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	A786804	<1.0	2.9	1.0	A786804
Alkalinity (Total as CaCO3)	mg/L	320	1.0	A786804	260	380	1.0	A786804
Bicarbonate (HCO3)	mg/L	390	1.0	A786804	320	450	1.0	A786804
Carbonate (CO3)	mg/L	<1.0	1.0	A786804	<1.0	3.5	1.0	A786804
Hydroxide (OH)	mg/L	<1.0	1.0	A786804	<1.0	<1.0	1.0	A786804
Chloride (Cl)	mg/L	25	1.0	A784123	9.6	11	1.0	A784123
Sulphate (SO4)	mg/L	120	5.0	A784123	63	81	1.0	A784123
Elements								
Dissolved Aluminum (Al)	mg/L	<0.0030	0.0030	A781955	<0.0030	<0.0030	0.0030	A781948
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	A781955	<0.00060	<0.00060	0.00060	A781948
Dissolved Arsenic (As)	mg/L	0.0021	0.00020	A781955	0.00042	0.00026	0.00020	A781948
Dissolved Barium (Ba)	mg/L	0.28	0.010	A781922	0.080	0.078	0.010	A781922
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	A781955	<0.0010	<0.0010	0.0010	A781948
Dissolved Boron (B)	mg/L	0.054	0.020	A781922	0.022	0.040	0.020	A781922
Dissolved Calcium (Ca)	mg/L	70	0.30	A781922	46	69	0.30	A781922
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	A781955	<0.0010	<0.0010	0.0010	A781948
Dissolved Cobalt (Co)	mg/L	<0.00030	0.00030	A781955	<0.00030	<0.00030	0.00030	A781948
Dissolved Copper (Cu)	mg/L	0.0012	0.0010	A781955	<0.0010	0.0017	0.0010	A781948
Dissolved Iron (Fe)	mg/L	<0.060	0.060	A781922	<0.060	<0.060	0.060	A781922
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	A781955	<0.00020	<0.00020	0.00020	A781948
Dissolved Lithium (Li)	mg/L	0.022	0.020	A781922	<0.020	0.022	0.020	A781922

RDL = Reportable Detection Limit
N/A = Not Applicable

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV210			BFV211	BFV212		
Sampling Date		2022/10/28 15:00			2022/10/28 14:45	2022/10/28 14:35		
COC Number		678814-02-01			678814-02-01	678814-02-01		
	UNITS	**WQ-03**	**RDL**	**QC Batch**	**WQ-02**	**WQ-04C**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	52	0.20	A781922	36	47	0.20	A781922
Dissolved Manganese (Mn)	mg/L	0.012	0.0040	A781922	0.079	0.0080	0.0040	A781922
Dissolved Molybdenum (Mo)	mg/L	0.0094	0.00020	A781955	0.00075	0.0019	0.00020	A781948
Dissolved Nickel (Ni)	mg/L	0.0016	0.00050	A781955	<0.00050	<0.00050	0.00050	A781948
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	A781922	<0.10	<0.10	0.10	A781922
Dissolved Potassium (K)	mg/L	10	0.30	A781922	2.9	4.8	0.30	A781922
Dissolved Selenium (Se)	mg/L	0.00058	0.00020	A781955	0.00044	0.0014	0.00020	A781948
Dissolved Silicon (Si)	mg/L	0.81	0.50	A781922	3.2	4.6	0.50	A781922
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	A781955	<0.00010	<0.00010	0.00010	A781948
Dissolved Sodium (Na)	mg/L	47	0.50	A781922	34	43	0.50	A781922
Dissolved Strontium (Sr)	mg/L	0.60	0.020	A781922	0.50	0.69	0.020	A781922
Dissolved Sulphur (S)	mg/L	43	0.20	A781922	22	27	0.20	A781922
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	A781955	<0.00020	<0.00020	0.00020	A781948
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	A781955	<0.0010	<0.0010	0.0010	A781948
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	A781955	<0.0010	<0.0010	0.0010	A781948
Dissolved Uranium (U)	mg/L	0.011	0.00010	A781955	0.0016	0.0042	0.00010	A781948
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	A781955	<0.0010	<0.0010	0.0010	A781948
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	A781955	<0.0030	0.0073	0.0030	A781948
RDL = Reportable Detection Limit								

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV213	BFV214		BFV215		BFV216		
Sampling Date		2022/10/28 14:20	2022/10/27 08:30		2022/10/27 09:45		2022/10/27 10:25		
COC Number		678814-02-01	678814-02-01		678814-02-01		678814-02-01		
	UNITS	WQ-07	WQ-05B	RDL	WQ-04B	QC Batch	WQ-04D	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	11	12	N/A	9.4	A778861	9.1	N/A	A778861
Cation Sum	meq/L	11	12	N/A	9.1	A778861	8.9	N/A	A778861
Hardness (CaCO3)	mg/L	430	500	0.50	360	A779886	350	0.50	A779886
Ion Balance (% Difference)	%	0.14	2.8	N/A	1.5	A778860	1.1	N/A	A778860
Calculated Total Dissolved Solids	mg/L	590	620	5.0	470	A778852	460	1.0	A778852
Elements									
Dissolved Cadmium (Cd)	mg/L	<0.000020	<0.000020	0.000020	<0.000020	A779878	<0.000020	0.000020	A779878
Misc. Inorganics									
Conductivity	uS/cm	990	1100	2.0	880	A786809	820	2.0	A786809
pH	pH	8.27	8.13	N/A	8.08	A786799	8.41	N/A	A786799
Anions									
Alkalinity (PP as CaCO3)	mg/L	<1.0	<1.0	1.0	<1.0	A786804	5.6	1.0	A786804
Alkalinity (Total as CaCO3)	mg/L	290	440	1.0	360	A786804	370	1.0	A786804
Bicarbonate (HCO3)	mg/L	360	540	1.0	440	A786804	430	1.0	A786804
Carbonate (CO3)	mg/L	<1.0	<1.0	1.0	<1.0	A786804	6.7	1.0	A786804
Hydroxide (OH)	mg/L	<1.0	<1.0	1.0	<1.0	A786804	<1.0	1.0	A786804
Chloride (Cl)	mg/L	12	17	1.0	36	A784123	9.8	1.0	A784123
Sulphate (SO4)	mg/L	220	140	5.0	54	A784123	69	1.0	A784123
Elements									
Dissolved Aluminum (Al)	mg/L	<0.0030	<0.0030	0.0030	<0.0030	A781948	<0.0030	0.0030	A781955
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	<0.00060	A781948	<0.00060	0.00060	A781955
Dissolved Arsenic (As)	mg/L	0.00080	0.00086	0.00020	<0.00020	A781948	<0.00020	0.00020	A781955
Dissolved Barium (Ba)	mg/L	0.095	0.13	0.010	0.059	A781922	0.069	0.010	A781922
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Boron (B)	mg/L	0.044	0.025	0.020	0.053	A781922	0.037	0.020	A781922
Dissolved Calcium (Ca)	mg/L	78	88	0.30	74	A781922	69	0.30	A781922
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Cobalt (Co)	mg/L	<0.00030	0.00056	0.00030	<0.00030	A781948	<0.00030	0.00030	A781955
Dissolved Copper (Cu)	mg/L	<0.0010	0.0026	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	0.060	<0.060	A781922	<0.060	0.060	A781922
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	<0.00020	A781948	<0.00020	0.00020	A781955
Dissolved Lithium (Li)	mg/L	0.022	<0.020	0.020	0.022	A781922	0.021	0.020	A781922

RDL = Reportable Detection Limit
N/A = Not Applicable

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV213	BFV214		BFV215		BFV216		
Sampling Date		2022/10/28 14:20	2022/10/27 08:30		2022/10/27 09:45		2022/10/27 10:25		
COC Number		678814-02-01	678814-02-01		678814-02-01		678814-02-01		
	UNITS	**WQ-07**	**WQ-05B**	**RDL**	**WQ-04B**	**QC Batch**	**WQ-04D**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	56	67	0.20	43	A781922	42	0.20	A781922
Dissolved Manganese (Mn)	mg/L	0.019	0.27	0.0040	0.0046	A781922	0.012	0.0040	A781922
Dissolved Molybdenum (Mo)	mg/L	0.0028	0.0020	0.00020	0.0015	A781948	0.0019	0.00020	A781955
Dissolved Nickel (Ni)	mg/L	0.00080	0.00098	0.00050	<0.00050	A781948	<0.00050	0.00050	A781955
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	<0.10	A781922	<0.10	0.10	A781922
Dissolved Potassium (K)	mg/L	5.9	3.8	0.30	4.1	A781922	4.8	0.30	A781922
Dissolved Selenium (Se)	mg/L	0.00086	0.0018	0.00020	0.0028	A781948	0.0015	0.00020	A781955
Dissolved Silicon (Si)	mg/L	1.2	3.7	0.50	3.8	A781922	4.5	0.50	A781922
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	<0.00010	A781948	<0.00010	0.00010	A781955
Dissolved Sodium (Na)	mg/L	45	37	0.50	41	A781922	42	0.50	A781922
Dissolved Strontium (Sr)	mg/L	0.77	0.70	0.020	0.77	A781922	0.66	0.020	A781922
Dissolved Sulphur (S)	mg/L	70	48	0.20	18	A781922	23	0.20	A781922
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	<0.00020	A781948	<0.00020	0.00020	A781955
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Uranium (U)	mg/L	0.0064	0.0091	0.00010	0.0042	A781948	0.0035	0.00010	A781955
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	0.0010	<0.0010	A781948	<0.0010	0.0010	A781955
Dissolved Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0030	<0.0030	A781948	0.029	0.0030	A781955
RDL = Reportable Detection Limit									

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV217	BFV218		
Sampling Date		2022/10/27 11:15	2022/10/28 16:45		
COC Number		678814-02-01	678814-02-01		
	UNITS	WQ-06	WQ-04A	RDL	QC Batch
Calculated Parameters					
Anion Sum	meq/L	9.0	8.7	N/A	A778861
Cation Sum	meq/L	9.0	8.6	N/A	A778861
Hardness (CaCO3)	mg/L	340	340	0.50	A779886
Ion Balance (% Difference)	%	0.18	0.58	N/A	A778860
Calculated Total Dissolved Solids	mg/L	460	440	1.0	A778852
Elements					
Dissolved Cadmium (Cd)	mg/L	<0.000020	<0.000020	0.000020	A779878
Misc. Inorganics					
Conductivity	uS/cm	830	790	2.0	A786809
pH	pH	8.23	8.21	N/A	A786799
Anions					
Alkalinity (PP as CaCO3)	mg/L	<1.0	<1.0	1.0	A786804
Alkalinity (Total as CaCO3)	mg/L	350	370	1.0	A786804
Bicarbonate (HCO3)	mg/L	420	450	1.0	A786804
Carbonate (CO3)	mg/L	<1.0	<1.0	1.0	A786804
Hydroxide (OH)	mg/L	<1.0	<1.0	1.0	A786804
Chloride (Cl)	mg/L	13	6.9	1.0	A784123
Sulphate (SO4)	mg/L	83	49	1.0	A784123
Elements					
Dissolved Aluminum (Al)	mg/L	<0.0030	<0.0030	0.0030	A781948
Dissolved Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	A781948
Dissolved Arsenic (As)	mg/L	0.00093	<0.00020	0.00020	A781948
Dissolved Barium (Ba)	mg/L	0.14	0.062	0.010	A781922
Dissolved Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	A781948
Dissolved Boron (B)	mg/L	0.041	0.045	0.020	A781922
Dissolved Calcium (Ca)	mg/L	54	70	0.30	A781922
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	A781948
Dissolved Cobalt (Co)	mg/L	<0.00030	<0.00030	0.00030	A781948
Dissolved Copper (Cu)	mg/L	<0.0010	0.0022	0.0010	A781948
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	0.060	A781922
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	A781948
Dissolved Lithium (Li)	mg/L	0.023	0.025	0.020	A781922

RDL = Reportable Detection Limit
N/A = Not Applicable

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ROUTINE WATER & DISS. REGULATED METALS (WATER)

Bureau Veritas ID		BFV217	BFV218		
Sampling Date		2022/10/27 11:15	2022/10/28 16:45		
COC Number		678814-02-01	678814-02-01		
	UNITS	WQ-06	WQ-04A	RDL	QC Batch
Dissolved Magnesium (Mg)	mg/L	51	39	0.20	A781922
Dissolved Manganese (Mn)	mg/L	0.039	<0.0040	0.0040	A781922
Dissolved Molybdenum (Mo)	mg/L	0.0028	0.0024	0.00020	A781948
Dissolved Nickel (Ni)	mg/L	0.00074	<0.00050	0.00050	A781948
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	0.10	A781922
Dissolved Potassium (K)	mg/L	5.0	3.8	0.30	A781922
Dissolved Selenium (Se)	mg/L	0.00089	0.0028	0.00020	A781948
Dissolved Silicon (Si)	mg/L	1.8	4.0	0.50	A781922
Dissolved Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	A781948
Dissolved Sodium (Na)	mg/L	46	41	0.50	A781922
Dissolved Strontium (Sr)	mg/L	0.65	0.66	0.020	A781922
Dissolved Sulphur (S)	mg/L	29	16	0.20	A781922
Dissolved Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	A781948
Dissolved Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	A781948
Dissolved Titanium (Ti)	mg/L	<0.0010	<0.0010	0.0010	A781948
Dissolved Uranium (U)	mg/L	0.0055	0.0044	0.00010	A781948
Dissolved Vanadium (V)	mg/L	<0.0010	<0.0010	0.0010	A781948
Dissolved Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0030	A781948
RDL = Reportable Detection Limit					

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TOTAL KJELDAHL NITROGEN (TOTAL)

Bureau Veritas ID		BFV210			BFV211	BFV212	BFV213		
Sampling Date		2022/10/28 15:00			2022/10/28 14:45	2022/10/28 14:35	2022/10/28 14:20		
COC Number		678814-02-01			678814-02-01	678814-02-01	678814-02-01		
	UNITS	**WQ-03**	**RDL**	**QC Batch**	**WQ-02**	**WQ-04C**	**WQ-07**	**RDL**	**QC Batch**
Calculated Parameters									
Total Total Kjeldahl Nitrogen (Calc)	mg/L	2.89	0.10	A778735	0.414	0.402	0.495	0.020	A780277
RDL = Reportable Detection Limit									

Bureau Veritas ID		BFV214	BFV215	BFV216	BFV217	BFV218		
Sampling Date		2022/10/27 08:30	2022/10/27 09:45	2022/10/27 10:25	2022/10/27 11:15	2022/10/28 16:45		
COC Number		678814-02-01	678814-02-01	678814-02-01	678814-02-01	678814-02-01		
	UNITS	**WQ-05B**	**WQ-04B**	**WQ-04D**	**WQ-06**	**WQ-04A**	**RDL**	**QC Batch**
Calculated Parameters								
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.549	0.651	0.142	0.550	0.167	0.020	A780277
RDL = Reportable Detection Limit								

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BFV210			BFV211			BFV212		
Sampling Date		2022/10/28 15:00			2022/10/28 14:45			2022/10/28 14:35		
COC Number		678814-02-01			678814-02-01			678814-02-01		
	UNITS	WQ-03	RDL	QC Batch	WQ-02	RDL	QC Batch	WQ-04C	RDL	QC Batch
ANIONS										
Nitrite (N)	mg/L	<0.0050	0.0050	A797982	<0.0050	0.0050	A794368	<0.0050	0.0050	A797982
Calculated Parameters										
Nitrate (N)	mg/L	0.11	0.020	A797184	0.025	0.020	A797184	0.18	0.020	A797190
Nitrate (NO3)	mg/L	0.50	0.089	A779082	0.11	0.089	A780263	0.80	0.089	A780263
Nitrite (NO2)	mg/L	<0.016	0.016	A779082	<0.016	0.016	A780263	<0.016	0.016	A780263
Demand Parameters										
Biochemical Oxygen Demand	mg/L	4.5	2.0	A778839	6.4	2.0	A778839	<2.0	2.0	A778839
Chemical Oxygen Demand	mg/L	70	10	A784263	177	10	A784263	34	10	A784263
Misc. Inorganics										
Dissolved Oxygen (O2)	mg/L	12	0.10	A778958	>15 (1)	0.10	A778958	14 (2)	0.10	A778958
Total Dissolved Solids	mg/L	540	10	A784408	340	10	A784408	480	10	A784408
Total Suspended Solids	mg/L	22	0.96	A781275	220	0.96	A781275	9.3	1.0	A781242
Nutrients										
Total Ammonia (N)	mg/L	1.4	0.015	A781252	0.071	0.015	A781252	<0.015	0.015	A781252
Orthophosphate (P)	mg/L	0.0064	0.0030	A782321	0.0039	0.0030	A782321	0.0031	0.0030	A782321
Dissolved Phosphorus (P)	mg/L				<0.0030	0.0030	A783154			
Total Phosphorus (P)	mg/L	0.031	0.0030	A783175	0.044	0.0030	A783175	<0.0030	0.0030	A788559
Nitrate plus Nitrite (N)	mg/L	0.112	0.020	A797976	0.025	0.020	A795878	0.181	0.020	A797976
Total Nitrogen (N)	mg/L	3.00	0.10	A786354	0.439	0.020	A786354	0.583	0.020	A795165
Lab Filtered Nutrients										
Dissolved Phosphorus (P)	mg/L	0.035	0.0030	A782905				<0.0030 (3)	0.0030	A788555
Physical Properties										
Turbidity	NTU	12	0.10	A780619	130	0.10	A780619	6.0	0.10	A780619

RDL = Reportable Detection Limit

(1) Result is greater than DO saturation limit due to possible matrix interference. Sample contained headspace increasing analytical uncertainty.

(2) Sample contained headspace increasing analytical uncertainty.

(3) Sample filtered and preserved past method specified hold time

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BFV213			BFV214			BFV215		
Sampling Date		2022/10/28 14:20			2022/10/27 08:30			2022/10/27 09:45		
COC Number		678814-02-01			678814-02-01			678814-02-01		
	UNITS	WQ-07	RDL	QC Batch	WQ-05B	RDL	QC Batch	WQ-04B	RDL	QC Batch
ANIONS										
Nitrite (N)	mg/L	<0.0050	0.0050	A797982	<0.0050	0.0050	A797982	<0.0050	0.0050	A797992
Calculated Parameters										
Nitrate (N)	mg/L	0.029	0.020	A797190	0.19	0.020	A797190	1.1	0.020	A797190
Nitrate (NO3)	mg/L	0.13	0.089	A780263	0.84	0.089	A780263	4.8	0.089	A780263
Nitrite (NO2)	mg/L	<0.016	0.016	A780263	<0.016	0.016	A780263	<0.016	0.016	A780263
Demand Parameters										
Biochemical Oxygen Demand	mg/L	<2.0	2.0	A778839	<2.0 (1)	2.0	A778839	<2.0 (1)	2.0	A778839
Chemical Oxygen Demand	mg/L	35	10	A784263	25	10	A784263	26	10	A784263
Misc. Inorganics										
Dissolved Oxygen (O2)	mg/L	14	0.10	A778958	7.2	0.10	A778958	>15 (2)	0.10	A778958
Total Dissolved Solids	mg/L	600	10	A784408	670	10	A782696	490	10	A782696
Total Suspended Solids	mg/L	3.4	0.99	A782589	21	1.0	A782589	36	0.99	A782596
Nutrients										
Total Ammonia (N)	mg/L	<0.015	0.015	A781252	0.093	0.015	A781252	<0.015	0.015	A781252
Orthophosphate (P)	mg/L	0.0051	0.0030	A782321	0.0032	0.0030	A782321	0.0035	0.0030	A782321
Total Phosphorus (P)	mg/L	0.0041	0.0030	A783175	<0.0030	0.0030	A783175	<0.0030	0.0030	A783175
Nitrate plus Nitrite (N)	mg/L	0.029	0.020	A797976	0.191	0.020	A797976	1.09	0.020	A797984
Total Nitrogen (N)	mg/L	0.524	0.020	A786354	0.740	0.020	A786354	1.74	0.020	A789394
Lab Filtered Nutrients										
Dissolved Phosphorus (P)	mg/L	0.0053 (3)	0.0030	A783180	<0.0030 (3)	0.0030	A782905	<0.0030 (3)	0.0030	A783180
Physical Properties										
Turbidity	NTU	5.8	0.10	A780619	12	0.10	A780619	16	0.10	A780619

RDL = Reportable Detection Limit

(1) Sample analyzed past hold time. Sample analysis is recommended within 48 hours of sampling.

(2) Result is greater than DO saturation limit due to possible matrix interference.Sample contained headspace increasing analytical uncertainty.

(3) Sample filtered and preserved past method specified hold time

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		BFV216		BFV217			BFV218		
Sampling Date		2022/10/27 10:25		2022/10/27 11:15			2022/10/28 16:45		
COC Number		678814-02-01		678814-02-01			678814-02-01		
	UNITS	WQ-04D	QC Batch	WQ-06	RDL	QC Batch	WQ-04A	RDL	QC Batch
ANIONS									
Nitrite (N)	mg/L	<0.0050	A797992	<0.0050	0.0050	A797992	<0.0050	0.0050	A797992
Calculated Parameters									
Nitrate (N)	mg/L	0.29	A797190	<0.020	0.020	A797190	0.83	0.020	A797190
Nitrate (NO3)	mg/L	1.3	A780263	<0.089	0.089	A780263	3.7	0.089	A780263
Nitrite (NO2)	mg/L	<0.016	A780263	<0.016	0.016	A780263	<0.016	0.016	A780263
Demand Parameters									
Biochemical Oxygen Demand	mg/L	<2.0 (1)	A778839	<2.0 (1)	2.0	A778839	<2.0	2.0	A778839
Chemical Oxygen Demand	mg/L	11	A784263	56	10	A784263	11	10	A784263
Misc. Inorganics									
Dissolved Oxygen (O2)	mg/L	>15 (2)	A778958	>15 (2)	0.10	A778958	7.4 (3)	0.10	A778958
Total Dissolved Solids	mg/L	480	A782696	470	10	A782696	430	10	A784408
Total Suspended Solids	mg/L	150	A782596	180	0.99	A782596	200	1.0	A782596
Nutrients									
Total Ammonia (N)	mg/L	<0.015	A781252	0.030	0.015	A781252	<0.015	0.015	A781252
Orthophosphate (P)	mg/L	0.0042	A782321	0.0050	0.0030	A782321	0.0030	0.0030	A782321
Total Phosphorus (P)	mg/L	<0.0030	A783175	0.0061	0.0030	A782777	<0.0030	0.0030	A782777
Nitrate plus Nitrite (N)	mg/L	0.287	A797984	<0.020	0.020	A797984	0.830	0.020	A797984
Total Nitrogen (N)	mg/L	0.430	A786354	0.550	0.020	A786354	0.997	0.020	A786354
Lab Filtered Nutrients									
Dissolved Phosphorus (P)	mg/L	<0.0030 (4)	A783180	0.0064 (4)	0.0030	A783180	<0.0030	0.0030	A783180
Physical Properties									
Turbidity	NTU	58	A780619	130	0.10	A780619	43	0.10	A780619

RDL = Reportable Detection Limit

(1) Analysis conducted on sample previously frozen to extend hold time

(2) Result is greater than DO saturation limit due to possible matrix interference.Sample contained headspace increasing analytical uncertainty.

(3) Sample contained headspace increasing analytical uncertainty.

(4) Sample filtered and preserved past method specified hold time

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GENERAL COMMENTS

Sample BFV210 [WQ-03] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV211 [WQ-02] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV212 [WQ-04C] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV213 [WQ-07] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV214 [WQ-05B] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Turbidity completed within five days of sampling. Data is satisfactory for compliance purposes. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV215 [WQ-04B] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Turbidity completed within five days of sampling. Data is satisfactory for compliance purposes. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV216 [WQ-04D] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Turbidity completed within five days of sampling. Data is satisfactory for compliance purposes. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV217 [WQ-06] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Turbidity completed within five days of sampling. Data is satisfactory for compliance purposes. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

Sample BFV218 [WQ-04A] : Sample was analyzed past method specified hold time for Biochemical Oxygen Demand. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. CSR/CCME requires Dissolved Oxygen to be analysed within 8 hours of sampling. This sample was analyzed past the hold time. Bureau Veritas Laboratories endeavors to analyze samples as soon as possible after receipt. Orthophosphate by Konelab completed within five days of sampling. Data is satisfactory for compliance purposes. Sample was analyzed past method specified hold time for Nitrite (N) by CFA.

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Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A778839	JKR	Spiked Blank	Biochemical Oxygen Demand	2022/11/03		90	%	85 - 115
A778839	JKR	Method Blank	Biochemical Oxygen Demand	2022/11/03	<2.0		mg/L	
A778839	JKR	RPD [BFV214-03]	Biochemical Oxygen Demand	2022/11/03	NC		%	20
A778958	JKR	Spiked Blank	Dissolved Oxygen (O2)	2022/10/29		100	%	80 - 120
A778958	JKR	RPD [BFV210-05]	Dissolved Oxygen (O2)	2022/10/29	1.7		%	20
A780619	NHE	Spiked Blank	Turbidity	2022/10/31		101	%	80 - 120
A780619	NHE	Method Blank	Turbidity	2022/10/31	<0.10		NTU	
A780619	NHE	RPD [BFV218-02]	Turbidity	2022/10/31	4.5		%	20
A781242	HE1	Matrix Spike	Total Suspended Solids	2022/11/01		NC	%	80 - 120
A781242	HE1	Spiked Blank	Total Suspended Solids	2022/11/01		101	%	80 - 120
A781242	HE1	Method Blank	Total Suspended Solids	2022/11/01	<1.0		mg/L	
A781242	HE1	RPD	Total Suspended Solids	2022/11/01	7.3		%	20
A781252	AFI	Matrix Spike	Total Ammonia (N)	2022/11/01		102	%	80 - 120
A781252	AFI	Spiked Blank	Total Ammonia (N)	2022/11/01		102	%	80 - 120
A781252	AFI	Method Blank	Total Ammonia (N)	2022/11/01	<0.015		mg/L	
A781252	AFI	RPD	Total Ammonia (N)	2022/11/01	0.87		%	20
A781275	SKP	Matrix Spike	Total Suspended Solids	2022/11/01		95	%	80 - 120
A781275	SKP	Spiked Blank	Total Suspended Solids	2022/11/01		93	%	80 - 120
A781275	SKP	Method Blank	Total Suspended Solids	2022/11/01	<1.0		mg/L	
A781275	SKP	RPD	Total Suspended Solids	2022/11/01	7.2		%	20
A781922	MPU	Matrix Spike	Dissolved Barium (Ba)	2022/11/01		86	%	80 - 120
			Dissolved Boron (B)	2022/11/01		95	%	80 - 120
			Dissolved Calcium (Ca)	2022/11/01		NC	%	80 - 120
			Dissolved Iron (Fe)	2022/11/01		NC	%	80 - 120
			Dissolved Lithium (Li)	2022/11/01		93	%	80 - 120
			Dissolved Magnesium (Mg)	2022/11/01		91	%	80 - 120
			Dissolved Manganese (Mn)	2022/11/01		NC	%	80 - 120
			Dissolved Phosphorus (P)	2022/11/01		97	%	80 - 120
			Dissolved Potassium (K)	2022/11/01		98	%	80 - 120
			Dissolved Silicon (Si)	2022/11/01		88	%	80 - 120
			Dissolved Sodium (Na)	2022/11/01		99	%	80 - 120
			Dissolved Strontium (Sr)	2022/11/01		88	%	80 - 120
			Dissolved Sulphur (S)	2022/11/01		96	%	80 - 120
A781922	MPU	Spiked Blank	Dissolved Barium (Ba)	2022/11/01		92	%	80 - 120
			Dissolved Boron (B)	2022/11/01		94	%	80 - 120
			Dissolved Calcium (Ca)	2022/11/01		94	%	80 - 120
			Dissolved Iron (Fe)	2022/11/01		94	%	80 - 120
			Dissolved Lithium (Li)	2022/11/01		92	%	80 - 120
			Dissolved Magnesium (Mg)	2022/11/01		93	%	80 - 120
			Dissolved Manganese (Mn)	2022/11/01		92	%	80 - 120
			Dissolved Phosphorus (P)	2022/11/01		94	%	80 - 120
			Dissolved Potassium (K)	2022/11/01		97	%	80 - 120
			Dissolved Silicon (Si)	2022/11/01		91	%	80 - 120
			Dissolved Sodium (Na)	2022/11/01		97	%	80 - 120
			Dissolved Strontium (Sr)	2022/11/01		90	%	80 - 120
			Dissolved Sulphur (S)	2022/11/01		92	%	80 - 120
A781922	MPU	Method Blank	Dissolved Barium (Ba)	2022/11/01	<0.010		mg/L	
			Dissolved Boron (B)	2022/11/01	<0.020		mg/L	
			Dissolved Calcium (Ca)	2022/11/01	<0.30		mg/L	
			Dissolved Iron (Fe)	2022/11/01	<0.060		mg/L	
			Dissolved Lithium (Li)	2022/11/01	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2022/11/01	<0.20		mg/L	
			Dissolved Manganese (Mn)	2022/11/01	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2022/11/01	<0.10		mg/L	
			Dissolved Potassium (K)	2022/11/01	<0.30		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silicon (Si)	2022/11/01	<0.50		mg/L	
			Dissolved Sodium (Na)	2022/11/01	<0.50		mg/L	
			Dissolved Strontium (Sr)	2022/11/01	<0.020		mg/L	
			Dissolved Sulphur (S)	2022/11/01	<0.20		mg/L	
A781922	MPU	RPD	Dissolved Barium (Ba)	2022/11/01	0.077		%	20
			Dissolved Boron (B)	2022/11/01	17		%	20
			Dissolved Calcium (Ca)	2022/11/01	0.20		%	20
			Dissolved Iron (Fe)	2022/11/01	0.14		%	20
			Dissolved Lithium (Li)	2022/11/01	13		%	20
			Dissolved Magnesium (Mg)	2022/11/01	0.62		%	20
			Dissolved Manganese (Mn)	2022/11/01	0.0029		%	20
			Dissolved Phosphorus (P)	2022/11/01	NC		%	20
			Dissolved Potassium (K)	2022/11/01	0.86		%	20
			Dissolved Silicon (Si)	2022/11/01	0.21		%	20
			Dissolved Sodium (Na)	2022/11/01	0.035		%	20
			Dissolved Strontium (Sr)	2022/11/01	0.029		%	20
			Dissolved Sulphur (S)	2022/11/01	4.1		%	20
A781948	STI	Matrix Spike	Dissolved Aluminum (Al)	2022/11/02		92	%	80 - 120
			Dissolved Antimony (Sb)	2022/11/02		115	%	80 - 120
			Dissolved Arsenic (As)	2022/11/02		81	%	80 - 120
			Dissolved Beryllium (Be)	2022/11/02		91	%	80 - 120
			Dissolved Chromium (Cr)	2022/11/02		81	%	80 - 120
			Dissolved Cobalt (Co)	2022/11/02		81	%	80 - 120
			Dissolved Copper (Cu)	2022/11/02		81	%	80 - 120
			Dissolved Lead (Pb)	2022/11/02		85	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/11/02		83	%	80 - 120
			Dissolved Nickel (Ni)	2022/11/02		81	%	80 - 120
			Dissolved Selenium (Se)	2022/11/02		93	%	80 - 120
			Dissolved Silver (Ag)	2022/11/02		81	%	80 - 120
			Dissolved Thallium (Tl)	2022/11/02		84	%	80 - 120
			Dissolved Tin (Sn)	2022/11/02		87	%	80 - 120
			Dissolved Titanium (Ti)	2022/11/02		81	%	80 - 120
			Dissolved Uranium (U)	2022/11/02		83	%	80 - 120
			Dissolved Vanadium (V)	2022/11/02		83	%	80 - 120
			Dissolved Zinc (Zn)	2022/11/02		87	%	80 - 120
A781948	STI	Spiked Blank	Dissolved Aluminum (Al)	2022/11/02		110	%	80 - 120
			Dissolved Antimony (Sb)	2022/11/02		110	%	80 - 120
			Dissolved Arsenic (As)	2022/11/02		93	%	80 - 120
			Dissolved Beryllium (Be)	2022/11/02		101	%	80 - 120
			Dissolved Chromium (Cr)	2022/11/02		94	%	80 - 120
			Dissolved Cobalt (Co)	2022/11/02		93	%	80 - 120
			Dissolved Copper (Cu)	2022/11/02		92	%	80 - 120
			Dissolved Lead (Pb)	2022/11/02		98	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/11/02		97	%	80 - 120
			Dissolved Nickel (Ni)	2022/11/02		93	%	80 - 120
			Dissolved Selenium (Se)	2022/11/02		103	%	80 - 120
			Dissolved Silver (Ag)	2022/11/02		95	%	80 - 120
			Dissolved Thallium (Tl)	2022/11/02		96	%	80 - 120
			Dissolved Tin (Sn)	2022/11/02		99	%	80 - 120
			Dissolved Titanium (Ti)	2022/11/02		100	%	80 - 120
			Dissolved Uranium (U)	2022/11/02		96	%	80 - 120
			Dissolved Vanadium (V)	2022/11/02		95	%	80 - 120
			Dissolved Zinc (Zn)	2022/11/02		86	%	80 - 120
A781948	STI	Method Blank	Dissolved Aluminum (Al)	2022/11/02	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2022/11/02	<0.00060		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2022/11/02	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2022/11/02	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2022/11/02	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/11/02	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/11/02	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/11/02	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2022/11/02	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/11/02	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/11/02	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/11/02	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2022/11/02	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/11/02	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/11/02	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/11/02	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/11/02	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/11/02	<0.0030		mg/L	
A781948	STI	RPD	Dissolved Aluminum (Al)	2022/11/02	NC		%	20
			Dissolved Antimony (Sb)	2022/11/02	NC		%	20
			Dissolved Arsenic (As)	2022/11/02	NC		%	20
			Dissolved Beryllium (Be)	2022/11/02	NC		%	20
			Dissolved Chromium (Cr)	2022/11/02	NC		%	20
			Dissolved Cobalt (Co)	2022/11/02	NC		%	20
			Dissolved Copper (Cu)	2022/11/02	NC		%	20
			Dissolved Lead (Pb)	2022/11/02	NC		%	20
			Dissolved Molybdenum (Mo)	2022/11/02	NC		%	20
			Dissolved Nickel (Ni)	2022/11/02	NC		%	20
			Dissolved Selenium (Se)	2022/11/02	NC		%	20
			Dissolved Silver (Ag)	2022/11/02	NC		%	20
			Dissolved Thallium (Tl)	2022/11/02	NC		%	20
			Dissolved Tin (Sn)	2022/11/02	NC		%	20
			Dissolved Titanium (Ti)	2022/11/02	NC		%	20
			Dissolved Uranium (U)	2022/11/02	NC		%	20
			Dissolved Vanadium (V)	2022/11/02	NC		%	20
			Dissolved Zinc (Zn)	2022/11/02	NC		%	20
A781955	STI	Matrix Spike	Dissolved Aluminum (Al)	2022/11/02		102	%	80 - 120
			Dissolved Antimony (Sb)	2022/11/02		115	%	80 - 120
			Dissolved Arsenic (As)	2022/11/02		85	%	80 - 120
			Dissolved Beryllium (Be)	2022/11/02		94	%	80 - 120
			Dissolved Chromium (Cr)	2022/11/02		86	%	80 - 120
			Dissolved Cobalt (Co)	2022/11/02		87	%	80 - 120
			Dissolved Copper (Cu)	2022/11/02		85	%	80 - 120
			Dissolved Lead (Pb)	2022/11/02		90	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/11/02		89	%	80 - 120
			Dissolved Nickel (Ni)	2022/11/02		84	%	80 - 120
			Dissolved Selenium (Se)	2022/11/02		99	%	80 - 120
			Dissolved Silver (Ag)	2022/11/02		85	%	80 - 120
			Dissolved Thallium (Tl)	2022/11/02		90	%	80 - 120
			Dissolved Tin (Sn)	2022/11/02		96	%	80 - 120
			Dissolved Titanium (Ti)	2022/11/02		92	%	80 - 120
			Dissolved Uranium (U)	2022/11/02		86	%	80 - 120
			Dissolved Vanadium (V)	2022/11/02		90	%	80 - 120
			Dissolved Zinc (Zn)	2022/11/02		91	%	80 - 120
A781955	STI	Spiked Blank	Dissolved Aluminum (Al)	2022/11/02		102	%	80 - 120
			Dissolved Antimony (Sb)	2022/11/02		110	%	80 - 120
			Dissolved Arsenic (As)	2022/11/02		93	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Beryllium (Be)	2022/11/02		100	%	80 - 120
			Dissolved Chromium (Cr)	2022/11/02		96	%	80 - 120
			Dissolved Cobalt (Co)	2022/11/02		95	%	80 - 120
			Dissolved Copper (Cu)	2022/11/02		94	%	80 - 120
			Dissolved Lead (Pb)	2022/11/02		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2022/11/02		96	%	80 - 120
			Dissolved Nickel (Ni)	2022/11/02		94	%	80 - 120
			Dissolved Selenium (Se)	2022/11/02		102	%	80 - 120
			Dissolved Silver (Ag)	2022/11/02		94	%	80 - 120
			Dissolved Thallium (Tl)	2022/11/02		97	%	80 - 120
			Dissolved Tin (Sn)	2022/11/02		98	%	80 - 120
			Dissolved Titanium (Ti)	2022/11/02		104	%	80 - 120
			Dissolved Uranium (U)	2022/11/02		96	%	80 - 120
			Dissolved Vanadium (V)	2022/11/02		97	%	80 - 120
			Dissolved Zinc (Zn)	2022/11/02		89	%	80 - 120
A781955	STI	Method Blank	Dissolved Aluminum (Al)	2022/11/02	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2022/11/02	<0.00060		mg/L	
			Dissolved Arsenic (As)	2022/11/02	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2022/11/02	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2022/11/02	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2022/11/02	<0.00030		mg/L	
			Dissolved Copper (Cu)	2022/11/02	<0.0010		mg/L	
			Dissolved Lead (Pb)	2022/11/02	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2022/11/02	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2022/11/02	<0.00050		mg/L	
			Dissolved Selenium (Se)	2022/11/02	<0.00020		mg/L	
			Dissolved Silver (Ag)	2022/11/02	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2022/11/02	<0.00020		mg/L	
			Dissolved Tin (Sn)	2022/11/02	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2022/11/02	<0.0010		mg/L	
			Dissolved Uranium (U)	2022/11/02	<0.00010		mg/L	
			Dissolved Vanadium (V)	2022/11/02	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2022/11/02	<0.0030		mg/L	
A781955	STI	RPD	Dissolved Aluminum (Al)	2022/11/02	NC		%	20
			Dissolved Antimony (Sb)	2022/11/02	NC		%	20
			Dissolved Arsenic (As)	2022/11/02	6.3		%	20
			Dissolved Beryllium (Be)	2022/11/02	NC		%	20
			Dissolved Chromium (Cr)	2022/11/02	0.24		%	20
			Dissolved Cobalt (Co)	2022/11/02	NC		%	20
			Dissolved Copper (Cu)	2022/11/02	5.1		%	20
			Dissolved Lead (Pb)	2022/11/02	NC		%	20
			Dissolved Molybdenum (Mo)	2022/11/02	3.7		%	20
			Dissolved Nickel (Ni)	2022/11/02	0.22		%	20
			Dissolved Selenium (Se)	2022/11/02	19		%	20
			Dissolved Silver (Ag)	2022/11/02	NC		%	20
			Dissolved Thallium (Tl)	2022/11/02	NC		%	20
			Dissolved Tin (Sn)	2022/11/02	NC		%	20
			Dissolved Titanium (Ti)	2022/11/02	NC		%	20
			Dissolved Uranium (U)	2022/11/02	0.28		%	20
			Dissolved Vanadium (V)	2022/11/02	NC		%	20
			Dissolved Zinc (Zn)	2022/11/02	NC		%	20
A782321	MAP	Matrix Spike [BFV211-01]	Orthophosphate (P)	2022/11/01		93	%	80 - 120
A782321	MAP	Spiked Blank	Orthophosphate (P)	2022/11/01		103	%	80 - 120
A782321	MAP	Method Blank	Orthophosphate (P)	2022/11/01	<0.0030		mg/L	
A782321	MAP	RPD [BFV211-01]	Orthophosphate (P)	2022/11/01	12		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A782589	SKP	Matrix Spike	Total Suspended Solids	2022/11/02		96	%	80 - 120
A782589	SKP	Spiked Blank	Total Suspended Solids	2022/11/02		91	%	80 - 120
A782589	SKP	Method Blank	Total Suspended Solids	2022/11/02	<1.0		mg/L	
A782589	SKP	RPD	Total Suspended Solids	2022/11/02	NC		%	20
A782596	SKP	Matrix Spike	Total Suspended Solids	2022/11/02		93	%	80 - 120
A782596	SKP	Spiked Blank	Total Suspended Solids	2022/11/02		96	%	80 - 120
A782596	SKP	Method Blank	Total Suspended Solids	2022/11/02	<1.0		mg/L	
A782596	SKP	RPD	Total Suspended Solids	2022/11/02	NC		%	20
A782696	HCL	Matrix Spike	Total Dissolved Solids	2022/11/02		96	%	80 - 120
A782696	HCL	Spiked Blank	Total Dissolved Solids	2022/11/02		99	%	80 - 120
A782696	HCL	Method Blank	Total Dissolved Solids	2022/11/02	<10		mg/L	
A782696	HCL	RPD	Total Dissolved Solids	2022/11/02	16		%	20
A782777	MAP	Matrix Spike	Total Phosphorus (P)	2022/11/03		NC	%	80 - 120
A782777	MAP	QC Standard	Total Phosphorus (P)	2022/11/02		98	%	80 - 120
A782777	MAP	Spiked Blank	Total Phosphorus (P)	2022/11/02		101	%	80 - 120
A782777	MAP	Method Blank	Total Phosphorus (P)	2022/11/02	<0.0030		mg/L	
A782777	MAP	RPD	Total Phosphorus (P)	2022/11/03	3.7		%	20
A782905	MAP	Matrix Spike [BFV214-01]	Dissolved Phosphorus (P)	2022/11/02		109	%	80 - 120
A782905	MAP	QC Standard	Dissolved Phosphorus (P)	2022/11/02		99	%	80 - 120
A782905	MAP	Spiked Blank	Dissolved Phosphorus (P)	2022/11/02		104	%	80 - 120
A782905	MAP	Method Blank	Dissolved Phosphorus (P)	2022/11/02	<0.0030		mg/L	
A782905	MAP	RPD [BFV210-01]	Dissolved Phosphorus (P)	2022/11/02	0.60		%	20
A783154	MAP	Matrix Spike [BFV211-07]	Dissolved Phosphorus (P)	2022/11/03		99	%	80 - 120
A783154	MAP	QC Standard	Dissolved Phosphorus (P)	2022/11/03		98	%	80 - 120
A783154	MAP	Spiked Blank	Dissolved Phosphorus (P)	2022/11/03		103	%	80 - 120
A783154	MAP	Method Blank	Dissolved Phosphorus (P)	2022/11/03	<0.0030		mg/L	
A783154	MAP	RPD [BFV211-07]	Dissolved Phosphorus (P)	2022/11/03	NC		%	20
A783175	MAP	Matrix Spike	Total Phosphorus (P)	2022/11/03		NC	%	80 - 120
A783175	MAP	QC Standard	Total Phosphorus (P)	2022/11/03		98	%	80 - 120
A783175	MAP	Spiked Blank	Total Phosphorus (P)	2022/11/03		103	%	80 - 120
A783175	MAP	Method Blank	Total Phosphorus (P)	2022/11/03	<0.0030		mg/L	
A783175	MAP	RPD	Total Phosphorus (P)	2022/11/03	1.9		%	20
A783180	MAP	Matrix Spike [BFV212-01]	Dissolved Phosphorus (P)	2022/11/03		96	%	80 - 120
A783180	MAP	QC Standard	Dissolved Phosphorus (P)	2022/11/03		98	%	80 - 120
A783180	MAP	Spiked Blank	Dissolved Phosphorus (P)	2022/11/03		102	%	80 - 120
A783180	MAP	Method Blank	Dissolved Phosphorus (P)	2022/11/03	<0.0030		mg/L	
A783180	MAP	RPD [BFV213-01]	Dissolved Phosphorus (P)	2022/11/03	16		%	20
A784123	BB3	Matrix Spike [BFV213-01]	Chloride (Cl)	2022/11/02		111	%	80 - 120
			Sulphate (SO4)	2022/11/02		NC	%	80 - 120
A784123	BB3	Spiked Blank	Chloride (Cl)	2022/11/02		100	%	80 - 120
			Sulphate (SO4)	2022/11/02		97	%	80 - 120
A784123	BB3	Method Blank	Chloride (Cl)	2022/11/02	<1.0		mg/L	
			Sulphate (SO4)	2022/11/02	<1.0		mg/L	
A784123	BB3	RPD [BFV213-01]	Chloride (Cl)	2022/11/02	4.4		%	20
			Sulphate (SO4)	2022/11/02	0.080		%	20
A784263	DSX	Matrix Spike [BFV210-07]	Chemical Oxygen Demand	2022/11/03		104	%	80 - 120
A784263	DSX	Spiked Blank	Chemical Oxygen Demand	2022/11/03		102	%	80 - 120
A784263	DSX	Method Blank	Chemical Oxygen Demand	2022/11/03	<10		mg/L	
A784263	DSX	RPD [BFV210-07]	Chemical Oxygen Demand	2022/11/03	2.9		%	20
A784408	GOC	Matrix Spike [BFV211-02]	Total Dissolved Solids	2022/11/03		100	%	80 - 120
A784408	GOC	Spiked Blank	Total Dissolved Solids	2022/11/03		93	%	80 - 120
A784408	GOC	Method Blank	Total Dissolved Solids	2022/11/03	<10		mg/L	
A784408	GOC	RPD [BFV210-02]	Total Dissolved Solids	2022/11/03	2.2		%	20
A786354	CBK	Spiked Blank	Total Nitrogen (N)	2022/11/04		98	%	80 - 120
A786354	CBK	Method Blank	Total Nitrogen (N)	2022/11/04	<0.020		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A786799	BTM	Spiked Blank	pH	2022/11/03		101	%	97 - 103
A786799	BTM	RPD	pH	2022/11/03	0.42		%	N/A
A786804	BTM	Matrix Spike	Alkalinity (Total as CaCO3)	2022/11/03		90	%	80 - 120
A786804	BTM	Spiked Blank	Alkalinity (Total as CaCO3)	2022/11/03		97	%	80 - 120
A786804	BTM	Method Blank	Alkalinity (PP as CaCO3)	2022/11/03	<1.0		mg/L	
			Alkalinity (Total as CaCO3)	2022/11/03	<1.0		mg/L	
			Bicarbonate (HCO3)	2022/11/03	<1.0		mg/L	
			Carbonate (CO3)	2022/11/03	<1.0		mg/L	
			Hydroxide (OH)	2022/11/03	<1.0		mg/L	
A786804	BTM	RPD	Alkalinity (PP as CaCO3)	2022/11/03	NC		%	20
			Alkalinity (Total as CaCO3)	2022/11/03	2.9		%	20
			Bicarbonate (HCO3)	2022/11/03	2.9		%	20
			Carbonate (CO3)	2022/11/03	NC		%	20
			Hydroxide (OH)	2022/11/03	NC		%	20
A786809	BTM	Spiked Blank	Conductivity	2022/11/03		102	%	80 - 120
A786809	BTM	Method Blank	Conductivity	2022/11/03	<2.0		uS/cm	
A788555	YL7	Matrix Spike	Dissolved Phosphorus (P)	2022/11/07		106	%	80 - 120
A788555	YL7	QC Standard	Dissolved Phosphorus (P)	2022/11/07		93	%	80 - 120
A788555	YL7	Spiked Blank	Dissolved Phosphorus (P)	2022/11/07		99	%	80 - 120
A788555	YL7	Method Blank	Dissolved Phosphorus (P)	2022/11/07	<0.0030		mg/L	
A788555	YL7	RPD	Dissolved Phosphorus (P)	2022/11/07	3.8		%	20
A788559	YL7	Matrix Spike	Total Phosphorus (P)	2022/11/07		100	%	80 - 120
A788559	YL7	QC Standard	Total Phosphorus (P)	2022/11/07		94	%	80 - 120
A788559	YL7	Spiked Blank	Total Phosphorus (P)	2022/11/07		96	%	80 - 120
A788559	YL7	Method Blank	Total Phosphorus (P)	2022/11/07	<0.0030		mg/L	
A788559	YL7	RPD	Total Phosphorus (P)	2022/11/07	17		%	20
A789394	CBK	Matrix Spike	Total Nitrogen (N)	2022/11/08		108	%	80 - 120
A789394	CBK	Spiked Blank	Total Nitrogen (N)	2022/11/08		96	%	80 - 120
A789394	CBK	Method Blank	Total Nitrogen (N)	2022/11/08	<0.020		mg/L	
A789394	CBK	RPD	Total Nitrogen (N)	2022/11/08	NC		%	20
A794368	IC4	Matrix Spike	Nitrite (N)	2022/11/13		103	%	80 - 120
A794368	IC4	Spiked Blank	Nitrite (N)	2022/11/13		101	%	80 - 120
A794368	IC4	Method Blank	Nitrite (N)	2022/11/13	<0.0050		mg/L	
A794368	IC4	RPD	Nitrite (N)	2022/11/13	NC		%	20
A795165	IC4	Matrix Spike	Total Nitrogen (N)	2022/11/12		NC	%	80 - 120
A795165	IC4	Spiked Blank	Total Nitrogen (N)	2022/11/12		96	%	80 - 120
A795165	IC4	Method Blank	Total Nitrogen (N)	2022/11/12	<0.020		mg/L	
A795878	IC4	Spiked Blank	Nitrate plus Nitrite (N)	2022/11/13		109	%	80 - 120
A795878	IC4	Method Blank	Nitrate plus Nitrite (N)	2022/11/13	<0.020		mg/L	
A797976	TSO	Matrix Spike [BFV214-01]	Nitrate plus Nitrite (N)	2022/11/16		106	%	80 - 120
A797976	TSO	Spiked Blank	Nitrate plus Nitrite (N)	2022/11/16		104	%	80 - 120
A797976	TSO	Method Blank	Nitrate plus Nitrite (N)	2022/11/16	<0.020		mg/L	
A797976	TSO	RPD [BFV214-01]	Nitrate plus Nitrite (N)	2022/11/16	3.7		%	25
A797982	TSO	Matrix Spike [BFV214-01]	Nitrite (N)	2022/11/16		105	%	80 - 120
A797982	TSO	Spiked Blank	Nitrite (N)	2022/11/16		100	%	80 - 120
A797982	TSO	Method Blank	Nitrite (N)	2022/11/16	<0.0050		mg/L	
A797982	TSO	RPD [BFV214-01]	Nitrite (N)	2022/11/16	NC		%	20
A797984	TSO	Matrix Spike	Nitrate plus Nitrite (N)	2022/11/16		NC	%	80 - 120
A797984	TSO	Spiked Blank	Nitrate plus Nitrite (N)	2022/11/16		105	%	80 - 120
A797984	TSO	Method Blank	Nitrate plus Nitrite (N)	2022/11/16	<0.020		mg/L	
A797984	TSO	RPD	Nitrate plus Nitrite (N)	2022/11/16	0.082		%	25
A797992	TSO	Matrix Spike	Nitrite (N)	2022/11/16		106	%	80 - 120
A797992	TSO	Spiked Blank	Nitrite (N)	2022/11/16		101	%	80 - 120
A797992	TSO	Method Blank	Nitrite (N)	2022/11/16	<0.0050		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A797992	TSO	RPD	Nitrite (N)	2022/11/16	0		%	20

N/A = Not Applicable

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

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

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

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

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

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

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

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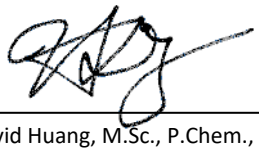
VALIDATION SIGNATURE PAGE

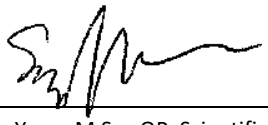
The analytical data and all QC contained in this report were reviewed and validated by:



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

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

Maria Magdalena Florescu, Ph.D., P.Chem., QP, Inorganics Manager



Sandy Yuan, M.Sc., QP, Scientific Specialist

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Automated Statchk

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

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1214

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

Page of

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#10658 Ausenco Sustainability Inc.	Company Name:		Quotation #:	C11354	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Cameron Davis	P.O. #:		C285489	678814
Address:	Suite 1430, 401-9 Avenue CALGARY AB T2P 3C5	Address:		Project:	102604-01	COC #:	Project Manager:
Tel:	(403) 264-0671 Fax: (403) 264-0670	Tel:	(587) 832-4864 Fax:	Project Name:		C#678814-02-01	Geraldlyn Gouthro
Email:	procure2pay.na@ausenco.com	Email:	cdavis@hemmera.com	Site #:			
				Sampled By:			

Regulatory Criteria:
- ☐ ATI
- ☐ CCME
- ☐ Other

Special Instructions:

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Routine Water & Diss. Regulated Metals	TDS, PO4,Turb	Ammonia-N (Total)	Total Kjeldahl Nitrogen (Total)	Total Suspended Solids (NFR)	Biochemical Oxygen Demand	COD by Colorimeter	Oxygen (Dissolved)	Total Phosphorus	Phosphorus -P (Total, Dissolved)	# of Bottles	Comments
1		WQ-03	22/10/28	15:00		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
2		WQ-02	22/10/28	14:45		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
3		WQ-04C	22/10/28	14:35		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
4		WQ-07	22/10/28	14:20		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
5		WQ-05B	22/10/27	08:30		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
6		WQ-04B	22/10/27	09:45		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
7		WQ-04D	22/10/27	10:25		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
8		WQ-06	22/10/27	11:15		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
9		WQ-04A	22/10/28	4:45		Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
KIRSTEN NORRIS	22/10/28		NICK BUTTY	2022/10/29	09:57		☐	4/3/4	☐ Yes ☐ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** ALL SAMPLES ARE HELD FOR 60 DAYS AFTER SAMPLE RECEIPT, FOR SPECIAL REQUESTS CONTACT YOUR PROJECT MANAGER

White: Bureau Veritas Yellow: Client

6/2/2

1/1/0

Bureau Veritas Canada (2019) Inc.

Your Project #: 102604-01
Your C.O.C. #: 678825-01-01

Attention: Cameron Davis

Ausenco Sustainability Inc.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/11/08
Report #: R3261029
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C285523
Received: 2022/10/29, 09:55

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hexavalent Chromium (1)	7	2022/11/04	2022/11/04	AB SOP-00063	SM 23 3500-Cr B m
Elements by ICPMS - Soils	5	2022/11/06	2022/11/07	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Soils	2	2022/11/06	2022/11/08	AB SOP-00001 / AB SOP-00043	EPA 6020b R2 m
Moisture	7	N/A	2022/11/04	AB SOP-00002	CCME PHC-CWS m
Soluble Ions	2	2022/11/06	2022/11/07	AB SOP-00033 / AB SOP-00042	EPA 6010d R5 m
Soluble Ions	5	2022/11/07	2022/11/08	AB SOP-00033 / AB SOP-00042	EPA 6010d R5 m
Soluble Paste	2	2022/11/06	2022/11/06	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Paste	5	2022/11/07	2022/11/07	AB SOP-00033	Carter 2nd ed 15.2 m
Soluble Boron Calculation	2	N/A	2022/11/07		Auto Calc
Soluble Boron Calculation	5	N/A	2022/11/08		Auto Calc

Remarks:

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

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

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

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

Your Project #: 102604-01
Your C.O.C. #: 678825-01-01

Attention: Cameron Davis

Ausenco Sustainability Inc.
Suite 1430, 401-9 Avenue
CALGARY, AB
CANADA T2P 3C5

Report Date: 2022/11/08
Report #: R3261029
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C285523

Received: 2022/10/29, 09:55

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

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

(1) Some soil samples may react with the Cr(VI) spike reducing it to Cr(III). These samples are highly unlikely to contain native hexavalent chromium. Thus a failed spike recovery does not invalidate a negative result on the native sample.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Geraldlyn Gouthro, Key Account Specialist
Email: geraldlyn.gouthro@bureauveritas.com
Phone# (780)577-7173

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AT1 REGULATED METALS - SOILS (SOIL)

Bureau Veritas ID		BFV582		BFV583			BFV584		
Sampling Date		2022/10/27 08:30		2022/10/27 09:45			2022/10/27 11:15		
COC Number		678825-01-01		678825-01-01			678825-01-01		
	UNITS	**WQ-05B**	**RDL**	**WQ-04B**	**RDL**	**QC Batch**	**WQ-06**	**RDL**	**QC Batch**
Calculated Parameters									
Calculated Boron (B)	mg/kg	<0.057	0.057	0.088	0.059	A780021	0.16	0.087	A780021
Elements									
Hex. Chromium (Cr 6+)	mg/kg	<0.080	0.080	<0.080	0.080	A786141	<0.16 (1)	0.16	A786141
Soluble Parameters									
Soluble Boron (B)	mg/L	<0.10	0.10	0.15	0.10	A789294	0.18	0.10	A788704
Saturation %	%	57	N/A	59	N/A	A787636	87	N/A	A787574
Elements									
Total Antimony (Sb)	mg/kg	<0.50	0.50	<0.50	0.50	A788325	<1.0	1.0	A788316
Total Arsenic (As)	mg/kg	4.7	1.0	4.4	1.0	A788325	7.2	2.0	A788316
Total Barium (Ba)	mg/kg	200	1.0	190	1.0	A788325	280	2.0	A788316
Total Beryllium (Be)	mg/kg	0.58	0.40	0.56	0.40	A788325	<0.80	0.80	A788316
Total Cadmium (Cd)	mg/kg	0.31	0.050	0.36	0.050	A788325	0.55	0.10	A788316
Total Chromium (Cr)	mg/kg	15	1.0	19	1.0	A788325	19	2.0	A788316
Total Cobalt (Co)	mg/kg	5.8	0.50	6.2	0.50	A788325	7.9	1.0	A788316
Total Copper (Cu)	mg/kg	14	1.0	15	1.0	A788325	22	2.0	A788316
Total Lead (Pb)	mg/kg	8.9	0.50	9.0	0.50	A788325	12	1.0	A788316
Total Mercury (Hg)	mg/kg	<0.050	0.050	<0.050	0.050	A788325	<0.10	0.10	A788316
Total Molybdenum (Mo)	mg/kg	0.49	0.40	0.76	0.40	A788325	1.6	0.80	A788316
Total Nickel (Ni)	mg/kg	17	1.0	18	1.0	A788325	25	2.0	A788316
Total Selenium (Se)	mg/kg	<0.50	0.50	0.94	0.50	A788325	1.3	1.0	A788316
Total Silver (Ag)	mg/kg	<0.20	0.20	<0.20	0.20	A788325	<0.40	0.40	A788316
Total Thallium (Tl)	mg/kg	0.16	0.10	0.16	0.10	A788325	0.24	0.20	A788316
Total Tin (Sn)	mg/kg	<1.0	1.0	<1.0	1.0	A788325	<2.0	2.0	A788316
Total Uranium (U)	mg/kg	0.71	0.20	0.83	0.20	A788325	2.4	0.40	A788316
Total Vanadium (V)	mg/kg	26	1.0	27	1.0	A788325	32	2.0	A788316
Total Zinc (Zn)	mg/kg	58	10	71	10	A788325	93	20	A788316

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to high moisture content, samples contain => 50% moisture.

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AT1 REGULATED METALS - SOILS (SOIL)

Bureau Veritas ID		BFV585			BFV586			BFV587		
Sampling Date		2022/10/27 10:25			2022/10/28 16:45			2022/10/28 14:45		
COC Number		678825-01-01			678825-01-01			678825-01-01		
	UNITS	WQ-04D	RDL	QC Batch	WQ-04A	RDL	QC Batch	WQ-02	RDL	QC Batch
Calculated Parameters										
Calculated Boron (B)	mg/kg	0.15	0.085	A780021	<0.099	0.099	A780021	0.13	0.074	A780021
Elements										
Hex. Chromium (Cr 6+)	mg/kg	<0.080	0.080	A786141	<0.18 (1)	0.18	A786141	<0.080	0.080	A786141
Soluble Parameters										
Soluble Boron (B)	mg/L	0.18	0.10	A789294	<0.10	0.10	A788704	0.18	0.10	A789294
Saturation %	%	85	N/A	A787636	99	N/A	A787574	74	N/A	A787636
Elements										
Total Antimony (Sb)	mg/kg	<0.50	0.50	A788325	<1.0	1.0	A788316	<0.50	0.50	A788325
Total Arsenic (As)	mg/kg	3.6	1.0	A788325	<2.0	2.0	A788316	2.9	1.0	A788325
Total Barium (Ba)	mg/kg	200	1.0	A788325	94	2.0	A788316	220	1.0	A788325
Total Beryllium (Be)	mg/kg	0.47	0.40	A788325	<0.80	0.80	A788316	0.54	0.40	A788325
Total Cadmium (Cd)	mg/kg	0.37	0.050	A788325	0.43	0.10	A788316	0.41	0.050	A788325
Total Chromium (Cr)	mg/kg	14	1.0	A788325	9.7	2.0	A788316	15	1.0	A788325
Total Cobalt (Co)	mg/kg	5.1	0.50	A788325	3.2	1.0	A788316	5.4	0.50	A788325
Total Copper (Cu)	mg/kg	12	1.0	A788325	11	2.0	A788316	13	1.0	A788325
Total Lead (Pb)	mg/kg	7.3	0.50	A788325	7.2	1.0	A788316	8.4	0.50	A788325
Total Mercury (Hg)	mg/kg	<0.050	0.050	A788325	<0.10	0.10	A788316	<0.050	0.050	A788325
Total Molybdenum (Mo)	mg/kg	0.78	0.40	A788325	1.2	0.80	A788316	0.59	0.40	A788325
Total Nickel (Ni)	mg/kg	16	1.0	A788325	11	2.0	A788316	17	1.0	A788325
Total Selenium (Se)	mg/kg	3.0	0.50	A788325	4.5	1.0	A788316	1.3	0.50	A788325
Total Silver (Ag)	mg/kg	<0.20	0.20	A788325	<0.40	0.40	A788316	<0.20	0.20	A788325
Total Thallium (Tl)	mg/kg	0.15	0.10	A788325	<0.20	0.20	A788316	0.15	0.10	A788325
Total Tin (Sn)	mg/kg	1.4	1.0	A788325	<2.0	2.0	A788316	<1.0	1.0	A788325
Total Uranium (U)	mg/kg	1.4	0.20	A788325	1.6	0.40	A788316	1.4	0.20	A788325
Total Vanadium (V)	mg/kg	21	1.0	A788325	14	2.0	A788316	24	1.0	A788325
Total Zinc (Zn)	mg/kg	270	10	A788325	37	20	A788316	64	10	A788325

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to high moisture content, samples contain => 50% moisture.

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AT1 REGULATED METALS - SOILS (SOIL)

Bureau Veritas ID		BFV588		
Sampling Date		2022/10/28 15:00		
COC Number		678825-01-01		
	UNITS	WQ-03	RDL	QC Batch
Calculated Parameters				
Calculated Boron (B)	mg/kg	0.21	0.10	A780021
Elements				
Hex. Chromium (Cr 6+)	mg/kg	<0.18 (1)	0.18	A786141
Soluble Parameters				
Soluble Boron (B)	mg/L	0.20	0.10	A789294
Saturation %	%	100	N/A	A787636
Elements				
Total Antimony (Sb)	mg/kg	<0.50	0.50	A788325
Total Arsenic (As)	mg/kg	5.6	1.0	A788325
Total Barium (Ba)	mg/kg	220	1.0	A788325
Total Beryllium (Be)	mg/kg	0.60	0.40	A788325
Total Cadmium (Cd)	mg/kg	0.43	0.050	A788325
Total Chromium (Cr)	mg/kg	15	1.0	A788325
Total Cobalt (Co)	mg/kg	5.9	0.50	A788325
Total Copper (Cu)	mg/kg	16	1.0	A788325
Total Lead (Pb)	mg/kg	9.5	0.50	A788325
Total Mercury (Hg)	mg/kg	<0.050	0.050	A788325
Total Molybdenum (Mo)	mg/kg	1.0	0.40	A788325
Total Nickel (Ni)	mg/kg	18	1.0	A788325
Total Selenium (Se)	mg/kg	1.7	0.50	A788325
Total Silver (Ag)	mg/kg	<0.20	0.20	A788325
Total Thallium (Tl)	mg/kg	0.18	0.10	A788325
Total Tin (Sn)	mg/kg	<1.0	1.0	A788325
Total Uranium (U)	mg/kg	2.0	0.20	A788325
Total Vanadium (V)	mg/kg	25	1.0	A788325
Total Zinc (Zn)	mg/kg	77	10	A788325

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to high moisture content, samples contain => 50% moisture.

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PHYSICAL TESTING (SOIL)

Bureau Veritas ID		BFV582	BFV583		BFV584		BFV585	BFV586		
Sampling Date		2022/10/27 08:30	2022/10/27 09:45		2022/10/27 11:15		2022/10/27 10:25	2022/10/28 16:45		
COC Number		678825-01-01	678825-01-01		678825-01-01		678825-01-01	678825-01-01		
	UNITS	WQ-05B	WQ-04B	QC Batch	WQ-06	QC Batch	WQ-04D	WQ-04A	RDL	QC Batch
Physical Properties										
Moisture	%	35	39	A785649	50	A785583	49	54	0.30	A785649
RDL = Reportable Detection Limit										

Bureau Veritas ID		BFV587	BFV588		
Sampling Date		2022/10/28 14:45	2022/10/28 15:00		
COC Number		678825-01-01	678825-01-01		
	UNITS	WQ-02	WQ-03	RDL	QC Batch
Physical Properties					
Moisture	%	42	57	0.30	A785649
RDL = Reportable Detection Limit					

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GENERAL COMMENTS

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

Package 1	1.3°C

AT1 REGULATED METALS - SOILS (SOIL) Comments

Sample BFV584 [WQ-06] Elements by ICPMS - Soils: Detection limits raised due to sample matrix.
Sample BFV586 [WQ-04A] Elements by ICPMS - Soils: Detection limits raised due to sample matrix.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A785583	MGL	Method Blank	Moisture	2022/11/04	<0.30		%	
A785583	MGL	RPD	Moisture	2022/11/04	2.6		%	20
A785649	A1H	Method Blank	Moisture	2022/11/04	<0.30		%	
A785649	A1H	RPD	Moisture	2022/11/04	7.0		%	20
A786141	GPJ	Matrix Spike	Hex. Chromium (Cr 6+)	2022/11/04		90	%	75 - 125
A786141	GPJ	Spiked Blank	Hex. Chromium (Cr 6+)	2022/11/04		101	%	80 - 120
A786141	GPJ	Method Blank	Hex. Chromium (Cr 6+)	2022/11/04	<0.080		mg/kg	
A786141	GPJ	RPD	Hex. Chromium (Cr 6+)	2022/11/04	NC		%	35
A787574	HAP	QC Standard	Saturation %	2022/11/06		97	%	75 - 125
A787574	HAP	RPD	Saturation %	2022/11/06	1.1		%	12
A787636	ABQ	QC Standard	Saturation %	2022/11/07		103	%	75 - 125
A787636	ABQ	RPD	Saturation %	2022/11/07	2.3		%	12
A788316	KH2	Matrix Spike	Total Antimony (Sb)	2022/11/08		107	%	75 - 125
			Total Arsenic (As)	2022/11/08		98	%	75 - 125
			Total Barium (Ba)	2022/11/08		NC	%	75 - 125
			Total Beryllium (Be)	2022/11/08		101	%	75 - 125
			Total Cadmium (Cd)	2022/11/08		101	%	75 - 125
			Total Chromium (Cr)	2022/11/08		89	%	75 - 125
			Total Cobalt (Co)	2022/11/08		98	%	75 - 125
			Total Copper (Cu)	2022/11/08		96	%	75 - 125
			Total Lead (Pb)	2022/11/08		97	%	75 - 125
			Total Mercury (Hg)	2022/11/08		98	%	75 - 125
			Total Molybdenum (Mo)	2022/11/08		101	%	75 - 125
			Total Nickel (Ni)	2022/11/08		91	%	75 - 125
			Total Selenium (Se)	2022/11/08		98	%	75 - 125
			Total Silver (Ag)	2022/11/08		100	%	75 - 125
			Total Thallium (Tl)	2022/11/08		99	%	75 - 125
			Total Tin (Sn)	2022/11/08		102	%	75 - 125
			Total Uranium (U)	2022/11/08		96	%	75 - 125
			Total Vanadium (V)	2022/11/08		106	%	75 - 125
			Total Zinc (Zn)	2022/11/08		93	%	75 - 125
A788316	KH2	QC Standard	Total Antimony (Sb)	2022/11/08		126	%	15 - 182
			Total Arsenic (As)	2022/11/08		98	%	53 - 147
			Total Barium (Ba)	2022/11/08		100	%	80 - 119
			Total Cadmium (Cd)	2022/11/08		104	%	72 - 128
			Total Chromium (Cr)	2022/11/08		99	%	59 - 141
			Total Cobalt (Co)	2022/11/08		96	%	58 - 142
			Total Copper (Cu)	2022/11/08		101	%	83 - 117
			Total Lead (Pb)	2022/11/08		109	%	79 - 121
			Total Molybdenum (Mo)	2022/11/08		106	%	67 - 133
			Total Nickel (Ni)	2022/11/08		105	%	79 - 121
			Total Silver (Ag)	2022/11/08		86	%	47 - 153
			Total Tin (Sn)	2022/11/08		101	%	67 - 133
			Total Uranium (U)	2022/11/08		95	%	77 - 123
			Total Vanadium (V)	2022/11/08		101	%	79 - 121
			Total Zinc (Zn)	2022/11/08		103	%	79 - 121
A788316	KH2	Spiked Blank	Total Antimony (Sb)	2022/11/08		109	%	80 - 120
			Total Arsenic (As)	2022/11/08		96	%	80 - 120
			Total Barium (Ba)	2022/11/08		96	%	80 - 120
			Total Beryllium (Be)	2022/11/08		93	%	80 - 120
			Total Cadmium (Cd)	2022/11/08		95	%	80 - 120
			Total Chromium (Cr)	2022/11/08		96	%	80 - 120
			Total Cobalt (Co)	2022/11/08		97	%	80 - 120
			Total Copper (Cu)	2022/11/08		98	%	80 - 120
			Total Lead (Pb)	2022/11/08		96	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Mercury (Hg)	2022/11/08		104	%	80 - 120
			Total Molybdenum (Mo)	2022/11/08		96	%	80 - 120
			Total Nickel (Ni)	2022/11/08		96	%	80 - 120
			Total Selenium (Se)	2022/11/08		99	%	80 - 120
			Total Silver (Ag)	2022/11/08		96	%	80 - 120
			Total Thallium (Tl)	2022/11/08		97	%	80 - 120
			Total Tin (Sn)	2022/11/08		94	%	80 - 120
			Total Uranium (U)	2022/11/08		98	%	80 - 120
			Total Vanadium (V)	2022/11/08		96	%	80 - 120
			Total Zinc (Zn)	2022/11/08		100	%	80 - 120
A788316	KH2	Method Blank	Total Antimony (Sb)	2022/11/08	<0.50		mg/kg	
			Total Arsenic (As)	2022/11/08	<1.0		mg/kg	
			Total Barium (Ba)	2022/11/08	<1.0		mg/kg	
			Total Beryllium (Be)	2022/11/08	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/11/08	<0.050		mg/kg	
			Total Chromium (Cr)	2022/11/08	<1.0		mg/kg	
			Total Cobalt (Co)	2022/11/08	<0.50		mg/kg	
			Total Copper (Cu)	2022/11/08	<1.0		mg/kg	
			Total Lead (Pb)	2022/11/08	<0.50		mg/kg	
			Total Mercury (Hg)	2022/11/08	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/11/08	<0.40		mg/kg	
			Total Nickel (Ni)	2022/11/08	<1.0		mg/kg	
			Total Selenium (Se)	2022/11/08	<0.50		mg/kg	
			Total Silver (Ag)	2022/11/08	<0.20		mg/kg	
			Total Thallium (Tl)	2022/11/08	<0.10		mg/kg	
			Total Tin (Sn)	2022/11/08	<1.0		mg/kg	
			Total Uranium (U)	2022/11/08	<0.20		mg/kg	
			Total Vanadium (V)	2022/11/08	<1.0		mg/kg	
			Total Zinc (Zn)	2022/11/08	<10		mg/kg	
A788316	KH2	RPD	Total Antimony (Sb)	2022/11/08	NC		%	30
			Total Arsenic (As)	2022/11/08	3.8		%	30
			Total Barium (Ba)	2022/11/08	2.3		%	35
			Total Beryllium (Be)	2022/11/08	1.4		%	30
			Total Cadmium (Cd)	2022/11/08	1.3		%	30
			Total Chromium (Cr)	2022/11/08	1.6		%	30
			Total Cobalt (Co)	2022/11/08	0.056		%	30
			Total Copper (Cu)	2022/11/08	2.7		%	30
			Total Lead (Pb)	2022/11/08	0.36		%	35
			Total Mercury (Hg)	2022/11/08	NC		%	35
			Total Molybdenum (Mo)	2022/11/08	5.0		%	35
			Total Nickel (Ni)	2022/11/08	0.30		%	30
			Total Selenium (Se)	2022/11/08	NC		%	30
			Total Silver (Ag)	2022/11/08	NC		%	35
			Total Thallium (Tl)	2022/11/08	1.8		%	30
			Total Tin (Sn)	2022/11/08	NC		%	35
			Total Uranium (U)	2022/11/08	2.9		%	30
			Total Vanadium (V)	2022/11/08	0.47		%	30
			Total Zinc (Zn)	2022/11/08	2.8		%	30
A788325	KH2	Matrix Spike	Total Antimony (Sb)	2022/11/07		103	%	75 - 125
			Total Arsenic (As)	2022/11/07		98	%	75 - 125
			Total Barium (Ba)	2022/11/07		NC	%	75 - 125
			Total Beryllium (Be)	2022/11/07		99	%	75 - 125
			Total Cadmium (Cd)	2022/11/07		100	%	75 - 125
			Total Chromium (Cr)	2022/11/07		120	%	75 - 125
			Total Cobalt (Co)	2022/11/07		100	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Copper (Cu)	2022/11/07		100	%	75 - 125
			Total Lead (Pb)	2022/11/07		97	%	75 - 125
			Total Mercury (Hg)	2022/11/07		89	%	75 - 125
			Total Molybdenum (Mo)	2022/11/07		101	%	75 - 125
			Total Nickel (Ni)	2022/11/07		101	%	75 - 125
			Total Selenium (Se)	2022/11/07		101	%	75 - 125
			Total Silver (Ag)	2022/11/07		71 (1)	%	75 - 125
			Total Thallium (Tl)	2022/11/07		97	%	75 - 125
			Total Tin (Sn)	2022/11/07		100	%	75 - 125
			Total Uranium (U)	2022/11/07		94	%	75 - 125
			Total Vanadium (V)	2022/11/07		160 (1)	%	75 - 125
			Total Zinc (Zn)	2022/11/07		NC	%	75 - 125
A788325	KH2	QC Standard	Total Antimony (Sb)	2022/11/07		97	%	15 - 182
			Total Arsenic (As)	2022/11/07		78	%	53 - 147
			Total Barium (Ba)	2022/11/07		94	%	80 - 119
			Total Cadmium (Cd)	2022/11/07		112	%	72 - 128
			Total Chromium (Cr)	2022/11/07		110	%	59 - 141
			Total Cobalt (Co)	2022/11/07		95	%	58 - 142
			Total Copper (Cu)	2022/11/07		96	%	83 - 117
			Total Lead (Pb)	2022/11/07		102	%	79 - 121
			Total Molybdenum (Mo)	2022/11/07		101	%	67 - 133
			Total Nickel (Ni)	2022/11/07		101	%	79 - 121
			Total Silver (Ag)	2022/11/07		107	%	47 - 153
			Total Tin (Sn)	2022/11/07		90	%	67 - 133
			Total Uranium (U)	2022/11/07		90	%	77 - 123
			Total Vanadium (V)	2022/11/07		101	%	79 - 121
			Total Zinc (Zn)	2022/11/07		96	%	79 - 121
A788325	KH2	Spiked Blank	Total Antimony (Sb)	2022/11/07		110	%	80 - 120
			Total Arsenic (As)	2022/11/07		96	%	80 - 120
			Total Barium (Ba)	2022/11/07		99	%	80 - 120
			Total Beryllium (Be)	2022/11/07		95	%	80 - 120
			Total Cadmium (Cd)	2022/11/07		96	%	80 - 120
			Total Chromium (Cr)	2022/11/07		97	%	80 - 120
			Total Cobalt (Co)	2022/11/07		97	%	80 - 120
			Total Copper (Cu)	2022/11/07		99	%	80 - 120
			Total Lead (Pb)	2022/11/07		96	%	80 - 120
			Total Mercury (Hg)	2022/11/07		100	%	80 - 120
			Total Molybdenum (Mo)	2022/11/07		97	%	80 - 120
			Total Nickel (Ni)	2022/11/07		96	%	80 - 120
			Total Selenium (Se)	2022/11/07		100	%	80 - 120
			Total Silver (Ag)	2022/11/07		97	%	80 - 120
			Total Thallium (Tl)	2022/11/07		97	%	80 - 120
			Total Tin (Sn)	2022/11/07		96	%	80 - 120
			Total Uranium (U)	2022/11/07		99	%	80 - 120
			Total Vanadium (V)	2022/11/07		96	%	80 - 120
			Total Zinc (Zn)	2022/11/07		97	%	80 - 120
A788325	KH2	Method Blank	Total Antimony (Sb)	2022/11/07	<0.50		mg/kg	
			Total Arsenic (As)	2022/11/07	<1.0		mg/kg	
			Total Barium (Ba)	2022/11/07	<1.0		mg/kg	
			Total Beryllium (Be)	2022/11/07	<0.40		mg/kg	
			Total Cadmium (Cd)	2022/11/07	<0.050		mg/kg	
			Total Chromium (Cr)	2022/11/07	<1.0		mg/kg	
			Total Cobalt (Co)	2022/11/07	<0.50		mg/kg	
			Total Copper (Cu)	2022/11/07	<1.0		mg/kg	
			Total Lead (Pb)	2022/11/07	<0.50		mg/kg	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Mercury (Hg)	2022/11/07	<0.050		mg/kg	
			Total Molybdenum (Mo)	2022/11/07	<0.40		mg/kg	
			Total Nickel (Ni)	2022/11/07	<1.0		mg/kg	
			Total Selenium (Se)	2022/11/07	<0.50		mg/kg	
			Total Silver (Ag)	2022/11/07	<0.20		mg/kg	
			Total Thallium (Tl)	2022/11/07	<0.10		mg/kg	
			Total Tin (Sn)	2022/11/07	<1.0		mg/kg	
			Total Uranium (U)	2022/11/07	<0.20		mg/kg	
			Total Vanadium (V)	2022/11/07	<1.0		mg/kg	
			Total Zinc (Zn)	2022/11/07	<10		mg/kg	
A788325	KH2	RPD	Total Antimony (Sb)	2022/11/07	6.4		%	30
			Total Arsenic (As)	2022/11/07	5.6		%	30
			Total Barium (Ba)	2022/11/07	5.8		%	35
			Total Beryllium (Be)	2022/11/07	3.8		%	30
			Total Cadmium (Cd)	2022/11/07	4.9		%	30
			Total Chromium (Cr)	2022/11/07	9.3		%	30
			Total Cobalt (Co)	2022/11/07	6.0		%	30
			Total Copper (Cu)	2022/11/07	5.8		%	30
			Total Lead (Pb)	2022/11/07	6.1		%	35
			Total Mercury (Hg)	2022/11/07	NC		%	35
			Total Molybdenum (Mo)	2022/11/07	14		%	35
			Total Nickel (Ni)	2022/11/07	7.7		%	30
			Total Selenium (Se)	2022/11/07	NC		%	30
			Total Silver (Ag)	2022/11/07	NC		%	35
			Total Thallium (Tl)	2022/11/07	3.8		%	30
			Total Tin (Sn)	2022/11/07	NC		%	35
			Total Uranium (U)	2022/11/07	8.8		%	30
			Total Vanadium (V)	2022/11/07	7.2		%	30
			Total Zinc (Zn)	2022/11/07	4.8		%	30
A788704	SJK	Matrix Spike	Soluble Boron (B)	2022/11/07		97	%	75 - 125
A788704	SJK	Spiked Blank	Soluble Boron (B)	2022/11/07		94	%	80 - 120
A788704	SJK	Method Blank	Soluble Boron (B)	2022/11/07	<0.10		mg/L	
A788704	SJK	RPD	Soluble Boron (B)	2022/11/07	NC		%	30
A789294	SJK	Matrix Spike	Soluble Boron (B)	2022/11/08		98	%	75 - 125
A789294	SJK	Spiked Blank	Soluble Boron (B)	2022/11/08		99	%	80 - 120
A789294	SJK	Method Blank	Soluble Boron (B)	2022/11/08	<0.10		mg/L	
A789294	SJK	RPD	Soluble Boron (B)	2022/11/08	14		%	30

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

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

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

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

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

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

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

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

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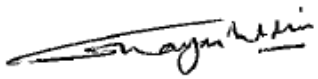
VALIDATION SIGNATURE PAGE

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



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

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

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

Page of

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#10658 Ausenco Sustainability Inc.	Company Name:		Quotation #:	C11354	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Cameron Davis	P.O. #:			678825
Address:	Suite 1430, 401-9 Avenue	Address:		Project:	102604-01		
	CALGARY AB T2P 3C5			Project Name:		COC #:	Project Manager:
Tel:	(403) 264-0671 Fax: (403) 264-0670	Tel:	(587) 832-4864 Fax:	Site #:		C#678825-01-01	Geraldlyn Gouthro
Email:	procure2pay.na@ausenco.com	Email:	cdavis@hemmera.com	Sampled By:			

Regulatory Criteria:
- ☐ ATI
- ☐ CCME
- ☐ Other

Special Instructions

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

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Soil	# of Bottles	Comments
1		WQ-05B	22/10/27	08:30			✓	2	
2		WQ-04B	22/10/27	09:45			✓	2	
3		WQ-06	22/10/27	11:15			✓	2	
4		WQ-04D	22/10/27	10:25			✓	2	
5		WQ-04A	22/10/28	16:45			✓	2	
6		WQ-02	22/10/28	14:45			✓	2	
7		WQ-03	22/10/28	15:00			✓	2	
8									
9									
10									

29-Oct-22 09:55
Geraldlyn Gouthro
C285523
IKA INS-0001

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
KIRSTEN NORRIS	22/10/28		Nick Bartoy	22/10/29	9:55		☐	1/2.4/1	☐ Yes ☐ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.
** ALL SAMPLES ARE HELD FOR 60 DAYS AFTER SAMPLE RECEIPT, FOR SPECIAL REQUESTS CONTACT YOUR PROJECT MANAGER

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Appendix D

Photo Log

Photo 1 View west from WQ-01 sample site, located within the Reference Wetland. Photo taken on May 26, 2022.

Photo 2 View north from WQ-01 sample site, located within the Reference Wetland. Photo taken on May 26, 2022.

Photo 3 View of ground conditions from WQ-01 sample site, located within the Reference Wetland. Photo taken during spring sampling on May 26, 2022.

Photo 4 View south from WQ-01 sample site, located within the Reference Wetland. Photo taken during fall sampling on May 25, 2022

Photo 5 View east from WQ-01 sample site, located within the Reference Wetland. Photo taken during fall sampling on October 27, 2022.

Photo 6 View west from WQ-01 sample site, located within the Reference Wetland. Photo taken during fall sampling on October 27, 2022.

Photo 7 View north from WQ-01 sample site, located within the Reference Wetland. Photo taken on October 27, 2022.

Photo 8 View of ground at WQ-01 sample site, located within the Reference Wetland. Photo taken on October 27, 2022.

Photo 9 View west from WQ-02 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 10 View east from WQ-02 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 11 View north from WQ-02 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 12 View of the ground conditions at WQ-02 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 13 View upstream (south) from WQ-02 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 14 View downstream (north) from WQ-02 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 15 View east from WQ-02 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 16 View of ground conditions from WQ-02 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 17 View east from WQ-03 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 18 View north from WQ-03 sample site, located within Wetland 06. Photo taken during spring sampling on May 26, 2022.

Photo 21 View west from WQ-03 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 22 View north from WQ-03 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 23 View south from WQ-03 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 24 View of ground conditions from WQ-03 sample site, located within Wetland 06. Photo taken during fall sampling on October 27, 2022

Photo 25 View southeast from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 26 View north from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26 2022.

Photo 27 View east from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 28 View north from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 27 View south from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 30 View east from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 31 Ground conditions at WQ-06, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 32 View west from WQ-06 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 33 View northwest from WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 34 View east from the WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022

Photo 37 View south from the WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 38 View north from the WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 39 View west from the WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 40 Ground conditions at WQ-07 sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 41 View southeast from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 42 View south from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 43 Ground view at WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 44 View northwest from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during spring sampling on May 26, 2022.

Photo 45 View south from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 46 View north from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 47 View west from WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 48 Ground conditions at WQ-04b sample site, located downslope of the SWCRR Project and Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 49 View northwest from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during spring sampling on May 26, 2022.

Photo 50 View northeast from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during spring sampling on May 26, 2022.

Photo 51 View North from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during spring sampling on May 26, 2022.

Photo 52 View southwest from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during Spring sampling on May 26, 2022.

Photo 53 View south from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 54 View North from WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 55 Ground conditions at the WQ-05b sample site, located downslope of the SWCRR Project and Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 56 View north of WQ-4a sample site located upslope of the SWCRR Project within Wetland 08. Photo taken during spring sampling on May 25, 2022.

Photo 57 View east from WQ-4a sample site, located upslope of the SWCRR Project within Wetland 08. Photo taken during spring sampling on May 25, 2022.

Photo 58 View west from WQ-4a sample site, located upslope of the SWCRR Project within Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 59 View of substrate at WQ-4a sample site, located upslope of the SWCRR Project within Wetland 08. Photo taken during fall sampling on October 27, 2022.

Photo 60 View of the WQ-4c sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during spring sampling on May 26, 2022.

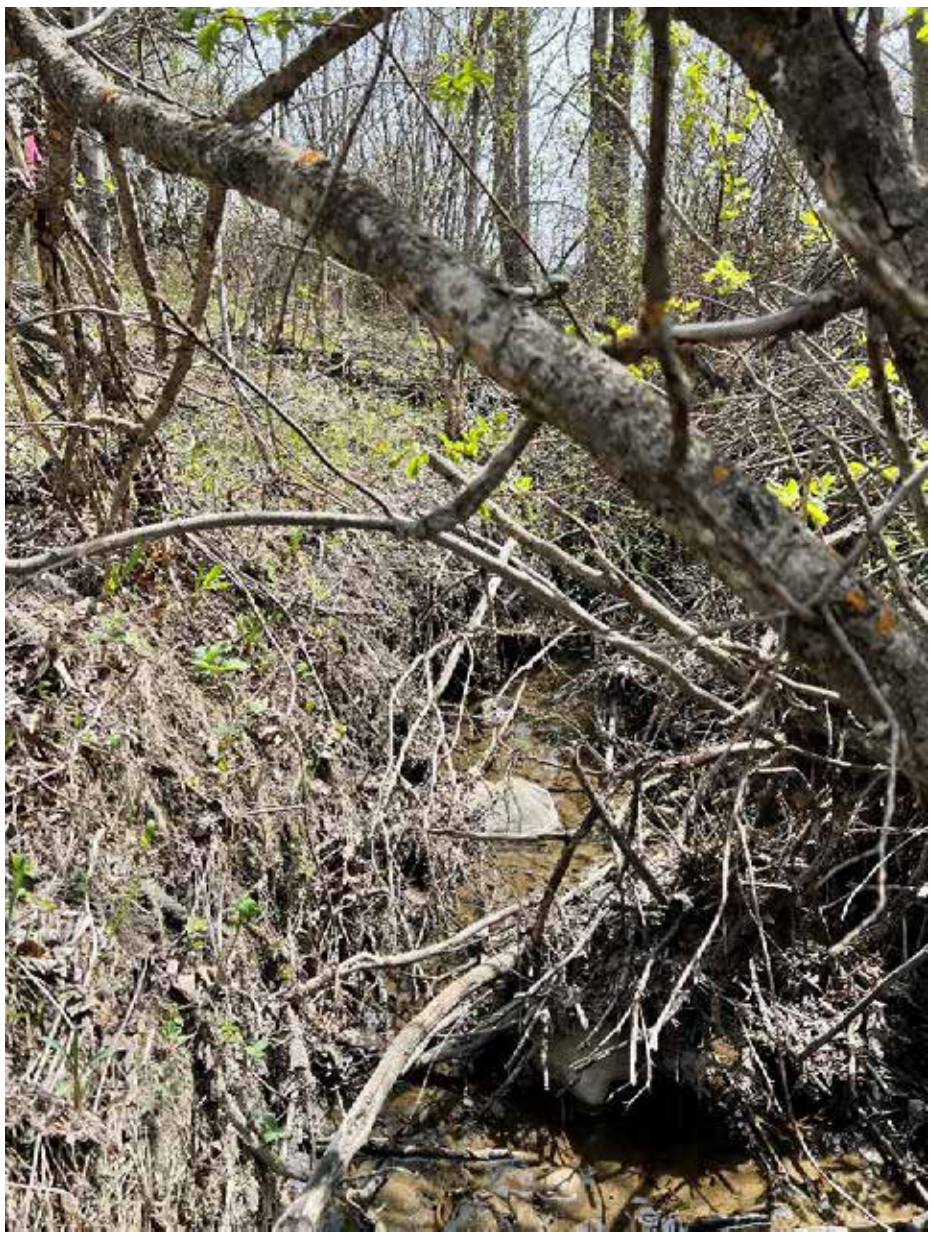

Photo 61 View Southwest of the WQ-4d sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during spring sampling on May 26, 2022.

Photo 62 View northeast of the WQ-4d sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during spring sampling on May 26, 2022

Photo 63 View northeast of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during spring sampling on May 26, 2022.

Photo 64 View east of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during spring sampling on May 26, 2022

Photo 65 View west of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 66 View east of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 67 View north of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 68 View south of the WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 69 Ground condition at WQ-5a sample site, located upslope of the SWCRR Project within Wetland 09. Photo taken during fall sampling on October 27, 2022.

Photo 70 View upstream (southwest) of the FL-01 inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 71 View upstream (northeast) of the FL-01 inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 72 View of the west bank at the FL-01 inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 73 View of east bank at the FL-01 inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 74 View upstream (south) of the FL-01 inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 75 View downstream (north) of the FL-01 inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 76 View of ground conditions at the FL-01 inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 77 View west (Left downstream bank) at the FL-01 inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 78 View of the eastern bank of the FL-02 Inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 79 View of the western bank of the FL-02 Inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 80 View downstream of the FL-02 Inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 81 View downstream (north) of the FL-02 Inflow site. A beaver dam located at the downstream extent of the inflow channel prevents surface connectivity between the Channel and Wetland 06. Photo taken during fall sampling on October 27, 2022.

Photo 82 View east from the FL-02 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 83 View of the western shore of the FL-02 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 84 Ground conditions at the FL-02 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 85 .View northeast of the FL-03 Inflow site. Photo taken during spring sampling on May 26, 2022

Photo 86 View northeast of the FL-03 Inflow site. Photo taken during spring sampling on May 26, 2022.

Photo 87 View east of the FL-03 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 88 View west of the FL-03 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 89 View north at the FL-03 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 90 View of ground conditions at the dry FL-03 Inflow site. Photo taken during fall sampling on October 27, 2022.

Photo 91 View southwest of the FL-04 outflow site. Photo taken during spring sampling on May 26, 2022.

Photo 92 View northeast of the FL-04 outflow site. Photo taken during spring sampling on May 26, 2022.

Photo 93 View of north at the dry FL-04 outflow site. Photo taken during spring sampling on May 26, 2022.

Photo 94 View of west at the dry FL-04 outflow site. Photo taken during spring sampling on May 26, 2022.

Photo 95 View upstream (south) of the FL-04 outflow site. Photo taken during fall sampling on October 27, 2022.

Photo 96 View downstream (north) of the FL-04 outflow site. Photo taken during fall sampling on October 27, 2022.

Photo 97 View west at the FL-04 outflow site. Photo taken during fall sampling on October 27, 2022.

Photo 98 View of ground conditions at the FL-04 outflow site. Photo taken during fall sampling on October 27, 2022.

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