

February 10, 2016

EDI Project No: 15Y0146

Assessment and Abandoned Mines Branch (AAM) K-149
Department of Energy, Mines and Resources, Yukon Government
Room 2C Royal Center, 4114-4th Avenue
PO 2703, Whitehorse, YT, Y1A 2C6

Attention: Erik Pit, Type II Project Manager

**RE: Mount Nansen Water Resources Investigations – Monthly Report: January 2016
FINAL**

Trip dates:	January 12 - 13, 2016
EDI field staff:	Scott Dilling, Joel MacFabe and Danny Skookum
Weather during trip:	Conditions for the three days included air temperatures from -10 to -6°C, with clear skies to light snow and calm to light wind conditions.

The following monthly report includes a summary of site conditions and data collected during EDI's January 2016 trip to Mount Nansen as part of the 2015/16 Water Resources Investigations. The January 2016 trip represents the third monitoring event of the winter season. See Table 1 for a summary of data included in this report.

Table 1. Summary of information provided in this monthly report.

Report Section	Description
Site Conditions	<ul style="list-style-type: none"> • Summary of weather and general site conditions
Meteorology	<ul style="list-style-type: none"> • Statement on station status and identification of any data gaps or QA/QC issues • Snow depth sensor QA/QC
Hydrology	<ul style="list-style-type: none"> • Discussion of noteworthy hydrology observations for this month • Statement of QA/QC for the data collected this month
Water Quality	<ul style="list-style-type: none"> • Summary of noteworthy water quality observations for this month • Statement on QA/QC sample results for this month
Program Recommendations	<ul style="list-style-type: none"> • Program recommendations for meteorological, hydrology and water quality programs
Additional Trip Information	<ul style="list-style-type: none"> • Project Safety Concerns • Wildlife sightings • Budget and schedule considerations



Report Section	Description
List of Attachments	<ul style="list-style-type: none">• Maps of stations and sites• Site and station photos from trip• Data Tables – hydrology and water quality• Water quality lab result reports

SITE CONDITIONS

The January 2016 site trip represented mid-winter conditions at the Mount Nansen site. Air temperatures were relatively warm, ranging from -10 to -6°C. Weather conditions ranged from clear skies to light snow, with calm to light winds. Ice cover was present across all watercourses and waterbodies, with ice thickness ranging from 2 cm to 70 cm. Water levels were lower than during the previous winter trips. Stations and sites along Pony Creek, Back Creek and Dome Creek remain frozen to bed as well as various seeps around the site.

METEOROLOGY

Meteorological data was collected at the ATM-ROAD station throughout the month of January 2016. EDI conducted a preliminary QA/QC review of the January 2016 data. All sensors appear to be functioning as expected, with the possible exception of the longwave radiation sensor. This sensor produced anomalous readings from January 10-26, 2016 then returned to what appear to be normal readings. The condition of the sensor was checked visually by EDI staff who observed minor frost on the lens; it is unclear whether the frost is causing the issues and this information should be investigated with Northern AvCom who maintains the station. The snow sensor data quality produced a good quality reading at the time of the field visit; however, within the hourly dataset for the month of January there were 48 values where the snow sensor quality values indicated reduced echo signal strength and two values with high measurement uncertainty (See Table 2, Note). The variation in data quality appears to be associated with snowfall events and the reduced sensor reflections on fresh snow (i.e., no apparent problems with the sensor). On January 12, 2016, the snow level measured by EDI was 32.5 cm, whereas the snow sensor measurement was 30.0 cm (Table 2).. This indicates that to date, the snow sensor appears to be slightly underestimating snow depth, however there is likely enough spatial variability of the snow distribution and ground surface elevation in the vicinity of the meteorological station that would account for the differences. The wind anemometer appears to have periodically frozen during January when there was high relative humidity and sub-zero temperatures. It appears that only the anemometer cups froze (extended periods of zero wind velocity) because wind direction data was recorded during these same periods.

Meteorological data for the winter season (October 15, 2015 to March 31, 2016) will be summarized and reported on in the March 2016 monthly report, which will include the winter seasonal analysis.



Table 2. Comparison of snow depth measured at the site with the snow sensor measurement.

Measurement Date/Time	Manual Snow Depth Measurement near Station (cm)	Meteorological Station Snow Sensor Measurement (cm)	Snow Sensor Quality ¹	Difference (cm)
October 13, 2015 13:00	0.0	0.6	181 (Good)	0.6
November 16, 2015 14:20	20.0	18.2	185 (Good)	1.8
December 15, 2015 18:05	29.1	27.1	182 (Good)	2.0
January 12, 2016 13:35	32.5	30.0	169 (Good)	2.5

Note:

¹- Quality numbers provide an indication of surface density in snow monitoring applications. Values will increase during snowfall events consisting of low-density snow. Quality Numbers: 0 = Not able to read distance; 152-210 = Good Measurement Quality Numbers; 210-300= Reduced Echo Signal Strength; 300-600 = High measurement uncertainty

HYDROLOGY

Discharge measurements were collected at all stations with suitable measurement conditions during the January 2016 trip. Water levels were continuing to decline to baseflow and represent the lowest to date in the 2015/2016 winter period. Hydrology stations at H-PC-DSP, H-BC, H-DC-B, H-DC-R and H-DC-D1b were frozen to substrate. Continuous water level records are available for five stations for the period up to January 12, 2016: H-VC-U, H-VC-DBC, H-VC-UMN, H-VC-R and H-VC-R+290. Data was downloaded successfully from the continuous water level logger at H-DC-M WP. In December 2015, it was suspected that the direct read cable to the logger was damaged, however it appears that the data communication error was associated with the communication device rather than damage to the cable.

See attached data tables for a summary of surface water conditions and hydrometric monitoring tasks completed at each station for January 2016 (Attachment 3). Quality control and quality assurance was conducted for all hydrometric data. Noteworthy observations are included below.

Noteworthy Observations

- Discharge measurements were collected with an ADV at all Victoria Creek stations, H-VC-U, H-VC-DBC, H-VC-UMN, H-VC-R and H-VC-R+290 with discharge values ranging from 0.025 to 0.057 m³/s. Note the ADV measurement collected at H-VC-R was discarded due to poor data quality and poor channel conditions for accurate measurements. These values were lower than the flows observed in December 2015 which ranged from 0.085 to 0.100 m³/s. A salt tracer was also conducted concurrently with the ADV measurement at one station – H-VC-R+290 with the discharge value measured as 0.030 m³/s (slightly above the ADV value of 0.025 m³/s).
 - A preliminary review of the discharge values from the Victoria Creek stations in January 2016 show that the measured discharge at H-VC-DBC (0.057 m³/s) is greater than at the



downstream station at H-VC-UMN ($0.033 \text{ m}^3/\text{s}$). Similarly, the discharge at H-VC-UMN is greater than the discharge downstream at H-VC-R+290 ($0.025 \text{ m}^3/\text{s}$). Typically, discharge increases in the downstream direction as the contributing watershed area increases, therefore this decreasing winter flow pattern may indicate that the Victoria Creek reaches are losing surface flow to groundwater. Similar discharge patterns have been previously noted along Victoria Creek in July 2014, May 2015, June 2015, July 2015, November 2015, and December 2015. A more detailed review of the local hydrology along Victoria Creek will be completed at the end of the winter season when additional low flow data is available.

- An instantaneous volumetric discharge measurement was collected at H-DC-DX+105 with a discharge of $0.000 \text{ m}^3/\text{s}$ (below reportable limits).
- The H-SEEP volumetric discharge measurement was $0.002 \text{ m}^3/\text{s}$. Flow rate measured at the pump in the seepage pond shack was $0.002 \text{ m}^3/\text{s}$.
- At H-DC-M WP, water was flowing through the weir plate and wooden support structure and was not suitable for the typical volumetric discharge measurement, thus a salt tracer test was conducted. The discharge value was $0.004 \text{ m}^3/\text{s}$. Note the direct read cable was functioning properly this trip and the cable did not need to be replaced, as was originally planned. Attempts were made to re-route water in active part of channel towards the stilling well to ensure the sensor remains wetted through winter. Large amounts of overflow ice were observed upstream of the weir pond, approximately 10 m upstream. This ice is extending downstream from the seepage discharge site.
- Overflow ice conditions were present along Dome Creek in the vicinity of H-DC-R, H-DC-B and upstream of H-DC-M WP. The H-DC-B and H-DC-R stations were frozen to bed, no measurements could be collected at these two stations.
- A new Solinst M1.5 barologger was installed at ATM-VC5 due to concerns with the data quality with the previous sensor. The barologger that was removed was collecting anomalous data for unknown reasons; this data will not be used for barometric compensation. The barometric sensor data from the AAM meteorological station will be used to supplement the barometric record for the water level logger atmospheric compensation.

WATER QUALITY

Water quality samples and data were collected at the regularly scheduled sites during the January 2016 trip. A total of 9 sites were sampled. Many stations remain frozen to substrate for the winter period (as noted in the 'Site Conditions' section and in Attachment 3). The regular monthly drinking water sample was collected from the pumphouse well (WQ-PW) and an LC50 sample was collected from the WQ-SEEP site. All samples were submitted for analysis through ALS Laboratories.

See the attached data tables for a summary of conditions at each site and a record of where samples were collected during each trip (Attachment 3). In-situ and laboratory results summary tables are also attached.



Parameters that exceeded the Canadian Council of Ministers of the Environment Freshwater Aquatic Life (CCME-AL) guidelines and/or the Mount Nansen Effluent Quality Standards (EQS) criteria are highlighted. The lab certificates of analysis are also attached in Attachment 4. Many results reflect typical conditions for this time of year at Mount Nansen where water levels have decreased and watercourses are covered in ice. Noteworthy observations and comments on sample QA/QC are included in the subsections below.

Noteworthy Observations

- The WQ-VC-U site exceeded the guidelines for total aluminum and iron, which is uncommon this time of year, unless there is high suspended sediment in the sample. Since the higher concentrations were only observed in the total metals samples versus the dissolved metals sample, and the site did have higher in-situ turbidity and total suspended solids concentration, it's likely that this result is due to the higher suspended sediment. This could have occurred during sampling if the substrate was disturbed during sample collection. The remaining Victoria Creek samples did not exceed any guideline or standard criteria.
- The total zinc concentration in the December 2016 WQ-SEEP sample was above the CCME-AL guideline with a concentration of 0.114 mg/L. This is similar to the December 2015 sample result of 0.111 mg/L. This site also commonly exceeds the guidelines and/or standards for ammonia, arsenic, cadmium, iron, and manganese.
 - The LC50 sample collected from the WQ-SEEP, had a 96-hour LC50 result of greater than 100%, with 100% trout survival at 96-hours.
- The WQ-TP samples exceeded the guidelines and/or standards for ammonia, fluoride, arsenic, cadmium, copper, lead, manganese, and zinc. These results are typical of the winter season.
- The WQ-DC-U site downstream of the WQ-DC-B and WQ-SEEP sites exceeded the guidelines and/or standards for ammonia, arsenic, iron, manganese and zinc (which is common in the winter months).
- The WQ-DC-DX+105 samples exceeded the guidelines and/or standards for fluoride, arsenic, cadmium, iron, manganese and zinc, and had the highest total and dissolved zinc concentrations of all sites sampled. These results are similar to previous sampling events.

QA/QC Samples

Travel Blank Sample – The travel blank had all parameters below detection limits, except for ammonia. This is a common occurrence when the samples provided by the lab are dated, and is no actual contamination from storage or transport is suspected.

Field Blank Sample – all parameters were below detection limits.

Replicate Sample(s) – The average relative percent difference (RPD) of the replicate sample set for WQ-VC-UMN-r was 3%, indicating that sample analysis was adequately precise (RPD<20%). The average RPD



for total metals in the replicate sample set was 7% and the average RPD for dissolved metals was 1%. All individual parameters had RPD less than 20% or below detection limits, except for dissolved cadmium (RPD of 63%). The larger RPD in the dissolved cadmium results for the replicate set may be a combination of higher natural variability in site conditions and imprecision in lab equipment. A review of other dissolved cadmium results for the trip, found that dissolved cadmium results were within the range of site variability.

PROGRAM RECOMMENDATIONS

- During each winter trip, continue to collect photographs and snow depths adjacent to the meteorological station compound to confirm snow sensor data.
- Northern AvCom should be notified of potential issues with the longwave radiation sensor. There may be data quality parameters that can be logged to assess the issue (in a similar manner as the snow sensor).
- Monitor ice build-up at the H-DC-M WP station and WQ-DC-U site.
- Conduct concurrent ADV and salt tracer discharge measurement tests at select Victoria Creek stations from February to March 2016, where possible, to continue to validate the salt tracer method.
- Many sites will remain frozen to substrate through the winter, and should be revisited in April/May depending on spring conditions. This likely applies to WQ-DC-DX, H/WQ-DC-D1b, WQ-PC-U, WQ-PC-D, H-PC-DSP, H/WQ-BC, H/WQ-DC-R, H/WQ-DC-B and WQ-CH-P-13-01; as well as the other seeps that have been dry most or all of the 2015 open water season – WQ-ADIT-SEEP, WQ-LW-SEEP-01, WQ-MS-S-08.

ADDITIONAL TRIP INFORMATION

Any changes to project scope (i.e. additional sites sampled):	None. All sampling and monitoring was conducted within scope. The trip took two days as the number of sites/stations is reduced in the winter. The next trip is scheduled for February 15-16, 2016 , and will be the fourth winter season trip.
Any alterations to sample schedule/budget:	None.
Additional Comments:	The existing direct read cable installed on the logger at H-DC-M WP was working properly during the site visit and did not need to be replaced. The replacement cable that was recently purchased will not be needed for the project and will not be charged as such. There had been issues with data downloading November 2015 and December 2015, indicating potential communication cable issues, but the problem did not re-occur on the January 2016 trip. A new barologger was installed at the ATM-VC-5 station in January 2016 and the condition of the existing barologger is currently being assessed.
Wildlife Sightings:	None.

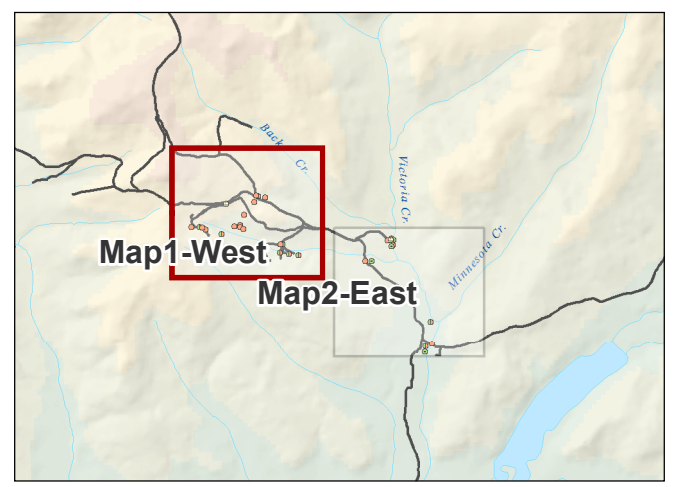
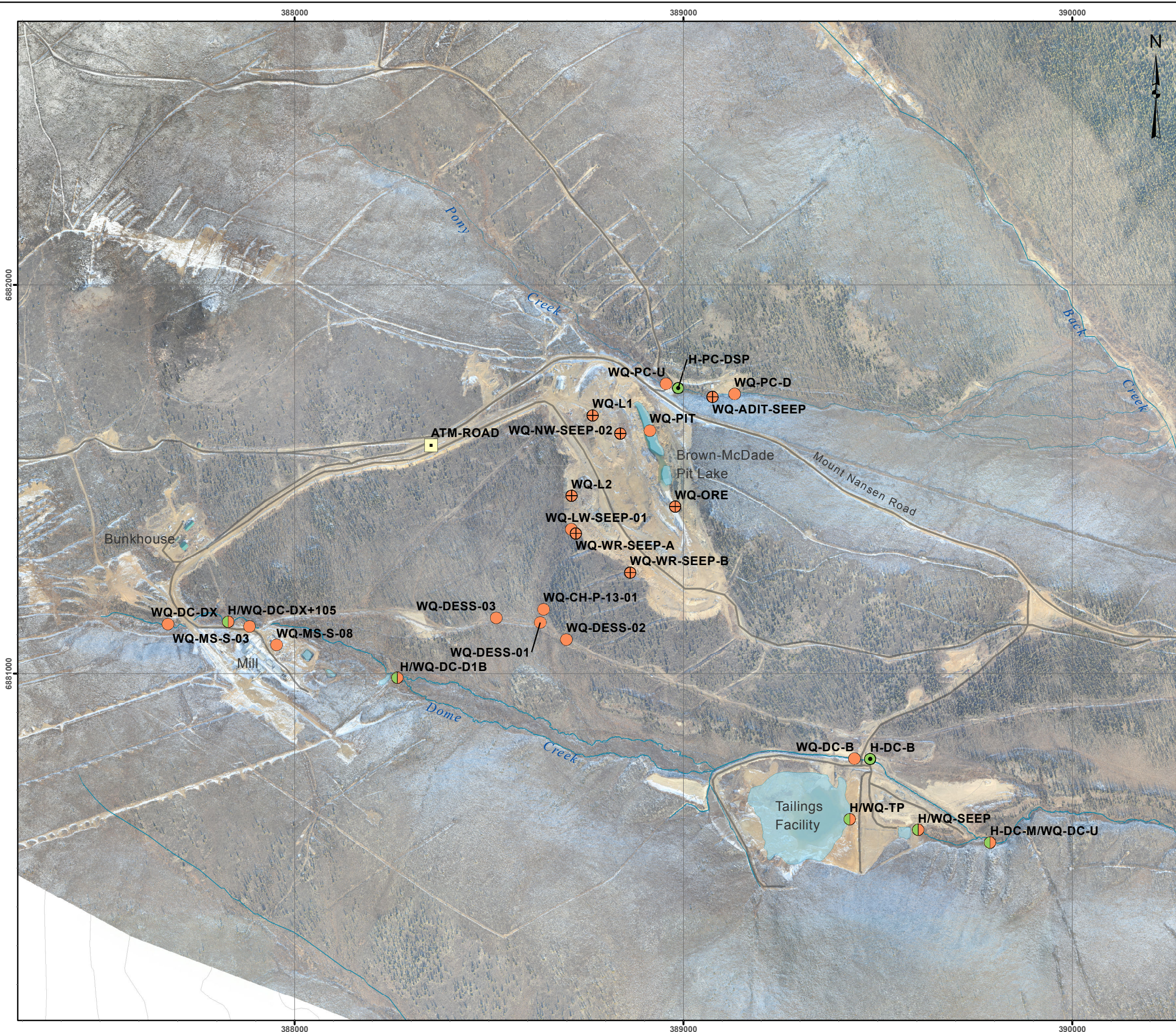


Site concerns (safety):	No concerns with site; however, there was an ice hazard on the Mount Nansen Access Road at the hairpin turn that typically has glaciation issues in the winter. Extra caution is required when approaching this area from either side and conditions may change from trip to trip. Fresh snow also may conceal the hazard. The EDI crew typically carries tire chains in the winter in case required for safe crossing; however, did not need to use them during the January 2016 trip.
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LIST OF ATTACHMENTS

The following information is attached to this monthly report:

1. Maps of Hydrometric Stations and Water Quality Sites
2. Site and Station Photos from the trip
3. Data Tables
 - a. Hydrology – Site Conditions and Tasks Completed & Summary Table of Discharge Measurements.
 - b. Water Quality – Site Conditions and Samples Collected & Summary Table of In Situ Parameters and Lab Results
4. Copies of Lab Certificate of Analysis (COA) & Yukon Environmental Health Services Bacteriological Results (November 2015).



Legend

- Atmospheric Station (label e.g. ATM-ROAD)
- Hydrometric Station and Water Quality Site (label e.g. H/WQ-VC-UMN)
- Hydrometric Station (label e.g. H-VC-R)
- Water Quality Site (label e.g. WQ-PC-U)
- + Temporary Water Quality Site (label e.g. WQ-MS-S-03)
- Unpaved Road/Access

Mount Nansen Site (West): Hydrometric Stations and Water Quality Sites

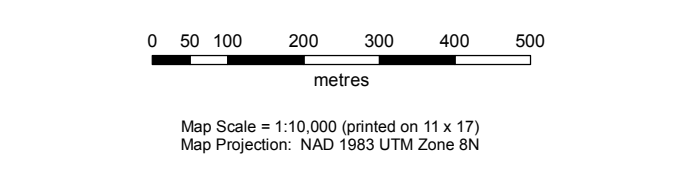
Notes:

1:50,000 and 1:250,000 Topographic Spatial Data provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

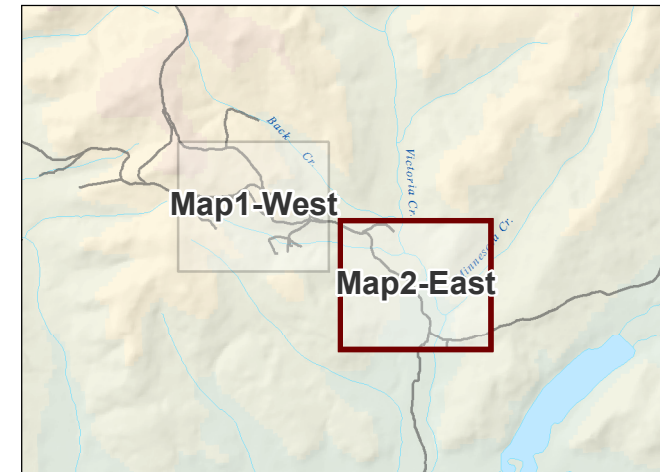
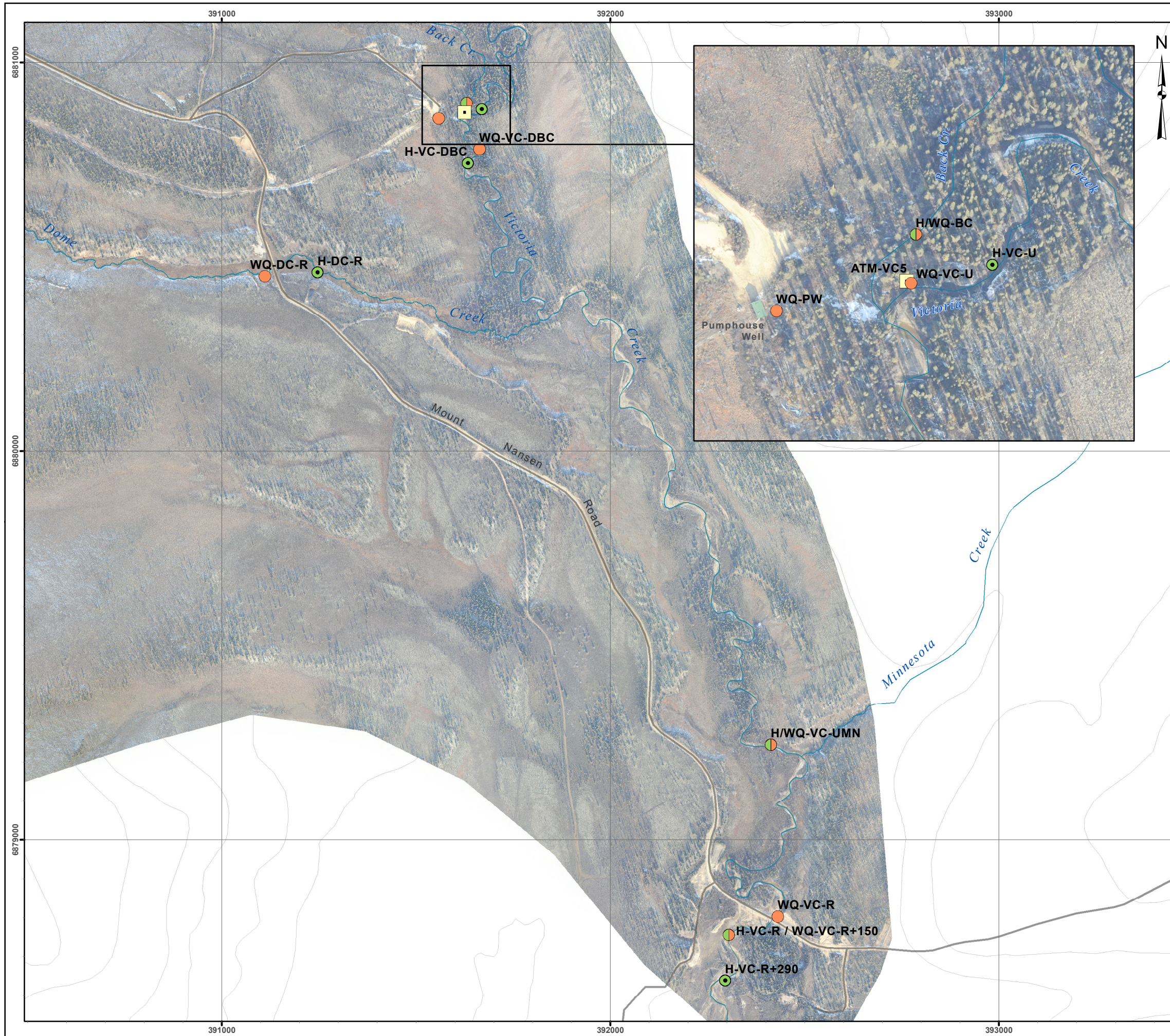
Watercourse, drainage areas and Mount Nansen Road layers digitized / modified by EDI (2011) using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

Imagery provided by Yukon Government - Energy, Mines and Resources - Abandoned Mines Branch.

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2015) was obtained using Garmin GPS technology.



Drawn: MP	Checked: MM/SD	Date: 21/09/2015	MAP 1
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Legend

- Atmospheric Station (label e.g. ATM-ROAD)
- Hydrometric Station and Water Quality Site (label e.g. H/WQ-VC-UMN)
- Hydrometric Station (label e.g. H-VC-R)
- Water Quality Site (label e.g. WQ-PC-U)
- Temporary Water Quality Site (label e.g. WQ-MS-S-03)
- Unpaved Road/Access

Mount Nansen Site (East): Hydrometric Stations and Water Quality Sites

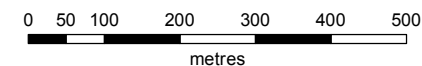
Notes:

1:50,000 and 1:250,000 Topographic Spatial Data provided by Geomatics - Yukon Government via online source (Corporate Spatial Warehouse) www.geomaticsyukon.ca.

Watercourse, drainage areas and Mount Nansen Road layers digitized / modified by EDI (2011) using orthophotos provided by Yukon Government, Energy, Mines and Resources (2011).

Imagery provided by Yukon Government - Energy, Mines and Resources - Abandoned Mines Branch.

Project data displayed is site specific. Data collected by EDI Environmental Dynamics Inc. (2015) was obtained using Garmin GPS technology.



Map Scale = 1:10,000 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 8N

Drawn: MP	Checked: MM/SD	Date: 21/09/2015	MAP 2
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Photo 1. H/WQ-DC-DX+105 – looking upstream.



Photo 2. H/WQ-DC-B – looking upstream. Site frozen to bed.



Photo 3. H/WQ-DC-B – looking downstream. Site frozen to bed.



Photo 4. H-DC-M WP – looking at weir pond.



Photo 5. WQ-DC-U looking downstream.



Photo 6. H-DC-R –Site frozen to bed. View downstream of road crossing.



Photo 7. WQ-DC-R – site frozen to bed. Overview of site upstream of road.



Photo 8. WQ-SEEP - looking downstream.



Photo 9. H-TP – staff gauges dry.



Photo 10. WQ-TP – sample collected through ice – photos too dark to show overall pond view.



Photo 11. H/WQ-BC – site remains dry.



Photo 12. ATM-VC5 – overview.



Photo 13. WQ-VC-U – looking downstream.



Photo 14. H-VC-U – looking upstream.



Photo 15. WQ-VC-DBC – looking upstream.



Photo 16. H-VC-DBC – looking upstream.



Photo 17. H-VC-UMN – view of left downstream bank.



Photo 18. WQ-VC-UMN – looking upstream – also location for ADV cross section (H-VC-UMN).



Photo 19. WQ-VC-R+150 – looking upstream.



Photo 20. H-VC-R – looking downstream.



Photo 21. H-VC-R+290 – looking downstream.



Photo 22. H/WQ-PW – overview.



Photo 23. Met station snow depth.



Photo 24. Met station overview.

Measurement ID	Hydrometric Identifier (HID)	Measurement Date	Measurement Time	Discharge Measurement Method	Discharge (m ³ /s)	Discharge Data Flag	Surveyed Water Elevation (m)	Survey Data Flag	Comments
410	ATM-VC5	13/01/2016	10:10	N					New barologger installed at site (SN: 2014638) in new housing unit to protect from weather. Logger setup with 15 minute interval, linear, metric. Old logger (SN: 12041756) removed from site due to suspected drifting.
412	H-DC-DX+105	13/01/2016	14:20	V	0.000	B		N	Thin layer of ice covering channel (0.02 m). Completed volumetric discharge measurement.
413	H-DC-B	12/01/2016	19:30	N				N	Channel frozen to bed with ice up to 0.7 m thick. No evidence of flow at measurement station since last visit. Overflow ice from upstream seepage area has advanced downstream since last visit and but remains upstream of tailings pond.
423	H-TP	12/01/2016	20:10	N				N	Approximately 0.2 m of snow at staff gauges with no ice or water.
421	H-SEEP	12/01/2016	20:30	V	0.002			N	Ice buildup 0.8 m thick inside culvert, but water flowing freely from pipe outlet. Flow rate at pump at 19:30 = 129.728 L/min (0.002 m ³ /s) and total discharge = 175,929 L.
414	H-DC-M WP	12/01/2016	17:55	SS	0.004	B		N	Water flowing between weir plate and wooden support structure. Salt tracer completed for discharge estimate. Direct read cable functioning properly and cable not replaced. Stilling well encased in frozen sand and ice. Re-routed water in active part of channel toward stilling well. Large amount of overflow ice upstream of weir pond. Front edge of ice is approximately 10 m upstream of weir pond.
417	H-BC	13/01/2016	10:30	N	0.000	X		N	Site dry. No evidence of flow since last site visit.
415	H-VC-U	13/01/2016	11:10	ADV-MID	0.040	B		N	Multiple open leads upstream and downstream of station. Ice thickness at well 0.05 m with water below at location of logger.
422	H-PW	13/01/2016	12:25	V	0.003			N	Ice accumulation downstream of pipe outlet. Water flows freely from pipe. Volumetric discharge measurement completed.
416	H-VC-DBC	13/01/2016	09:10	ADV-MID	0.057	B		N	Removed ice (0.03 m thick) from cross-section cut from ADV measurement in December. Total ice thickness 0.45 m. Ice surrounds stilling well with water flowing beneath.
418	H-VC-UMN	13/01/2016	12:50	ADV-MID	0.033	B		N	Total ice thickness 0.2 m, with 0.05 m of new ice at ADV cross-section. Several thinly ice covered spots in vicinity of site.
419	H-VC-R	12/01/2016	14:35	ADV-MID		X		N	Evidence of recent flow beyond extents of active channel. Poor channel conditions for ADV measurements due to low flow depth and large substrate materials along bed. ADV measurement completed, but results discarded due to poor quality.
420	H-VC-R+290	12/01/2016	16:00	ADV-MID	0.025	B		N	ADV and salt tracer completed for discharge estimate. Ice thickness varies from 0.02 to 0.1 m.
420	H-VC-R+290	12/01/2016	16:00	SS	0.030	B		N	ADV and salt tracer completed for discharge estimate. Ice thickness varies from 0.02 to 0.1 m.

* Pony Creek (H-PC-DSP) and Dome Creek at D1b (H-DC-D1b) remain frozen to bed for winter period.

Discharge Measurement Method Legend

Measurement Method ID	Measurement Method	Measurement Description
ADV-MID	Mid Section Method - Acoustic Doppler Velocimeter	Cross-sectional velocity using an ADV, mid-section method.
SS	Brine Salt Slug Tracer	Salt dilution gauging using a brine salt slug.
V	Volumetric	Volumetric measurement obtained by filling a graduated container at a culvert, pipe outlet or weir.
W	Weir	Measurement obtained by a rated structure (v-notch weir).
N	None	No measurement could be obtained.
SD	Dry Salt Slug Tracer	Salt dilution gauging using a dry salt slug.
HWM	High Water Mark - Indirect Method	Indirect method using high water mark in the slope-area calculation for estimating high discharges.
ADCP	Acoustic Doppler Current Profiler	Cross-sectional velocity using an ADCP, mid-section method.
SC	Constant Rate Salt Tracer	Salt dilution gauging using the constant rate method.
CM-MID	Mid Section Method - Current Meter	Cross-sectional velocity using a velocimeter (Swiffer or Pygmy AA)

Hydrometric Stations

Hydrometric ID	Hydrometric Stations
ATM-VC5	Atmospheric Barologger (5) at Victoria Creek
H-BC	Back Creek
H-DC-B	Diversion Channel at Bridge
H-DC-D1B	Dome Creek at D1b
H-DC-DX	Dome Creek at DX
H-DC-DX+105	Dome Creek at DX+105
H-DC-M-WP	Middle Dome Creek at Weir Pond
H-DC-R	Dome Creek at Road
H-PC-DSP	Pony Creek Downstream of Pit
H-SEEP	Seepage Pond Outflow
H-TP	Tailings Pond
H-VC-DBC	Victoria Creek Downstream of Back Creek
H-VC-R	Victoria Creek at Road
H-VC-U	Upper Victoria Creek
H-VC-UMN	Victoria Creek Upstream of Minnesota Creek

Discharge Data Flag Legend

Discharge Data Flag	Discharge Data Flag Description
E	Estimated value
B	Backwater effects (ice related)
F	Instrument malfunction
M	Manual measurement
A	Automated measurement (logged)
ML	Missing length data
MD	Missing depth data
MW	Missing width data
O	Outside of measurement reporting range
P	Potential Place Mining Interference with Flow
S	Suspect data
X	Poor channel conditions for discharge measurement
MI	Missing Data
SH-L	Data logger Shift
SH-SG	Staff Gauge Shift
UR	Under review

Survey Data Flag Legend

Survey Flag	Survey Flag Description
S	Suspect data
MI	Missing data
UR	Under review
F	Instrument Malfunction
O	Outside measurement Accuracy (+/-0.003 m)
N	No survey conducted

Water Quality Site	Sample Collected? (Y/N)	Measurement Date	Comments
WQ-BC	N	13-Jan-16	Site is dry. No changes or evidence of flow since last visit.
WQ-CH-P-13-01	N	12-Jan-16	Remains frozen to bed for winter.
WQ-DC-B	N	12-Jan-16	Diversion channel dry at bridge - no flow beneath ice. Checked three holes from previous visit and all dry with no signs of fresh water at any time between visits.
WQ-DC-D1b	N	12-Jan-16	Remains frozen to bed for winter.
WQ-DC-DX	N	12-Jan-16	Remains frozen to bed for winter.
WQ-DC-DX+105	Y	13-Jan-16	Channel thinly covered with ice approximately 0.02m thick. Orange coloured sediments over bed.
WQ-DC-R	N	12-Jan-16	Remains frozen to bed for winter.
WQ-DC-U	Y	12-Jan-16	Extensive overflow from seep upstream. Seep ice from right bank upstream of weir pond. Minor overflow ice extends down to weir pond. Smell of sulphur noticeable at site. Snow depth 0.2m.
WQ-PC-D	N	12-Jan-16	Remains frozen to bed for winter.
WQ-PC-U	N	12-Jan-16	Remains frozen to bed for winter.
WQ-PW	Y	13-Jan-16	Typical conditions at site. Ice accumulation downstream but water flowing freely from pipe. Drinking water sample collected.
WQ-SEEP	Y	12-Jan-16	Temporarily moved seep pipe to allow for ease of LT50 sample collection. Site conditions normal. Open water downstream of stand pipe.
WQ-TP	Y	12-Jan-16	Drilled hole with ice auger. Water depth 1 m below ice. Allowed water to settle in hole for 5 minutes prior to collecting sample.
WQ-VC-DBC	Y	13-Jan-16	Two open leads downstream of sample site. Snow depth 0.25m. Several thin ice covered sections upstream.
WQ-VC-R	N	12-Jan-16	Frozen to bed - thick overflow ice - sampled from WQ-VC-R+150 downstream.
WQ-VC-R+150	Y	12-Jan-16	Sample collected from winter sampling location (downstream of road). No open leads. Snow depth varies from 0.01 to 0.25m.
WQ-VC-U	Y	13-Jan-16	Several open leads in vicinity of sample location. Ice thickness ranges from 0 to 0.05m. Snow depth 0 to 0.2m.
WQ-VC-UMN	Y	13-Jan-16	No open leads near site. Ice cover at sample location 0.05m. Snow depth 0.2m.
QA/QC Samples			
Replicate 1	Y	13-Jan-16	Replicate collected at WQ-VC-UMN (sample ID WQ-VC-UMN-r).
Field Blank	Y	13-Jan-16	Sample bottles filled with deionized water supplied by ALS; samples were filtered and preserved as instructed. Collected at WQ-VC-DBC.
Travel Blank	Y	-	Samples provided by lab and were transported to and from site.

Summary of Water Quality Results for the January 11-12, 2016 Trip.

Analyte	Units	CCME-WATER-F-AL	Mount Nansen Effluent Discharge Standards	Sample ID/Site ID	Date Sampled	Detection Limit	WQ-VQ-U	WQ-VQ-DBC	WQ-VQ-UMN	WQ-VQ-UMN-r	QA/QC	WQ-VQ-UMN-r	WQ-VQ-R+150	WQ-DC-DX+105	WQ-TP	WQ-SEEP	WQ-DC-U	WQ-PW	FIELD BLANK	TRAVEL BLANK
							1/13/2016 9:50:00 AM	1/13/2016 9:35:00 AM	1/13/2016 12:40:00 PM	1/13/2016 12:50:00 PM	1/12/2016 4:40:00 PM	1/13/2016 2:20:00 PM	01/12/2016 7:15:00 PM	01/12/2016 6:22:00 PM	01/12/2016 5:40:00 PM	1/13/2016 11:15:00 AM	1/13/2016 10:45:00 AM			
Temperature (in-situ)	°C	-	-	-	-	-	-0.2	-0.2	-0.3	-	-	-	-	0.1	0.2	0.2	-	-	-0.1	-
Specific Conductivity (in-situ)	µS/cm	-	-	-	-	225.6	226.4	264.2	-	-	-	228	839.1	2345.0	1692.0	1663	132.5	-	-	-
pH (in-situ)	pH	6.5 - 9.0	6.0 - 8.5	-	-	6.81	5.82	7.29	-	-	-	7.13	7.48	7.04	7.5	7.07	-	-	-	-
Dissolved Oxygen (in-situ)	mg/L	-	-	-	-	8.37	8.62	9.15	-	-	-	8.72	2.69	1.46	6.3	7.26	-	-	-	-
Turbidity (in-situ)	NTU	-	-	-	-	5.33	0.89	0.72	-	-	-	0.01	11.92	4.86	11.04	6.95	-	-	-	-
Colour, True	CU	15	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5.0
Conductivity	µS/cm	-	-	2	-	226	226	267	265	1%	-	259	1150	2400	1650	1620	-	-	-	<2.0
Hardness (as CaCO3)	mg/L	-	-	0.5	-	117	117	136	137	1%	-	130	679	1490	894	900	-	-	-	<2.0
pH (lab)	pH	6.5 - 9.0	6.0 - 8.5	0.1	-	7.57	7.49	7.55	7.59	1%	-	7.57	7.52	7.70	7.62	7.63	-	-	-	<5.0
Total Suspended Solids	mg/L	-	50	3	-	16	16	<3.0	3.3	<DL	-	<3.0	5.3	30.7	6	-	-	-	-	<3.0
Total Dissolved Solids	mg/L	-	-	1	-	121	122	146	147	1%	-	140	788	2030	1270	1220	-	-	-	<1.0
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	1	-	91.1	92.3	96.8	97.7	1%	-	92.2	259	203	245	259	-	-	-	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0	<1.0	<1.0	<DL	-	<1.0	<1.0	<1.0	<1.0	-	-	-	-	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	1	-	<1.0	<1.0	<1.0	<1.0	<DL	-	<1.0	<1.0	<1.0	<1.0	-	-	-	-	<1.0
Alkalinity, Total (as CaCO3)	mg/L	-	-	1	-	91.1	92.3	96.8	97.7	1%	-	92.2	259	203	245	259	-	-	-	<1.0
Ammonia, Total (as N)	mg/L	0.75	-	0.005	-	<0.0050	<0.0050	<0.0050	<0.0050	<DL	-	<0.0050	0.0186	1.1	4.76	3.96	-	-	-	<0.0050
Chloride (Cl)	mg/L	120	-	0.5	-	<0.50	<0.50	<0.50	<0.50	<DL	-	<0.50	<0.50	<2.5	<2.5	<2.5	-	-	-	<0.50
Fluoride (F)	mg/L	0.12	-	0.02	-	0.038	0.035	0.039	0.037	<2xdl	-	0.037	0.149	0.35	0.113	0.146	-	-	-	<0.020
Nitrate (as N)	mg/L	13	-	0.005	-	0.147	0.147	0.155	0.147	1%	-	0.143	0.011	0.147	0.066	0.382	-	-	-	0.125
Nitrite (as N)	mg/L	0.06	-	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<DL	-	<0.0010	<0.0020	<0.0050	0.0207	0.018	-	-	-	<0.0050
Sulfate (SO4)	mg/L	-	-	0.3	-	21.5	21.4	35.7	35.7	0%	-	38.7	1300	729	694	29.6	-	-	-	<0.010
Cyanide, Weak Acid Diss	mg/L	-	0.1	0.005	-	<0.0050	<0.0050	<0.0050	<0.0050	<DL	-	<0.0050	<0.0050	<0.0050	0.0097	0.0183	-	-	-	<0.0050
Cyanide, Total	mg/L	-	0.3	0.005	-	<0.0050	<0.0050	<0.0050	<0.0050	<DL	-	<0.0050	<0.0050	0.0713	0.0345	-	-	-	-	<0.0050
Cyanate	mg/L	-	-	0.2	-	<0.20	<0.20	<0.20	<0.20	<DL	-	0.25	<0.20	<0.20	<0.20	<0.20	-	-	-	<0.20
Thiocyanate (SCN)	mg/L	-	-	0.5	-	<0.50	<0.50	<0.50	<0.50	<DL	-	<0.50	<0.50	4.23	2.6	-	-	-	-	<0.50
Aluminum (Al)-Total	mg/L	0.1	-	0.003	-	0.237	0.0112	0.0128	0.0128	<2xdl	-	0.0096	0.0048	0.0192	0.0165	0.0153	-	-	-	<0.030
Antimony (Sb)-Total	mg/L	-	0.15	0.0001	-	0.00013	<0.00010	0.00073	0.00073	1%	-	0.00053	0.00034	0.0064	0.00054	0.00036	-	-	-	<0.00010
Arsenic (As)-Total	mg/L	0.005	-	0.0001	-	0.00063	0.00031	0.0042	0.0042	0%	-	0.00142	0.011	0.147	0.066	0.0391	-	-	-	<0.00010
Barium (Ba)-Total	mg/L	-	1.0	0.0005	-	0.0842	0.0899	0.0731	0.0733	0%	-	0.0765	0.0117	0.0293	0.0574	0.0668	-	-	-	<0.00050
Beryllium (Be)-Total	mg/L	-	-	0.00002	-	<0.000020	<0.000020	<0.000020	<0.000020	<DL	-	<0.000020	<0.000020	<0.000040	<0.000020	<0.000020	-	-	-	<0.000020
Bismuth (Bi)-Total	mg/L	-	-	0.00005	-	<0.000050	<0.000050	<0.000050	<0.000050	<DL	-	<0.000050	<0.000050	<0.000010	<0.000050	<0.000050	-	-	-	<0.000050
Boron (B)-Total	mg/L	-	-	0.01	-	<0.010	<0.010	<0.010	<0.010	<DL	-	<0.010	0.055	0.131	0.045	-	-	-	-	<0.010
Cadmium (Cd)-Total (Lab Result)	mg/L	0.00009	0.02	0.000005	-	0.0000394	0.0000311	0.0000566	0.0000566	0%	-	<0.000050	0.0017	0.00325	0.000606	0.00027	-	-	-	<0.000050
Cadmium (Cd)-Total (Hardness Adjusted Guideline)	mg/L	-	-	-	-	0.000181	0.000181	0.000205	0.000197	-	-	0.000370	0.000370	0.000370	0.000370	0.000370	-	-	-	0.000370
Calcium (Ca)-Total	mg/L	-	-	0.05	-	29.9	30.9	35.4	35.5	0%	-	33.8	172	440	262	256	-	-	-	<0.050
Chromium (Cr)-Total	mg/L	0.0089	0.04	0.0001	-	0.00038	<0.00010	<0.00010	<0.00010	<DL	-	<0.00010	<0.00010	0.00031	0.00056	0.00035	-	-	-	<0.0020
Cobalt (Co)-Total	mg/L	-	-	0.0001	-	0.00022	<0.00010	<0.00010	<0.00010	<DL	-	<0.00010	0.00076	0.0008	0.00847	0.0063	-	-	-	<0.00010
Copper (Cu)-Total (Lab Result)	mg/L	0.002	0.2	0.0005	-	0.0017	0.0011	0.00123	0.00122	<2xdl	-	0.00106	<0.00050	0.00470	0.00297	0.00213	-	-	-	<0.00050
Copper (Cu)-Total (Hardness Adjusted Guideline)	mg/L	-	-	-	-	0.00270	0.00270	0.00270	0.00270	-	-	0.00270	0.00270	0.00270	0.00270	0.00270	-	-	-	0.00270
Iron (Fe)-Total	mg/L	0.3	1.0	0.01	-	0.336	0.016	0.025	0.025	<2xdl	-	0.011	0.401	0.296	15.1	2.01	-	-	-	<0.030
Lead (Pb)-Total (Lab Result)	mg/L	0.001	0.1	0.00005	-	0.00036	<0.000050	0.000316	0.000323	2%	-	<0.000050	0.00052	0.00762	0.000072	<0.000050	-	-	-	<0.000050
Lead (Pb)-Total (Hardness Adjusted Guideline)	mg/L	-	-	-	-	0.00389	0.00389	0.00471	0.00475	-	-	0.00444	0.00700	0.00700	0.00700	0.00700	-	-	-	0.00700
Lithium (Li)-Total	mg/L	-	-	0.001	-	<0.0010	<0.0010	<0.0010	<0.0010	<DL	-	0.00075	0.0144	0.0011	0.011	-	-	-	-	<0.0010
Magnesium (Mg)-Total	mg/L	-	-	0.1	-	9.56	9.85	11.5	11.5	0%	-	11.3	58	83	56.5	64.4	-	-	-	<0.10
Manganese (Mn)-Total	mg/L	-	0.5	0.0001	-	0.161	0.112	0.0352	0.0338	4%	-	0.00177	1.23	1.4	6.51	5.77	-	-	-	<0.0020
Mercury (Hg)-Total	mg/L	0.000026	0.005	0.000005	-	<0.000050	<0.000050	<0.000050	<0.000050	<DL	-	<0.000050	<0.000050	0.000087	0.000062	<0.000050	-	-	-	<0.000050
Molybdenum (Mo)-Total	mg/L	0.0073	-	0.00005	-	0.00039	0.000391	0.000379	0.000374	1%	-	0.0004	0.000379	0.00176	0.000899	-	-	-	-	<0.000050
Nickel (Ni)-Total (Lab Result)	mg/L	0.025	0.3	0.0005	-	0.00061	<0.00050	<0.00050	<0.00050	<DL	-	<0.00050	0.00154	0.0029	0.00393	0.00278	-	-	-	<0.00050
Nickel (Ni)-Total (Hardness Adjusted Guideline)	mg/L	-	-	-	-	0.10769	0.10769	0.13074	0.12141	-	-	0.11667	0.15000	0.15000	0.15000	0.15000	-	-	-	0.15000
Phosphorus (P)-Total	mg/L	-	-	0.05	-	<0.050	<0.050	<0.050	<0.050	<DL	-	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	-	<0.050
Potassium (K)-Total	mg/L	-	-	0.1	-	0.88	0.88	1.05	1.01	4%	-	1.06	3.99	30.7	7.58	7.13	-	-	-	<0.10
Selenium (Se)-Total	mg/L	0.001	-	0.00005	-	0.000051	<0.000050	0.000063	0.000055	<2xdl	-	<0.000050	<0.000050	<0.000265	0.000206	0.000206	-	-	-	<0.00050
Silicon (Si)-Total	mg/L	-	-	0.05	-	6.37	6.27	6.41	6.38	0%	-	6.2	6.31	5.22	7.55	7.21	-	-	-	<0.050
Silver (Ag)-Total	mg/L	0.00025	0.1	0.00001	-	<0.000010	<0.000010	<0.000010	<0.000010	<DL	-	<0.000010	<0.000010	0.000174	0.000032	0.000016	-	-	-	<0.000010
Sodium (Na)-Total	mg/L	-	-	0.05	-	2.74	2.8	3.6	3.56	1%	-	3.43	5.05	31.4	35.5	32.5	-	-	-	<0.050
Strontium (Sr)-Total	mg/L	-	-	0.0002	-	0.307	0.315	0.321	0.321	0%	-	0.303	0.4	1.14	0.769	0.794	-	-	-	<0.0020
Sulfur (S)-Total	mg/L	-	-	0.5	-	7.21	7.47	12.2	12.2	0%	-	12	136	449	245	240	-	-	-	<0.50
Thallium (Tl)-Total	mg/L	0.0008	-	0.00001	-	<0.000010	<0.000010	<0.000010	<0.000010	<DL	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	-	-	-	<0.000010
Tin (Sn)-Total	mg/L	-	-	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	<DL	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	-	-	<0.0010
Titanium (Ti)-Total	mg/L	-	-	0.0003	-	0.00807	<0.00030	<0.00030	<0.00030	<DL	-	<0.00030	<0.00060	<0.0015	0.00093	0.00093	-	-	-	<0.00030
Uranium (U)-Total	mg/L	0.015	-	0.00001	-	0.000654	0.000622	0.000734	0.000726	1%	-	0.000729	0.00415	0.00012	0.00161	0.00163	-	-	-	<0.00010
Vanadium (V)-Total	mg/L	-	-	0.0005	-	0.00076	<0.00050	<0.00050	<0.00050	<DL	-	<0.00050	<0.00050	<0.0010	0.00225	0.00091	-	-	-	<0.00050
Zinc (Zn)-Total	mg/L	0.03	0.3	0.003	-	0.0030	0.0049	<0.0030	<0.0030	<2xdl	-	0.0030	0.688							



EDI ENVIRONMENTAL DYNAMICS INC.
ATTN: Meghan Marjanovic
2195 - 2nd Ave
Whitehorse YT Y1A 3T8

Date Received: 14-JAN-16
Report Date: 27-JAN-16 15:47 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L1723337
Project P.O. #: NOT SUBMITTED
Job Reference: MOUNT NANSEN 15-Y-0146
C of C Numbers: 1, 2
Legal Site Desc:

Comments: ADDITIONAL 26-JAN-16 17:54

Can Dang
Senior Account Manager

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ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1723337-1 Water 12-JAN-16 17:40 WQ-DC-U	L1723337-2 Water 12-JAN-16 18:22 WQ-SEEP	L1723337-3 Water 12-JAN-16 16:40 WQ-VC-R+150	L1723337-4 Water 12-JAN-16 19:15 WQ-TP	L1723337-5 Water 13-JAN-16 10:45 FIELD BLANK
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	1620	1650	259	2400	<2.0
	Hardness (as CaCO3) (mg/L)	900	894	130	1490	<0.50
	pH (pH)	7.62	7.02	7.57	7.70	5.79
	Total Suspended Solids (mg/L)	6.0	30.7	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	1220	1270	140	2030	<1.0
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	259	245	92.2	203	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	259	245	92.2	203	<1.0
	Ammonia, Total (as N) (mg/L)	3.96	4.76	<0.0050	1.10	<0.0050
	Chloride (Cl) (mg/L)	<2.5 ^{DLA}	<2.5 ^{DLA}	<0.50	<2.5 ^{DLA}	<0.50
	Fluoride (F) (mg/L)	0.146	0.113	0.037	0.35	<0.020
	Nitrate (as N) (mg/L)	0.382	0.686	0.183	0.147	<0.0050
	Nitrite (as N) (mg/L)	0.0180	0.0207	<0.0010	<0.0050 ^{DLA}	<0.0010
	Sulfate (SO4) (mg/L)	694	729	34.7	1300	<0.30
	Anion Sum (meq/L)	19.7	20.1	2.58	31.2	<0.10
	Cation Sum (meq/L)	20.1	20.9	2.77	32.0	<0.10
	Cation - Anion Balance (%)	1.1	2.0	3.5	1.2	0.0
	Cyanides	Cyanide, Weak Acid Diss (mg/L)	0.0183	0.0097	<0.0050	<0.0050
Cyanide, Total (mg/L)		0.0345	0.0713	<0.0050	<0.0050	<0.0050
Cyanate (mg/L)		<0.20	<0.20	0.25	<0.20	<0.20
Thiocyanate (SCN) (mg/L)		2.60	4.23	<0.50	<0.50	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0153	0.0165	0.0096	0.0192	<0.0030
	Antimony (Sb)-Total (mg/L)	0.00036	0.00054	0.00053	0.0386	<0.00010
	Arsenic (As)-Total (mg/L)	0.0361	0.0656	0.00142	0.147	<0.00010
	Barium (Ba)-Total (mg/L)	0.0668	0.0574	0.0765	0.0293	<0.000050
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000040 ^{DLA}	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.00010 ^{DLA}	<0.000050
	Boron (B)-Total (mg/L)	0.045	0.055	<0.010	0.131	<0.010
	Cadmium (Cd)-Total (mg/L)	0.000270	0.000606	<0.0000050	0.00325	<0.0000050
	Calcium (Ca)-Total (mg/L)	256	262	33.8	440	<0.050
	Chromium (Cr)-Total (mg/L)	0.00035	0.00056	<0.00010	0.00031	<0.00010
	Cobalt (Co)-Total (mg/L)	0.00630	0.00847	<0.00010	0.00080	<0.00010
	Copper (Cu)-Total (mg/L)	0.00213	0.00297	0.00106	0.0437	<0.00050
	Iron (Fe)-Total (mg/L)	2.01	15.1	0.011	0.296	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050	0.000072	<0.000050	0.00762	<0.000050
	Lithium (Li)-Total (mg/L)	0.0011	0.0013	<0.0010	0.0144	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1723337-6 Water TRAVEL BLANK	L1723337-7 Water 13-JAN-16 14:20 WQ-DC-DX+105	L1723337-8 Water 13-JAN-16 12:40 WQ-VC-UMN	L1723337-9 Water 13-JAN-16 12:50 WQ-VC-UMN-R	L1723337-10 Water 13-JAN-16 09:35 WQ-VC-DBC
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	1150	267	265	226
	Hardness (as CaCO3) (mg/L)	<0.50	679	136	137	117
	pH (pH)	5.51	7.53	7.55	7.59	7.49
	Total Suspended Solids (mg/L)	<3.0	5.3	<3.0	3.3	<3.0
	Total Dissolved Solids (mg/L)	<1.0	788	146	147	122
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	259	96.8	97.7	92.3
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	259	96.8	97.7	92.3
	Ammonia, Total (as N) (mg/L)	0.0055 ^{RRV}	0.0186	<0.0050	<0.0050	<0.0050
	Chloride (Cl) (mg/L)	<0.50	<1.0 ^{DLA}	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	<0.020	0.149	0.039	0.037	0.035
	Nitrate (as N) (mg/L)	<0.0050	0.011	0.155	0.156	0.147
	Nitrite (as N) (mg/L)	<0.0010	<0.0020 ^{DLA}	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	<0.30	387	35.7	35.7	21.4
	Anion Sum (meq/L)	<0.10	13.3	2.69	2.71	2.30
	Cation Sum (meq/L)	<0.10	13.9	2.90	2.92	2.47
	Cation - Anion Balance (%)	0.0	2.6	3.8	3.7	3.6
	Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total (mg/L)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cyanate (mg/L)		<0.20	<0.20	<0.20	<0.20	<0.20
Thiocyanate (SCN) (mg/L)		<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030	0.0048	0.0128	0.0128	0.0112
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00934	0.00073	0.00074	<0.00010
	Arsenic (As)-Total (mg/L)	<0.00010	0.0410	0.00420	0.00420	0.00031
	Barium (Ba)-Total (mg/L)	<0.000050	0.0117	0.0731	0.0733	0.0809
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	0.00170	0.0000566	0.0000566	0.0000311
	Calcium (Ca)-Total (mg/L)	<0.050	172	35.4	35.5	30.9
	Chromium (Cr)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00076	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	0.00123	0.00122	0.00110
	Iron (Fe)-Total (mg/L)	<0.010	0.401	0.025	0.025	0.016
	Lead (Pb)-Total (mg/L)	<0.000050	0.000052	0.000316	0.000323	<0.000050
	Lithium (Li)-Total (mg/L)	<0.0010	0.0075	<0.0010	<0.0010	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1723337-11	Water	13-JAN-16	09:50	WQ-VC-U
WATER						
Physical Tests	Conductivity (uS/cm)			226		
	Hardness (as CaCO3) (mg/L)			117		
	pH (pH)			7.53		
	Total Suspended Solids (mg/L)			16.0		
	Total Dissolved Solids (mg/L)			121		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)			91.1		
	Alkalinity, Carbonate (as CaCO3) (mg/L)			<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)			<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)			91.1		
	Ammonia, Total (as N) (mg/L)			<0.0050		
	Chloride (Cl) (mg/L)			<0.50		
	Fluoride (F) (mg/L)			0.038		
	Nitrate (as N) (mg/L)			0.147		
	Nitrite (as N) (mg/L)			<0.0010		
	Sulfate (SO4) (mg/L)			21.5		
	Anion Sum (meq/L)			2.28		
	Cation Sum (meq/L)			2.49		
	Cation - Anion Balance (%)			4.3		
Cyanides	Cyanide, Weak Acid Diss (mg/L)			<0.0050		
	Cyanide, Total (mg/L)			<0.0050		
	Cyanate (mg/L)			<0.20		
	Thiocyanate (SCN) (mg/L)			<0.50		
Total Metals	Aluminum (Al)-Total (mg/L)			0.237		
	Antimony (Sb)-Total (mg/L)			0.00013		
	Arsenic (As)-Total (mg/L)			0.00063		
	Barium (Ba)-Total (mg/L)			0.0842		
	Beryllium (Be)-Total (mg/L)			<0.000020		
	Bismuth (Bi)-Total (mg/L)			<0.000050		
	Boron (B)-Total (mg/L)			<0.010		
	Cadmium (Cd)-Total (mg/L)			0.0000394		
	Calcium (Ca)-Total (mg/L)			29.9		
	Chromium (Cr)-Total (mg/L)			0.00038		
	Cobalt (Co)-Total (mg/L)			0.00022		
	Copper (Cu)-Total (mg/L)			0.00170		
	Iron (Fe)-Total (mg/L)			0.336		
	Lead (Pb)-Total (mg/L)			0.000360		
	Lithium (Li)-Total (mg/L)			<0.0010		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1723337-1	L1723337-2	L1723337-3	L1723337-4	L1723337-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	12-JAN-16	12-JAN-16	12-JAN-16	12-JAN-16	13-JAN-16
		Sampled Time	17:40	18:22	16:40	19:15	10:45
		Client ID	WQ-DC-U	WQ-SEEP	WQ-VC-R+150	WQ-TP	FIELD BLANK
Grouping	Analyte						
WATER							
Total Metals	Magnesium (Mg)-Total (mg/L)		64.4	56.5	11.3	83.0	<0.10
	Manganese (Mn)-Total (mg/L)		5.77	6.51	0.00177	1.40	<0.00010
	Mercury (Hg)-Total (mg/L)		<0.0000050	0.0000062	<0.0000050	0.0000087	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		0.000899	0.00106	0.000400	0.00176	<0.000050
	Nickel (Ni)-Total (mg/L)		0.00278	0.00393	<0.00050	0.0029	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)		7.13	7.58	1.06	30.7	<0.10
	Selenium (Se)-Total (mg/L)		0.000206	0.000265	<0.000050	<0.00010 ^{DLA}	<0.000050
	Silicon (Si)-Total (mg/L)		7.21	7.55	6.20	5.22	<0.050
	Silver (Ag)-Total (mg/L)		0.000016	0.000032	<0.000010	0.000174	<0.000010
	Sodium (Na)-Total (mg/L)		32.5	35.5	3.43	31.4	<0.050
	Strontium (Sr)-Total (mg/L)		0.794	0.769	0.303	1.14	<0.00020
	Sulfur (S)-Total (mg/L)		240	245	12.0	449	<0.50
	Thallium (Tl)-Total (mg/L)		<0.000010	<0.000010	<0.000010	0.000281	<0.000010
	Tin (Sn)-Total (mg/L)		<0.00010	<0.00010 ^{DLM}	<0.00010	<0.00020 ^{DLA}	<0.00010
	Titanium (Ti)-Total (mg/L)		0.00093	<0.0015	<0.00030	<0.00060 ^{DLA}	<0.00030
	Uranium (U)-Total (mg/L)		0.00161	0.00192	0.000729	0.00213	<0.000010
	Vanadium (V)-Total (mg/L)		0.00091	0.00225	<0.00050	<0.0010 ^{DLA}	<0.00050
	Zinc (Zn)-Total (mg/L)		0.0368	0.114	<0.0030	0.376	<0.0030
	Zirconium (Zr)-Total (mg/L)		0.00037	0.00067	<0.00030	<0.00060 ^{DLA}	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0061	0.0093	0.0048	0.0055	<0.0010
	Antimony (Sb)-Dissolved (mg/L)		0.00035	0.00053	0.00050	0.0379	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.0344	0.0450	0.00127	0.107	<0.00010
	Barium (Ba)-Dissolved (mg/L)		0.0673	0.0579	0.0754	0.0288	<0.000050
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000040 ^{DLA}	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.00010 ^{DLA}	<0.000050
	Boron (B)-Dissolved (mg/L)		0.044	0.053	<0.010	0.131	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		0.000240	0.000497	0.0000133	0.00317	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)		255	265	34.0	458	<0.050
	Chromium (Cr)-Dissolved (mg/L)		0.00026	0.00044	<0.00010	<0.00020 ^{DLA}	<0.00010
	Cobalt (Co)-Dissolved (mg/L)		0.00611	0.00828	<0.00010	0.00074	<0.00010
	Copper (Cu)-Dissolved (mg/L)		0.00181	0.00213	0.00099	0.0389	<0.00020
	Iron (Fe)-Dissolved (mg/L)		1.64	14.2	<0.010	0.064	<0.010
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	0.00181	<0.000050
	Lithium (Li)-Dissolved (mg/L)		0.0011	0.0012	<0.0010	0.0146	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1723337-6 Water TRAVEL BLANK	L1723337-7 Water 13-JAN-16 14:20 WQ-DC-DX+105	L1723337-8 Water 13-JAN-16 12:40 WQ-VC-UMN	L1723337-9 Water 13-JAN-16 12:50 WQ-VC-UMN-R	L1723337-10 Water 13-JAN-16 09:35 WQ-VC-DBC	
Grouping	Analyte					
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)	<0.10	58.0	11.5	11.5	9.85
	Manganese (Mn)-Total (mg/L)	<0.00010	1.23	0.0352	0.0338	0.112
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	<0.000050	0.000379	0.000379	0.000374	0.000391
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00154	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total (mg/L)	<0.10	3.99	1.05	1.01	0.88
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050	0.000063	0.000055	<0.000050
	Silicon (Si)-Total (mg/L)	<0.050	6.31	6.41	6.38	6.27
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	<0.050	5.05	3.60	3.56	2.80
	Strontium (Sr)-Total (mg/L)	<0.00020	0.400	0.321	0.321	0.315
	Sulfur (S)-Total (mg/L)	<0.50	136	12.2	12.2	7.47
	Thallium (Tl)-Total (mg/L)	<0.000010	0.000088	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Total (mg/L)	<0.000010	0.00415	0.000734	0.000726	0.000622
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	0.688	0.0050	0.0049	<0.0030
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		<0.0010	0.0057	0.0054	0.0055
	Antimony (Sb)-Dissolved (mg/L)		0.00909	0.00068	0.00065	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.0203	0.00365	0.00369	0.00026
	Barium (Ba)-Dissolved (mg/L)		0.0115	0.0720	0.0725	0.0797
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		0.000495	0.0000261	0.0000499	0.0000211
	Calcium (Ca)-Dissolved (mg/L)		177	36.1	36.1	31.0
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)		0.00075	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)		<0.00020	0.00112	0.00115	0.00101
	Iron (Fe)-Dissolved (mg/L)		0.257	0.012	0.013	<0.010
	Lead (Pb)-Dissolved (mg/L)		<0.000050	0.000055	0.000052	<0.000050
	Lithium (Li)-Dissolved (mg/L)		0.0082	<0.0010	<0.0010	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1723337-11	Water	13-JAN-16	09:50	WQ-VC-U
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)		9.56			
	Manganese (Mn)-Total (mg/L)		0.161			
	Mercury (Hg)-Total (mg/L)		<0.0000050			
	Molybdenum (Mo)-Total (mg/L)		0.000390			
	Nickel (Ni)-Total (mg/L)		0.00061			
	Phosphorus (P)-Total (mg/L)		<0.050			
	Potassium (K)-Total (mg/L)		0.88			
	Selenium (Se)-Total (mg/L)		0.000051			
	Silicon (Si)-Total (mg/L)		6.37			
	Silver (Ag)-Total (mg/L)		<0.000010			
	Sodium (Na)-Total (mg/L)		2.74			
	Strontium (Sr)-Total (mg/L)		0.307			
	Sulfur (S)-Total (mg/L)		7.21			
	Thallium (Tl)-Total (mg/L)		<0.000010			
	Tin (Sn)-Total (mg/L)		<0.00010			
	Titanium (Ti)-Total (mg/L)		0.00807			
	Uranium (U)-Total (mg/L)		0.000654			
	Vanadium (V)-Total (mg/L)		0.00076			
	Zinc (Zn)-Total (mg/L)		<0.0030			
	Zirconium (Zr)-Total (mg/L)		<0.00030			
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD			
	Dissolved Metals Filtration Location		FIELD			
	Aluminum (Al)-Dissolved (mg/L)		0.0056			
	Antimony (Sb)-Dissolved (mg/L)		<0.00010			
	Arsenic (As)-Dissolved (mg/L)		0.00022			
	Barium (Ba)-Dissolved (mg/L)		0.0804			
	Beryllium (Be)-Dissolved (mg/L)		<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050			
	Boron (B)-Dissolved (mg/L)		<0.010			
	Cadmium (Cd)-Dissolved (mg/L)		0.0000272			
	Calcium (Ca)-Dissolved (mg/L)		31.1			
	Chromium (Cr)-Dissolved (mg/L)		<0.00010			
	Cobalt (Co)-Dissolved (mg/L)		<0.00010			
	Copper (Cu)-Dissolved (mg/L)		0.00103			
	Iron (Fe)-Dissolved (mg/L)		<0.010			
	Lead (Pb)-Dissolved (mg/L)		<0.000050			
	Lithium (Li)-Dissolved (mg/L)		<0.0010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1723337-1	L1723337-2	L1723337-3	L1723337-4	L1723337-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	12-JAN-16	12-JAN-16	12-JAN-16	12-JAN-16	13-JAN-16
		Sampled Time	17:40	18:22	16:40	19:15	10:45
		Client ID	WQ-DC-U	WQ-SEEP	WQ-VC-R+150	WQ-TP	FIELD BLANK
Grouping	Analyte						
WATER							
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)		63.7	56.4	11.0	83.3	<0.10
	Manganese (Mn)-Dissolved (mg/L)		5.60	6.36	0.00133	1.37	<0.00010
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)		0.000814	0.000984	0.000357	0.00166	<0.000050
	Nickel (Ni)-Dissolved (mg/L)		0.00265	0.00389	<0.00050	0.0028	<0.00050
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)		6.95	7.44	0.92	29.0	<0.10
	Selenium (Se)-Dissolved (mg/L)		0.000183	0.000241	<0.000050	<0.00010 ^{DLA}	<0.000050
	Silicon (Si)-Dissolved (mg/L)		7.05	7.54	6.10	5.32	<0.050
	Silver (Ag)-Dissolved (mg/L)		<0.000010	0.000011	<0.000010	0.000056	<0.000010
	Sodium (Na)-Dissolved (mg/L)		31.7	35.6	3.32	31.2	<0.050
	Strontium (Sr)-Dissolved (mg/L)		0.775	0.757	0.293	1.15	<0.00020
	Sulfur (S)-Dissolved (mg/L)		231	235	11.9	435	<0.50
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	0.000276	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010 ^{DLM}	<0.00010 ^{DLM}	<0.00010	<0.00020 ^{DLA}	<0.00010
	Titanium (Ti)-Dissolved (mg/L)		<0.00090 ^{DLM}	<0.0012 ^{DLM}	<0.00030	<0.00060 ^{DLA}	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.00155	0.00188	0.000675	0.00212	<0.000010
	Vanadium (V)-Dissolved (mg/L)		0.00084	0.00165	<0.00050	<0.0010 ^{DLA}	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		0.0361	0.115	<0.0010	0.365	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)		0.00037	0.00066	<0.00030	<0.00060 ^{DLA}	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1723337-6 Water TRAVEL BLANK	L1723337-7 Water 13-JAN-16 14:20 WQ-DC-DX+105	L1723337-8 Water 13-JAN-16 12:40 WQ-VC-UMN	L1723337-9 Water 13-JAN-16 12:50 WQ-VC-UMN-R	L1723337-10 Water 13-JAN-16 09:35 WQ-VC-DBC
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)		57.8	11.2	11.4	9.49
	Manganese (Mn)-Dissolved (mg/L)		1.20	0.0332	0.0326	0.108
	Mercury (Hg)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Dissolved (mg/L)		0.000356	0.000351	0.000325	0.000337
	Nickel (Ni)-Dissolved (mg/L)		0.00145	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)		3.71	0.91	0.85	0.76
	Selenium (Se)-Dissolved (mg/L)		<0.000050	0.000063	<0.000050	<0.000050
	Silicon (Si)-Dissolved (mg/L)		6.31	6.34	6.53	6.15
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)		4.99	3.54	3.60	2.77
	Strontium (Sr)-Dissolved (mg/L)		0.402	0.315	0.309	0.303
	Sulfur (S)-Dissolved (mg/L)		133	12.2	11.9	7.33
	Thallium (Tl)-Dissolved (mg/L)		0.000084	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)		0.00406	0.000693	0.000674	0.000583
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)		0.664	0.0050	0.0045	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	<0.00030

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1723337-11			
		Description	Water			
		Sampled Date	13-JAN-16			
		Sampled Time	09:50			
		Client ID	WQ-VC-U			
Grouping	Analyte					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)		9.55			
	Manganese (Mn)-Dissolved (mg/L)		0.106			
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)		0.000338			
	Nickel (Ni)-Dissolved (mg/L)		<0.00050			
	Phosphorus (P)-Dissolved (mg/L)		<0.050			
	Potassium (K)-Dissolved (mg/L)		0.77			
	Selenium (Se)-Dissolved (mg/L)		0.000053			
	Silicon (Si)-Dissolved (mg/L)		6.23			
	Silver (Ag)-Dissolved (mg/L)		<0.000010			
	Sodium (Na)-Dissolved (mg/L)		2.81			
	Strontium (Sr)-Dissolved (mg/L)		0.304			
	Sulfur (S)-Dissolved (mg/L)		7.35			
	Thallium (Tl)-Dissolved (mg/L)		<0.000010			
	Tin (Sn)-Dissolved (mg/L)		<0.00010			
	Titanium (Ti)-Dissolved (mg/L)		<0.00030			
	Uranium (U)-Dissolved (mg/L)		0.000574			
	Vanadium (V)-Dissolved (mg/L)		<0.00050			
	Zinc (Zn)-Dissolved (mg/L)		<0.0010			
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Method Blank	Conductivity	B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Antimony (Sb)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Ammonia, Total (as N)	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Aluminum (Al)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -7, -8, -9
Matrix Spike	Antimony (Sb)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Arsenic (As)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Lead (Pb)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Manganese (Mn)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Titanium (Ti)-Total	MS-B	L1723337-1, -10, -11, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
CL-IC-N-WR	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
CN-CNO-WT	Water	Cyanate	APHA 4500-CN-L
This analysis is carried out using procedures adapted from APHA method 4500-CN "Cyanide". Cyanate is determined by the Cyanate hydrolysis method using an ammonia selective electrode			
CN-SCN-VA	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.

CN-T-CFA-VA Water Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

CN-WAD-CFA-VA Water Weak Acid Diss. Cyanide in water by CFA APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-IC-N-WR Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

F-SIE-VA Water Fluoride by SIE APHA 4500-F "Fluoride"

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode.

This method has a significant negative interference (i.e. results could be biased low) when Al³⁺ is present in the sample at a concentration greater than 2.5 mg/L.

F-SIE-VA Water Fluoride by SIE APHA 4500-F Fluoride

This analysis is carried out using procedures adapted from APHA Method 4500-F "Fluoride". Fluoride is determined using a selective ion electrode.

This method has a significant negative interference (i.e. results could be biased low) when Al³⁺ is present in the sample at a concentration greater than 2.5 mg/L.

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

$$\text{Ion Balance (\%)} = \frac{[\text{Cation Sum} - \text{Anion Sum}]}{[\text{Cation Sum} + \text{Anion Sum}]}$$

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 µm), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-DIS-LOW-ICP-VA Water Dissolved Metals in Water by ICPOES EPA 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-LOW-ICP-VA Water Total Metals in Water by ICPOES EPA 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the

Reference Information

American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-WR Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-WR Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

S-DIS-ICP-VA Water Dissolved Sulfur in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

S-TOT-ICP-VA Water Total Sulfur in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

SO4-IC-N-WR Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".

TSS-MAN-WR Water Total Suspended Solids by Gravimetric APHA 2540 D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids are determined by filtering a sample through a glass fibre filter and drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Reference Information

VA

ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

2

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



ENVIRONMENTAL DYNAMICS INC.
ATTN: Meghan Marjanovic
2195 - 2nd Ave
Whitehorse YT Y1A 3T8

Date Received: 14-JAN-16
Report Date: 22-JAN-16 12:33 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L1723426
Project P.O. #: NOT SUBMITTED
Job Reference: MOUNT NANSEN 15-Y-0146
C of C Numbers: 1
Legal Site Desc:

Can Dang
Senior Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1723426-1	Water	13-JAN-16	11:15	WQ-PW
WATER						
Physical Tests	Colour, True (CU)			<5.0		
	Conductivity (uS/cm)			324		
	Hardness (as CaCO3) (mg/L)			193		
	pH (pH)			7.63		
	Total Dissolved Solids (mg/L)			199		
	Turbidity (NTU)			0.16		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)			163		
	Chloride (Cl) (mg/L)			<0.50		
	Fluoride (F) (mg/L)			0.088		
	Nitrate (as N) (mg/L)			0.125		
	Nitrite (as N) (mg/L)			<0.0010		
	Sulfate (SO4) (mg/L)			29.6		
	Anion Sum (meq/L)			3.88		
	Cation Sum (meq/L)			4.10		
	Cation - Anion Balance (%)			2.7		
Total Metals	Aluminum (Al)-Total (mg/L)			<0.010		
	Antimony (Sb)-Total (mg/L)			<0.00050		
	Arsenic (As)-Total (mg/L)			0.00048		
	Barium (Ba)-Total (mg/L)			0.083		
	Boron (B)-Total (mg/L)			<0.10		
	Cadmium (Cd)-Total (mg/L)			<0.00020		
	Calcium (Ca)-Total (mg/L)			45.3		
	Chromium (Cr)-Total (mg/L)			<0.0020		
	Copper (Cu)-Total (mg/L)			<0.0010		
	Iron (Fe)-Total (mg/L)			<0.030		
	Lead (Pb)-Total (mg/L)			0.00065		
	Magnesium (Mg)-Total (mg/L)			19.4		
	Manganese (Mn)-Total (mg/L)			<0.0020		
	Mercury (Hg)-Total (mg/L)			<0.00020		
	Potassium (K)-Total (mg/L)			0.86		
	Selenium (Se)-Total (mg/L)			<0.0010		
	Sodium (Na)-Total (mg/L)			5.2		
	Uranium (U)-Total (mg/L)			0.00163		
	Zinc (Zn)-Total (mg/L)			<0.050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Aluminum (Al)-Total	MB-LOR	L1723426-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1723426-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
CL-IC-N-WR	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COLOUR-TRUE-VA	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.			
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
EC-MAN-WR	Water	Conductivity by Meter	APHA 2510 (B)
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using an electrode.			
F-IC-N-WR	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO ₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-TOT-CVAFS-VA	Water	Total Hg in Water by CVAFS LOR=50ppt	EPA 1631E (mod)
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
IONBALANCE-VA	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
NO2-L-IC-N-WR	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

Reference Information

NO3-L-IC-N-WR Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-MAN-WR Water pH by Meter APHA 4500-H+

pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 – 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.

SO4-IC-N-WR Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".

TURBIDITY-VA Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

TURBIDITY-VA Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



L1723426-COFC

COC Number: 14 -

Page ___ of ___

Report To	Report Format / Distribution	Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company: EDI	Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3pm - business days)
Contact: Meghan Marjanovic	Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input type="checkbox"/> No	P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address: 2195 - 2nd Avenue Whitehorse, YT Y1A 3T8	<input type="checkbox"/> Criteria on Report - provide details below if box checked	E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone: 867-393-4882	Select Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge
	Email 1 or Fax: mmarjanovic@dynamics.com	Specify Date Required for E2, E or P:
	Email 2: Emilie.Hamm@gov.yk.ca	
	Email 3: erik.pit@gov.yk.ca	

Invoice To	Invoice Distribution	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	Number of Containers
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Email 1 or Fax: sjenner@dynamics.com	
Company: EDI	Email 2: mmarjanovic@dynamics.com	
Contact: S Jenner		
Project Information	Oil and Gas Required Fields (client use)	
ALS Quote #: Q49312	Approver ID:	
Job #: MOUNT NANSEN 15-Y-0146	Cost Center:	
PO / AFE:	GL Account:	
LSD:	Routing Code:	
	Activity Code:	

ALS Lab Work Order #: (lab use only)	ALS Contact: Sean Sluggett	Sampler: DH, SM, DS
--------------------------------------	----------------------------	---------------------

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	FULL-TOT-DW-WR	Number of Containers
	WQ - PW	15-Dec-15	15:00	Water	<input checked="" type="checkbox"/>	3
		13-Jan-16	11:15	Water	<input checked="" type="checkbox"/>	

Drinking Water (DW) Samples (client use)	Special Instructions / Specify Criteria to add on report (client use)	INITIAL SHIPMENT RECEPTION (lab use only)
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No		Received by:
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No		Date: 16 Dec 2015 Time: 12:03
		Received by:
		Date: 14 Jan 2016 Time: 9:30

SAMPLE CONDITION AS RECEIVED (lab use only)						Number of Containers
Frozen	<input checked="" type="checkbox"/>	SIF Observations:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Ice packs	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Custody seal intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Cooling Initiated:	<input checked="" type="checkbox"/>					
INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C				
5.9		3.9/4.0				
FINAL SHIPMENT RECEPTION (lab use only)						
Received by:		Date: 17 Dec 2015 Time: 11:00				



EDI ENVIRONMENTAL DYNAMICS INC.
ATTN: Meghan Marjanovic
2195 - 2nd Ave
Whitehorse YT Y1A 3T8

Date Received: 14-JAN-16
Report Date: 29-JAN-16 17:35 (MT)
Version: FINAL

Client Phone: 867-393-4882

Certificate of Analysis

Lab Work Order #: L1723350
Project P.O. #: NOT SUBMITTED
Job Reference: MOUNT NANSEN 15-Y-0148
C of C Numbers: 1
Legal Site Desc:

Comments: Addendum.
The client sample ID on the container was different than what was noted on the chain of custody form. The Client ID was noted on the container was used instead.

Can Dang
Senior Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID					
Grouping	Analyte				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
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** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
----------------------------	---------------------

Chain of Custody Numbers:

1

GLOSSARY OF REPORT TERMS

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

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

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

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



ALS Environmental
ATTN: Can Dang
Suite 100-8081 Lougheed Hwy.
Burnaby, BC
V5A 1W9

Report Date: January 27, 2016
Work Order: 16118

Data Report

Species: Rainbow trout (*Oncorhynchus mykiss*)
Protocol: EPS 1/RM/13 (Second Ed. with 2007 amendments)

Table 1. Results for the 96-h rainbow trout acute toxicity test.

Sample ID	Collection Date and Time	96-h LC50 (%v/v)
L1723350-1 (WQ-SEEP)	January 13, 2016 @ N/A	> 100

N/A = Not Available.

The test met performance criterion and there were no deviations from the test method. The results relate only to the sample tested.

Josh Baker, M.Sc., P.Chem.
Environmental Chemist

Reviewed By:
Edmund Canaria, R.P.Bio
Senior Reviewer

Rainbow Trout Summary Sheet

Client: ALS

Start Date/Time: Jan 18/16 @ 1430h

Work Order No.: 16118

Test Species: Oncorhynchus mykiss

Sample Information:

Sample ID: L1723350-1 WQ-SEEP
Sample Date: Jan 13/16
Date Received: Jan 18/16
Sample Volume: 2 x 20L
Other: /

Test Validity Criteria:

≥ 90% control survival

WQ Ranges:

T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Dilution Water:

Type: Dechlorinated Municipal Tap Water
Hardness (mg/L CaCO₃): 8
Alkalinity (mg/L CaCO₃): 6

Test Organism Information:

Batch No.: 121815
Source: Aqua Farms
No. Fish/Volume (L): 10/12L
Loading Density (g/L): 0.44
Mean Length ± SD (mm): 32 ± 2
Mean Weight ± SD (g): 0.52 ± 0.04

Range: 30-35
Range: 0.46-0.59
EC

Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZn32
Stock Solution ID: 15Zn05
Date Initiated: Jan 6/16
96-h LC50 (95% CL): 45.9 (34.3 - 61.5) mg/L Zn

Reference Toxicant Mean and Historical Range: 72.0 (35.3 - 147.0) mg/L Zn
Reference Toxicant CV (%): 42.8%

Test Results: The 96-hr LC50 > 100% (v/v)

Reviewed by: [Signature]

Date reviewed: January 26, 2016

96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#: ALS
 Sample I.D. L1723350-1 WQ-SEEP
 W.O. # 16118
 RBT Batch #: 121815
 Date Collected/Time: Jan 13/16 @ N/A
 Date Setup/Time: Jan 18/16 @ 1430L
 Sample Setup By: EC

Number Fish/Volume: 10/12 L
 7-d % Mortality: 0.2
 Total Pre-aeration Time (mins): 30 mins
 Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N): X

D.O. meter: 2
 pH meter: 1
 Cond. Meter: 2

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.0	/	14.0
pH	6.7	/	6.7
D.O. (mg/L)	8.0	/	8.5
Cond. (µS/cm)	1627	/	1624

Concentration (% v/v)	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
C+1				10	10	10	10	14.0	14.0	14.0	14.0	14.0	10.0	9.7	10.0	9.9	9.9	6.7	6.9	6.7	7.0	6.9	27	33
6.25				10	10	10	10	14.0	14.0	14.0	14.0	14.0	10.0	9.7	10.0	9.8	9.8	6.8	7.3	7.2	7.3	7.3	149	151
12.5				10	10	10	10	14.0	14.0	14.0	14.0	14.0	10.0	9.8	9.9	9.9	9.8	6.8	7.5	7.5	7.5	7.5	299	302
25				10	10	10	10	14.0	14.0	14.0	14.0	14.0	9.9	9.9	10.1	9.9	9.9	6.7	7.9	7.8	7.9	7.9	539	541
50				10	10	10	10	14.0	14.0	14.0	14.0	14.0	9.8	10.0	10.2	10.1	9.9	6.7	8.1	8.1	8.1	8.1	949	948.5
100				10	10	10	10	14.0	14.0	14.0	14.0	14.0	8.5	10.0	10.2	10.0	10.0	6.7	8.2	8.2	8.3	8.3	1624	1604
Initials				EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC	EC

WQ Ranges: T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

Sample Description/Comments: Orange, Opaque, Odourless, No ppt Fish surfacing @ 70.

Fish Description at 96 h OK Number of Stressed Fish at 96 h 0

Other Observations: _____

Reviewed by: EC

Date Reviewed: January 26, 2016



L1723350

VANCOUVER

Subcontract Request Form

Subcontract To:

NAUTILUS ENVIRONMENTAL

8664 COMMERCE COURT
BURNABY, BC V5A 4N7

NOTES: Please reference on final report and invoice: PO# L1723350
ALS requires QC data to be provided with your final results.
wo# 16118

Please see enclosed 1 sample(s) in 2 Container(s)

Table with columns: SAMPLE NUMBER, ANALYTICAL REQUIRED, DATE SAMPLED, DUE DATE, Priority Flag. Row 1: L1723350-1 WQ-SEEP, Trout Bioassay LC50 (96 Hour) - Nautilus (TROUT-LC50-96HR-NL 1), 1/13/2016, 1/25/2016

Subcontract Info Contact: Walter Lin (604) 253-4188
Analysis and reporting info contact: Can Dang
8081 LOUGHEED HWY
SUITE 100
BURNABY, BC V5A 1W9
Phone: (604) 253-4188 Email: can.dang@alsglobal.com

Please email confirmation of receipt to: can.dang@alsglobal.com

Shipped By: Date Shipped:
Received By: Nautilus Date Received: Jan 18/16 @ 09:40
Verified By: NY- Mai Yamamoto Date Verified:
Temperature: 5.6 °C
Sample Integrity Issues: 2x20L blue jugs.

Sample Description:
Orange, Opaque,
Odorless, No ppt.



L1723350-COFC

Report To		Report Format / D		Rush Turnaround Time (TAT) is not available for all tests)																	
Company: EDI		Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)		R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																	
Contact: Meghan Marjanovic		Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																	
Address: 2195 - 2nd Avenue Whitehorse, YT Y1A 3T8		<input type="checkbox"/> Criteria on Report - provide details below if box checked		E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																	
Phone: 867-393-4882		Select Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																	
		Email 1 or Fax: mmarianovic@edynamics.com		Specify Date Required for E2, E or P:																	
		Email 2: erik.plt@gov.yk.ca																			
		Email 3: Emilie.Hamm@gov.yk.ca																			
Invoice To		Invoice Distribution		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																	
Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																			
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Email 1 or Fax: sjenner@edynamics.com																			
Company: EDI		Email 2: mmarianovic@edynamics.com																			
Contact: S Jenner																					
Project Information		Oil and Gas Required Fields (client use)																			
ALS Quote #: Q49310		Approver ID:		Cost Center:																	
Job #: MOUNT NANSEN 15-Y-0146		GL Account:		Routing Code:																	
PO / AFE:		Activity Code:																			
LSD:		Location:																			
ALS Lab Work Order # (lab use only)		ALS Contact: Sean Sluggett		Sampler:																	
ALS Sample # (lab use only)		Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mmm-yy)		Time (hh:mm)		Sample Type		Rainbow Trout LC50										Number of Containers	
		WR-PW		13-Jan-16		1115		Water		R											
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report (client Use)		SAMPLE CONDITION AS RECEIVED (lab use only)																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input type="checkbox"/> No				Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/> Ice packs Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/> Cooling Initiated <input checked="" type="checkbox"/>																	
Are samples for human drinking water use? <input type="checkbox"/> Yes <input type="checkbox"/> No				INITIAL COOLER TEMPERATURES °C # [3.9] [3.9] FINAL COOLER TEMPERATURES °C # [] []																	
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)																	
Released by: _____ Date: _____ Time: _____		Received by: _____ Date: 14 Jan 16 Time: 9:30		Received by: _____ Date: 14 Jan 16 Time: 12:00																	



BACTERIOLOGICAL ANALYSIS OF DRINKING WATER
ANALYSE BACTÉRIOLOGIQUE DE L'EAU POTABLE

Health and Social Services
 Santé et Affaires sociales
 Environmental Health Services
 Service d'hygiène du milieu

#2 Hospital Road, Whitehorse, Yukon Y1A 3H8
 phone : (867) 667-8391 fax : (867) 667-8322
 Toll free: 1-800-661-0408 ext.8391

2 Hospital Road, Whitehorse (Yukon) Y1A 3H8
 Tél. : 867-667-8391 Téléc. : 867-667-8322
 Sans frais au Yukon : 1-800-661-0408, poste 8391

Contact Information · Coordonnées de la personne ressource

Contact Person MEGHAN MARJANOVIC Phone 867-393-4882
 Personne ressource
 Mailing address _____ Télécopieur _____
 Adresse postale _____ Postal code _____
 Code postal _____

First Nation, Municipal or Business Name _____
 Nom de la Première nation, de la municipalité ou de l'entreprise
 Agent EDI ENVIRONMENTAL DYNAMICS Fax _____
 Télécopieur _____

Sampling Location · Lieu de la prise d'échantillon

Municipal Address NANSEN PUMPHOUSE WELL Subdivision _____
 Adresse municipale _____ Cotissement _____
 Legal Description Lot _____ Quad _____ Plan no. _____
 Désignation officielle Lot _____ Quadrilatère _____ Plan n° _____
 Other Information (e.g., Location, Business / Building Name) _____
 Autres renseignements (ex. : emplacement, nom de l'entreprise, nom de l'édifice) _____

Sample Collection / Prélèvement de l'échantillon

Sample Collected By SD Date 15/01/13 Time 1115 am
 Échantillon prélevé par _____ Date _____ Heure _____ pm
 Sampling Site (e.g., kitchen tap) PUMPHOUSE WELL
 Point d'échantillonnage (ex. : robinet de cuisine)
 Is this a Resample from a Previous Test? Yes No Previous Sample Number _____
 Est-ce un deuxième échantillon d'un test antérieur? Oui Non Numéro de l'échantillon précédent _____

Sample Supply / Source d'approvisionnement en eau

Public Supply Bulk Water Distributor Business Private Residence
 Municipal - par canalisation Municipal - par camion Privé - entreprise Privé - résidence

Sample Source / Provenance de l'échantillon

Dug Well Driven Well Drilled Well Depth of Well _____
 Puits creusé Puits tubulaire Puits foré à la sondeuse Profondeur du puits _____
 Water Holding Tank Other (explain) _____
 Réservoir d'eau Autre (précisez) _____

Water Treatment / Traitement de l'eau

Is the Water Chlorinated? Yes No Free Available Chlorine _____ ppm
 L'eau contient-elle du chlore? Oui Non Chlore libre disponible _____ mg/L
 Other Treatment Systems (e.g., UV, softener, filter) _____
 Autre dispositif de traitement (ex. : désinfection aux rayons UV, adoucisseur d'eau, filtre) _____

For Laboratory Use Only / À l'usage du laboratoire seulement

Receipt of Sample Date 16-01-14 Time 9400 By SS
 Réception de l'échantillon Date _____ Heure _____ pm Par _____
 Condition of Sample Satisfactory Unsatisfactory Details 8.0°C
 État de l'échantillon Satisfaisant Non satisfaisant Précisez _____
 Incubation Date 16-01-14 Time 1100 By SS Incubator 1
 Incubation Date _____ Heure _____ pm Par _____ Incubateur _____
 Analysis Completed Date 16-01-15 Time 1200 By SS
 Analyse terminée Date _____ Heure _____ pm Par _____

Results (See Reverse Side for Interpretation) per 100 ml
Résultats (Voir au verso l'interprétation des résultats)

Total Coliforms/Coliformes totaux <input type="checkbox"/> Present / Présence <input checked="" type="checkbox"/> Absent / Absence	E. coli/E. coli <input type="checkbox"/> Present / Présence <input checked="" type="checkbox"/> Absent / Absence
--	--

Comments / Commentaires

Report Authorized By [Signature] Position WLT Date 16-01-15
 Rapport autorisé par _____ Poste _____ Date _____
 YY/MM/DD · AA/MM/JJ

Distribution: White - Chain of Custody Yellow - Lab Copy Pink - Client Copy
 Distribution : Blanc - Chaîne de possession Jaune - Laboratoire Rose - Client

Sample Number : **62114**
 Numéro de l'échantillon : **62114**