# August 2016 Clinton Creek Surface Water Quality and Hydrological Monitoring Program
# Monthly Summary Report

Prepared for:
**Government of Yukon**
**Assessment and Abandoned Mines**
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File: 1343-005.19
December 2016

HEMMERA

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# 1.0 INTRODUCTION

This Work was performed in accordance with Contract C00033502 between Hemmera Envirochem Inc. ("Hemmera") and Government of Yukon (YG), dated May 13, 2016 ("Contract"). In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

Hemmera and Ecological Logistics & Research Ltd. (Hemmera/ELR) were retained by the YG, Assessment and Abandoned Mines (AAM) to conduct a water quality and hydrological monitoring program at the Clinton Creek Mine site during the 2016/2017 fiscal year. The Site plan and investigation locations are presented in **Figures 1** and **2**, attached to this report.

The purpose of this 2016/17 sampling program is to monitor water quality, hydrology, and meteorological station data from the Site as part of the overall care, maintenance and closure program objectives for the Site. The water quality and hydrology scope of work was based on program recommendations developed by Hemmera/ELR in 2015 (Hemmera 2015), while the meteorological station was installed and is managed by AAM, with maintenance work performed by other contractors.

This monthly summary report forms part of our overall scope of work, and is intended to provide a summary of the scope of work performed, a brief overview of methods used, deviations from the intended program scope, as well as raw program data and data summaries.

## 2.0 AUGUST 2016 MONITORING PROGRAM SCOPE

The specific scope of work for the August 2016 sampling event included:

- Visiting 17 surface water quality sampling stations and six (6) groundwater seep/pit lake stations to collect *in-situ* water quality measurements and samples for laboratory analysis, where possible.
- Collection of manual discharge measurements at 14 stream locations including flow, stream width, stream depth, and other site characteristics. This included the two sites where automated hydrometric stations are installed.
- Collection of survey data, staff gauge readings, and stream gauging data at two hydrometric monitoring sites.
- Completion of a download of the meteorological station data and hydrometric station data that is satellite-linked (hosted by Northern AvCom). The data is downloaded each month and a visual check performed to ensure that the various sensors are functioning and continuing to collect data.
- Collection of *in-situ* water quality measurements and profiles from three (3) sites on Hudgeon Lake at one (1) metre increments.

## 3.0 SUMMARY OF FIELD ACTIVITIES

Hemmera/ELR successfully completed the monthly field monitoring program during August 15 to August 21, 2016. The program was completed by Norbert Botca of Hemmera and Glenn Rudman of ELR.

**Table 1** below presents a summary of the program sample site names and locations, as well as a summary of August 2016 data collection scope for water quality and hydrology. **Table 2** below provides a brief summary of activities completed during the August 2016 field program. **Figures 1** and **2**, attached to this report show the sample site locations.

**Table 1 Sample Site Descriptions and Locations – August 2016**

| Station Code | Hydrology Data Collected | Water Quality Data Collected | Station Description | Location (UTM, Zone 7N) | |
|---|---|---|---|---|---|
| | | | | Easting | Northing |
| **Exposed Sites** | | | | | |
| E1 | | ✓ | Clinton Creek downstream of gabions | 513645 | 7147111 |
| E1(H) | ✓ | ✓ | Clinton Creek at the outlet of Hudgeon Lake | 512806 | 7147438 |
| E2 | ✓ | ✓[1] | Clinton Creek, downstream of Porcupine Creek but upstream of Wolverine Creek | 514158 | 7147076 |
| E3 | | ✓[1] | Wolverine Creek, upstream of culvert | 514178 | 7147189 |
| E3(H) | ✓ | | Wolverine Creek approximately 300 m upstream of the Clinton Creek confluence | 514170 | 7147608 |
| E4 | ✓ | ✓ | Clinton Creek downstream of Wolverine Creek but upstream of Eagle Creek | 515950 | 7145287 |
| E7 | ✓ | ✓ | Clinton Creek near mouth | 519400 | 7142042 |
| E8 | | ✓ | Forty Mile River downstream of Clinton Creek | 519457 | 7142795 |
| E9[2] | | | Porcupine Creek at its discharge into Clinton Creek | - | - |
| **Reference Sites** | | | | | |
| R1 | ✓ | ✓[1] | Clinton Creek upstream of Hudgeon Lake | 510718 | 7147525 |
| R2 | ✓ | ✓ | Easter Creek upstream of Hudgeon Lake | 512023 | 7148061 |
| R3 | ✓ | ✓[1] | Wolverine Creek, upstream of tailings | 513952 | 7148677 |
| R4 | ✓ | ✓ | Eagle Creek, upstream of culvert | 515981 | 7145344 |
| R6 | | ✓ | Forty Mile River, upstream of Clinton Creek | 519485 | 7141731 |
| R7 | ✓ | ✓ | Porcupine Creek, upstream of waste rock | 513026 | 7145669 |
| R8 | ✓ | ✓ | Unnamed creek that enters Hudgeon Lake west of Easter Creek | 511885 | 7147805 |
| R9 | ✓ | ✓ | Unnamed stream input on the south side of Hudgeon Lake | 512343 | 7146753 |
| R11 | ✓ | ✓ | Unnamed tributary to Wolverine Creek between R3 and E3(H). | 514177 | 7147828 |
| R11(H) | ✓ | | Unnamed tributary to Wolverine Creek between R3 and E3(H). | 514161 | 7147793 |

| Station Code | Hydrology Data Collected | Water Quality Data Collected | Station Description | Location (UTM, Zone 7N) | |
|---|---|---|---|---|---|
| | | | | Easting | Northing |
| **Groundwater Seepage and Pit Sites** | | | | | |
| GWCC-1 | | ✓ | Toe of the Waste Rock dump flowing into ponded area at Porcupine Creek | 513902 | 7146960 |
| GWCC-2 | | ✓ | Toe of the Waste Rock dump flowing into ponded area approx. 10 m northwest of GWCC-1 | 513899 | 7146968 |
| GWCC-3 | | ✓ | Toe of the Waste Rock dump flowing into side channel, approx. 10 m northwest of GWCC-2 | 513882 | 7147038 |
| GWCC-4 | | ✓ | Toe of the Waste Rock dump flowing into side channel, approx. 10 m northwest of GWCC-3 | 513868 | 7147052 |
| GWCC-5 | ✓ | ✓ | Groundwater flows in old Clinton Creek channel | 513984 | 7147127 |
| SL | | ✓[3] | Snowshoe Pit Lake from shore | 513824 | 7146703 |
| PL[4] | | | Porcupine Pit Lake from shore | - | - |
| **Hudgeon Lake *In-Situ* Depth Profile Data Sites** | | | | | |
| HL1 | | ✓ | Hudgeon Lake, near the west end | 511284 | 7147219 |
| HL2 | | ✓ | Hudgeon Lake, near the center | 511924 | 7147168 |
| HL3 | | ✓ | Hudgeon Lake, close to the outlet | 512485 | 7147190 |

[1] – Asbestos sample collected monthly in addition to regular program analytical set.
[2] – Site E9 was not established during the August program as there was no surface water flow at the site.
[3] – Survey data is also collected to record water elevation.
[4] – Porcupine Pit is part of the program but is not visited due to concerns with pit wall instability.

**Table 2 Field Program Activity Summary**

| Task | Summary of Task and Program Observations / Anomalies |
|---|---|
| Surface Water Quality Sampling | Sampling was successfully completed at 16 surface water stations out of a total of 17 stations; Station E9 was dry and a sample could not be collected. The 16 collected samples were received by the lab within required hold times. |
| Stream Gauging | Stream gauging was successfully completed at 14 hydrology sites. |
| Surveying of Hydrometric Sites | Surveys of benchmarks and instruments at the two hydrometric sites were completed and compared on-site to previous surveys. |
| Meteorological Station and Hydrometric Station Download/Check | The meteorological station near E1(H) was visually assessed. Data was downloaded and reviewed and all data through to the end of August 2016 appear to be complete. |
| Hudgeon Lake In-Situ Measurements | *In-situ* depth profile measurements were measured and collected in one (1) metre depth increments for identified parameters at the three previously established sites. |

# 4.0 AUGUST 2016 MONITORING PROGRAM RESULTS SUMMARY

## 4.1 SURFACE WATER QUALITY ANALYTICAL RESULTS AND EXCEEDANCES

Laboratory analytical results are presented in **Table 3**, attached to this report. Laboratory analytical results are compared to Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FAL; CCME, 2014) guidelines, where exceedances of CCME-FAL guidelines are shaded grey. In several instances, laboratory reportable detection limits (RDL) for parameters exceeded applicable CCME FAL standards (lightly shaded values in **Table 3**). In these cases, samples having elevated levels of certain parameters required laboratory dilution prior to performing the required analyses, thereby resulting in an elevated RDL. For the purpose of this report, samples where the reported RDL is greater than the applicable guideline have not been reported as CCME FAL exceedances. Laboratory analytical reports are provided in **Appendix 1**, while field forms are provided in **Appendix 2**.

For sites where duplicate samples were collected, corresponding monitoring and duplicate sample results were compared to the QA/QC analysis threshold of 20% Relative Percent Difference (RPD). The analytical results for field blanks and travel blanks were reviewed for any parameter detections. QA/QC results are presented in **Table 4**, attached to this report.

For the August program, the 20% RPD threshold was exceeded for dissolved arsenic (24.32%); dissolved manganese (20.41%; dissolved sodium (23.67%), total chromium and trivalent chromium (31.58%), total nickel (24.34%) and total titanium (27.78%) in sample E1 and its duplicate DUP1; and dissolved cadmium (30.91%), dissolved molybdenum (28.78%), dissolved strontium (27.54%) and dissolved uranium (27.69%) in sample E1 (H) and its duplicate DUP2. A discussion with the field crew suggests that there were no sampling factors believed to have contributed to these exceedences, but that water conditions were very high and turbid in August; this is considered the most likely contributing factor. Despite this number of RPD values, the actual reported values were low, and do not in any way affect the occurrence of CCME FAL exceedences.

A slight detection of total barium was noted in in one travel blank (0.000051 mg/L compared to detection limit of 0.000050 mg/L). This detection was essentially at the detection limit and is considered to represent a slight anomaly of data, and not a contamination issue.

A condensed summary of CCME FAL guideline exceedances for the August 2016 water quality results is provided in **Table 5** below, for ease of review.

**Table 5 Summary of CCME FAL Guideline Exceedances for August 2016 Sampling Program**

| | | Site Type | Reference Sites | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | R1 | R2 | R3 | R4 * | R6 * | R7 | R8 | R9 | R11 |
| | | Date Sampled | 19/08/2016 | 19/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | 17/08/2016 | 19/08/2016 | 20/08/2016 | 16/08/2016 |
| | | Site Condition | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| **Parameter** | Units | CCME-FAL[1, 2, 3, 4] | | | | | | | | | |
| **Physical Tests** | | | | | | | | | | | |
| Field Dissolved Oxygen | mg/L | 9.5 [6] | | | | | | | | | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | Varies [8] | | 0.112 | | | 0.126 | 0.168 | | | |
| *Aluminum CCME-FAL* | *mg/L* | - | | 0.1000 | | | 0.1000 | 0.1000 | | | |
| Arsenic (As)-Dissolved | mg/L | 0.005 | | | | | | | | | |
| Hexavalent Chromium (VI)-Dissolved | mg/L | 0.001 | | | | | | | | | |
| Copper (Cu)-Dissolved | mg/L | Varies [10] | | | | | | 0.00480 | | 0.00462 | |
| *Copper CCME-FAL* | *mg/L* | - | | | | | | *0.00255* | | *0.004* | |
| Iron (Fe)-Dissolved | mg/L | 0.3 | | 0.597 | 0.361 | | 0.420 | 1.15 | | 1.06 | 0.433 |
| Selenium (Se)-Dissolved | mg/L | 0.001 | 0.00238 | | | 0.00414 | | | 0.00272 | 0.00203 | 0.00179 |
| **Total Metals** | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | Varies [8] | 1.79 | 1.16 | 5.77 | 8.01 | 1.94 | 3.45 | | 2.38 | 7.66 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.1000* | *0.1000* | | *0.1000* | *0.10000* |
| Arsenic (As)-Total | mg/L | 0.005 | | | | 0.0119 | | | | | 0.00670 |
| Cadmium (Cd)-Total | mg/L | Varies [9] | | | | 0.00143 | | | | | 0.000450 |
| *Cadmium CCME-FAL* | *mg/L* | - | | | | *0.000290* | | | | | *0.000212* |
| Trivalent Chromium (III)-Total | mg/L | 0.0089 | | | 0.0108 | 0.0220 | | | | | 0.0159 |
| Hexavalent Chromium (VI)-Total | mg/L | 0.001 | | | | | | | | | 0.0014 |
| Copper (Cu)-Total | mg/L | Varies [10] | 0.0074 | 0.00424 | 0.0160 | 0.0382 | | 0.0111 | | 0.0108 | 0.0235 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | *0.004* | *0.004* | | *0.00255* | | *0.004* | *0.00319* |
| Iron (Fe)-Total | mg/L | 0.3 | 3.00 | 2.23 | 10.2 | 14.7 | 2.98 | 5.75 | | 4.55 | 15.6 |
| Lead (Pb)-Total | mg/L | Varies [11] | | | | 0.0100 | | | | | 0.0112 |
| *Lead CCME-FAL* | *mg/L* | - | | | | *0.007* | | | | | *0.00497* |
| Mercury (Hg)-Total | mg/L | 2.6E-05 | | | 0.000042 | 0.000143 | | <0.000050 | | <0.000050 | 0.000164 |
| Selenium (Se)-Total | mg/L | 0.001 | 0.00246 | | 0.00148 | 0.00611 | | | 0.00338 | 0.00248 | 0.00282 |
| Silver (Ag)-Total | mg/L | 0.00025 | | | 0.000132 | 0.000825 | | | | | 0.000384 |
| Zinc (Zn)-Total | mg/L | 0.03 | | | 0.0343 | 0.0637 | | | | | 0.0587 |

**Table 5 Summary of CCME FAL Guideline Exceedances for August 2016 Sampling Program (contd.)**

| | | Site Type | Exposure Sites | | | | | | | Groundwater Seepage Sites | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | E1 | E1(H) | E2 | E3 | E4 * | E7 * | E8 * | SL | GWCC-1 | GWCC-2 | GWCC-3 | GWCC-4 | GWCC-5 * |
| | | Date Sampled | 16/08/2016 | 20/08/2016 | 17/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | 18/08/2016 | 20/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 18/08/2016 |
| | | Site Condition | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| **Parameter** | Units | CCME-FAL [1, 2, 3, 4] | | | | | | | | | | | | | |
| **Physical Tests** | | | | | | | | | | | | | | | |
| Field Dissolved Oxygen | mg/L | 9.5 [6] | | 8.9 | | | | | | | 7.92 | 7.81 | 5.39 | 4.78 | 6.61 |
| **Dissolved Metals** | | | | | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | Varies [8] | | | | | | | 0.126 | | | | | | |
| *Aluminum CCME-FAL* | *mg/L* | - | | | | | | | *0.1000* | | | | | | |
| Arsenic (As)-Dissolved | mg/L | 0.005 | | | | | | | | 0.0133 | | | | | |
| Hexavalent Chromium (VI)-Dissolved | mg/L | 0.001 | | | | | | | | | | 0.0020 | 0.0020 | | |
| Copper (Cu)-Dissolved | mg/L | Varies [10] | | | | | | | | | | | | | |
| *Copper CCME-FAL* | *mg/L* | - | | | | | | | | | | | | | |
| Iron (Fe)-Dissolved | mg/L | 0.3 | | | | 0.350 | | 0.320 | 0.400 | | | | | | |
| Selenium (Se)-Dissolved | mg/L | 0.001 | 0.00157 | 0.00166 | 0.00194 | 0.00148 | 0.00196 | 0.00198 | | 0.0127 | 0.0114 | 0.0103 | 0.00349 | 0.00206 | 0.0117 |
| **Total Metals** | | | | | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | Varies [8] | 0.170 | 0.122 | 0.128 | 6.99 | 1.29 | 2.76 | 2.48 | | 0.107 | | | | |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.100* | *0.1000* | | *0.1000* | | | | |
| Arsenic (As)-Total | mg/L | 0.005 | | | | 0.00718 | | | | 0.0152 | 0.00518 | | | | |
| Cadmium (Cd)-Total | mg/L | Varies [9] | | | | 0.000796 | | | | | | | | | |
| *Cadmium CCME-FAL* | *mg/L* | - | | | | *0.000318* | | | | | | | | | |
| Trivalent Chromium (III)-Total | mg/L | 0.0089 | | | | 0.0180 | | 0.0108 | | | | | | | |
| Hexavalent Chromium (VI)-Total | mg/L | 0.001 | | | | | | | | | 0.0013 | 0.0022 | 0.0017 | | |
| Copper (Cu)-Total | mg/L | Varies [10] | | | | 0.0252 | 0.00654 | 0.0113 | | | | | | | |
| *Copper CCME-FAL* | *mg/L* | - | | | | *0.004* | *0.004* | *0.004* | | | | | | | |
| Iron (Fe)-Total | mg/L | 0.3 | 0.545 | 0.436 | 0.481 | 13.1 | 2.33 | 5.40 | 3.52 | | | | | | |
| Lead (Pb)-Total | mg/L | Varies [11] | | | | 0.00940 | | | | | | | | | |
| *Lead CCME-FAL* | *mg/L* | - | | | | *0.007* | | | | | | | | | |
| Mercury (Hg)-Total | mg/L | 2.6E-05 | | | | 0.000081 | | <0.000050 | | | | | | | |
| Selenium (Se)-Total | mg/L | 0.001 | 0.00166 | 0.00174 | 0.00185 | 0.00275 | 0.00202 | 0.00231 | | 0.0137 | 0.0113 | 0.0102 | 0.00297 | 0.00189 | 0.0122 |
| Silver (Ag)-Total | mg/L | 0.00025 | | | | 0.000295 | | 0.000125 | | | | | | | |
| Zinc (Zn)-Total | mg/L | 0.03 | | | | 0.0575 | | | | | | | | | |

**Notes:** Please see the notes that follow **Tables 3** and **4** for full explanations of CCME-FAL Guidelines and superscript notes.

### 4.2 HUDGEON LAKE *IN-SITU* PROFILE DATA

The raw Hudgeon Lake *in-situ* profile data for the August 2016 monitoring event is provided in **Appendix 3**.

### 4.3 STREAM GAUGING DATA

The tabulated stream gauging data from the August 2016 monitoring event is provided in **Appendix 4**.

### 4.4 HYDROMETRIC STATION SURVEY DATA

The survey data collected from the Wolverine Creek and Hudgeon Lake hydrometric stations is provided in **Appendix 5**. The survey data from the August sampling event is suggesting that currently the structures at the Hudgeon Lake hydrometric station site are stable and not moving.

## 5.0 RECOMMENDATIONS

Hemmera/ELR have prepared the following recommendations based on the observations and results of the August 2016 water quality and hydrological monitoring program:

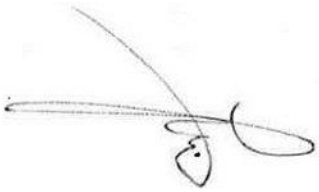
1. Continue to survey the benchmarks and instrumentation at the two hydrometric sites E1(H) and E3(H) monthly.

## 6.0 CLOSURE

Hemmera/ELR are pleased to provide the Government of Yukon, Assessment and Abandoned Mines this report that summarizes the Winter 2016 water quality and hydrological monitoring program at the Clinton Creek Site. Please do not hesitate to contact us should you have any questions regarding this report.

Sincerely,

Written by:
**Hemmera Envirochem Inc.**



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# 7.0 REFERENCES

Canadian Council of Ministers of the Environment (CCME). 2014. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Accessed online at http://st-ts.ccme.ca/, August2014.

# FIGURES

512000

514000

7148000

7146000

Easter Creek

Wolverine Creek

Clinton Creek

Hudgeon Lake

Porcupine Pit Lake

Snowshoe Pit Lake

Porcupine Creek

Site Access Road

R3
Water Quality/Hydrology

R2
Water Quality/Hydrology

R8
Water Quality/Hydrology

R1
Water Quality/Hydrology

R11
Water Quality

R11(H)
Hydrology

E3(H)
Hydrology

E1(H)
Water Quality / Hydrology

E1
Water Quality

E3
Water Quality

E2
Water Quality / Hydrology

E9
Water Quality/Hydrology

HL1
In-situ/Depth Profile

HL2
In-situ/Depth Profile

HL3
In-situ/Depth Profile

Location of 2016 Snow Survey

SL
Water Quality / Water Level

PL
Water Quality

R9
Water Quality/Hydrology

R7
Water Quality/Hydrology

E9
Water Quality/Hydrology

GWCC-5
Water Quality/Hydrology

E2
Water Quality / Hydrology

Clinton Creek (Old)

Clinton Creek

GWCC-4
Water Quality

GWCC-3
Water Quality

GWCC-2
Water Quality

GWCC-1
Water Quality

NOTES:

Projection: UTM Zone 7 NAD83
Units: Meters
NTS Mapsheet: 116C07

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Imagery Courtesy of Yukon Geomatics.

# Clinton Creek Surface Water Quality and Hydrological Monitoring

Ecological Logistics & Research Ltd.

HEMMERA

Client:

Yukon Energy, Mines and Resources
Assessment and Abandoned Mines

## Legend

**Water Type**

- Surface Water
- Groundwater

**Site Type**

- Exposed
- Reference

- Topographic Watercourse Data (may not be truly representative of on-site conditions)

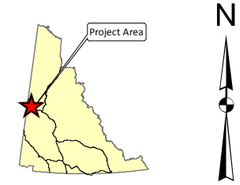


**FIGURE 1**

Sampling Stations

Site Area

| | |
|---|---|
| Date: November 24, 2016 | Scale: 1:15,000 |
| ELR Project #: 16-240.4<br>Hemmera Project #: 1343-005.19 | Rev. #: 1 |

514000
516000
518000
7144000
7142000

Clinton Creek
Eagle Creek
R4
Water Quality/Hydrology
E4
Water Quality/Hydrology
Site Access Road
Forty Mile River
E8
Water Quality
Clinton Creek
E7
Water Quality/Hydrology
R6
Water Quality

NOTES:

Projection: UTM Zone 7 NAD83
Units: Meters
NTS Mapsheet: 116C07

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Imagery Courtesy of Yukon Geomatics.

# Clinton Creek Surface Water Quality and Hydrological Monitoring

Ecological Logistics & Research Ltd.

HEMMERA

Client:

Yukon
Energy, Mines and Resources
Assessment and Abandoned Mines

## Legend

**Water Type**

Surface Water

**Site Type**

Exposed

Reference

Topographic Watercourse Data

(may not be truly representative of on-site conditions)


N

0 150 300 600

Meters

**FIGURE 2**

Sampling Stations

Forty Mile River Area

| | |
|---|---|
| Date: November 24, 2016 | Scale: 1:18,000 |
| ELR Project #: 16-240.4<br>Hemmera Project #: 1343-005.19 | Rev. #: 1 |

# TABLES

**Table 3: Analytical Chemistry Data**

| | | Site Type | Reference Sites | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | Clinton Creek | Easter Creek | Wolverine Creek | Eagle Creek | Forty Mile River | Porcupine Creek | Unnamed creek | Unnamed creek | Unnamed Creek |
| | | Sample ID | R1 | R2 | R3 | R4 * | R6 * | R7 | R8 | R9 | R11 |
| | | Date Sampled | 19/08/2016 | 19/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | 17/08/2016 | 19/08/2016 | 20/08/2016 | 16/08/2016 |
| | | ALS Work Order | L1816799 | L1816799 | L1816106 | L1816799 | L1816799 | L1816106 | L1816799 | L1816799 | L1816106 |
| **Parameter** | Units | CCME-FAL[1, 2, 3, 4] | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| **Physical Tests** | | | | | | | | | | | |
| Lab pH | pH units | 6.5-9.0 [5] | 8.00 | 7.96 | 8.00 | 7.96 | 7.78 | 7.80 | 7.79 | 7.79 | 7.78 |
| Field pH | pH units | 6.5-9.0 [5] | 8.13 | 8.79 | - | 8.16 | 7.78 | 8.66 | 7.9 | 7.9 | - |
| Field Temperature | C | - | 6.8 | 6.9 | 5 | 4.4 | 9.9 | 3.1 | 6.2 | 3.5 | 2.9 |
| Lab Conductivity | uS/cm | - | 539 | 401 | 426 | 399 | 183 | 224 | 235 | 470 | 309 |
| Field Conductivity | uS/cm | - | 352.1 | 260.6 | 262.2 | 231.1 | 115.9 | 126.7 | 151.8 | 279.5 | 170.6 |
| Field Specific Conductivity | uS/cm | - | 540 | 398.5 | 423.7 | 380.7 | 163 | 217.6 | 237.1 | 474 | 295.1 |
| Field Dissolved Oxygen | mg/L | 9.5 [6] | 11.44 | 11.62 | 12.34 | 12.77 | 10.96 | 12.58 | 11.83 | 12.61 | 13.25 |
| Field Oxidation - Redox Potent | mV | - | 67 | 132.8 | -94.9 | 141.2 | 145.1 | 28.2 | 134.3 | 22.4 | -45.3 |
| Total Suspended Solids | mg/L | - | 88 | 21 | 440 | 550 | 56 | 230 | 2.3 | 93 | 1100 |
| Total Hardness (as CaCO3) | mg/L | - | 315 | 231 | 207 | 207 | 78.8 | 109 | 123 | 267 | 142 |
| **Anions and Nutrients** | | | | | | | | | | | |
| Nitrate (as N) | mg/L | 13 | 0.159 | 0.0477 | 0.0473 | 0.147 | 0.0920 | 0.0977 | <0.0050 | 0.182 | 0.0583 |
| Nitrite (as N) | mg/L | 0.06 | 0.0025 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| Ammonia, Total (as N) | mg/L | Varies [7] | 0.0516 | 0.0162 | 0.0571 | 0.0829 | 0.0172 | 0.0931 | 0.0056 | 0.118 | 0.1150 |
| *Ammonia CCME-FAL* | *mg/L* | - | *0.9971* | *0.2313* | *1.266* | *1.127* | *1.731* | *0.4089* | *1.76* | *2.19* | *1.266* |
| Sulfate (SO4) | mg/L | - | 170 | 107 | 122 | 98.8 | 33.2 | 51.2 | 60.1 | 154 | 84.9 |
| **Inorganic/Organic Carbon** | | | | | | | | | | | |
| Dissolved Organic Carbon | mg/L | - | 16.7 | 20.5 | 20.2 | 18.4 | 22.1 | 32.6 | 14.6 | 25.8 | 20.5 |
| **Asbestos** | | | | | | | | | | | |
| Total Asbestos | MFL | - | <AS | - | <AS | - | - | - | - | - | - |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | Varies [8] | 0.0485 | 0.112 | 0.0639 | 0.0513 | 0.126 | 0.168 | 0.0346 | 0.100 | 0.0728 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.10000* |
| Antimony (Sb)-Dissolved | mg/L | - | 0.00023 | 0.00038 | 0.00021 | 0.00039 | 0.00013 | 0.00022 | 0.00074 | 0.00023 | 0.00023 |
| Arsenic (As)-Dissolved | mg/L | 0.005 | 0.00064 | 0.00097 | 0.00076 | 0.00152 | 0.00072 | 0.00139 | 0.00030 | 0.00115 | 0.00073 |
| Barium (Ba)-Dissolved | mg/L | - | 0.0594 | 0.0568 | 0.0642 | 0.0844 | 0.0405 | 0.0775 | 0.0415 | 0.102 | 0.0507 |
| Beryllium (Be)-Dissolved | mg/L | - | <0.000020 | <0.000020 | <0.000020 | <0.000020 | 0.000032 | 0.000035 | <0.000020 | 0.000023 | <0.000020 |
| Bismuth (Bi)-Dissolved | mg/L | - | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Boron (B)-Dissolved | mg/L | 1.5 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 |
| Cadmium (Cd)-Dissolved | mg/L | Varies [9] | 0.0000590 | 0.0000264 | 0.0000148 | 0.0000411 | 0.0000291 | 0.0000247 | 0.0000183 | 0.0000538 | 0.0000216 |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.00037* | *0.000318* | *0.000290* | *0.000290* | *0.0001301* | *0.000170* | *0.000188* | *0.000358* | *0.000212* |
| Calcium (Ca)-Dissolved | mg/L | - | 77.2 | 44.2 | 40.9 | 52.5 | 21.0 | 23.7 | 30.9 | 64.1 | 34.6 |
| Chromium (Cr)-Dissolved | mg/L | - | 0.00041 | 0.00122 | 0.00084 | 0.00063 | 0.00062 | 0.00137 | 0.00083 | 0.00115 | 0.00089 |
| Trivalent Chromium (III)-Dissolved | mg/L | 0.0089 | - | 0.00122 | - | - | - | 0.00137 | - | 0.00115 | - |
| Hexavalent Chromium (VI)-Dissolved | mg/L | 0.001 | - | <0.0010 | - | - | - | <0.0010 | - | <0.0010 | - |
| Cobalt (Co)-Dissolved | mg/L | - | 0.00062 | 0.00044 | 0.00044 | 0.00060 | 0.00045 | 0.00094 | <0.00010 | 0.00112 | 0.00063 |
| Copper (Cu)-Dissolved | mg/L | Varies [10] | 0.00254 | 0.00261 | 0.00257 | 0.00282 | 0.00360 | 0.00480 | 0.00183 | 0.00462 | 0.00252 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | *0.004* | *0.004* | *0.02* | *0.00255* | *0.00282* | *0.004* | *0.00319* |
| Iron (Fe)-Dissolved | mg/L | 0.3 | 0.299 | 0.597 | 0.361 | 0.249 | 0.420 | 1.15 | 0.074 | 1.06 | 0.433 |
| Lead (Pb)-Dissolved | mg/L | Varies [11] | 0.000116 | 0.000053 | 0.000070 | 0.000058 | 0.000079 | 0.000089 | <0.000050 | 0.000081 | 0.000175 |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | *0.007* | *0.007* | *0.002349* | *0.00355* | *0.00414* | *0.007* | *0.00497* |
| Lithium (Li)-Dissolved | mg/L | - | 0.0024 | 0.0038 | 0.0017 | 0.0015 | 0.0028 | <0.0010 | 0.0011 | <0.0010 | <0.0010 |
| Magnesium (Mg)-Dissolved | mg/L | - | 29.7 | 29.2 | 25.5 | 18.5 | 6.41 | 12.1 | 11.0 | 26.0 | 13.5 |
| Manganese (Mn)-Dissolved | mg/L | - | 0.242 | 0.0993 | 0.131 | 0.172 | 0.0424 | 0.269 | 0.00667 | 0.506 | 0.163 |
| Mercury (Hg)-Dissolved | mg/L | 0.000026 | <0.0000050 | <0.0000050 | <0.0000050 | 0.0000053 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | 0.0000055 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.073 | 0.00110 | 0.000492 | 0.000980 | 0.00116 | 0.000352 | 0.000692 | 0.000803 | 0.00109 | 0.00132 |
| Nickel (Ni)-Dissolved | mg/L | Varies [12] | 0.00363 | 0.00525 | 0.00394 | 0.00637 | 0.00300 | 0.00456 | 0.00290 | 0.00461 | 0.00283 |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | *0.15* | *0.15* | *0.07975* | *0.102* | *0.112* | *0.15* | *0.125* |
| Phosphorus (P)-Dissolved | mg/L | - | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Potassium (K)-Dissolved | mg/L | - | 0.48 | 0.52 | 0.36 | 0.36 | 0.76 | 0.18 | <0.10 | 0.51 | 0.31 |
| Selenium (Se)-Dissolved | mg/L | 0.001 | 0.00238 | 0.000733 | 0.000958 | 0.00414 | 0.000207 | 0.000798 | 0.00272 | 0.00203 | 0.00179 |
| Silicon (Si)-Dissolved | mg/L | - | 4.95 | 6.30 | 6.04 | 5.44 | 6.57 | 5.35 | 6.60 | 5.34 | 5.82 |
| Silver (Ag)-Dissolved | mg/L | 0.00025 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Sodium (Na)-Dissolved | mg/L | - | 2.46 | 2.49 | 2.97 | 2.85 | 2.94 | 1.82 | 3.97 | 2.82 | 2.83 |
| Strontium (Sr)-Dissolved | mg/L | - | 0.333 | 0.217 | 0.190 | 0.229 | 0.111 | 0.0808 | 0.137 | 0.235 | 0.153 |
| Sulfur (S)-Dissolved | mg/L | - | 57.3 | 35.6 | 42.3 | 29.2 | 9.19 | 17.6 | 20.1 | 51.3 | 29.2 |
| Thallium (Tl)-Dissolved | mg/L | 0.0008 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Tin (Sn)-Dissolved | mg/L | - | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Titanium (Ti)-Dissolved | mg/L | - | 0.00090 | 0.00178 | 0.00124 | 0.00146 | 0.00214 | 0.00331 | 0.00064 | 0.00273 | 0.00247 |
| Uranium (U)-Dissolved | mg/L | 0.015 | 0.00183 | 0.00186 | 0.00153 | 0.00164 | 0.000672 | 0.000239 | 0.000089 | 0.00115 | 0.000581 |
| Vanadium (V)-Dissolved | mg/L | - | <0.00050 | 0.00097 | 0.00083 | 0.00069 | 0.00127 | 0.00141 | <0.00050 | 0.00119 | 0.00067 |
| Zinc (Zn)-Dissolved | mg/L | 0.03 | 0.0018 | 0.0042 | 0.0015 | 0.0023 | 0.0018 | <0.0010 | 0.0012 | 0.0014 | 0.0011 |
| Zirconium (Zr)-Dissolved | mg/L | - | 0.00104 | 0.00101 | 0.00083 | 0.00086 | 0.00127 | 0.00147 | 0.00072 | 0.00131 | 0.00139 |

**Table 3: Analytical Chemistry Data**

| | | Site Type | Exposure Sites | | | | | | | | Groundwater Seepage Sites | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | Clinton Creek | | | Wolverine Creek | Clinton Creek | | Porcupine Creek | Forty Mile River | Snowshoe Pit | Waste Rock Seepage | | | | Abandoned Channel |
| | | Sample ID | E1 | E1(H) | E2 | E3 | E4 * | E7 * | E9 | E8 * | SL | GWCC-1 | GWCC-2 | GWCC-3 | GWCC-4 | GWCC-5 * |
| | | Date Sampled | 16/08/2016 | 20/08/2016 | 17/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | - | 18/08/2016 | 20/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 18/08/2016 |
| | | ALS Work Order | L1816106 | L1816799 | L1816106 | L1816106 | L1816799 | L1816799 | - | L1816799 | L1816799 | L1816106 | L1816106 | L1816106 | L1816106 | L1816799 |
| **Parameter** | Units | CCME-FAL [1, 2, 3, 4] | Good | Good | Good | Good | Good | Good | Dry | Good | Good | Good | Good | Good | Good | Good |
| **Physical Tests** | | | | | | | | | | | | | | | | |
| Lab pH | pH units | 6.5-9.0 [5] | 8.09 | 7.91 | 8.17 | 8.06 | 7.88 | 7.94 | - | 7.78 | 8.13 | 8.11 | 8.15 | 7.63 | 8.01 | 7.86 |
| Field pH | pH units | 6.5-9.0 [5] | 8.88 | 7.89 | 7.79 | - | 7.85 | 8 | - | 8.37 | 8.28 | 7.83 | 8.34 | 7.76 | 7.74 | 7.65 |
| Field Temperature | C | - | 12.8 | 12.1 | 11.9 | 5.9 | 12 | 8 | - | 9.3 | 8.2 | 7.7 | 6.7 | 7.2 | 8.1 | 9.3 |
| Lab Conductivity | uS/cm | - | 473 | 434 | 568 | 446 | 561 | 509 | - | 192 | 1110 | 1300 | 1900 | 1610 | 1360 | 950 |
| Field Conductivity | uS/cm | - | 338.3 | 332.3 | 410.3 | 272.8 | 416.7 | 353.5 | - | 119.5 | 777 | 848 | 1218 | 1048 | 870 | 702 |
| Field Specific Conductivity | uS/cm | - | 441.1 | 441 | 547 | 430 | 554 | 523 | - | 171 | 1143 | 1265 | 1870 | 1590 | 1284 | 1003 |
| Field Dissolved Oxygen | mg/L | 9.5 [6] | 10.13 | 8.9 | 10.15 | 12.11 | 10.25 | 11.11 | - | 11.04 | 11 | 7.92 | 7.81 | 5.39 | 4.78 | 6.61 |
| Field Oxidation - Redox Potent | mV | - | -27.9 | 117.1 | 73.6 | -100.8 | 125.9 | 113.1 | - | 220 | 134.1 | 129.7 | 105.2 | 162.6 | 177 | 154 |
| Total Suspended Solids | mg/L | - | 4.9 | 2.9 | 4.1 | 600 | 51 | 120 | - | 77 | 4.9 | 4.8 | <2.0 | <2.0 | <2.0 | <2.0 |
| Total Hardness (as CaCO3) | mg/L | - | 238 | 246 | 301 | 231 | 307 | 296 | - | 81.5 | 711 | 758 | 1180 | 1000 | 810 | 601 |
| **Anions and Nutrients** | | | | | | | | | | | | | | | | |
| Nitrate (as N) | mg/L | 13 | 0.122 | 0.111 | 0.129 | 0.0891 | 0.116 | 0.126 | - | 0.0939 | 0.122 | 0.174 | 0.351 | 0.343 | 0.242 | <0.010 |
| Nitrite (as N) | mg/L | 0.06 | 0.0017 | <0.0010 | 0.0024 | 0.0024 | <0.0010 | <0.0010 | - | <0.0010 | <0.0020 | <0.0020 | <0.0050 | <0.0050 | <0.0020 | <0.0020 |
| Ammonia, Total (as N) | mg/L | Varies [7] | 0.0183 | 0.0215 | 0.0204 | 0.0705 | 0.0306 | 0.0494 | - | 0.0146 | <0.0050 | 0.0073 | <0.0050 | <0.0050 | <0.0050 | <0.0050 |
| *Ammonia CCME-FAL* | *mg/L* | - | *0.715* | *1.139* | *1.451* | *0.282* | *1.257* | *1.22* | - | *0.4804* | *0.6383* | *1.835* | *0.6270* | *2.240* | *2.183* | *2.440* |
| Sulfate (SO4) | mg/L | - | 130 | 130 | 171 | 128 | 176 | 154 | - | 36.4 | 502 | 549 | 916 | 760 | 562 | 333 |
| **Inorganic/Organic Carbon** | | | | | | | | | | | | | | | | |
| Dissolved Organic Carbon | mg/L | - | 18.5 | 16.9 | 17.2 | 19.3 | 17.7 | 17.3 | - | 22.2 | 11.3 | 9.83 | 7.92 | 7.86 | 8.43 | 8.27 |
| **Asbestos** | | | | | | | | | | | | | | | | |
| Total Asbestos | MFL | - | - | - | 81.29 | 373.26 | - | - | - | - | - | - | - | - | - | - |
| **Dissolved Metals** | | | | | | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | Varies [8] | 0.0546 | 0.0556 | 0.0469 | 0.0601 | 0.0482 | 0.0479 | - | 0.126 | 0.0131 | 0.0025 | 0.0023 | 0.0016 | 0.0017 | 0.0014 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.100* | - | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* |
| Antimony (Sb)-Dissolved | mg/L | - | 0.00032 | 0.00040 | 0.00040 | 0.00043 | 0.00045 | 0.00036 | - | 0.00012 | 0.00272 | 0.00269 | 0.00207 | 0.00115 | 0.00098 | 0.00083 |
| Arsenic (As)-Dissolved | mg/L | 0.005 | 0.00083 | 0.00083 | 0.00099 | 0.00097 | 0.00107 | 0.00103 | - | 0.00072 | 0.0133 | 0.00472 | 0.00323 | 0.00106 | 0.00104 | 0.00060 |
| Barium (Ba)-Dissolved | mg/L | - | 0.0647 | 0.0681 | 0.0641 | 0.0640 | 0.0692 | 0.0746 | - | 0.0428 | 0.0184 | 0.0178 | 0.0245 | 0.0256 | 0.0288 | 0.0486 |
| Beryllium (Be)-Dissolved | mg/L | - | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | - | 0.000028 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| Bismuth (Bi)-Dissolved | mg/L | - | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | - | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| Boron (B)-Dissolved | mg/L | 1.5 | <0.010 | <0.010 | 0.016 | 0.023 | 0.024 | 0.016 | - | <0.010 | 0.033 | 0.083 | 0.166 | 0.120 | 0.093 | 0.058 |
| Cadmium (Cd)-Dissolved | mg/L | Varies [9] | 0.0000422 | 0.0000320 | 0.0000472 | 0.0000206 | 0.0000297 | 0.0000275 | - | 0.0000094 | 0.0000268 | 0.0000398 | 0.000168 | 0.000131 | 0.0000807 | 0.000107 |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.000326* | *0.000335* | *0.00037* | *0.000318* | *0.00037* | *0.00037* | - | *0.0001337* | *0.00037* | *0.00037* | *0.00037* | *0.00037* | *0.00037* | *0.00037* |
| Calcium (Ca)-Dissolved | mg/L | - | 55.4 | 58.2 | 63.5 | 42.9 | 63.7 | 62.2 | - | 21.4 | 172 | 152 | 186 | 136 | 118 | 137 |
| Chromium (Cr)-Dissolved | mg/L | - | 0.00066 | 0.00064 | 0.00055 | 0.00107 | 0.00087 | 0.00082 | - | 0.00066 | 0.00087 | 0.00070 | 0.00161 | 0.00130 | 0.00075 | 0.00065 |
| Trivalent Chromium (III)-Dissolved | mg/L | 0.0089 | - | - | - | 0.00107 | - | - | - | - | - | - | <0.00043 | <0.00042 | - | - |
| Hexavalent Chromium (VI)-Dissolved | mg/L | 0.001 | - | - | - | <0.0010 | - | - | - | - | - | - | 0.0020 | 0.0020 | - | - |
| Cobalt (Co)-Dissolved | mg/L | - | 0.00040 | 0.00046 | 0.00045 | 0.00056 | 0.00056 | 0.00063 | - | 0.00045 | 0.00012 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Copper (Cu)-Dissolved | mg/L | Varies [10] | 0.00303 | 0.00299 | 0.00287 | 0.00256 | 0.00273 | 0.00281 | - | 0.00358 | 0.00182 | 0.00149 | 0.00151 | 0.00104 | 0.00097 | 0.00073 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | - | *0.02* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* |
| Iron (Fe)-Dissolved | mg/L | 0.3 | 0.243 | 0.277 | 0.254 | 0.350 | 0.286 | 0.320 | - | 0.400 | 0.037 | <0.010 | <0.010 | <0.010 | <0.010 | 0.017 |
| Lead (Pb)-Dissolved | mg/L | Varies [11] | 0.000078 | 0.000110 | 0.000071 | 0.000124 | 0.000069 | 0.000086 | - | 0.000067 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | - | *0.002452* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* |
| Lithium (Li)-Dissolved | mg/L | - | 0.0024 | 0.0029 | 0.0045 | 0.0015 | 0.0057 | 0.0046 | - | 0.0026 | 0.0078 | 0.0239 | 0.0551 | 0.0220 | 0.0140 | 0.0108 |
| Magnesium (Mg)-Dissolved | mg/L | - | 24.1 | 24.4 | 34.5 | 30.1 | 35.9 | 34.3 | - | 6.84 | 68.5 | 91.7 | 174 | 160 | 125 | 62.7 |
| Manganese (Mn)-Dissolved | mg/L | - | 0.135 | 0.164 | 0.137 | 0.147 | 0.153 | 0.185 | - | 0.0462 | 0.0108 | 0.00052 | 0.00027 | 0.00019 | 0.00032 | 0.00133 |
| Mercury (Hg)-Dissolved | mg/L | 0.000026 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | - | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Dissolved | mg/L | 0.073 | 0.00104 | 0.00128 | 0.00116 | 0.00122 | 0.00131 | 0.00103 | - | 0.000367 | 0.00175 | 0.00198 | 0.00223 | 0.00271 | 0.00224 | 0.00202 |
| Nickel (Ni)-Dissolved | mg/L | Varies [12] | 0.00445 | 0.00391 | 0.00758 | 0.00492 | 0.00907 | 0.00856 | - | 0.00311 | 0.0130 | 0.0281 | 0.0488 | 0.0438 | 0.0383 | 0.0195 |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | - | *0.08181* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* |
| Phosphorus (P)-Dissolved | mg/L | - | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | - | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Potassium (K)-Dissolved | mg/L | - | 0.43 | 0.47 | 0.54 | 0.45 | 0.59 | 0.61 | - | 0.73 | 1.13 | 1.49 | 2.25 | 1.72 | 1.45 | 0.95 |
| Selenium (Se)-Dissolved | mg/L | 0.001 | 0.00157 | 0.00166 | 0.00194 | 0.00148 | 0.00196 | 0.00198 | - | 0.000289 | 0.0127 | 0.0114 | 0.0103 | 0.00349 | 0.00206 | 0.0117 |
| Silicon (Si)-Dissolved | mg/L | - | 4.88 | 4.98 | 4.91 | 5.96 | 5.20 | 5.28 | - | 6.46 | 5.03 | 6.26 | 6.29 | 5.12 | 5.29 | 4.69 |
| Silver (Ag)-Dissolved | mg/L | 0.00025 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | - | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Sodium (Na)-Dissolved | mg/L | - | 2.41 | 2.42 | 2.74 | 3.30 | 3.43 | 3.04 | - | 2.98 | 1.82 | 3.66 | 11.0 | 6.51 | 4.53 | 3.99 |
| Strontium (Sr)-Dissolved | mg/L | - | 0.251 | 0.314 | 0.312 | 0.203 | 0.329 | 0.266 | - | 0.115 | 0.747 | 0.953 | 1.44 | 0.917 | 0.597 | 0.864 |
| Sulfur (S)-Dissolved | mg/L | - | 45.7 | 43.2 | 59.6 | 45.0 | 55.9 | 51.4 | - | 9.85 | 166 | 186 | 302 | 249 | 190 | 110 |
| Thallium (Tl)-Dissolved | mg/L | 0.0008 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | - | <0.000010 | 0.000015 | 0.000047 | 0.000075 | 0.000080 | 0.000061 | 0.000013 |
| Tin (Sn)-Dissolved | mg/L | - | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | - | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Titanium (Ti)-Dissolved | mg/L | - | 0.00121 | 0.00123 | 0.00099 | 0.00194 | 0.00114 | 0.00137 | - | 0.00209 | 0.00032 | <0.00030 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |
| Uranium (U)-Dissolved | mg/L | 0.015 | 0.00148 | 0.00185 | 0.00160 | 0.00142 | 0.00164 | 0.00134 | - | 0.000682 | 0.00185 | 0.00250 | 0.00432 | 0.00275 | 0.00172 | 0.00320 |
| Vanadium (V)-Dissolved | mg/L | - | 0.00058 | 0.00059 | 0.00050 | 0.00088 | 0.00063 | 0.00069 | - | 0.00124 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Zinc (Zn)-Dissolved | mg/L | 0.03 | 0.0030 | 0.0011 | <0.0010 | 0.0011 | 0.0019 | 0.0066 | - | 0.0015 | <0.0010 | 0.0025 | 0.0043 | 0.0036 | 0.0035 | <0.0010 |
| Zirconium (Zr)-Dissolved | mg/L | - | 0.00094 | 0.00121 | 0.00087 | 0.00100 | 0.00100 | 0.00096 | - | 0.00127 | <0.00030 | <0.00030 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |

**Table 3: Analytical Chemistry Data**

| | | Site Type | Reference Sites | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | Clinton Creek | Easter Creek | Wolverine Creek | Eagle Creek | Forty Mile River | Porcupine Creek | Unnamed creek | Unnamed creek | Unnamed Creek |
| | | Sample ID | R1 | R2 | R3 | R4 * | R6 * | R7 | R8 | R9 | R11 |
| | | Date Sampled | 19/08/2016 | 19/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | 17/08/2016 | 19/08/2016 | 20/08/2016 | 16/08/2016 |
| | | ALS Work Order | L1816799 | L1816799 | L1816106 | L1816799 | L1816799 | L1816106 | L1816799 | L1816799 | L1816106 |
| **Parameter** | Units | CCME-FAL[1, 2, 3, 4] | Good | Good | Good | Good | Good | Good | Good | Good | Good |
| **Total Metals** | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | Varies [8] | 1.79 | 1.16 | 5.77 | 8.01 | 1.94 | 3.45 | 0.0653 | 2.38 | 7.66 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.10000* |
| Antimony (Sb)-Total | mg/L | - | 0.00040 | 0.00057 | 0.00056 | 0.00162 | 0.00018 | 0.00037 | 0.00074 | 0.00042 | 0.00097 |
| Arsenic (As)-Total | mg/L | 0.005 | 0.00205 | 0.00208 | 0.00473 | 0.0119 | 0.00160 | 0.00348 | 0.00041 | 0.00274 | 0.00670 |
| Barium (Ba)-Total | mg/L | - | 0.107 | 0.0761 | 0.271 | 0.385 | 0.0687 | 0.165 | 0.0440 | 0.163 | 0.270 |
| Beryllium (Be)-Total | mg/L | - | 0.000085 | 0.000055 | 0.000204 | 0.000323 | 0.000086 | 0.000121 | <0.000020 | 0.000097 | 0.000282 |
| Bismuth (Bi)-Total | mg/L | - | <0.000050 | <0.000050 | 0.000058 | 0.000128 | <0.000050 | <0.000050 | <0.000050 | <0.000050 | 0.000206 |
| Boron (B)-Total | mg/L | 1.5 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 | <0.010 |
| Cadmium (Cd)-Total | mg/L | Varies [9] | 0.000220 | 0.0000585 | 0.000251 | 0.00143 | 0.0000407 | 0.000120 | 0.0000218 | 0.000191 | 0.000450 |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.00037* | *0.000318* | *0.000290* | *0.000290* | *0.0001301* | *0.000170* | *0.000188* | *0.000358* | *0.000212* |
| Calcium (Ca)-Total | mg/L | - | 72.3 | 41.3 | 45.2 | 63.0 | 21.6 | 25.6 | 29.8 | 62.1 | 37.7 |
| Chromium (Cr)-Total | mg/L | - | 0.00490 | 0.00390 | 0.0108 | 0.0220 | 0.00365 | 0.00756 | 0.00101 | 0.00627 | 0.0173 |
| Trivalent Chromium (III)-Total | mg/L | 0.0089 | 0.00490 | 0.00390 | 0.0108 | 0.0220 | 0.00365 | 0.00756 | 0.00101 | 0.00627 | 0.0159 |
| Hexavalent Chromium (VI)-Total | mg/L | 0.001 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.0014 |
| Cobalt (Co)-Total | mg/L | - | 0.00202 | 0.00119 | 0.00448 | 0.00881 | 0.00156 | 0.00314 | <0.00010 | 0.00286 | 0.00657 |
| Copper (Cu)-Total | mg/L | Varies [10] | 0.00740 | 0.00424 | 0.0160 | 0.0382 | 0.00628 | 0.0111 | 0.00210 | 0.0108 | 0.0235 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | *0.004* | *0.004* | *0.02* | *0.00255* | *0.00282* | *0.004* | *0.00319* |
| Iron (Fe)-Total | mg/L | 0.3 | 3.00 | 2.23 | 10.2 | 14.7 | 2.98 | 5.75 | 0.140 | 4.55 | 15.6 |
| Lead (Pb)-Total | mg/L | Varies [11] | 0.00321 | 0.000915 | 0.00487 | 0.0100 | 0.00108 | 0.00213 | <0.000050 | 0.00175 | 0.0112 |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | *0.007* | *0.007* | *0.002349* | *0.00355* | *0.00414* | *0.007* | *0.00497* |
| Lithium (Li)-Total | mg/L | - | 0.0035 | 0.0046 | 0.0058 | 0.0083 | 0.0039 | 0.0025 | 0.0010 | 0.0027 | 0.0073 |
| Magnesium (Mg)-Total | mg/L | - | 26.9 | 26.4 | 28.8 | 23.2 | 6.88 | 13.4 | 10.8 | 26.1 | 17.1 |
| Manganese (Mn)-Total | mg/L | - | 0.339 | 0.129 | 0.304 | 0.729 | 0.108 | 0.362 | 0.00903 | 0.611 | 0.407 |
| Mercury (Hg)-Total | mg/L | 0.000026 | <0.000025 | <0.000025 | 0.000042 | 0.000143 | <0.000025 | <0.000050 | <0.000025 | <0.000050 | 0.000164 |
| Molybdenum (Mo)-Total | mg/L | 0.073 | 0.00147 | 0.000601 | 0.00181 | 0.00338 | 0.000402 | 0.000888 | 0.000858 | 0.00151 | 0.00424 |
| Nickel (Ni)-Total | mg/L | Varies [12] | 0.00853 | 0.00778 | 0.0161 | 0.0458 | 0.00549 | 0.0103 | 0.00308 | 0.00964 | 0.0223 |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | *0.15* | *0.15* | *0.07975* | *0.102* | *0.112* | *0.15* | *0.125* |
| Phosphorus (P)-Total | mg/L | - | 0.067 | 0.058 | 0.363 | 0.672 | 0.067 | 0.152 | <0.050 | 0.106 | 0.335 |
| Potassium (K)-Total | mg/L | - | 0.74 | 0.60 | 1.07 | 1.27 | 0.95 | 0.45 | 0.10 | 0.72 | 1.49 |
| Selenium (Se)-Total | mg/L | 0.001 | 0.00246 | 0.000773 | 0.00148 | 0.00611 | 0.000323 | 0.000941 | 0.00338 | 0.00248 | 0.00282 |
| Silicon (Si)-Total | mg/L | - | 6.98 | 7.56 | 15.8 | 17.9 | 9.52 | 10.4 | 6.54 | 8.80 | 19.1 |
| Silver (Ag)-Total | mg/L | 0.00025 | 0.000078 | 0.000018 | 0.000132 | 0.000825 | 0.000020 | 0.000044 | <0.000010 | 0.000050 | 0.000384 |
| Sodium (Na)-Total | mg/L | - | 2.82 | 2.30 | 2.94 | 3.45 | 2.98 | 2.13 | 4.24 | 3.04 | 3.02 |
| Strontium (Sr)-Total | mg/L | - | 0.325 | 0.235 | 0.192 | 0.320 | 0.120 | 0.0894 | 0.130 | 0.274 | 0.183 |
| Sulfur (S)-Total | mg/L | - | 57.7 | 34.6 | 42.2 | 31.200 | 9.490 | 17.9 | 21.100 | 52.7 | 28.4 |
| Thallium (Tl)-Total | mg/L | 0.0008 | 0.000037 | 0.000015 | 0.000068 | 0.000156 | 0.000018 | 0.000030 | <0.000010 | 0.000024 | 0.000140 |
| Tin (Sn)-Total | mg/L | - | <0.00010 | <0.00010 | <0.00010 | 0.00012 | <0.00010 | <0.00010 | 0.00017 | <0.00010 | 0.00011 |
| Titanium (Ti)-Total | mg/L | - | 0.0374 | 0.0345 | 0.155 | 0.142 | 0.0682 | 0.100 | 0.00138 | 0.0769 | 0.0925 |
| Uranium (U)-Total | mg/L | 0.015 | 0.00200 | 0.00215 | 0.00217 | 0.00285 | 0.000929 | 0.000476 | 0.000096 | 0.00148 | 0.00158 |
| Vanadium (V)-Total | mg/L | - | 0.00504 | 0.00419 | 0.0176 | 0.0245 | 0.00621 | 0.0115 | <0.00050 | 0.00835 | 0.0217 |
| Zinc (Zn)-Total | mg/L | 0.03 | 0.0154 | 0.0070 | 0.0343 | 0.0637 | 0.0101 | 0.0160 | <0.0030 | 0.0165 | 0.0587 |
| Zirconium (Zr)-Total | mg/L | - | 0.00119 | 0.00106 | 0.00134 | 0.00190 | 0.00121 | 0.00132 | 0.00067 | 0.00125 | 0.00216 |

## Table 3: Analytical Chemistry Data

| | | Site Type | Exposure Sites | | | | | | | | Groundwater Seepage Sites | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | Clinton Creek | | | Wolverine Creek | Clinton Creek | | Porcupine Creek | Forty Mile River | Snowshoe Pit | Waste Rock Seepage | | | | Abandoned Channel |
| | | Sample ID | E1 | E1(H) | E2 | E3 | E4 * | E7 * | E9 | E8 * | SL | GWCC-1 | GWCC-2 | GWCC-3 | GWCC-4 | GWCC-5 * |
| | | Date Sampled | 16/08/2016 | 20/08/2016 | 17/08/2016 | 16/08/2016 | 18/08/2016 | 18/08/2016 | - | 18/08/2016 | 20/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 17/08/2016 | 18/08/2016 |
| | | ALS Work Order | L1816106 | L1816799 | L1816106 | L1816106 | L1816799 | L1816799 | - | L1816799 | L1816799 | L1816106 | L1816106 | L1816106 | L1816106 | L1816799 |
| **Parameter** | Units | CCME-FAL [1, 2, 3, 4] | Good | Good | Good | Good | Good | Good | Dry | Good | Good | Good | Good | Good | Good | Good |
| **Total Metals** | | | | | | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | Varies [8] | 0.170 | 0.122 | 0.128 | 6.99 | 1.29 | 2.76 | - | 2.48 | 0.0319 | 0.107 | 0.0032 | <0.0030 | <0.0030 | <0.0030 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | *0.1000* | *0.10000* | *0.1000* | *0.100* | - | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* | *0.1000* |
| Antimony (Sb)-Total | mg/L | - | 0.00038 | 0.00040 | 0.00043 | 0.00098 | 0.00062 | 0.00096 | - | 0.00022 | 0.00293 | 0.00281 | 0.00207 | 0.00116 | 0.00104 | 0.00081 |
| Arsenic (As)-Total | mg/L | 0.005 | 0.00103 | 0.00098 | 0.00114 | 0.00718 | 0.00227 | 0.00472 | - | 0.00189 | 0.0152 | 0.00518 | 0.00331 | 0.00093 | 0.00108 | 0.00061 |
| Barium (Ba)-Total | mg/L | - | 0.0678 | 0.0681 | 0.0664 | 0.293 | 0.104 | 0.148 | - | 0.0801 | 0.0221 | 0.0279 | 0.0250 | 0.0225 | 0.0281 | 0.0491 |
| Beryllium (Be)-Total | mg/L | - | 0.000021 | 0.000020 | <0.000020 | 0.000266 | 0.000055 | 0.000121 | - | 0.000092 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| Bismuth (Bi)-Total | mg/L | - | <0.000050 | <0.000050 | <0.000050 | 0.000326 | <0.000050 | <0.000050 | - | <0.000050 | <0.000050 | <0.000050 | 0.000088 | <0.000050 | <0.000050 | <0.000050 |
| Boron (B)-Total | mg/L | 1.5 | <0.010 | <0.010 | 0.016 | 0.024 | 0.025 | 0.024 | - | <0.010 | 0.036 | 0.088 | 0.181 | 0.139 | 0.103 | 0.058 |
| Cadmium (Cd)-Total | mg/L | Varies [9] | 0.0000490 | 0.0000421 | 0.0000526 | 0.000796 | 0.000169 | 0.000251 | - | 0.0000638 | 0.0000309 | 0.0000585 | 0.000167 | 0.0000883 | 0.0000688 | 0.000113 |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.000326* | *0.000335* | *0.00037* | *0.000318* | *0.00037* | *0.00037* | - | *0.0001337* | *0.00037* | *0.00037* | *0.00037* | *0.00037* | *0.00037* | *0.00037* |
| Calcium (Ca)-Total | mg/L | - | 57.4 | 57.2 | 64.5 | 47.4 | 61.4 | 61.9 | - | 22.7 | 168 | 157 | 188 | 136 | 118 | 130 |
| Chromium (Cr)-Total | mg/L | - | 0.00154 | 0.00090 | 0.00117 | 0.0190 | 0.00500 | 0.0108 | - | 0.00461 | 0.00123 | 0.00131 | 0.00188 | 0.00121 | 0.00080 | 0.00074 |
| Trivalent Chromium (III)-Total | mg/L | 0.0089 | 0.00154 | - | 0.00117 | 0.0180 | 0.00500 | 0.0108 | - | 0.00461 | 0.00123 | <0.00073 | <0.00075 | <0.00072 | - | - |
| Hexavalent Chromium (VI)-Total | mg/L | 0.001 | <0.0010 | - | <0.0010 | 0.0010 | <0.0010 | <0.0010 | - | <0.0010 | <0.0010 | 0.0013 | 0.0022 | 0.0017 | - | - |
| Cobalt (Co)-Total | mg/L | - | 0.00056 | 0.00051 | 0.00060 | 0.00718 | 0.00175 | 0.00329 | - | 0.00197 | 0.00016 | 0.00015 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Copper (Cu)-Total | mg/L | Varies [10] | 0.00324 | 0.00314 | 0.00309 | 0.0252 | 0.00654 | 0.0113 | - | 0.00742 | 0.00202 | 0.00183 | 0.00155 | 0.00093 | 0.00100 | 0.00081 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | - | *0.02* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* | *0.004* |
| Iron (Fe)-Total | mg/L | 0.3 | 0.545 | 0.436 | 0.481 | 13.1 | 2.33 | 5.40 | - | 3.52 | 0.074 | 0.200 | <0.010 | <0.010 | <0.010 | 0.018 |
| Lead (Pb)-Total | mg/L | Varies [11] | 0.000254 | 0.000248 | 0.000211 | 0.00940 | 0.00135 | 0.00365 | - | 0.00134 | <0.000050 | 0.000090 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | - | *0.002452* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* | *0.007* |
| Lithium (Li)-Total | mg/L | - | 0.0025 | 0.0027 | 0.0042 | 0.0072 | 0.0064 | 0.0085 | - | 0.0040 | 0.0081 | 0.0244 | 0.0580 | 0.0230 | 0.0140 | 0.0102 |
| Magnesium (Mg)-Total | mg/L | - | 25.0 | 24.3 | 33.4 | 32.1 | 36.2 | 34.9 | - | 7.64 | 67.5 | 87.3 | 169 | 151 | 120 | 60.1 |
| Manganese (Mn)-Total | mg/L | - | 0.147 | 0.169 | 0.154 | 0.463 | 0.212 | 0.329 | - | 0.132 | 0.0134 | 0.00389 | 0.00027 | 0.00023 | 0.00036 | 0.00130 |
| Mercury (Hg)-Total | mg/L | 0.000026 | <0.000025 | <0.0000050 | <0.000025 | 0.000081 | 0.0000183 | <0.000050 | - | <0.000025 | 0.0000068 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.073 | 0.00119 | 0.00130 | 0.00135 | 0.00349 | 0.00173 | 0.00224 | - | 0.000439 | 0.00192 | 0.0155 | 0.00305 | 0.00287 | 0.00256 | 0.00210 |
| Nickel (Ni)-Total | mg/L | Varies [12] | 0.00599 | 0.00411 | 0.00813 | 0.0303 | 0.0154 | 0.0239 | - | 0.00670 | 0.0157 | 0.0308 | 0.0503 | 0.0376 | 0.0376 | 0.0195 |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | - | *0.08181* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* | *0.15* |
| Phosphorus (P)-Total | mg/L | - | <0.050 | <0.050 | <0.050 | 0.436 | 0.067 | 0.168 | - | 0.090 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Potassium (K)-Total | mg/L | - | 0.49 | 0.50 | 0.57 | 1.24 | 0.73 | 1.01 | - | 0.97 | 1.17 | 1.55 | 2.27 | 1.68 | 1.45 | 0.88 |
| Selenium (Se)-Total | mg/L | 0.001 | 0.00166 | 0.00174 | 0.00185 | 0.00275 | 0.00202 | 0.00231 | - | 0.000327 | 0.0137 | 0.0113 | 0.0102 | 0.00297 | 0.00189 | 0.0122 |
| Silicon (Si)-Total | mg/L | - | 5.16 | 5.10 | 5.05 | 16.3 | 6.81 | 9.95 | - | 10.1 | 5.07 | 6.52 | 6.27 | 5.02 | 5.29 | 4.46 |
| Silver (Ag)-Total | mg/L | 0.00025 | <0.000010 | <0.000010 | <0.000010 | 0.000295 | 0.000056 | 0.000125 | - | 0.000022 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| Sodium (Na)-Total | mg/L | - | 2.36 | 2.38 | 2.75 | 3.54 | 3.53 | 3.12 | - | 3.21 | 2.14 | 3.77 | 11.5 | 5.37 | 4.43 | 3.99 |
| Strontium (Sr)-Total | mg/L | - | 0.252 | 0.296 | 0.309 | 0.235 | 0.328 | 0.369 | - | 0.122 | 0.804 | 0.995 | 1.46 | 0.921 | 0.632 | 0.843 |
| Sulfur (S)-Total | mg/L | - | 46.2 | 45.3 | 61 | 44.4 | 58 | 53.6 | - | 10.6 | 174 | 191 | 319 | 252 | 194 | 112 |
| Thallium (Tl)-Total | mg/L | 0.0008 | <0.000010 | <0.000010 | 0.000016 | 0.000092 | 0.000027 | 0.000052 | - | 0.000022 | 0.000017 | 0.000050 | 0.000076 | 0.000087 | 0.000069 | 0.000014 |
| Tin (Sn)-Total | mg/L | - | <0.00010 | <0.00010 | <0.00010 | 0.00012 | <0.00010 | <0.00010 | - | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Titanium (Ti)-Total | mg/L | - | 0.00451 | 0.00292 | 0.00357 | 0.111 | 0.0322 | 0.0755 | - | 0.0879 | 0.00061 | 0.00585 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |
| Uranium (U)-Total | mg/L | 0.015 | 0.00153 | 0.00179 | 0.00166 | 0.00258 | 0.00183 | 0.00224 | - | 0.000974 | 0.00209 | 0.00264 | 0.00451 | 0.00287 | 0.00187 | 0.00322 |
| Vanadium (V)-Total | mg/L | - | 0.00121 | 0.00099 | 0.00098 | 0.0218 | 0.00454 | 0.00874 | - | 0.00779 | <0.00050 | 0.00081 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Zinc (Zn)-Total | mg/L | 0.03 | 0.0031 | <0.0030 | 0.0035 | 0.0575 | 0.0120 | 0.0227 | - | 0.0126 | 0.0030 | 0.0033 | 0.0053 | 0.0034 | <0.0030 | <0.0030 |
| Zirconium (Zr)-Total | mg/L | - | 0.00101 | 0.00114 | 0.00092 | 0.00227 | 0.00103 | 0.00128 | - | 0.00115 | <0.00030 | <0.00030 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |

## Table 4: Analytical Quality Assurance and Control

| | | Site Type | Duplicate Pairs | | | | | | Blanks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | E1 / DUP-1 | | | E1-(H) / DUP-2 | | | Field Blanks | Travel Blanks | |
| | | Sample ID | E1 | E1 (DUP-1) | RPD (%)[13] | E1(H) | E1(H) [DUP-2] | RPD (%)[13] | FB-1 (E1) | TRAVEL_BLANK | TRAVEL_BLANK |
| | | Date Sampled | 16/08/2016 | 16/08/2016 | | 20/08/2016 | 20/08/2016 | | 16/08/2016 | 17/08/2016 | 22/08/2016 |
| | | ALS Work Order | L1816106 | L1816106 | | L1816799 | L1816799 | | L1816106 | L1816106 | L1816799 |
| **Parameter** | Units | CCME-FAL[1, 2, 3, 4] | Good | Good | | Good | Good | | Good | - | - |
| **Physical Tests** | | | | | | | | | | | |
| Lab pH | pH units | 6.5-9.0[5] | 8.09 | 8.18 | 1.11 | 7.91 | 7.91 | 0.00 | 5.73 | 5.63 | 5.17 |
| Field pH | pH units | 6.5-9.0[5] | 8.88 | 8.88 | - | 7.89 | 7.89 | - | - | - | - |
| Field Temperature | C | - | 12.8 | 12.8 | - | 12.1 | 12.1 | - | - | - | - |
| Lab Conductivity | uS/cm | - | 473 | 475 | 0.42 | 434 | 442 | 1.83 | <2.0 | <2.0 | <2.0 |
| Field Conductivity | uS/cm | - | 338.3 | 338.3 | - | 332.3 | 332.3 | - | - | - | - |
| Field Specific Conductivity | uS/cm | - | 441.1 | 441.1 | - | 441 | 441 | - | - | - | - |
| Field Dissolved Oxygen | mg/L | 9.5[6] | 10.13 | 10.13 | - | 8.9 | 8.9 | - | - | - | - |
| Field Oxidation - Redox Potent | mV | - | -27.9 | -27.9 | - | 117.1 | 117.1 | - | - | - | - |
| Total Suspended Solids | mg/L | - | 4.9 | <2.0 | nc | 2.9 | <2.0 | nc | <2.0 | <2.0 | <2.0 |
| Total Hardness (as CaCO3) | mg/L | - | 238 | 238 | 0.00 | 246 | 250 | 1.61 | <0.50 | <0.50 | <0.50 |
| **Anions and Nutrients** | | | | | | | | | | | |
| Nitrate (as N) | mg/L | 13 | 0.122 | 0.118 | 3.33 | 0.111 | 0.113 | 1.79 | <0.0050 | <0.0050 | <0.0050 |
| Nitrite (as N) | mg/L | 0.06 | 0.0017 | <0.0010 | nc | <0.0010 | 0.0026 | nc | <0.0010 | <0.0010 | <0.0010 |
| Ammonia, Total (as N) | mg/L | Varies[7] | 0.0183 | 0.0170 | 7.37 | 0.0215 | 0.0206 | 4.28 | <0.0050 | <0.0050 | <0.0050 |
| *Ammonia CCME-FAL* | *mg/L* | - | - | *0.1276* | - | *1.139* | *1.139* | - | - | - | - |
| Sulfate (SO4) | mg/L | - | 130 | 130 | 0.00 | 130 | 130 | 0.00 | <0.30 | <0.30 | <0.30 |
| **Inorganic/Organic Carbon** | | | | | | | | | | | |
| Dissolved Organic Carbon | mg/L | - | 18.5 | 18.7 | 1.08 | 16.9 | 18.8 | 10.64 | <0.50 | - | - |
| **Asbestos** | | | | | | | | | | | |
| Total Asbestos | MFL | - | - | - | - | - | - | - | - | - | - |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum (Al)-Dissolved | mg/L | Varies[8] | 0.0546 | 0.0457 | 17.75 | 0.0556 | 0.0617 | 10.40 | <0.0010 | - | - |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | - | *0.1000* | *0.1000* | - | - | - | - |
| Antimony (Sb)-Dissolved | mg/L | - | 0.00032 | 0.00028 | 13.33 | 0.00040 | 0.00032 | nc | <0.00010 | - | - |
| Arsenic (As)-Dissolved | mg/L | 0.005 | 0.00083 | 0.00065 | ***24.32*** | 0.00083 | 0.00081 | 2.44 | <0.00010 | - | - |
| Barium (Ba)-Dissolved | mg/L | - | 0.0647 | 0.0544 | 17.30 | 0.0681 | 0.0694 | 1.89 | <0.000050 | - | - |
| Beryllium (Be)-Dissolved | mg/L | - | <0.000020 | <0.000020 | nc | <0.000020 | <0.000020 | nc | <0.000020 | - | - |
| Bismuth (Bi)-Dissolved | mg/L | - | <0.000050 | <0.000050 | nc | <0.000050 | <0.000050 | nc | <0.000050 | - | - |
| Boron (B)-Dissolved | mg/L | 1.5 | <0.010 | <0.010 | nc | <0.010 | <0.010 | nc | <0.010 | - | - |
| Cadmium (Cd)-Dissolved | mg/L | Varies[9] | 0.0000422 | 0.0000187 | nc | 0.0000320 | 0.0000437 | ***30.91*** | <0.0000050 | - | - |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.000326* | *0.000326* | - | *0.000335* | *0.000339* | - | - | - | - |
| Calcium (Ca)-Dissolved | mg/L | - | 55.4 | 55.7 | 0.54 | 58.2 | 59.2 | 1.70 | <0.050 | - | - |
| Chromium (Cr)-Dissolved | mg/L | - | 0.00066 | 0.00055 | 18.18 | 0.00064 | 0.00071 | 10.37 | <0.00010 | - | - |
| Trivalent Chromium (III)-Dissolved | mg/L | 0.0089 | - | - | - | - | - | - | - | - | - |
| Hexavalent Chromium (VI)-Dissolved | mg/L | 0.001 | - | - | - | - | - | - | - | - | - |
| Cobalt (Co)-Dissolved | mg/L | - | 0.00040 | 0.00034 | 16.22 | 0.00046 | 0.00050 | 8.33 | <0.00010 | - | - |
| Copper (Cu)-Dissolved | mg/L | Varies[10] | 0.00303 | 0.00248 | 19.96 | 0.00299 | 0.00318 | 6.16 | <0.00020 | - | - |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | - | *0.004* | *0.004* | - | - | - | - |
| Iron (Fe)-Dissolved | mg/L | 0.3 | 0.243 | 0.251 | 3.24 | 0.277 | 0.288 | 3.89 | <0.010 | - | - |
| Lead (Pb)-Dissolved | mg/L | Varies[11] | 0.000078 | 0.000068 | 13.70 | 0.000110 | 0.000107 | 2.76 | <0.000050 | - | - |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | - | *0.007* | *0.007* | - | - | - | - |
| Lithium (Li)-Dissolved | mg/L | - | 0.0024 | 0.0022 | 8.70 | 0.0029 | 0.0023 | nc | <0.0010 | - | - |
| Magnesium (Mg)-Dissolved | mg/L | - | 24.1 | 24.1 | 0.00 | 24.4 | 24.7 | 1.22 | <0.10 | - | - |
| Manganese (Mn)-Dissolved | mg/L | - | 0.135 | 0.110 | ***20.41*** | 0.164 | 0.170 | 3.59 | <0.00010 | - | - |
| Mercury (Hg)-Dissolved | mg/L | 0.000026 | <0.0000050 | <0.0000050 | nc | <0.0000050 | <0.0000050 | nc | <0.0000050 | - | - |
| Molybdenum (Mo)-Dissolved | mg/L | 0.073 | 0.00104 | 0.000858 | 19.18 | 0.00128 | 0.000958 | ***28.78*** | <0.000050 | - | - |
| Nickel (Ni)-Dissolved | mg/L | Varies[12] | 0.00445 | 0.00374 | 17.34 | 0.00391 | 0.00418 | 6.67 | <0.00050 | - | - |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | - | *0.15* | *0.15* | - | - | - | - |
| Phosphorus (P)-Dissolved | mg/L | - | <0.050 | <0.050 | nc | <0.050 | <0.050 | nc | <0.050 | - | - |
| Potassium (K)-Dissolved | mg/L | - | 0.43 | 0.44 | 2.30 | 0.47 | 0.46 | 2.15 | <0.10 | - | - |
| Selenium (Se)-Dissolved | mg/L | 0.001 | 0.00157 | 0.00152 | 3.24 | 0.00166 | 0.00170 | 2.38 | <0.000050 | - | - |
| Silicon (Si)-Dissolved | mg/L | - | 4.88 | 4.93 | 1.02 | 4.98 | 5.03 | 1.00 | <0.050 | - | - |
| Silver (Ag)-Dissolved | mg/L | 0.00025 | <0.000010 | <0.000010 | nc | <0.000010 | <0.000010 | nc | <0.000010 | - | - |
| Sodium (Na)-Dissolved | mg/L | - | 2.41 | 1.90 | ***23.67*** | 2.42 | 2.50 | 3.25 | <0.050 | - | - |
| Strontium (Sr)-Dissolved | mg/L | - | 0.251 | 0.215 | 15.45 | 0.314 | 0.238 | ***27.54*** | <0.00020 | - | - |
| Sulfur (S)-Dissolved | mg/L | - | 45.7 | 44.7 | 2.21 | 43.2 | 43.4 | 0.46 | <0.50 | - | - |
| Thallium (Tl)-Dissolved | mg/L | 0.0008 | <0.000010 | <0.000010 | nc | <0.000010 | <0.000010 | nc | <0.000010 | - | - |
| Tin (Sn)-Dissolved | mg/L | - | <0.00010 | <0.00010 | nc | <0.00010 | <0.00010 | nc | <0.00010 | - | - |
| Titanium (Ti)-Dissolved | mg/L | - | 0.00121 | 0.00101 | 18.02 | 0.00123 | 0.00134 | 8.56 | <0.00030 | - | - |
| Uranium (U)-Dissolved | mg/L | 0.015 | 0.00148 | 0.00128 | 14.49 | 0.00185 | 0.00140 | ***27.69*** | <0.000010 | - | - |
| Vanadium (V)-Dissolved | mg/L | - | 0.00058 | 0.00052 | 10.91 | 0.00059 | 0.00063 | 6.56 | <0.00050 | - | - |
| Zinc (Zn)-Dissolved | mg/L | 0.03 | 0.0030 | <0.0010 | nc | 0.0011 | 0.0011 | 0.00 | <0.0010 | - | - |
| Zirconium (Zr)-Dissolved | mg/L | - | 0.00094 | 0.00081 | 14.86 | 0.00121 | 0.00093 | nc | <0.00030 | - | - |

**Table 4: Analytical Quality Assurance and Control**

| | | Site Type | Duplicate Pairs | | | | | | Blanks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site Location | E1 / DUP-1 | | | E1-(H) / DUP-2 | | | Field Blanks | Travel Blanks | |
| | | Sample ID | E1 | E1 (DUP-1) | RPD (%)[13] | E1(H) | E1(H) [DUP-2] | RPD (%)[13] | FB-1 (E1) | TRAVEL_BLANK | TRAVEL_BLANK |
| | | Date Sampled | 16/08/2016 | 16/08/2016 | | 20/08/2016 | 20/08/2016 | | 16/08/2016 | 17/08/2016 | 22/08/2016 |
| | | ALS Work Order | L1816106 | L1816106 | | L1816799 | L1816799 | | L1816106 | L1816106 | L1816799 |
| **Parameter** | Units | CCME-FAL[1, 2, 3, 4] | Good | Good | | Good | Good | | Good | - | - |
| **Total Metals** | | | | | | | | | | | |
| Aluminum (Al)-Total | mg/L | Varies [8] | 0.170 | 0.145 | 15.87 | 0.122 | 0.119 | 2.49 | <0.0030 | <0.0030 | <0.0030 |
| *Aluminum CCME-FAL* | *mg/L* | - | *0.1000* | *0.1000* | - | *0.1000* | *0.1000* | - | - | - | - |
| Antimony (Sb)-Total | mg/L | - | 0.00038 | 0.00031 | nc | 0.00040 | 0.00035 | 13.33 | <0.00010 | <0.00010 | <0.00010 |
| Arsenic (As)-Total | mg/L | 0.005 | 0.00103 | 0.00090 | 13.47 | 0.00098 | 0.00095 | 3.11 | <0.00010 | <0.00010 | <0.00010 |
| Barium (Ba)-Total | mg/L | - | 0.0678 | 0.0607 | 11.05 | 0.0681 | 0.0659 | 3.28 | <0.000050 | **0.000051** | <0.000050 |
| Beryllium (Be)-Total | mg/L | - | 0.000021 | <0.000020 | nc | 0.000020 | <0.000020 | nc | <0.000020 | <0.000020 | <0.000020 |
| Bismuth (Bi)-Total | mg/L | - | <0.000050 | <0.000050 | nc | <0.000050 | <0.000050 | nc | <0.000050 | <0.000050 | <0.000050 |
| Boron (B)-Total | mg/L | 1.5 | <0.010 | <0.010 | nc | <0.010 | <0.010 | nc | <0.010 | <0.010 | <0.010 |
| Cadmium (Cd)-Total | mg/L | Varies [9] | 0.0000490 | 0.0000232 | nc | 0.0000421 | 0.0000429 | 1.88 | <0.0000050 | <0.0000050 | <0.0000050 |
| *Cadmium CCME-FAL* | *mg/L* | - | *0.000326* | *0.000326* | - | *0.000335* | *0.000339* | - | - | - | - |
| Calcium (Ca)-Total | mg/L | - | 57.4 | 56.9 | 0.87 | 57.2 | 57.1 | 0.17 | <0.050 | <0.050 | <0.050 |
| Chromium (Cr)-Total | mg/L | - | 0.00154 | 0.00112 | ***31.58*** | 0.00090 | 0.00088 | 2.25 | <0.00010 | <0.00010 | <0.00010 |
| Trivalent Chromium (III)-Total | mg/L | 0.0089 | 0.00154 | 0.00112 | ***31.58*** | - | - | nc | - | - | - |
| Hexavalent Chromium (VI)-Total | mg/L | 0.001 | <0.0010 | <0.0010 | nc | - | - | nc | - | - | - |
| Cobalt (Co)-Total | mg/L | - | 0.00056 | 0.00051 | 9.35 | 0.00051 | 0.00050 | 1.98 | <0.00010 | <0.00010 | <0.00010 |
| Copper (Cu)-Total | mg/L | Varies [10] | 0.00324 | 0.00297 | 8.70 | 0.00314 | 0.00327 | 4.06 | <0.00050 | <0.00050 | <0.00050 |
| *Copper CCME-FAL* | *mg/L* | - | *0.004* | *0.004* | - | *0.004* | *0.004* | - | - | - | - |
| Iron (Fe)-Total | mg/L | 0.3 | 0.545 | 0.524 | 3.93 | 0.436 | 0.439 | 0.69 | <0.010 | <0.010 | <0.010 |
| Lead (Pb)-Total | mg/L | Varies [11] | 0.000254 | 0.000213 | 17.56 | 0.000248 | 0.000236 | 4.96 | <0.000050 | <0.000050 | <0.000050 |
| *Lead CCME-FAL* | *mg/L* | - | *0.007* | *0.007* | - | *0.007* | *0.007* | - | - | - | - |
| Lithium (Li)-Total | mg/L | - | 0.0025 | 0.0022 | 12.77 | 0.0027 | 0.0026 | 3.77 | <0.0010 | <0.0010 | <0.0010 |
| Magnesium (Mg)-Total | mg/L | - | 25.0 | 24.9 | 0.40 | 24.3 | 24.3 | 0.00 | <0.10 | <0.10 | <0.10 |
| Manganese (Mn)-Total | mg/L | - | 0.147 | 0.128 | 13.82 | 0.169 | 0.163 | 3.61 | <0.00010 | <0.00010 | <0.00010 |
| Mercury (Hg)-Total | mg/L | 0.000026 | <0.000025 | 0.0000057 | nc | <0.0000050 | <0.000025 | nc | <0.0000050 | <0.0000050 | <0.0000050 |
| Molybdenum (Mo)-Total | mg/L | 0.073 | 0.00119 | 0.00100 | 17.35 | 0.00130 | 0.00114 | 13.11 | <0.000050 | <0.000050 | <0.000050 |
| Nickel (Ni)-Total | mg/L | Varies [12] | 0.00599 | 0.00469 | ***24.34*** | 0.00411 | 0.00410 | 0.24 | <0.00050 | <0.00050 | <0.00050 |
| *Nickel CCME-FAL* | *mg/L* | - | *0.15* | *0.15* | - | *0.15* | *0.15* | - | - | - | - |
| Phosphorus (P)-Total | mg/L | - | <0.050 | <0.050 | nc | <0.050 | <0.050 | nc | <0.050 | <0.050 | <0.050 |
| Potassium (K)-Total | mg/L | - | 0.49 | 0.48 | 2.06 | 0.50 | 0.47 | 6.19 | <0.10 | <0.10 | <0.10 |
| Selenium (Se)-Total | mg/L | 0.001 | 0.00166 | 0.00146 | 12.82 | 0.00174 | 0.00177 | 1.71 | <0.000050 | <0.000050 | <0.000050 |
| Silicon (Si)-Total | mg/L | - | 5.16 | 5.16 | 0.00 | 5.10 | 5.03 | 1.38 | <0.050 | <0.050 | <0.050 |
| Silver (Ag)-Total | mg/L | 0.00025 | <0.000010 | <0.000010 | nc | <0.000010 | <0.000010 | nc | <0.000010 | <0.000010 | <0.000010 |
| Sodium (Na)-Total | mg/L | - | 2.36 | 1.95 | 19.03 | 2.38 | 2.34 | 1.69 | <0.050 | <0.050 | <0.050 |
| Strontium (Sr)-Total | mg/L | - | 0.252 | 0.212 | 17.24 | 0.296 | 0.252 | 16.06 | <0.00020 | <0.00020 | <0.00020 |
| Sulfur (S)-Total | mg/L | - | 46.5 | 46.2 | 0.65 | 45.8 | 45.3 | 1.10 | <0.50 | <0.50 | <0.50 |
| Thallium (Tl)-Total | mg/L | 0.0008 | <0.000010 | 0.000013 | nc | <0.000010 | <0.000010 | nc | <0.000010 | <0.000010 | <0.000010 |
| Tin (Sn)-Total | mg/L | - | <0.00010 | <0.00010 | nc | <0.00010 | <0.00010 | nc | <0.00010 | <0.00010 | <0.00010 |
| Titanium (Ti)-Total | mg/L | - | 0.00451 | 0.00341 | ***27.78*** | 0.00292 | 0.00290 | 0.69 | <0.00030 | <0.00030 | <0.00030 |
| Uranium (U)-Total | mg/L | 0.015 | 0.00153 | 0.00127 | 18.57 | 0.00179 | 0.00148 | 18.96 | <0.000010 | <0.000010 | <0.000010 |
| Vanadium (V)-Total | mg/L | - | 0.00121 | 0.00114 | 5.96 | 0.00099 | 0.00102 | 2.99 | <0.00050 | <0.00050 | <0.00050 |
| Zinc (Zn)-Total | mg/L | 0.03 | 0.0031 | <0.0030 | nc | <0.0030 | <0.0030 | nc | <0.0030 | <0.0030 | <0.0030 |
| Zirconium (Zr)-Total | mg/L | - | 0.00101 | 0.00084 | 18.38 | 0.00114 | 0.00098 | 15.09 | <0.00030 | <0.00030 | <0.00030 |

## Notes

(1) CCME guideline exceedences shaded with dark grey. Light grey shading denotes reportable detection limit in exceedence of CCME Guideline. Where guideline value is dependent on hardness or pH, reported values have been compared against a guideline value calculated for each site based on the relevant value, and the guideline value has been noted as "varies".

(2) - = No standard or not analyzed

(3) CCME = Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, 1999, updated to July 2016

(4) CCME FAL = Chapter 4, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, updated to July 2016

(5) CCME FAL stipulates pH not < 6.5 and not > 9

(6) Guideline note: Lowest acceptable dissolved oxygen concentration for cold-water biota, early life stages

(7) Ammonia varies with pH and temperature for CCME FAL; see the CCME ammonia fact sheet for details regarding the applicable criteria, ammonia-NH3 versus total ammonia-N,and other usage guidelines. CCME values listed in the table are expressed as ammonia (N) When field pH is not available, lab pH is used. When field and lab pH are both not available, the most stringent guideline has been used.

(8) Aluminum varies with pH as follows for CCME FAL:

| | | |
|---|---|---|
| 0.005 | if | pH<6.5 |
| 0.1 | if | pH>=6.5 |

when field pH is not available, lab pH is used. When field and lab pH are both not available, the most stringent guideline has been used.

(9) Cadmium varies with Hardness in mg/L as follows for CCME FAL:

| | | |
|---|---|---|
| 0.00 | if | H<17 |
| 0.00004 - 0.00037 | if | H>=17 and H<=280 as follows; CWQG (µg/L) = 10{0.83(log[hardness]) – 2.46 } |
| 0.00 | if | H>280 |

(10) Copper varies with Hardness in mg/L as follows for CCME FAL:

| | | |
|---|---|---|
| 0.002 | if | H<82 |
| 0.002 - 0.004 | if | H>=82 and H<=180 as follows; CWQG (µg/L) = 0.2 * e{0.8545[ln(hardness)]-1.465} |
| 0.004 | if | H>180 |

(11) Lead varies with Hardness in mg/L as follows for CCME FAL:

| | | |
|---|---|---|
| 0.001 | if | H<60 |
| .001 - 0.00 | if | H>=60 and H<=180 as follows; CWQG (µg/L)= e{1.273[ln(hardness)]-4.705} |
| 0.007 | if | H>180 |

(12) Nickel varies with Hardness in mg/L as follows for CCME FAL:

| | | |
|---|---|---|
| 0.025 | if | H<60 |
| 025 - 0.15 | if | H>=60 and H<=180 as follows; CWQG (µg/L) = e{0.76[ln(hardness)]+1.06} |
| 0.15 | if | H>180 |

(13) RPD = Relative Percent Difference. The difference between a sample and its field duplicate over the average of two values. *nc* = not calculated. RPD is not calculated if either the sample or the field duplicate concentration is less than five times the detection limit.

*Italics* text indicates the parameter-specific standard (calculated) for a particular sample.

**Bold** and underlined indicates values above RDL in Field Blank of Travel Blank

***Bold*** and Italic Indicates QAQC values exceed expected results (i.e. RDP values exceed 20% ).

* Due to laboratory holding time constraints, samples for general chemistry analysis (i.e. lab pH, lab conductivity, nitrate, nitrite, and sulphate) were collected at a different time and date than the remainder of the sample set. Sample date/time for general chemistry data with this type of discrepancy are listed below:

R4 - August.20, 2016 at 14:30

R6 - August.20, 2016 at 15:05

E4 - August.20, 2016 at 14:25

E7 - August.20, 2016 at 14:45

E8 - August.20, 2016 at 14:50

GWCC5 - August.20, 2016 at 14:10

# APPENDIX 1

## Laboratory Certificates of Analysis

HEMMERA ENVIROCHEM INC.
ATTN: Natasha Sandys
230 - 2237 2nd Avenue
Whitehorse YK Y1A 0K7

Date Received: 19-AUG-16
Report Date: 20-SEP-16 17:51 (MT)
Version: FINAL REV. 2

Client Phone: 867-456-4865

# Certificate of Analysis

## Lab Work Order #: L1816106

Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.19
C of C Numbers:
Legal Site Desc:

Comments:

20-SEP-2016 This report replaces the previous version and contains additional analyses, as requested.

Brent Mack, B.Sc.
Account Manager

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-1 Water 16-AUG-16 17:10 E1 | L1816106-2 Water 17-AUG-16 14:20 E2 | L1816106-3 Water 16-AUG-16 16:10 E3 | L1816106-5 Water 16-AUG-16 14:10 R3 | L1816106-6 Water 17-AUG-16 09:40 R7 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 473 | 568 | 446 | 426 | 224 |
| | Hardness (as CaCO3) (mg/L) | 238 | 301 | 231 | 207 | 109 |
| | pH (pH) | 8.09 | 8.17 | 8.06 | 8.00 | 7.80 |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | 0.0183 | 0.0204 | 0.0705 | 0.0571 | 0.0931 |
| | Nitrate (as N) (mg/L) | 0.122 | 0.129 | 0.0891 | 0.0473 | 0.0977 |
| | Nitrite (as N) (mg/L) | 0.0017 | 0.0024 | 0.0024 | <0.0010 | <0.0010 |
| | Phosphorus (P)-Total (mg/L) | 0.0042 | 0.0047 | 0.503 | 0.331 | 0.135 |
| | Sulfate (SO4) (mg/L) | 130 | 171 | 128 | 122 | 51.2 |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | 18.5 | 17.2 | 19.3 | 20.2 | 32.6 |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 0.170 | 0.128 | 6.99 | 5.77 | 3.45 |
| | Antimony (Sb)-Total (mg/L) | 0.00038 | 0.00043 | 0.00098 | 0.00056 | 0.00037 |
| | Arsenic (As)-Total (mg/L) | 0.00103 | 0.00114 | 0.00718 | 0.00473 | 0.00348 |
| | Barium (Ba)-Total (mg/L) | 0.0678 | 0.0664 | 0.293 | 0.271 | 0.165 |
| | Beryllium (Be)-Total (mg/L) | 0.000021 | <0.000020 | 0.000266 | 0.000204 | 0.000121 |
| | Bismuth (Bi)-Total (mg/L) | <0.000050 | <0.000050 | 0.000326 | 0.000058 | <0.000050 |
| | Boron (B)-Total (mg/L) | <0.010 | 0.016 | 0.024 | <0.010 | <0.010 |
| | Cadmium (Cd)-Total (mg/L) | 0.0000490 | 0.0000526 | 0.000796 | 0.000251 | 0.000120 |
| | Calcium (Ca)-Total (mg/L) | 57.4 | 64.5 | 47.4 | 45.2 | 25.6 |
| | Chromium (Cr)-Total (mg/L) | 0.00154 | 0.00117 | 0.0190 | 0.0108 | 0.00756 |
| | Cobalt (Co)-Total (mg/L) | 0.00056 | 0.00060 | 0.00718 | 0.00448 | 0.00314 |
| | Copper (Cu)-Total (mg/L) | 0.00324 | 0.00309 | 0.0252 | 0.0160 | 0.0111 |
| | Iron (Fe)-Total (mg/L) | 0.545 | 0.481 | 13.1 | 10.2 | 5.75 |
| | Lead (Pb)-Total (mg/L) | 0.000254 | 0.000211 | 0.00940 | 0.00487 | 0.00213 |
| | Lithium (Li)-Total (mg/L) | 0.0025 | 0.0042 | 0.0072 | 0.0058 | 0.0025 |
| | Magnesium (Mg)-Total (mg/L) | 25.0 | 33.4 | 32.1 | 28.8 | 13.4 |
| | Manganese (Mn)-Total (mg/L) | 0.147 | 0.154 | 0.463 | 0.304 | 0.362 |
| | Mercury (Hg)-Total (mg/L) | <0.000025 DLM | <0.000025 DLM | 0.000081 | 0.000042 | <0.000050 DLM |
| | Molybdenum (Mo)-Total (mg/L) | 0.00119 | 0.00135 | 0.00349 | 0.00181 | 0.000888 |
| | Nickel (Ni)-Total (mg/L) | 0.00599 | 0.00813 | 0.0303 | 0.0161 | 0.0103 |
| | Phosphorus (P)-Total (mg/L) | <0.050 | <0.050 | 0.436 | 0.363 | 0.152 |
| | Potassium (K)-Total (mg/L) | 0.49 | 0.57 | 1.24 | 1.07 | 0.45 |
| | Selenium (Se)-Total (mg/L) | 0.00166 | 0.00185 | 0.00275 | 0.00148 | 0.000941 |
| | Silicon (Si)-Total (mg/L) | 5.16 | 5.05 | 16.3 | 15.8 | 10.4 |
| | Silver (Ag)-Total (mg/L) | <0.000010 | <0.000010 | 0.000295 | 0.000132 | 0.000044 |
| | Sodium (Na)-Total (mg/L) | 2.36 | 2.75 | 3.54 | 2.94 | 2.13 |
| | Strontium (Sr)-Total (mg/L) | 0.252 | 0.309 | 0.235 | 0.192 | 0.0894 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-7 Water 16-AUG-16 12:30 R11 | L1816106-8 Water 17-AUG-16 13:30 GWCC-1 | L1816106-9 Water 17-AUG-16 13:10 GWCC-2 | L1816106-10 Water 17-AUG-16 12:50 GWCC-3 | L1816106-11 Water 17-AUG-16 12:25 GWCC-4 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 309 | 1300 | 1900 | 1610 | 1360 |
| | Hardness (as CaCO3) (mg/L) | 142 | 758 | 1180 | 1000 | 810 |
| | pH (pH) | 7.78 | 8.11 | 8.15 | 7.63 | 8.01 |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | 0.115 | 0.0073 | <0.0050 | <0.0050 | <0.0050 |
| | Nitrate (as N) (mg/L) | 0.0583 | 0.174 DLDS | 0.351 DLDS | 0.343 DLDS | 0.242 DLDS |
| | Nitrite (as N) (mg/L) | <0.0010 | <0.0020 | <0.0050 | <0.0050 | <0.0020 |
| | Phosphorus (P)-Total (mg/L) | 0.583 | 0.0024 | 0.012 | <0.0020 | <0.0020 |
| | Sulfate (SO4) (mg/L) | 84.9 | 549 | 916 | 760 | 562 |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | 20.5 | 9.83 | 7.92 | 7.86 | 8.43 |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 7.66 | 0.107 | 0.0032 | <0.0030 | <0.0030 |
| | Antimony (Sb)-Total (mg/L) | 0.00097 | 0.00281 | 0.00207 | 0.00116 | 0.00104 |
| | Arsenic (As)-Total (mg/L) | 0.00670 | 0.00518 | 0.00331 | 0.00093 | 0.00108 |
| | Barium (Ba)-Total (mg/L) | 0.270 | 0.0279 | 0.0250 | 0.0225 | 0.0281 |
| | Beryllium (Be)-Total (mg/L) | 0.000282 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| | Bismuth (Bi)-Total (mg/L) | 0.000206 | <0.000050 | 0.000088 | <0.000050 | <0.000050 |
| | Boron (B)-Total (mg/L) | <0.010 | 0.088 | 0.181 | 0.139 | 0.103 |
| | Cadmium (Cd)-Total (mg/L) | 0.000450 | 0.0000585 | 0.000167 | 0.0000883 | 0.0000688 |
| | Calcium (Ca)-Total (mg/L) | 37.7 | 157 | 188 | 136 | 118 |
| | Chromium (Cr)-Total (mg/L) | 0.0173 | 0.00131 | 0.00188 | 0.00121 | 0.00080 |
| | Cobalt (Co)-Total (mg/L) | 0.00657 | 0.00015 | <0.00010 | <0.00010 | <0.00010 |
| | Copper (Cu)-Total (mg/L) | 0.0235 | 0.00183 | 0.00155 | 0.00093 | 0.00100 |
| | Iron (Fe)-Total (mg/L) | 15.6 | 0.200 | <0.010 | <0.010 | <0.010 |
| | Lead (Pb)-Total (mg/L) | 0.0112 | 0.000090 | <0.000050 | <0.000050 | <0.000050 |
| | Lithium (Li)-Total (mg/L) | 0.0073 | 0.0244 | 0.0580 | 0.0230 | 0.0140 |
| | Magnesium (Mg)-Total (mg/L) | 17.1 | 87.3 | 169 | 151 | 120 |
| | Manganese (Mn)-Total (mg/L) | 0.407 | 0.00389 | 0.00027 | 0.00023 | 0.00036 |
| | Mercury (Hg)-Total (mg/L) | 0.000164 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| | Molybdenum (Mo)-Total (mg/L) | 0.00424 | 0.0155 | 0.00305 | 0.00287 | 0.00256 |
| | Nickel (Ni)-Total (mg/L) | 0.0223 | 0.0308 | 0.0503 | 0.0376 | 0.0376 |
| | Phosphorus (P)-Total (mg/L) | 0.335 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Potassium (K)-Total (mg/L) | 1.49 | 1.55 | 2.27 | 1.68 | 1.45 |
| | Selenium (Se)-Total (mg/L) | 0.00282 | 0.0113 | 0.0102 | 0.00297 | 0.00189 |
| | Silicon (Si)-Total (mg/L) | 19.1 | 6.52 | 6.27 | 5.02 | 5.29 |
| | Silver (Ag)-Total (mg/L) | 0.000384 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| | Sodium (Na)-Total (mg/L) | 3.02 | 3.77 | 11.5 | 5.37 | 4.43 |
| | Strontium (Sr)-Total (mg/L) | 0.183 | 0.995 | 1.46 | 0.921 | 0.632 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1816106-12 | L1816106-13 | L1816106-14 | | |
|---|---|---|---|---|---|
| Description | Water | Water | Water | | |
| Sampled Date | 16-AUG-16 | 16-AUG-16 | | | |
| Sampled Time | 17:10 | 17:10 | | | |
| Client ID | FB-1 | DUP-1 | TRAVEL BLANK | | |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Physical Tests** Conductivity (uS/cm) | <2.0 | 475 | <2.0 | | |
| Hardness (as CaCO3) (mg/L) | <0.50 | 238 | <0.50 HTC | | |
| pH (pH) | 5.73 | 8.18 | 5.63 | | |
| **Anions and Nutrients** Ammonia, Total (as N) (mg/L) | <0.0050 | 0.0170 | <0.0050 | | |
| Nitrate (as N) (mg/L) | <0.0050 | 0.118 | <0.0050 | | |
| Nitrite (as N) (mg/L) | <0.0010 | <0.0010 | <0.0010 | | |
| Phosphorus (P)-Total (mg/L) | <0.0020 | 0.0044 | <0.0020 | | |
| Sulfate (SO4) (mg/L) | <0.30 | 130 | <0.30 | | |
| **Organic / Inorganic Carbon** Dissolved Organic Carbon (mg/L) | <0.50 | 18.7 | | | |
| **Total Metals** Aluminum (Al)-Total (mg/L) | <0.0030 | 0.145 | <0.0030 | | |
| Antimony (Sb)-Total (mg/L) | <0.00010 | 0.00031 | <0.00010 | | |
| Arsenic (As)-Total (mg/L) | <0.00010 | 0.00090 | <0.00010 | | |
| Barium (Ba)-Total (mg/L) | <0.000050 | 0.0607 | 0.000051 RRV | | |
| Beryllium (Be)-Total (mg/L) | <0.000020 | <0.000020 | <0.000020 | | |
| Bismuth (Bi)-Total (mg/L) | <0.000050 | <0.000050 | <0.000050 | | |
| Boron (B)-Total (mg/L) | <0.010 | <0.010 | <0.010 | | |
| Cadmium (Cd)-Total (mg/L) | <0.0000050 | 0.0000232 | <0.0000050 | | |
| Calcium (Ca)-Total (mg/L) | <0.050 | 56.9 | <0.050 | | |
| Chromium (Cr)-Total (mg/L) | <0.00010 | 0.00112 | <0.00010 | | |
| Cobalt (Co)-Total (mg/L) | <0.00010 | 0.00051 | <0.00010 | | |
| Copper (Cu)-Total (mg/L) | <0.00050 | 0.00297 | <0.00050 | | |
| Iron (Fe)-Total (mg/L) | <0.010 | 0.524 | <0.010 | | |
| Lead (Pb)-Total (mg/L) | <0.000050 | 0.000213 | <0.000050 | | |
| Lithium (Li)-Total (mg/L) | <0.0010 | 0.0022 | <0.0010 | | |
| Magnesium (Mg)-Total (mg/L) | <0.10 | 24.9 | <0.10 | | |
| Manganese (Mn)-Total (mg/L) | <0.00010 | 0.128 | <0.00010 | | |
| Mercury (Hg)-Total (mg/L) | <0.0000050 | 0.0000057 | <0.0000050 | | |
| Molybdenum (Mo)-Total (mg/L) | <0.000050 | 0.00100 | <0.000050 | | |
| Nickel (Ni)-Total (mg/L) | <0.00050 | 0.00469 | <0.00050 | | |
| Phosphorus (P)-Total (mg/L) | <0.050 | <0.050 | <0.050 | | |
| Potassium (K)-Total (mg/L) | <0.10 | 0.48 | <0.10 | | |
| Selenium (Se)-Total (mg/L) | <0.000050 | 0.00146 | <0.000050 | | |
| Silicon (Si)-Total (mg/L) | <0.050 | 5.16 | <0.050 | | |
| Silver (Ag)-Total (mg/L) | <0.000010 | <0.000010 | <0.000010 | | |
| Sodium (Na)-Total (mg/L) | <0.050 | 1.95 | <0.050 | | |
| Strontium (Sr)-Total (mg/L) | <0.00020 | 0.212 | <0.00020 | | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-1 Water 16-AUG-16 17:10 E1 | L1816106-2 Water 17-AUG-16 14:20 E2 | L1816106-3 Water 16-AUG-16 16:10 E3 | L1816106-5 Water 16-AUG-16 14:10 R3 | L1816106-6 Water 17-AUG-16 09:40 R7 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Total Metals** | Sulfur (S)-Total (mg/L) | 46.5 | 61.0 | 44.4 | 42.2 | 17.9 |
| | Thallium (Tl)-Total (mg/L) | <0.000010 | 0.000016 | 0.000092 | 0.000068 | 0.000030 |
| | Tin (Sn)-Total (mg/L) | <0.00010 | <0.00010 | 0.00012 | <0.00010 | <0.00010 |
| | Titanium (Ti)-Total (mg/L) | 0.00451 | 0.00357 | 0.111 | 0.155 | 0.100 |
| | Uranium (U)-Total (mg/L) | 0.00153 | 0.00166 | 0.00258 | 0.00217 | 0.000476 |
| | Vanadium (V)-Total (mg/L) | 0.00121 | 0.00098 | 0.0218 | 0.0176 | 0.0115 |
| | Zinc (Zn)-Total (mg/L) | 0.0031 | 0.0035 | 0.0575 | 0.0343 | 0.0160 |
| | Zirconium (Zr)-Total (mg/L) | 0.00101 | 0.00092 | 0.00227 | 0.00134 | 0.00132 |
| **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) | 0.0546 | 0.0469 | 0.0601 | 0.0639 | 0.168 |
| | Antimony (Sb)-Dissolved (mg/L) | 0.00032 | 0.00040 | 0.00043 | 0.00021 | 0.00022 |
| | Arsenic (As)-Dissolved (mg/L) | 0.00083 | 0.00099 | 0.00097 | 0.00076 | 0.00139 |
| | Barium (Ba)-Dissolved (mg/L) | 0.0647 | 0.0641 | 0.0640 | 0.0642 | 0.0775 |
| | Beryllium (Be)-Dissolved (mg/L) | <0.000020 | <0.000020 | <0.000020 | <0.000020 | 0.000035 |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| | Boron (B)-Dissolved (mg/L) | <0.010 | 0.016 | 0.023 | <0.010 | <0.010 |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.0000422 | 0.0000472 | 0.0000206 | 0.0000148 | 0.0000247 |
| | Calcium (Ca)-Dissolved (mg/L) | 55.4 | 63.5 | 42.9 | 40.9 | 23.7 |
| | Chromium (Cr)-Dissolved (mg/L) | 0.00066 | 0.00055 | 0.00107 | 0.00084 | 0.00137 |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00040 | 0.00045 | 0.00056 | 0.00044 | 0.00094 |
| | Copper (Cu)-Dissolved (mg/L) | 0.00303 | 0.00287 | 0.00256 | 0.00257 | 0.00480 |
| | Iron (Fe)-Dissolved (mg/L) | 0.243 | 0.254 | 0.350 | 0.361 | 1.15 |
| | Lead (Pb)-Dissolved (mg/L) | 0.000078 | 0.000071 | 0.000124 | 0.000070 | 0.000089 |
| | Lithium (Li)-Dissolved (mg/L) | 0.0024 | 0.0045 | 0.0015 | 0.0017 | <0.0010 |
| | Magnesium (Mg)-Dissolved (mg/L) | 24.1 | 34.5 | 30.1 | 25.5 | 12.1 |
| | Manganese (Mn)-Dissolved (mg/L) | 0.135 | 0.137 | 0.147 | 0.131 | 0.269 |
| | Mercury (Hg)-Dissolved (mg/L) | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.00104 | 0.00116 | 0.00122 | 0.000980 | 0.000692 |
| | Nickel (Ni)-Dissolved (mg/L) | 0.00445 | 0.00758 | 0.00492 | 0.00394 | 0.00456 |
| | Phosphorus (P)-Dissolved (mg/L) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Potassium (K)-Dissolved (mg/L) | 0.43 | 0.54 | 0.45 | 0.36 | 0.18 |
| | Selenium (Se)-Dissolved (mg/L) | 0.00157 | 0.00194 | 0.00148 | 0.000958 | 0.000798 |
| | Silicon (Si)-Dissolved (mg/L) | 4.88 | 4.91 | 5.96 | 6.04 | 5.35 |
| | Silver (Ag)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| | Sodium (Na)-Dissolved (mg/L) | 2.41 | 2.74 | 3.30 | 2.97 | 1.82 |
| | Strontium (Sr)-Dissolved (mg/L) | 0.251 | 0.312 | 0.203 | 0.190 | 0.0808 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-7 Water 16-AUG-16 12:30 R11 | L1816106-8 Water 17-AUG-16 13:30 GWCC-1 | L1816106-9 Water 17-AUG-16 13:10 GWCC-2 | L1816106-10 Water 17-AUG-16 12:50 GWCC-3 | L1816106-11 Water 17-AUG-16 12:25 GWCC-4 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Total Metals** | Sulfur (S)-Total (mg/L) | 28.4 | 191 | 319 | 252 | 194 |
| | Thallium (Tl)-Total (mg/L) | 0.000140 | 0.000050 | 0.000076 | 0.000087 | 0.000069 |
| | Tin (Sn)-Total (mg/L) | 0.00011 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| | Titanium (Ti)-Total (mg/L) | 0.0925 | 0.00585 | <0.00030 | <0.00030 | <0.00030 |
| | Uranium (U)-Total (mg/L) | 0.00158 | 0.00264 | 0.00451 | 0.00287 | 0.00187 |
| | Vanadium (V)-Total (mg/L) | 0.0217 | 0.00081 | <0.00050 | <0.00050 | <0.00050 |
| | Zinc (Zn)-Total (mg/L) | 0.0587 | 0.0033 | 0.0053 | 0.0034 | <0.0030 |
| | Zirconium (Zr)-Total (mg/L) | 0.00216 | <0.00030 | <0.00030 | <0.00030 | <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) | 0.0728 | 0.0025 | 0.0023 | 0.0016 | 0.0017 |
| | Antimony (Sb)-Dissolved (mg/L) | 0.00023 | 0.00269 | 0.00207 | 0.00115 | 0.00098 |
| | Arsenic (As)-Dissolved (mg/L) | 0.00073 | 0.00472 | 0.00323 | 0.00106 | 0.00104 |
| | Barium (Ba)-Dissolved (mg/L) | 0.0507 | 0.0178 | 0.0245 | 0.0256 | 0.0288 |
| | Beryllium (Be)-Dissolved (mg/L) | <0.000020 | <0.000020 | <0.000020 | <0.000020 | <0.000020 |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| | Boron (B)-Dissolved (mg/L) | <0.010 | 0.083 | 0.166 | 0.120 | 0.093 |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.0000216 | 0.0000398 | 0.000168 | 0.000131 DTC | 0.0000807 |
| | Calcium (Ca)-Dissolved (mg/L) | 34.6 | 152 | 186 | 136 | 118 |
| | Chromium (Cr)-Dissolved (mg/L) | 0.00089 | 0.00070 | 0.00161 | 0.00130 | 0.00075 |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00063 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| | Copper (Cu)-Dissolved (mg/L) | 0.00252 | 0.00149 | 0.00151 | 0.00104 | 0.00097 |
| | Iron (Fe)-Dissolved (mg/L) | 0.433 | <0.010 | <0.010 | <0.010 | <0.010 |
| | Lead (Pb)-Dissolved (mg/L) | 0.000175 | <0.000050 | <0.000050 | <0.000050 | <0.000050 |
| | Lithium (Li)-Dissolved (mg/L) | <0.0010 | 0.0239 | 0.0551 | 0.0220 | 0.0140 |
| | Magnesium (Mg)-Dissolved (mg/L) | 13.5 | 91.7 | 174 | 160 | 125 |
| | Manganese (Mn)-Dissolved (mg/L) | 0.163 | 0.00052 | 0.00027 | 0.00019 | 0.00032 |
| | Mercury (Hg)-Dissolved (mg/L) | 0.0000055 | <0.0000050 | <0.0000050 | <0.0000050 | <0.0000050 |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.00132 | 0.00198 | 0.00223 | 0.00271 | 0.00224 |
| | Nickel (Ni)-Dissolved (mg/L) | 0.00283 | 0.0281 | 0.0488 | 0.0438 | 0.0383 |
| | Phosphorus (P)-Dissolved (mg/L) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Potassium (K)-Dissolved (mg/L) | 0.31 | 1.49 | 2.25 | 1.72 | 1.45 |
| | Selenium (Se)-Dissolved (mg/L) | 0.00179 | 0.0114 | 0.0103 | 0.00349 | 0.00206 |
| | Silicon (Si)-Dissolved (mg/L) | 5.82 | 6.26 | 6.29 | 5.12 | 5.29 |
| | Silver (Ag)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| | Sodium (Na)-Dissolved (mg/L) | 2.83 | 3.66 | 11.0 | 6.51 | 4.53 |
| | Strontium (Sr)-Dissolved (mg/L) | 0.153 | 0.953 | 1.44 | 0.917 | 0.597 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-12 Water 16-AUG-16 17:10 FB-1 | L1816106-13 Water 16-AUG-16 17:10 DUP-1 | L1816106-14 Water TRAVEL BLANK | | |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Total Metals** | Sulfur (S)-Total (mg/L) | <0.50 | 46.2 | <0.50 | | |
| | Thallium (Tl)-Total (mg/L) | <0.000010 | 0.000013 | <0.000010 | | |
| | Tin (Sn)-Total (mg/L) | <0.00010 | <0.00010 | <0.00010 | | |
| | Titanium (Ti)-Total (mg/L) | <0.00030 | 0.00341 | <0.00030 | | |
| | Uranium (U)-Total (mg/L) | <0.000010 | 0.00127 | <0.000010 | | |
| | Vanadium (V)-Total (mg/L) | <0.00050 | 0.00114 | <0.00050 | | |
| | Zinc (Zn)-Total (mg/L) | <0.0030 | <0.0030 | <0.0030 | | |
| | Zirconium (Zr)-Total (mg/L) | <0.00030 | 0.00084 | <0.00030 | | |
| **Dissolved Metals** | Dissolved Mercury Filtration Location | FIELD | FIELD | | | |
| | Dissolved Metals Filtration Location | FIELD | FIELD | | | |
| | Aluminum (Al)-Dissolved (mg/L) | <0.0010 | 0.0457 | | | |
| | Antimony (Sb)-Dissolved (mg/L) | <0.00010 | 0.00028 | | | |
| | Arsenic (As)-Dissolved (mg/L) | <0.00010 | 0.00065 | | | |
| | Barium (Ba)-Dissolved (mg/L) | <0.000050 | 0.0544 | | | |
| | Beryllium (Be)-Dissolved (mg/L) | <0.000020 | <0.000020 | | | |
| | Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | <0.000050 | | | |
| | Boron (B)-Dissolved (mg/L) | <0.010 | <0.010 | | | |
| | Cadmium (Cd)-Dissolved (mg/L) | <0.0000050 | 0.0000187 | | | |
| | Calcium (Ca)-Dissolved (mg/L) | <0.050 | 55.7 | | | |
| | Chromium (Cr)-Dissolved (mg/L) | <0.00010 | 0.00055 | | | |
| | Cobalt (Co)-Dissolved (mg/L) | <0.00010 | 0.00034 | | | |
| | Copper (Cu)-Dissolved (mg/L) | <0.00020 | 0.00248 | | | |
| | Iron (Fe)-Dissolved (mg/L) | <0.010 | 0.251 | | | |
| | Lead (Pb)-Dissolved (mg/L) | <0.000050 | 0.000068 | | | |
| | Lithium (Li)-Dissolved (mg/L) | <0.0010 | 0.0022 | | | |
| | Magnesium (Mg)-Dissolved (mg/L) | <0.10 | 24.1 | | | |
| | Manganese (Mn)-Dissolved (mg/L) | <0.00010 | 0.110 | | | |
| | Mercury (Hg)-Dissolved (mg/L) | <0.0000050 | <0.0000050 | | | |
| | Molybdenum (Mo)-Dissolved (mg/L) | <0.000050 | 0.000858 | | | |
| | Nickel (Ni)-Dissolved (mg/L) | <0.00050 | 0.00374 | | | |
| | Phosphorus (P)-Dissolved (mg/L) | <0.050 | <0.050 | | | |
| | Potassium (K)-Dissolved (mg/L) | <0.10 | 0.44 | | | |
| | Selenium (Se)-Dissolved (mg/L) | <0.000050 | 0.00152 | | | |
| | Silicon (Si)-Dissolved (mg/L) | <0.050 | 4.93 | | | |
| | Silver (Ag)-Dissolved (mg/L) | <0.000010 | <0.000010 | | | |
| | Sodium (Na)-Dissolved (mg/L) | <0.050 | 1.90 | | | |
| | Strontium (Sr)-Dissolved (mg/L) | <0.00020 | 0.215 | | | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816106-1 Water 16-AUG-16 17:10 E1 | L1816106-2 Water 17-AUG-16 14:20 E2 | L1816106-3 Water 16-AUG-16 16:10 E3 | L1816106-5 Water 16-AUG-16 14:10 R3 | L1816106-6 Water 17-AUG-16 09:40 R7 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Dissolved Metals** | Sulfur (S)-Dissolved (mg/L) | 45.7 | 59.6 | 45.0 | 42.3 | 17.6 |
| | Thallium (Tl)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | <0.000010 | <0.000010 |
| | Tin (Sn)-Dissolved (mg/L) | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| | Titanium (Ti)-Dissolved (mg/L) | 0.00121 | 0.00099 | 0.00194 | 0.00124 | 0.00331 |
| | Uranium (U)-Dissolved (mg/L) | 0.00148 | 0.00160 | 0.00142 | 0.00153 | 0.000239 |
| | Vanadium (V)-Dissolved (mg/L) | 0.00058 | 0.00050 | 0.00088 | 0.00083 | 0.00141 |
| | Zinc (Zn)-Dissolved (mg/L) | 0.0030 | <0.0010 | 0.0011 | 0.0015 | <0.0010 |
| | Zirconium (Zr)-Dissolved (mg/L) | 0.00094 | 0.00087 | 0.00100 | 0.00083 | 0.00147 |
| **Speciated Metals** | Chromium (III)-Dissolved (mg/L) | | | 0.00107 | | 0.00137 |
| | Chromium (III)-Total (mg/L) | 0.00154 | 0.00117 | 0.0180 | 0.0108 | 0.00756 |
| | Hexavalent Chromium (mg/L) | <0.0010 | <0.0010 | 0.0010 | <0.0010 | <0.0010 |
| | Hexavalent Chromium-Dissolved (mg/L) | | | <0.0010 | | <0.0010 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1816106-7 | L1816106-8 | L1816106-9 | L1816106-10 | L1816106-11 |
|---|---|---|---|---|---|
| Description | Water | Water | Water | Water | Water |
| Sampled Date | 16-AUG-16 | 17-AUG-16 | 17-AUG-16 | 17-AUG-16 | 17-AUG-16 |
| Sampled Time | 12:30 | 13:30 | 13:10 | 12:50 | 12:25 |
| Client ID | R11 | GWCC-1 | GWCC-2 | GWCC-3 | GWCC-4 |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Dissolved Metals** | | | | | |
| Sulfur (S)-Dissolved (mg/L) | 29.2 | 186 | 302 | 249 | 190 |
| Thallium (Tl)-Dissolved (mg/L) | <0.000010 | 0.000047 | 0.000075 | 0.000080 | 0.000061 |
| Tin (Sn)-Dissolved (mg/L) | <0.00010 | <0.00010 | <0.00010 | <0.00010 | <0.00010 |
| Titanium (Ti)-Dissolved (mg/L) | 0.00247 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |
| Uranium (U)-Dissolved (mg/L) | 0.000581 | 0.00250 | 0.00432 | 0.00275 | 0.00172 |
| Vanadium (V)-Dissolved (mg/L) | 0.00067 | <0.00050 | <0.00050 | <0.00050 | <0.00050 |
| Zinc (Zn)-Dissolved (mg/L) | 0.0011 | 0.0025 | 0.0043 | 0.0036 | 0.0035 |
| Zirconium (Zr)-Dissolved (mg/L) | 0.00139 | <0.00030 | <0.00030 | <0.00030 | <0.00030 |
| **Speciated Metals** | | | | | |
| Chromium (III)-Dissolved (mg/L) | | | <0.00043 | <0.00042 | |
| Chromium (III)-Total (mg/L) | 0.0159 | <0.00073 | <0.00075 | <0.00072 | |
| Hexavalent Chromium (mg/L) | 0.0014 | 0.0013 | 0.0022 | 0.0017 | |
| Hexavalent Chromium-Dissolved (mg/L) | | | 0.0020 | 0.0020 | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1816106-12 | L1816106-13 | L1816106-14 | | |
|---|---|---|---|---|---|---|
| | Description | Water | Water | Water | | |
| | Sampled Date | 16-AUG-16 | 16-AUG-16 | | | |
| | Sampled Time | 17:10 | 17:10 | | | |
| | Client ID | FB-1 | DUP-1 | TRAVEL BLANK | | |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Sulfur (S)-Dissolved (mg/L) | <0.50 | 44.7 | | | |
| | Thallium (Tl)-Dissolved (mg/L) | <0.000010 | <0.000010 | | | |
| | Tin (Sn)-Dissolved (mg/L) | <0.00010 | <0.00010 | | | |
| | Titanium (Ti)-Dissolved (mg/L) | <0.00030 | 0.00101 | | | |
| | Uranium (U)-Dissolved (mg/L) | <0.000010 | 0.00128 | | | |
| | Vanadium (V)-Dissolved (mg/L) | <0.00050 | 0.00052 | | | |
| | Zinc (Zn)-Dissolved (mg/L) | <0.0010 | <0.0010 | | | |
| | Zirconium (Zr)-Dissolved (mg/L) | <0.00030 | 0.00081 | | | |
| **Speciated Metals** | Chromium (III)-Dissolved (mg/L) | | | | | |
| | Chromium (III)-Total (mg/L) | | 0.00112 | | | |
| | Hexavalent Chromium (mg/L) | | <0.0010 | | | |
| | Hexavalent Chromium-Dissolved (mg/L) | | | | | |

* 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 | Molybdenum (Mo)-Total | MB-LOR | L1816106-1, -2, -3, -5, -6, -7, -8 |
| Matrix Spike | Dissolved Organic Carbon | MS-B | L1816106-1, -13, -2, -3, -5, -6, -7 |
| Matrix Spike | Barium (Ba)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Barium (Ba)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Boron (B)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Nickel (Ni)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Sodium (Na)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Sodium (Na)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Calcium (Ca)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Calcium (Ca)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Iron (Fe)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Magnesium (Mg)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Magnesium (Mg)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Silicon (Si)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Silicon (Si)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Silicon (Si)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Boron (B)-Total | MS-B | L1816106-1, -2, -3, -5, -6, -7, -8 |
| Matrix Spike | Sodium (Na)-Total | MS-B | L1816106-1, -2, -3, -5, -6, -7, -8 |
| Matrix Spike | Sulfur (S)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |
| Matrix Spike | Sulfur (S)-Dissolved | MS-B | L1816106-1, -10, -11, -12, -13, -2, -3, -5, -6, -7, -8, -9 |

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLDS | Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity. |
| DLM | Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity). |
| DTC | Dissolved concentration exceeds total. Results were confirmed by re-analysis. |
| HTC | Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable). |
| 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. |
| RRV | Reported Result Verified By Repeat Analysis |

## Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|---|---|---|
| **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.

| | | | |
|---|---|---|---|
| **CARBONS-DOC-VA** | Water | Dissolved organic carbon by combustion | APHA 5310B TOTAL ORGANIC CARBON (TOC) |

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

| | | | |
|---|---|---|---|
| **CR-CR3-DIS-CALC-ED** | Water | Dissolved Trivalent Chromium in Water | CALCULATION |

Chromium (III)-Dissolved is calculated as the difference between the dissolved chromium and the dissolved hexavalent chromium (Cr(VI)) results.

| | | | |
|---|---|---|---|
| **CR-CR3-TOT-CALC-ED** | Water | Total Trivalent Chromium in Water | CALCULATION |

Chromium (III)-Total is calculated as the difference between the total chromium and the hexavalent chromium (Cr(VI)) results.

# Reference Information

**CR-CR6-ED** Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

**CR6-D-IC-ED** Water Chromium, Dissolved Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on a field-filtered, field-preserved sample.

**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.

**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 um), 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.

**MET-D-CCMS-VA** Water Dissolved Metals 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.

**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 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)

# Reference Information

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

**P-T-PRES-COL-VA** Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

**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.

** 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 |
|---|---|
| ED | ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA |
| WR | ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA |
| VA | ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA |

**Chain of Custody Numbers:**

# Reference Information

**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.*

Contact: Brent Mack
Company: ALS Environmental
Address: 8081 Lougheed HWY, Suite 100
Burnaby, BC V5A1W9

**REFERENCE DATA**

Project / Location: L1816106
PO Number: L1816106
ALS Work Order: 1608964

TEM Water Narrative: Analysis performed on FEI Tecnai TEM with integrated EDXA capabilities. Morphology, EDXA, and SAED measurements used to determine fiber species. Representative EDXA spectra of each asbestos type detected included. Compliance samples must be received and filtered within 48 hours of collection. Collection is performed outside ALS and is the responsibility of the client. Samples disposed after 60 days. TEM grids archived 3 years. Results apply only to portions analyzed.

TEM Water Methods: "EPA 100.2" refers to drinking water samples filtered on 47mm, 0.22µm pore MCE filters. "EPA 100.1" refers to drinking water samples filtered on 47mm, 0.1µm pore Polycarbonate filters. No standard method for asbestos in nonpotable water exists. All TEM waters (potable and nonpotable) analyzed at >10,000x magnification for asbestos fibers >10µm long. Whenever possible, sufficient volume is analyzed to yield an AS of <0.20 MFL based on the detection of 1 confirmed asbestos fiber in the total area analyzed. However, the volume analyzed is dependent upon a filter loading of <25% particulate. Samples containing excessive suspended solids may not reach the recommended AS of <0.20 MFL. In any case, a minimum of 4 and a maximum of 10 openings are analyzed regardless of the AS reached or asbestos concentration detected. ALS will report results directly to state of origin only when;

a) the Chain of Custody clearly states "drinking water for state compliance",
b) the appropriate state drinking water form is submitted with the samples,
c) the state form is completely filled out by the client prior to submittal, and
d) the address to which the form is to be sent is provided.

NOTES: *NA=Not Applicable, ND=None Detected, AS=Analytical Sensitivity, MFL=Millions of Fibers per Liter. † Act-Tremolite concentrations include Actinolite as well as the Libby Amphiboles; Tremolite, Winchite, & Richterite.*

*OH Lab ID: #4077, Ohio Analysts; P. Johnson #2268, A. Sohn #3431*
*PA Lab ID: #68-01320, Cert. #003*
*NELAC accredited through New York ELAP, LAB #11371*

**TEM ANALYSIS DATA**

EDXA Resolution (eV): <175
Accelerating Voltage (keV): 100
Prep Start Date: 8/29/2016
Calibration Constant (µm/cm): 0.74
Camera Constant (mm-Å): 129.25
Analysis Start Date: 8/31/2016

Pamela Johnson
Pamela Johnson
ALS TEM Analyst

Shawn Smythe
Shawn Smythe
ALS Project Manager

## IDENTIFICATION

| | | |
|---|---|---|
| Client Sample ID: | L1816106-2 E2 | L1816106-5 R3 |
| ALS Sample ID: | 1608964-02 | 1608964-04 |
| Method: | EPA 100.2 | EPA 100.2 |
| Date of Collection: | 8/17/2016 | 8/16/2016 |
| Time of Collection: | 14:20 | 14:10 |

## FILTRATION & ANALYSIS

| | | |
|---|---|---|
| Date of Filtration: | 8/29/2016 | 8/29/2016 |
| Time of Filtration: | 1:05 | 1:05 |
| Volume Filtered (L): | 0.015 | 0.002 |
| Openings Analyzed: | 4 | 10 |
| Avg. Opening Area ($mm^2$): | 0.0108 | 0.0108 |
| AS (MFL): | 1.66 | 4.98 |

## ASBESTOS COUNT

| | | |
|---|---|---|
| Chrysotile: | 14 | 0 |
| Amosite: | 0 | 0 |
| Crocidolite: | 0 | 0 |
| Act-Tremolite†: | 0 | 0 |
| Anthophyllite: | 0 | 0 |
| Total Asbestos: | 14 | 0 |

## ASBESTOS CONCENTRATION (MFL)

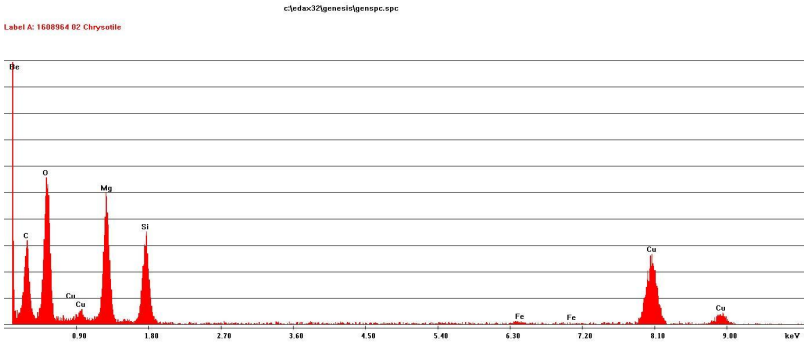
| | | |
|---|---|---|
| Chrysotile: | 23.23 | <AS |
| Amosite: | <AS | <AS |
| Crocidolite: | <AS | <AS |
| Act-Tremolite†: | <AS | <AS |
| Anthophyllite: | <AS | <AS |
| **Total Asbestos:** | **23.23** | **<AS** |

## NOTES

Samples L1816106-2 E2 and L1816106-5 R3; Excessive suspended solids prevented filtration of sufficient volume required to attain the recommended method AS of <0.20 MFL.

## EDXA SPECTRA

*NOTE: Spurious peaks may originate from low background sample holder, column pole pieces, TEM grids, prep solutions or matrix materials.*



01-Sep-2016

Brent Mack
ALS Environmental
8081 Lougheed HWY
Suite 100
Burnaby, BC V5A1W9

Tel: (604) 253-4188
Fax:

Re: L1816106 Work Order: **1608964**

Dear Brent,

ALS Environmental received 13 samples on 26-Aug-2016 for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 19.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Shawn Smythe

Electronically approved by: Shawn Smythe

Shawn Smythe
Project Manager

# ALS Environmental

Date: 01-Sep-16

**Client:** ALS Environmental
**Project:** L1816106
**Work Order:** **1608964**

## Work Order Sample Summary

| Lab Samp ID | Client Sample ID | Matrix | Tag Number | Collection Date | Date Received | Hold |
|---|---|---|---|---|---|---|
| 1608964-01 | L1816106-1 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-02 | L1816106-2 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-03 | L1816106-3 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-04 | L1816106-5 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-05 | L1816106-6 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-06 | L1816106-7 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-07 | L1816106-8 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-08 | L1816106-9 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-09 | L1816106-10 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-10 | L1816106-11 | Water | | 8/17/2016 | 8/26/2016 | ☐ |
| 1608964-11 | L1816106-12 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-12 | L1816106-13 | Water | | 8/16/2016 | 8/26/2016 | ☐ |
| 1608964-13 | L1816106-14 | Water | | 8/16/2016 | 8/26/2016 | ☐ |

## ALS Environmental

*Date: 01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106
**Work Order:** 1608964

# Case Narrative

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Results relate only to the items tested and are not blank corrected unless indicated.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-1 **Lab ID:** 1608964-01
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **4.9** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-2 **Lab ID:** 1608964-02
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **4.1** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-3 **Lab ID:** 1608964-03
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **600** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-5 **Lab ID:** 1608964-04
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **440** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-6 **Lab ID:** 1608964-05
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **230** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-7 **Lab ID:** 1608964-06
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **1,100** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-8 **Lab ID:** 1608964-07
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **4.8** | H | **2.0** | **mg/L** | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-9 **Lab ID:** 1608964-08
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-10 **Lab ID:** 1608964-09
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-11 **Lab ID:** 1608964-10
**Collection Date:** 8/17/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-12 **Lab ID:** 1608964-11
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-13 **Lab ID:** 1608964-12
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

# ALS Environmental

**Date:** *01-Sep-16*

**Client:** ALS Environmental
**Project:** L1816106 **Work Order:** 1608964
**Sample ID:** L1816106-14 **Lab ID:** 1608964-13
**Collection Date:** 8/16/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | H | 2.0 | mg/L | 1 | 8/30/2016 |

**Note:**

ALS Environmental

Date: 01-Sep-16

**Client:** ALS Environmental

# QC BATCH REPORT

**Work Order:** 1608964

**Project:** L1816106

Batch ID: **R132428** Instrument ID: **WETCHEM** Method: **E160.2**

**MBLK** Sample ID: **MB-R132428-R132428** Units: **mg/L** Analysis Date: **8/30/2016**

Client ID: Run ID: **WETCHEM_160830C** SeqNo: **1346893** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | | | | | | | | |

**LCS** Sample ID: **LCS-R132428-R132428** Units: **mg/L** Analysis Date: **8/30/2016**

Client ID: Run ID: **WETCHEM_160830C** SeqNo: **1346894** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | 905.2 | 2.0 | 1000 | 0 | 90.5 | 70-130 | 0 | | | |

**DUP** Sample ID: **1608964-10A Dup** Units: **mg/L** Analysis Date: **8/30/2016**

Client ID: **L1816106-11** Run ID: **WETCHEM_160830C** SeqNo: **1346906** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | 0 | 0 | 0 | | 0.93 | 0 | | H |

**DUP** Sample ID: **1608964-13A Dup** Units: **mg/L** Analysis Date: **8/30/2016**

Client ID: **L1816106-14** Run ID: **WETCHEM_160830C** SeqNo: **1346910** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | 0 | 0 | 0 | | 1.12 | 0 | | H |

**The following samples were analyzed in this batch:**

| | | |
|---|---|---|
| 1608964-01A | 1608964-02A | 1608964-03A |
| 1608964-04A | 1608964-05A | 1608964-06A |
| 1608964-07A | 1608964-08A | 1608964-09A |
| 1608964-10A | 1608964-11A | 1608964-12A |
| 1608964-13A | | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

# ALS Environmental

Date: 01-Sep-16

**Client:** ALS Environmental
**Project:** L1816106
**WorkOrder:** **1608964**

## QUALIFIERS, ACRONYMS, UNITS

| Qualifier | Description |
|---|---|
| * | Value exceeds Regulatory Limit |
| a | Not accredited |
| B | Analyte detected in the associated Method Blank above the Reporting Limit |
| E | Value above quantitation range |
| H | Analyzed outside of Holding Time |
| J | Analyte detected below quantitation limit |
| n | Not offered for accreditation |
| ND | Not Detected at the Reporting Limit |
| O | Sample amount is > 4 times amount spiked |
| P | Dual Column results percent difference > 40% |
| R | RPD above laboratory control limit |
| S | Spike Recovery outside laboratory control limits |
| U | Analyzed but not detected above the MDL |

| Acronym | Description |
|---|---|
| DUP | Method Duplicate |
| E | EPA Method |
| LCS | Laboratory Control Sample |
| LCSD | Laboratory Control Sample Duplicate |
| MBLK | Method Blank |
| MDL | Method Detection Limit |
| MQL | Method Quantitation Limit |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| PDS | Post Digestion Spike |
| PQL | Practical Quantitaion Limit |
| SDL | Sample Detection Limit |
| SW | SW-846 Method |

| Units Reported | Description |
|---|---|
| % | |
| mg/L | |

ALS Environmental

## Sample Receipt Checklist

Client Name: **ALS-VANCOUVER** Date/Time Received: **26-Aug-16 00:00**

Work Order: **1608964** Received by: **RDN**

Checklist completed by: Chris Gibson 29-Aug-16 Reviewed by: Shawn Smythe 29-Aug-16

eSignature | Date | eSignature | Date

Matrices:

Carrier name: FedEx

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shipping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | |
| Temperature(s)/Thermometer(s): | 5.8 | | |
| Cooler(s)/Kit(s): | | | |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted by: | - | | |

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

Contact: Brent Mack
Company: ALS Environmental
Address: 8081 Lougheed HWY, Suite 100
Burnaby, BC V5A1W9

## REFERENCE DATA

Project / Location: L1816106
PO Number: L1816106
ALS Work Order: 1608811

TEM Water Narrative: Analysis performed on FEI Tecnai TEM with integrated EDXA capabilities. Morphology, EDXA, and SAED measurements used to determine fiber species. Representative EDXA spectra of each asbestos type detected included. Compliance samples must be received and filtered within 48 hours of collection. Collection is performed outside ALS and is the responsibility of the client. Samples disposed after 60 days. TEM grids archived 3 years. Results apply only to portions analyzed.

TEM Water Methods: "EPA 100.2" refers to drinking water samples filtered on 47mm, 0.22µm pore MCE filters. "EPA 100.1" refers to drinking water samples filtered on 47mm, 0.1µm pore Polycarbonate filters. No standard method for asbestos in nonpotable water exists. All TEM waters (potable and nonpotable) analyzed at >10,000x magnification for asbestos fibers >10µm long. Whenever possible, sufficient volume is analyzed to yield an AS of <0.20 MFL based on the detection of 1 confirmed asbestos fiber in the total area analyzed. However, the volume analyzed is dependent upon a filter loading of <25% particulate. Samples containing excessive suspended solids may not reach the recommended AS of <0.20 MFL. In any case, a minimum of 4 and a maximum of 10 openings are analyzed regardless of the AS reached or asbestos concentration detected. ALS will report results directly to state of origin only when;

a) the Chain of Custody clearly states "drinking water for state compliance",
b) the appropriate state drinking water form is submitted with the samples,
c) the state form is completely filled out by the client prior to submittal, and
d) the address to which the form is to be sent is provided.

NOTES: *NA=Not Applicable, ND=None Detected, AS=Analytical Sensitivity, MFL=Millions of Fibers per Liter. † Act-Tremolite concentrations include Actinolite as well as the Libby Amphiboles; Tremolite, Winchite, & Richterite.*

*OH Lab ID: #4077, Ohio Analysts; P. Johnson #2268, A. Sohn #3431*
*PA Lab ID: #68-01320, Cert. #003*
*NELAC accredited through New York ELAP, LAB #11371*

## TEM ANALYSIS DATA

EDXA Resolution (eV): <175
Accelerating Voltage (keV): 100
Prep Start Date: 8/24/2016
Calibration Constant (µm/cm): 0.74
Camera Constant (mm-Å): 129.25
Analysis Start Date: 8/26/2016

Pamela Johnson
Pamela Johnson
ALS TEM Analyst

Shawn Smythe
Shawn Smythe
ALS Project Manager

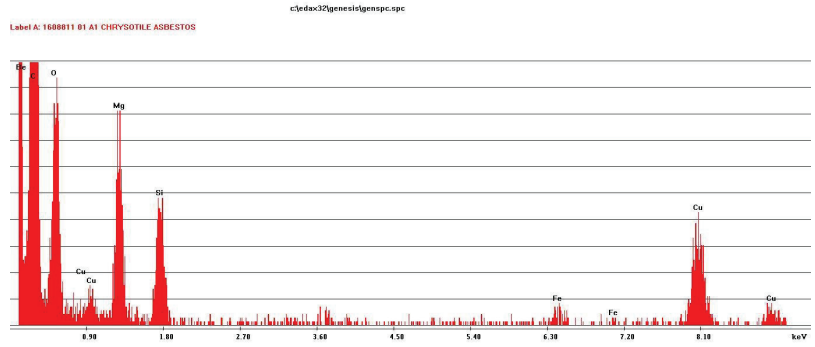
| IDENTIFICATION | | | |
|---|---|---|---|
| Client Sample ID: | L1816106-2 E2 | L1816106-4 E3 | L1816106-5 R3 |
| ALS Sample ID: | 1608811-01 | 1608811-02 | 1608811-03 |
| Method: | EPA 100.2 | EPA 100.2 | EPA 100.2 |
| Date of Collection: | 8/17/2016 | 8/17/2016 | 8/16/2016 |
| Time of Collection: | Not Provided | Not Provided | Not Provided |
| **FILTRATION & ANALYSIS** | | | |
| Date of Filtration: | 8/23/2016 | 8/23/2016 | 8/23/2016 |
| Time of Filtration: | 16:35 | 16:35 | 16:35 |
| Volume Filtered (L): | 0.015 | 0.001 | 0.001 |
| Openings Analyzed: | 4 | 4 | 10 |
| Avg. Opening Area ($mm^2$): | 0.0108 | 0.0108 | 0.0108 |
| AS (MFL): | 1.66 | 24.88 | 9.95 |
| **ASBESTOS COUNT** | | | |
| Chrysotile: | 49 | 15 | 0 |
| Amosite: | 0 | 0 | 0 |
| Crocidolite: | 0 | 0 | 0 |
| Act-Tremolite†: | 0 | 0 | 0 |
| Anthophyllite: | 0 | 0 | 0 |
| Total Asbestos: | 49 | 15 | 0 |
| **ASBESTOS CONCENTRATION (MFL)** | | | |
| Chrysotile: | 81.29 | 373.26 | <AS |
| Amosite: | <AS | <AS | <AS |
| Crocidolite: | <AS | <AS | <AS |
| Act-Tremolite†: | <AS | <AS | <AS |
| Anthophyllite: | <AS | <AS | <AS |
| **Total Asbestos:** | **81.29** | **373.26** | **<AS** |

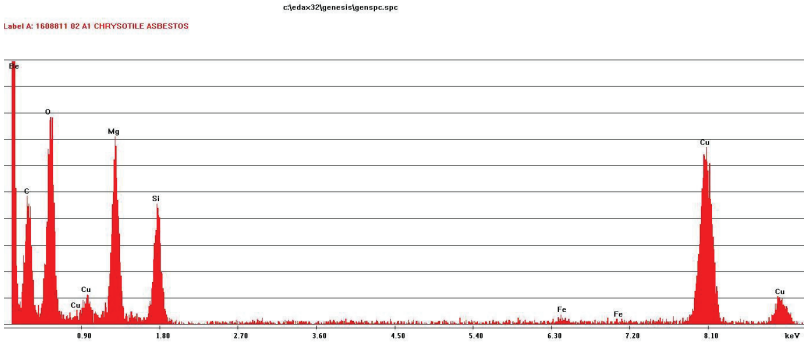
**NOTES**

All samples contained excessive suspended solids prohibiting filtration of sufficient sample to reach the recommended method AS of <0.20 MFL.
Analysis of samples L1816106-2 E2 and L1816106-4 E2 was terminated with the completion of the minimum 4 openings due to heavy concentrations of asbestos.
Analysis of sample L1816106-5 R3 was terminated with the completion of the maximum 10 openings.

## EDXA SPECTRA

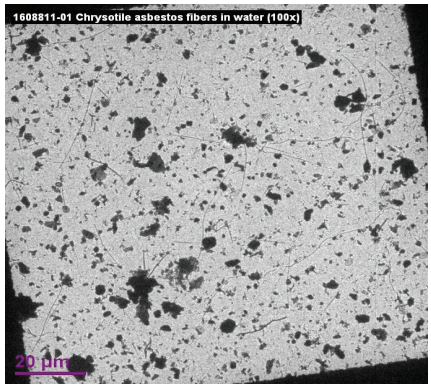
*NOTE: Spurious peaks may originate from low background sample holder, column pole pieces, TEM grids, prep solutions or matrix materials.*

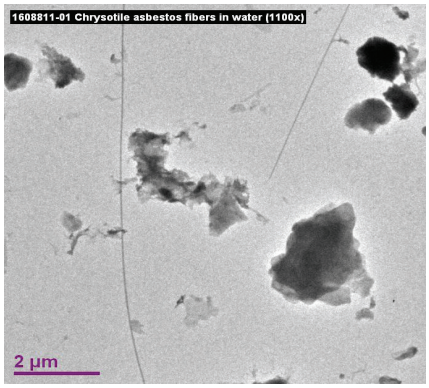


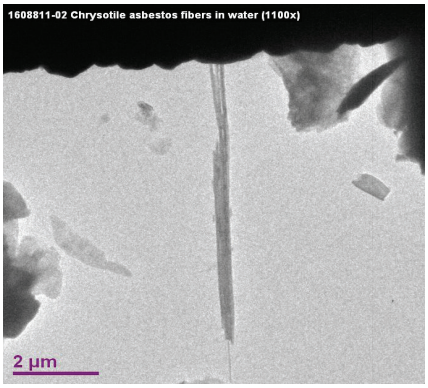

## PHOTOMICROGRAPHS

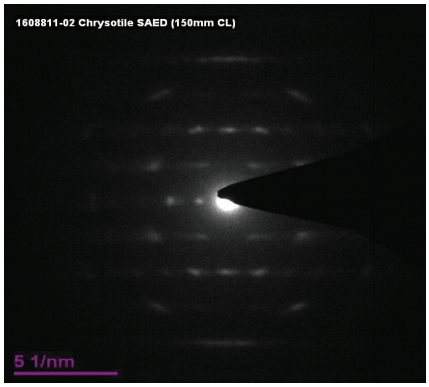
*Collected using Gatan Digital Micrograph.*





ALS Environmental

www.alsglobal.com

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1816106-COFC

COC Number: 1

Page 1 of 2

| Report To | | Report Format / Distribution | | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: | | R |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report | ☑ Yes ☐ No | P |
| Address: | 230 - 2237 2nd Avenue Whitehorse, YT | Select Distribution: | | E |
| | | | | E2 |
| Phone: | 867-456-4865 | Email 1 or Fax | nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 | chris@elr.ca | |

| Invoice To | | Invoice Distribution | |
|---|---|---|---|
| | Same as Report To ☑ Yes ☐ No | Select Invoice Distribution: | |
| | Copy of Invoice with Report ☐ Yes ☑ No | Email 1 or Fax | nsandys@hemmera.com |
| Company: | Hemmera Environchem Inc. | Email 2 | chris@elr.ca |
| Contact: | Natasha Sandys | | |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |
| ALS Lab Work Order # (lab use only) | | ALS Contact: | Sampler: AN/CH |

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

| ALS Sample # (lab use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | F/P Low Level Diss. Met (incl. Hg) and Hardness | P Low Level Tot. Met (incl. Hg) and Hardness | P Chromium Speciation (III/VI) - Total | F/P Chromium Speciation (III/VI) - Dissolved | P Ammonia - N | F/P Dissolved Organic Carbon (DOC) | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E1 | 16-Aug-16 | 17:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | E2 | 17-Aug-16 | 14:20 | Water | R | R | | | R | R | R | R | R | R | R | R | R | 11 |
| | E3 | 16-Aug-16 | 16:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | E3 | 17-Aug-16 | 8:10 | Water | | | | | | | | | | | | R | | 1 |
| | R3 | 16-Aug-16 | 14:10 | Water | R | R | | | R | R | R | R | R | R | R | R | R | 11 |
| | R7 | 17-Aug-16 | 9:40 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | R11 | 16-Aug-16 | 12:30 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | GWCC-1 | 17-Aug-16 | 13:30 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | GWCC-2 | 17-Aug-16 | 13:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | GWCC-3 | 17-Aug-16 | 12:50 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | GWCC-4 | 17-Aug-16 | 12:25 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | FB-1 | 16-Aug-16 | 17:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |

**Short Holding Time**

*Rush Processing*

| Drinking Water (DW) Samples[1] (client use) | Special Instructions / Specify Criteria to add on report (client use) |
|---|---|
| Are samples taken from a Regulated DW System? ☐ Yes ☑ No | Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results. |
| Are samples for human drinking water use? ☐ Yes ☑ No | |

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| | | | 1°C | 1.8°C | 0.5°C |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | | FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: | Time: | Received by: | Date: | Time: |
| | Aug 19, 2016 | 09:45 | Shayan | Aug-19 | 940 | Shayan | Aug. 20 | 1150 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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

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

8, 7, 6, 6, 5

ALS Environmental

www.alsglobal.com

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1816106-COFC

COC Number: 1

Page 2 of 2

| Report To | | Report Format / Distribution | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL) | R ☑ Regular (Standard TAT if received by 3 pm - business days) |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report ☑ Yes ☐ No | P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT |
| Address: | 230 - 2237 2nd Avenue<br>Whitehorse, YT | ☐ Criteria on Report - provide details below if box checked<br>Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX | E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT<br>E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge |
| Phone: | 867-456-4865 | Email 1 or Fax nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 chris@elr.ca | |

| Invoice To | Same as Report To ☑ Yes ☐ No | Invoice Distribution | Analysis Request |
|---|---|---|---|
| | Copy of Invoice with Report ☐ Yes ☑ No | Select Invoice Distribution: ☑ EMAIL ☑ MAIL ☐ FAX | Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below |
| Company: | Hemmera Environchem Inc. | Email 1 or Fax nsandys@hemmera.com | |
| Contact: | Natasha Sandys | Email 2 chris@elr.ca | |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |

**ALS Lab Work Order # (lab use only):** | **ALS Contact:** | **Sampler:** AN/CH

| 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 | Low Level Diss. Met (incl. Hg) and Hardness | Low Level Tot. Met (incl. Hg) and Hardness | Chromium Speciation (III/VI) - Total | Chromium Speciation (III/VI) - Dissolved | Ammonia - N | Dissolved Organic Carbon (DOC) | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | F/P | P | P | F/P | P | F/P | | | | | | | | |
| | Dup-1 | 16-Aug-16 | 17:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | Travel Blank | | | Water | | R | | | R | R | R | R | R | R | R | | R | 7 |
| | | | | | | | | | | | | | | | | | | |
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Short Holding Time

• Rush Processing

| Drinking Water (DW) Samples[1] (client use) | Special Instructions / Specify Criteria to add on report (client Use) |
|---|---|
| Are samples taken from a Regulated DW System? ☐ Yes ☑ No | Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results. |
| Are samples for human drinking water use? ☐ Yes ☑ No | |

**SAMPLE CONDITION AS RECEIVED (lab use only)**

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice packs Yes ☐ No ☐ | Custody seal Intact Yes ☐ No ☐

Cooling Initiated ☐

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| | | | 1°C | 1.8°C | 0.5°C |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | | FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: | Time: | Received by: | Date: | Time: |
| | Aug 19, 2016 | 09:45 | Shayan | Aug. 19 | 940 | Shayan | Aug. 20 | 1150 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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NAFT-03256a v09 Front/04 January 2014

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

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

8, 7, 6, 6, 5

HEMMERA ENVIROCHEM INC.
ATTN: Natasha Sandys
230 - 2237 2nd Avenue
Whitehorse YK Y1A 0K7

Date Received: 22-AUG-16
Report Date: 20-SEP-16 17:55 (MT)
Version: FINAL REV. 2

Client Phone: 867-456-4865

# Certificate of Analysis

## Lab Work Order #: L1816799

Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.19
C of C Numbers: 1, 2
Legal Site Desc:

Comments:

20-SEP-2016 This report replaces the previous version and contains additional analyses, as requested.

Brent Mack, B.Sc.
Account Manager

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-1 Water 18-AUG-16 15:10 E4 | L1816799-2 Water 20-AUG-16 14:25 E4 | L1816799-3 Water 18-AUG-16 13:15 E8 | L1816799-4 Water 20-AUG-16 14:50 E8 | L1816799-5 Water 18-AUG-16 13:55 R4 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 307 | 561 | 81.5 | 192 | 207 |
| | Hardness (as CaCO3) (mg/L) | | | | | |
| | pH (pH) | | 7.88 | | 7.78 | |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | 0.0306 | | 0.0146 | | 0.0829 |
| | Nitrate (as N) (mg/L) | | 0.116 | | 0.0939 | |
| | Nitrite (as N) (mg/L) | | <0.0010 | | <0.0010 | |
| | Phosphorus (P)-Total (mg/L) | 0.0183 | | 0.0181 | | 0.538 |
| | Sulfate (SO4) (mg/L) | | 176 | | 36.4 | |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | 17.7 | | 22.2 | | 18.4 |
| | Total Organic Carbon (mg/L) | | | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 1.29 | | 2.48 | | 8.01 |
| | Antimony (Sb)-Total (mg/L) | 0.00062 | | 0.00022 | | 0.00162 |
| | Arsenic (As)-Total (mg/L) | 0.00227 | | 0.00189 | | 0.0119 |
| | Barium (Ba)-Total (mg/L) | 0.104 | | 0.0801 | | 0.385 |
| | Beryllium (Be)-Total (mg/L) | 0.000055 | | 0.000092 | | 0.000323 |
| | Bismuth (Bi)-Total (mg/L) | <0.000050 | | <0.000050 | | 0.000128 |
| | Boron (B)-Total (mg/L) | 0.025 | | <0.010 | | <0.010 |
| | Cadmium (Cd)-Total (mg/L) | 0.000169 | | 0.0000638 | | 0.00143 |
| | Calcium (Ca)-Total (mg/L) | 61.4 | | 22.7 | | 63.0 |
| | Chromium (Cr)-Total (mg/L) | 0.00500 | | 0.00461 | | 0.0220 |
| | Cobalt (Co)-Total (mg/L) | 0.00175 | | 0.00197 | | 0.00881 |
| | Copper (Cu)-Total (mg/L) | 0.00654 | | 0.00742 | | 0.0382 |
| | Iron (Fe)-Total (mg/L) | 2.33 | | 3.52 | | 14.7 |
| | Lead (Pb)-Total (mg/L) | 0.00135 | | 0.00134 | | 0.0100 |
| | Lithium (Li)-Total (mg/L) | 0.0064 | | 0.0040 | | 0.0083 |
| | Magnesium (Mg)-Total (mg/L) | 36.2 | | 7.64 | | 23.2 |
| | Manganese (Mn)-Total (mg/L) | 0.212 | | 0.132 | | 0.729 |
| | Mercury (Hg)-Total (mg/L) | 0.0000183 | | <0.000025 DLM | | 0.000143 |
| | Molybdenum (Mo)-Total (mg/L) | 0.00173 | | 0.000439 | | 0.00338 |
| | Nickel (Ni)-Total (mg/L) | 0.0154 | | 0.00670 | | 0.0458 |
| | Phosphorus (P)-Total (mg/L) | 0.067 | | 0.090 | | 0.672 |
| | Potassium (K)-Total (mg/L) | 0.73 | | 0.97 | | 1.27 |
| | Selenium (Se)-Total (mg/L) | 0.00202 | | 0.000327 | | 0.00611 |
| | Silicon (Si)-Total (mg/L) | 6.81 | | 10.1 | | 17.9 |
| | Silver (Ag)-Total (mg/L) | 0.000056 | | 0.000022 | | 0.000825 |
| | Sodium (Na)-Total (mg/L) | 3.53 | | 3.21 | | 3.45 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-6 Water 20-AUG-16 14:30 R4 | L1816799-7 Water 18-AUG-16 18:10 R6 | L1816799-8 Water 20-AUG-16 15:05 R6 | L1816799-9 Water 18-AUG-16 16:50 GWCC-5 | L1816799-10 Water 20-AUG-16 14:10 GWCC-5 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 399 | | 183 | | 950 |
| | Hardness (as CaCO3) (mg/L) | | 78.8 | | 601 | |
| | pH (pH) | 7.96 | | 7.78 | | 7.86 |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | | 0.0172 | | <0.0050 | |
| | Nitrate (as N) (mg/L) | 0.147 | | 0.0920 | | <0.010 DLDS |
| | Nitrite (as N) (mg/L) | <0.0010 | | <0.0010 | | <0.0020 DLDS |
| | Phosphorus (P)-Total (mg/L) | | 0.0108 | | <0.0020 | |
| | Sulfate (SO4) (mg/L) | 98.8 | | 33.2 | | 333 |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | | 22.1 | | 8.27 | |
| | Total Organic Carbon (mg/L) | | | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | | 1.94 | | <0.0030 | |
| | Antimony (Sb)-Total (mg/L) | | 0.00018 | | 0.00081 | |
| | Arsenic (As)-Total (mg/L) | | 0.00160 | | 0.00061 | |
| | Barium (Ba)-Total (mg/L) | | 0.0687 | | 0.0491 | |
| | Beryllium (Be)-Total (mg/L) | | 0.000086 | | <0.000020 | |
| | Bismuth (Bi)-Total (mg/L) | | <0.000050 | | <0.000050 | |
| | Boron (B)-Total (mg/L) | | <0.010 | | 0.058 | |
| | Cadmium (Cd)-Total (mg/L) | | 0.0000407 | | 0.000113 | |
| | Calcium (Ca)-Total (mg/L) | | 21.6 | | 130 | |
| | Chromium (Cr)-Total (mg/L) | | 0.00365 | | 0.00074 | |
| | Cobalt (Co)-Total (mg/L) | | 0.00156 | | <0.00010 | |
| | Copper (Cu)-Total (mg/L) | | 0.00628 | | 0.00081 | |
| | Iron (Fe)-Total (mg/L) | | 2.98 | | 0.018 | |
| | Lead (Pb)-Total (mg/L) | | 0.00108 | | <0.000050 | |
| | Lithium (Li)-Total (mg/L) | | 0.0039 | | 0.0102 | |
| | Magnesium (Mg)-Total (mg/L) | | 6.88 | | 60.1 | |
| | Manganese (Mn)-Total (mg/L) | | 0.108 | | 0.00130 | |
| | Mercury (Hg)-Total (mg/L) | | <0.000025 DLM | | <0.0000050 | |
| | Molybdenum (Mo)-Total (mg/L) | | 0.000402 | | 0.00210 | |
| | Nickel (Ni)-Total (mg/L) | | 0.00549 | | 0.0195 | |
| | Phosphorus (P)-Total (mg/L) | | 0.067 | | <0.050 | |
| | Potassium (K)-Total (mg/L) | | 0.95 | | 0.88 | |
| | Selenium (Se)-Total (mg/L) | | 0.000323 | | 0.0122 | |
| | Silicon (Si)-Total (mg/L) | | 9.52 | | 4.46 | |
| | Silver (Ag)-Total (mg/L) | | 0.000020 | | <0.000010 | |
| | Sodium (Na)-Total (mg/L) | | 2.98 | | 3.99 | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-11 Water 19-AUG-16 14:50 R1 | L1816799-12 Water 19-AUG-16 16:35 R2 | L1816799-13 Water 20-AUG-16 10:10 DUP-2 | L1816799-14 Water 22-AUG-16 TRAVEL BLANK | L1816799-15 Water 19-AUG-16 17:45 R8 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 539 | 401 | 442 | <2.0 HTC | 235 |
| | Hardness (as CaCO3) (mg/L) | 315 | 231 | 250 | <0.50 | 123 |
| | pH (pH) | 8.00 | 7.96 | 7.91 | 5.17 | 7.79 |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | 0.0516 | 0.0162 | 0.0206 | <0.0050 | 0.0056 |
| | Nitrate (as N) (mg/L) | 0.159 | 0.0477 | 0.113 | <0.0050 | <0.0050 |
| | Nitrite (as N) (mg/L) | 0.0025 | <0.0010 | 0.0026 | <0.0010 | <0.0010 |
| | Phosphorus (P)-Total (mg/L) | 0.0188 | 0.0166 | 0.0051 | <0.0020 | <0.0020 |
| | Sulfate (SO4) (mg/L) | 170 | 107 | 130 | <0.30 | 60.1 |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | 16.7 | 20.5 | 18.8 | | 14.6 |
| | Total Organic Carbon (mg/L) | | | | <0.50 | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 1.79 | 1.16 | 0.119 | <0.0030 | 0.0653 |
| | Antimony (Sb)-Total (mg/L) | 0.00040 | 0.00057 | 0.00035 | <0.00010 | 0.00074 |
| | Arsenic (As)-Total (mg/L) | 0.00205 | 0.00208 | 0.00095 | <0.00010 | 0.00041 |
| | Barium (Ba)-Total (mg/L) | 0.107 | 0.0761 | 0.0659 | <0.000050 | 0.0440 |
| | Beryllium (Be)-Total (mg/L) | 0.000085 | 0.000055 | <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) | 0.000220 | 0.0000585 | 0.0000429 | <0.0000050 | 0.0000218 |
| | Calcium (Ca)-Total (mg/L) | 72.3 | 41.3 | 57.1 | <0.050 | 29.8 |
| | Chromium (Cr)-Total (mg/L) | 0.00490 | 0.00390 | 0.00088 | <0.00010 | 0.00101 |
| | Cobalt (Co)-Total (mg/L) | 0.00202 | 0.00119 | 0.00050 | <0.00010 | <0.00010 |
| | Copper (Cu)-Total (mg/L) | 0.00740 | 0.00424 | 0.00327 | <0.00050 | 0.00210 |
| | Iron (Fe)-Total (mg/L) | 3.00 | 2.23 | 0.439 | <0.010 | 0.140 |
| | Lead (Pb)-Total (mg/L) | 0.00321 | 0.000915 | 0.000236 | <0.000050 | <0.000050 |
| | Lithium (Li)-Total (mg/L) | 0.0035 | 0.0046 | 0.0026 | <0.0010 | 0.0010 |
| | Magnesium (Mg)-Total (mg/L) | 26.9 | 26.4 | 24.3 | <0.10 | 10.8 |
| | Manganese (Mn)-Total (mg/L) | 0.339 | 0.129 | 0.163 | <0.00010 | 0.00903 |
| | Mercury (Hg)-Total (mg/L) | <0.000025 DLM | <0.000025 DLM | <0.000025 DLM | <0.0000050 | <0.000025 DLM |
| | Molybdenum (Mo)-Total (mg/L) | 0.00147 | 0.000601 | 0.00114 | <0.000050 | 0.000858 |
| | Nickel (Ni)-Total (mg/L) | 0.00853 | 0.00778 | 0.00410 | <0.00050 | 0.00308 |
| | Phosphorus (P)-Total (mg/L) | 0.067 | 0.058 | <0.050 | <0.050 | <0.050 |
| | Potassium (K)-Total (mg/L) | 0.74 | 0.60 | 0.47 | <0.10 | 0.10 |
| | Selenium (Se)-Total (mg/L) | 0.00246 | 0.000773 | 0.00177 | <0.000050 | 0.00338 |
| | Silicon (Si)-Total (mg/L) | 6.98 | 7.56 | 5.03 | <0.050 | 6.54 |
| | Silver (Ag)-Total (mg/L) | 0.000078 | 0.000018 | <0.000010 | <0.000010 | <0.000010 |
| | Sodium (Na)-Total (mg/L) | 2.82 | 2.30 | 2.34 | <0.050 | 4.24 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-16 Water 20-AUG-16 08:50 R9 | L1816799-17 Water 20-AUG-16 13:05 SL | L1816799-18 Water 18-AUG-16 11:35 E7 | L1816799-19 Water 20-AUG-16 14:45 E7 | L1816799-20 Water 20-AUG-16 10:10 E1(H) |
|---|---|---|---|---|---|---|
| **Sample ID** | | | | | | |
| **Description** | | | | | | |
| **Sampled Date** | | | | | | |
| **Sampled Time** | | | | | | |
| **Client ID** | | | | | | |
| **WATER** | | | | | | |
| **Physical Tests** | Conductivity (uS/cm) | 470 | 1110 | | 509 | 434 |
| | Hardness (as CaCO3) (mg/L) | 267 | 711 | 296 | | 246 |
| | pH (pH) | 7.79 | 8.13 | | 7.94 | 7.91 |
| **Anions and Nutrients** | Ammonia, Total (as N) (mg/L) | 0.118 | <0.0050 | 0.0494 | | 0.0215 |
| | Nitrate (as N) (mg/L) | 0.182 | 0.122 | | 0.126 | 0.111 |
| | Nitrite (as N) (mg/L) | <0.0010 | <0.0020 DLDS | | <0.0010 | <0.0010 |
| | Phosphorus (P)-Total (mg/L) | 0.0285 | <0.0020 | 0.0055 RRV | | 0.0041 |
| | Sulfate (SO4) (mg/L) | 154 | 502 | | 154 | 130 |
| **Organic / Inorganic Carbon** | Dissolved Organic Carbon (mg/L) | 25.8 | 11.3 | 17.3 | | 16.9 |
| | Total Organic Carbon (mg/L) | | | | | |
| **Total Metals** | Aluminum (Al)-Total (mg/L) | 2.38 | 0.0319 | 2.76 | | 0.122 |
| | Antimony (Sb)-Total (mg/L) | 0.00042 | 0.00293 | 0.00096 | | 0.00040 |
| | Arsenic (As)-Total (mg/L) | 0.00274 | 0.0152 | 0.00472 | | 0.00098 |
| | Barium (Ba)-Total (mg/L) | 0.163 | 0.0221 | 0.148 | | 0.0681 |
| | Beryllium (Be)-Total (mg/L) | 0.000097 | <0.000020 | 0.000121 | | 0.000020 |
| | Bismuth (Bi)-Total (mg/L) | <0.000050 | <0.000050 | <0.000050 | | <0.000050 |
| | Boron (B)-Total (mg/L) | <0.010 | 0.036 | 0.024 | | <0.010 |
| | Cadmium (Cd)-Total (mg/L) | 0.000191 | 0.0000309 | 0.000251 | | 0.0000421 |
| | Calcium (Ca)-Total (mg/L) | 62.1 | 168 | 61.9 | | 57.2 |
| | Chromium (Cr)-Total (mg/L) | 0.00627 | 0.00123 | 0.0108 | | 0.00090 |
| | Cobalt (Co)-Total (mg/L) | 0.00286 | 0.00016 | 0.00329 | | 0.00051 |
| | Copper (Cu)-Total (mg/L) | 0.0108 | 0.00202 | 0.0113 | | 0.00314 |
| | Iron (Fe)-Total (mg/L) | 4.55 | 0.074 | 5.40 | | 0.436 |
| | Lead (Pb)-Total (mg/L) | 0.00175 | <0.000050 | 0.00365 | | 0.000248 |
| | Lithium (Li)-Total (mg/L) | 0.0027 | 0.0081 | 0.0085 | | 0.0027 |
| | Magnesium (Mg)-Total (mg/L) | 26.1 | 67.5 | 34.9 | | 24.3 |
| | Manganese (Mn)-Total (mg/L) | 0.611 | 0.0134 | 0.329 | | 0.169 |
| | Mercury (Hg)-Total (mg/L) | <0.000050 DLM | 0.0000068 | <0.000050 DLM | | <0.0000050 |
| | Molybdenum (Mo)-Total (mg/L) | 0.00151 | 0.00192 | 0.00224 | | 0.00130 |
| | Nickel (Ni)-Total (mg/L) | 0.00964 | 0.0157 | 0.0239 | | 0.00411 |
| | Phosphorus (P)-Total (mg/L) | 0.106 | <0.050 | 0.168 | | <0.050 |
| | Potassium (K)-Total (mg/L) | 0.72 | 1.17 | 1.01 | | 0.50 |
| | Selenium (Se)-Total (mg/L) | 0.00248 | 0.0137 | 0.00231 | | 0.00174 |
| | Silicon (Si)-Total (mg/L) | 8.80 | 5.07 | 9.95 | | 5.10 |
| | Silver (Ag)-Total (mg/L) | 0.000050 | <0.000010 | 0.000125 | | <0.000010 |
| | Sodium (Na)-Total (mg/L) | 3.04 | 2.14 | 3.12 | | 2.38 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1816799-1 | L1816799-2 | L1816799-3 | L1816799-4 | L1816799-5 |
|---|---|---|---|---|---|
| Description | Water | Water | Water | Water | Water |
| Sampled Date | 18-AUG-16 | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 | 18-AUG-16 |
| Sampled Time | 15:10 | 14:25 | 13:15 | 14:50 | 13:55 |
| Client ID | E4 | E4 | E8 | E8 | R4 |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Total Metals** Strontium (Sr)-Total (mg/L) | 0.328 | | 0.122 | | 0.320 |
| Sulfur (S)-Total (mg/L) | 58.0 | | 10.6 | | 31.2 |
| Thallium (Tl)-Total (mg/L) | 0.000027 | | 0.000022 | | 0.000156 |
| Tin (Sn)-Total (mg/L) | <0.00010 | | <0.00010 | | 0.00012 |
| Titanium (Ti)-Total (mg/L) | 0.0322 | | 0.0879 | | 0.142 |
| Uranium (U)-Total (mg/L) | 0.00183 | | 0.000974 | | 0.00285 |
| Vanadium (V)-Total (mg/L) | 0.00454 | | 0.00779 | | 0.0245 |
| Zinc (Zn)-Total (mg/L) | 0.0120 | | 0.0126 | | 0.0637 |
| Zirconium (Zr)-Total (mg/L) | 0.00103 | | 0.00115 | | 0.00190 |
| **Dissolved Metals** Dissolved Mercury Filtration Location | FIELD | | FIELD | | FIELD |
| Dissolved Metals Filtration Location | FIELD | | FIELD | | FIELD |
| Aluminum (Al)-Dissolved (mg/L) | 0.0482 | | 0.126 | | 0.0513 |
| Antimony (Sb)-Dissolved (mg/L) | 0.00045 | | 0.00012 | | 0.00039 |
| Arsenic (As)-Dissolved (mg/L) | 0.00107 | | 0.00072 | | 0.00152 |
| Barium (Ba)-Dissolved (mg/L) | 0.0692 | | 0.0428 | | 0.0844 |
| Beryllium (Be)-Dissolved (mg/L) | <0.000020 | | 0.000028 | | <0.000020 |
| Bismuth (Bi)-Dissolved (mg/L) | <0.000050 | | <0.000050 | | <0.000050 |
| Boron (B)-Dissolved (mg/L) | 0.024 | | <0.010 | | <0.010 |
| Cadmium (Cd)-Dissolved (mg/L) | 0.0000297 | | 0.0000094 | | 0.0000411 |
| Calcium (Ca)-Dissolved (mg/L) | 63.7 | | 21.4 | | 52.5 |
| Chromium (Cr)-Dissolved (mg/L) | 0.00087 | | 0.00066 | | 0.00063 |
| Cobalt (Co)-Dissolved (mg/L) | 0.00056 | | 0.00045 | | 0.00060 |
| Copper (Cu)-Dissolved (mg/L) | 0.00273 | | 0.00358 | | 0.00282 |
| Iron (Fe)-Dissolved (mg/L) | 0.286 | | 0.400 | | 0.249 |
| Lead (Pb)-Dissolved (mg/L) | 0.000069 | | 0.000067 | | 0.000058 |
| Lithium (Li)-Dissolved (mg/L) | 0.0057 | | 0.0026 | | 0.0015 |
| Magnesium (Mg)-Dissolved (mg/L) | 35.9 | | 6.84 | | 18.5 |
| Manganese (Mn)-Dissolved (mg/L) | 0.153 | | 0.0462 | | 0.172 |
| Mercury (Hg)-Dissolved (mg/L) | <0.0000050 | | <0.0000050 | | 0.0000053 |
| Molybdenum (Mo)-Dissolved (mg/L) | 0.00131 | | 0.000367 | | 0.00116 |
| Nickel (Ni)-Dissolved (mg/L) | 0.00907 | | 0.00311 | | 0.00637 |
| Phosphorus (P)-Dissolved (mg/L) | <0.050 | | <0.050 | | <0.050 |
| Potassium (K)-Dissolved (mg/L) | 0.59 | | 0.73 | | 0.36 |
| Selenium (Se)-Dissolved (mg/L) | 0.00196 | | 0.000289 | | 0.00414 |
| Silicon (Si)-Dissolved (mg/L) | 5.20 | | 6.46 | | 5.44 |
| Silver (Ag)-Dissolved (mg/L) | <0.000010 | | <0.000010 | | <0.000010 |
| Sodium (Na)-Dissolved (mg/L) | 3.43 | | 2.98 | | 2.85 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1816799-6 | L1816799-7 | L1816799-8 | L1816799-9 | L1816799-10 |
|---|---|---|---|---|---|
| Description | Water | Water | Water | Water | Water |
| Sampled Date | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 |
| Sampled Time | 14:30 | 18:10 | 15:05 | 16:50 | 14:10 |
| Client ID | R4 | R6 | R6 | GWCC-5 | GWCC-5 |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Total Metals** Strontium (Sr)-Total (mg/L) | | 0.120 | | 0.843 | |
| Sulfur (S)-Total (mg/L) | | 9.49 | | 112 | |
| Thallium (Tl)-Total (mg/L) | | 0.000018 | | 0.000014 | |
| Tin (Sn)-Total (mg/L) | | <0.00010 | | <0.00010 | |
| Titanium (Ti)-Total (mg/L) | | 0.0682 | | <0.00030 | |
| Uranium (U)-Total (mg/L) | | 0.000929 | | 0.00322 | |
| Vanadium (V)-Total (mg/L) | | 0.00621 | | <0.00050 | |
| Zinc (Zn)-Total (mg/L) | | 0.0101 | | <0.0030 | |
| Zirconium (Zr)-Total (mg/L) | | 0.00121 | | <0.00030 | |
| **Dissolved Metals** Dissolved Mercury Filtration Location | | FIELD | | FIELD | |
| Dissolved Metals Filtration Location | | FIELD | | FIELD | |
| Aluminum (Al)-Dissolved (mg/L) | | 0.126 | | 0.0014 | |
| Antimony (Sb)-Dissolved (mg/L) | | 0.00013 | | 0.00083 | |
| Arsenic (As)-Dissolved (mg/L) | | 0.00072 | | 0.00060 | |
| Barium (Ba)-Dissolved (mg/L) | | 0.0405 | | 0.0486 | |
| Beryllium (Be)-Dissolved (mg/L) | | 0.000032 | | <0.000020 | |
| Bismuth (Bi)-Dissolved (mg/L) | | <0.000050 | | <0.000050 | |
| Boron (B)-Dissolved (mg/L) | | <0.010 | | 0.058 | |
| Cadmium (Cd)-Dissolved (mg/L) | | 0.0000291 | | 0.000107 | |
| Calcium (Ca)-Dissolved (mg/L) | | 21.0 | | 137 | |
| Chromium (Cr)-Dissolved (mg/L) | | 0.00062 | | 0.00065 | |
| Cobalt (Co)-Dissolved (mg/L) | | 0.00045 | | <0.00010 | |
| Copper (Cu)-Dissolved (mg/L) | | 0.00360 | | 0.00073 | |
| Iron (Fe)-Dissolved (mg/L) | | 0.420 | | 0.017 | |
| Lead (Pb)-Dissolved (mg/L) | | 0.000079 | | <0.000050 | |
| Lithium (Li)-Dissolved (mg/L) | | 0.0028 | | 0.0108 | |
| Magnesium (Mg)-Dissolved (mg/L) | | 6.41 | | 62.7 | |
| Manganese (Mn)-Dissolved (mg/L) | | 0.0424 | | 0.00133 | |
| Mercury (Hg)-Dissolved (mg/L) | | <0.0000050 | | <0.0000050 | |
| Molybdenum (Mo)-Dissolved (mg/L) | | 0.000352 | | 0.00202 | |
| Nickel (Ni)-Dissolved (mg/L) | | 0.00300 | | 0.0195 | |
| Phosphorus (P)-Dissolved (mg/L) | | <0.050 | | <0.050 | |
| Potassium (K)-Dissolved (mg/L) | | 0.76 | | 0.95 | |
| Selenium (Se)-Dissolved (mg/L) | | 0.000207 | | 0.0117 | |
| Silicon (Si)-Dissolved (mg/L) | | 6.57 | | 4.69 | |
| Silver (Ag)-Dissolved (mg/L) | | <0.000010 | | <0.000010 | |
| Sodium (Na)-Dissolved (mg/L) | | 2.94 | | 3.99 | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-11 Water 19-AUG-16 14:50 R1 | L1816799-12 Water 19-AUG-16 16:35 R2 | L1816799-13 Water 20-AUG-16 10:10 DUP-2 | L1816799-14 Water 22-AUG-16 TRAVEL BLANK | L1816799-15 Water 19-AUG-16 17:45 R8 |
|---|---|---|---|---|---|---|
| **WATER** | | | | | | |
| **Total Metals** | Strontium (Sr)-Total (mg/L) | 0.325 | 0.235 | 0.252 | <0.00020 | 0.130 |
| | Sulfur (S)-Total (mg/L) | 57.7 | 34.6 | 45.3 | <0.50 | 21.1 |
| | Thallium (Tl)-Total (mg/L) | 0.000037 | 0.000015 | <0.000010 | <0.000010 | <0.000010 |
| | Tin (Sn)-Total (mg/L) | <0.00010 | <0.00010 | <0.00010 | <0.00010 | 0.00017 |
| | Titanium (Ti)-Total (mg/L) | 0.0374 | 0.0345 | 0.00290 | <0.00030 | 0.00138 |
| | Uranium (U)-Total (mg/L) | 0.00200 | 0.00215 | 0.00148 | <0.000010 | 0.000096 |
| | Vanadium (V)-Total (mg/L) | 0.00504 | 0.00419 | 0.00102 | <0.00050 | <0.00050 |
| | Zinc (Zn)-Total (mg/L) | 0.0154 | 0.0070 | <0.0030 | <0.0030 | <0.0030 |
| | Zirconium (Zr)-Total (mg/L) | 0.00119 | 0.00106 | 0.00098 | <0.00030 | 0.00067 |
| **Dissolved Metals** | Dissolved Mercury Filtration Location | FIELD | FIELD | FIELD | | FIELD |
| | Dissolved Metals Filtration Location | FIELD | FIELD | FIELD | | FIELD |
| | Aluminum (Al)-Dissolved (mg/L) | 0.0485 | 0.112 | 0.0617 | | 0.0346 |
| | Antimony (Sb)-Dissolved (mg/L) | 0.00023 | 0.00038 | 0.00032 | | 0.00074 |
| | Arsenic (As)-Dissolved (mg/L) | 0.00064 | 0.00097 | 0.00081 | | 0.00030 |
| | Barium (Ba)-Dissolved (mg/L) | 0.0594 | 0.0568 | 0.0694 | | 0.0415 |
| | 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) | 0.0000590 | 0.0000264 | 0.0000437 | | 0.0000183 |
| | Calcium (Ca)-Dissolved (mg/L) | 77.2 | 44.2 | 59.2 | | 30.9 |
| | Chromium (Cr)-Dissolved (mg/L) | 0.00041 | 0.00122 | 0.00071 | | 0.00083 |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00062 | 0.00044 | 0.00050 | | <0.00010 |
| | Copper (Cu)-Dissolved (mg/L) | 0.00254 | 0.00261 | 0.00318 | | 0.00183 |
| | Iron (Fe)-Dissolved (mg/L) | 0.299 | 0.597 | 0.288 | | 0.074 |
| | Lead (Pb)-Dissolved (mg/L) | 0.000116 | 0.000053 | 0.000107 | | <0.000050 |
| | Lithium (Li)-Dissolved (mg/L) | 0.0024 | 0.0038 | 0.0023 | | 0.0011 |
| | Magnesium (Mg)-Dissolved (mg/L) | 29.7 | 29.2 | 24.7 | | 11.0 |
| | Manganese (Mn)-Dissolved (mg/L) | 0.242 | 0.0993 | 0.170 | | 0.00667 |
| | Mercury (Hg)-Dissolved (mg/L) | <0.0000050 | <0.0000050 | <0.0000050 | | <0.0000050 |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.00110 | 0.000492 | 0.000958 | | 0.000803 |
| | Nickel (Ni)-Dissolved (mg/L) | 0.00363 | 0.00525 | 0.00418 | | 0.00290 |
| | Phosphorus (P)-Dissolved (mg/L) | <0.050 | <0.050 | <0.050 | | <0.050 |
| | Potassium (K)-Dissolved (mg/L) | 0.48 | 0.52 | 0.46 | | <0.10 |
| | Selenium (Se)-Dissolved (mg/L) | 0.00238 | 0.000733 | 0.00170 | | 0.00272 |
| | Silicon (Si)-Dissolved (mg/L) | 4.95 | 6.30 | 5.03 | | 6.60 |
| | Silver (Ag)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | | <0.000010 |
| | Sodium (Na)-Dissolved (mg/L) | 2.46 | 2.49 | 2.50 | | 3.97 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| | Sample ID | L1816799-16 | L1816799-17 | L1816799-18 | L1816799-19 | L1816799-20 |
|---|---|---|---|---|---|---|
| | Description | Water | Water | Water | Water | Water |
| | Sampled Date | 20-AUG-16 | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 | 20-AUG-16 |
| | Sampled Time | 08:50 | 13:05 | 11:35 | 14:45 | 10:10 |
| | Client ID | R9 | SL | E7 | E7 | E1(H) |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Total Metals** | Strontium (Sr)-Total (mg/L) | 0.274 | 0.804 | 0.369 | | 0.296 |
| | Sulfur (S)-Total (mg/L) | 52.7 | 174 | 53.6 | | 45.8 |
| | Thallium (Tl)-Total (mg/L) | 0.000024 | 0.000017 | 0.000052 | | <0.000010 |
| | Tin (Sn)-Total (mg/L) | <0.00010 | <0.00010 | <0.00010 | | <0.00010 |
| | Titanium (Ti)-Total (mg/L) | 0.0769 | 0.00061 | 0.0755 | | 0.00292 |
| | Uranium (U)-Total (mg/L) | 0.00148 | 0.00209 | 0.00224 | | 0.00179 |
| | Vanadium (V)-Total (mg/L) | 0.00835 | <0.00050 | 0.00874 | | 0.00099 |
| | Zinc (Zn)-Total (mg/L) | 0.0165 | 0.0030 | 0.0227 | | <0.0030 |
| | Zirconium (Zr)-Total (mg/L) | 0.00125 | <0.00030 | 0.00128 | | 0.00114 |
| **Dissolved Metals** | Dissolved Mercury Filtration Location | FIELD | FIELD | FIELD | | FIELD |
| | Dissolved Metals Filtration Location | FIELD | FIELD | FIELD | | FIELD |
| | Aluminum (Al)-Dissolved (mg/L) | 0.100 | 0.0131 | 0.0479 | | 0.0556 |
| | Antimony (Sb)-Dissolved (mg/L) | 0.00023 | 0.00272 | 0.00036 | | 0.00040 |
| | Arsenic (As)-Dissolved (mg/L) | 0.00115 | 0.0133 | 0.00103 | | 0.00083 |
| | Barium (Ba)-Dissolved (mg/L) | 0.102 | 0.0184 | 0.0746 | | 0.0681 |
| | Beryllium (Be)-Dissolved (mg/L) | 0.000023 | <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 | 0.033 | 0.016 | | <0.010 |
| | Cadmium (Cd)-Dissolved (mg/L) | 0.0000538 | 0.0000268 | 0.0000275 | | 0.0000320 |
| | Calcium (Ca)-Dissolved (mg/L) | 64.1 | 172 | 62.2 | | 58.2 |
| | Chromium (Cr)-Dissolved (mg/L) | 0.00115 | 0.00087 | 0.00082 | | 0.00064 |
| | Cobalt (Co)-Dissolved (mg/L) | 0.00112 | 0.00012 | 0.00063 | | 0.00046 |
| | Copper (Cu)-Dissolved (mg/L) | 0.00462 | 0.00182 | 0.00281 | | 0.00299 |
| | Iron (Fe)-Dissolved (mg/L) | 1.06 | 0.037 | 0.320 | | 0.277 |
| | Lead (Pb)-Dissolved (mg/L) | 0.000081 | <0.000050 | 0.000086 | | 0.000110 |
| | Lithium (Li)-Dissolved (mg/L) | <0.0010 | 0.0078 | 0.0046 | | 0.0029 |
| | Magnesium (Mg)-Dissolved (mg/L) | 26.0 | 68.5 | 34.3 | | 24.4 |
| | Manganese (Mn)-Dissolved (mg/L) | 0.506 | 0.0108 | 0.185 | | 0.164 |
| | Mercury (Hg)-Dissolved (mg/L) | <0.0000050 | <0.0000050 | <0.0000050 | | <0.0000050 |
| | Molybdenum (Mo)-Dissolved (mg/L) | 0.00109 | 0.00175 | 0.00103 | | 0.00128 |
| | Nickel (Ni)-Dissolved (mg/L) | 0.00461 | 0.0130 | 0.00856 | | 0.00391 |
| | Phosphorus (P)-Dissolved (mg/L) | <0.050 | <0.050 | <0.050 | | <0.050 |
| | Potassium (K)-Dissolved (mg/L) | 0.51 | 1.13 | 0.61 | | 0.47 |
| | Selenium (Se)-Dissolved (mg/L) | 0.00203 | 0.0127 | 0.00198 | | 0.00166 |
| | Silicon (Si)-Dissolved (mg/L) | 5.34 | 5.03 | 5.28 | | 4.98 |
| | Silver (Ag)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | | <0.000010 |
| | Sodium (Na)-Dissolved (mg/L) | 2.82 | 1.82 | 3.04 | | 2.42 |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-1 Water 18-AUG-16 15:10 E4 | L1816799-2 Water 20-AUG-16 14:25 E4 | L1816799-3 Water 18-AUG-16 13:15 E8 | L1816799-4 Water 20-AUG-16 14:50 E8 | L1816799-5 Water 18-AUG-16 13:55 R4 |
|---|---|---|---|---|---|---|
| **Sample ID** | | | | | | |
| **Description** | | | | | | |
| **Sampled Date** | | | | | | |
| **Sampled Time** | | | | | | |
| **Client ID** | | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Strontium (Sr)-Dissolved (mg/L) | 0.329 | | 0.115 | | 0.229 |
| | Sulfur (S)-Dissolved (mg/L) | 55.9 | | 9.85 | | 29.2 |
| | Thallium (Tl)-Dissolved (mg/L) | <0.000010 | | <0.000010 | | <0.000010 |
| | Tin (Sn)-Dissolved (mg/L) | <0.00010 | | <0.00010 | | <0.00010 |
| | Titanium (Ti)-Dissolved (mg/L) | 0.00114 | | 0.00209 | | 0.00146 |
| | Uranium (U)-Dissolved (mg/L) | 0.00164 | | 0.000682 | | 0.00164 |
| | Vanadium (V)-Dissolved (mg/L) | 0.00063 | | 0.00124 | | 0.00069 |
| | Zinc (Zn)-Dissolved (mg/L) | 0.0019 | | 0.0015 | | 0.0023 |
| | Zirconium (Zr)-Dissolved (mg/L) | 0.00100 | | 0.00127 | | 0.00086 |
| **Speciated Metals** | Chromium (III)-Dissolved (mg/L) | | | | | |
| | Chromium (III)-Total (mg/L) | 0.00500 | | 0.00461 | | 0.0220 |
| | Hexavalent Chromium (mg/L) | <0.0010 | | <0.0010 | | <0.0010 |
| | Hexavalent Chromium-Dissolved (mg/L) | | | | | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID | L1816799-6 | L1816799-7 | L1816799-8 | L1816799-9 | L1816799-10 |
|---|---|---|---|---|---|
| Description | Water | Water | Water | Water | Water |
| Sampled Date | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 |
| Sampled Time | 14:30 | 18:10 | 15:05 | 16:50 | 14:10 |
| Client ID | R4 | R6 | R6 | GWCC-5 | GWCC-5 |
| **Grouping** / **Analyte** | | | | | |
| **WATER** | | | | | |
| **Dissolved Metals** Strontium (Sr)-Dissolved (mg/L) | | 0.111 | | 0.864 | |
| Sulfur (S)-Dissolved (mg/L) | | 9.19 | | 110 | |
| Thallium (Tl)-Dissolved (mg/L) | | <0.000010 | | 0.000013 | |
| Tin (Sn)-Dissolved (mg/L) | | <0.00010 | | <0.00010 | |
| Titanium (Ti)-Dissolved (mg/L) | | 0.00214 | | <0.00030 | |
| Uranium (U)-Dissolved (mg/L) | | 0.000672 | | 0.00320 | |
| Vanadium (V)-Dissolved (mg/L) | | 0.00127 | | <0.00050 | |
| Zinc (Zn)-Dissolved (mg/L) | | 0.0018 | | <0.0010 | |
| Zirconium (Zr)-Dissolved (mg/L) | | 0.00127 | | <0.00030 | |
| **Speciated Metals** Chromium (III)-Dissolved (mg/L) | | | | | |
| Chromium (III)-Total (mg/L) | | 0.00365 | | | |
| Hexavalent Chromium (mg/L) | | <0.0010 | | | |
| Hexavalent Chromium-Dissolved (mg/L) | | | | | |

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

| Grouping | Analyte | L1816799-11 Water 19-AUG-16 14:50 R1 | L1816799-12 Water 19-AUG-16 16:35 R2 | L1816799-13 Water 20-AUG-16 10:10 DUP-2 | L1816799-14 Water 22-AUG-16 TRAVEL BLANK | L1816799-15 Water 19-AUG-16 17:45 R8 |
|---|---|---|---|---|---|---|
| **Sample ID / Description / Sampled Date / Sampled Time / Client ID** | | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Strontium (Sr)-Dissolved (mg/L) | 0.333 | 0.217 | 0.238 | | 0.137 |
| | Sulfur (S)-Dissolved (mg/L) | 57.3 | 35.6 | 43.4 | | 20.1 |
| | Thallium (Tl)-Dissolved (mg/L) | <0.000010 | <0.000010 | <0.000010 | | <0.000010 |
| | Tin (Sn)-Dissolved (mg/L) | <0.00010 | <0.00010 | <0.00010 | | <0.00010 |
| | Titanium (Ti)-Dissolved (mg/L) | 0.00090 | 0.00178 | 0.00134 | | 0.00064 |
| | Uranium (U)-Dissolved (mg/L) | 0.00183 | 0.00186 | 0.00140 | | 0.000089 |
| | Vanadium (V)-Dissolved (mg/L) | <0.00050 | 0.00097 | 0.00063 | | <0.00050 |
| | Zinc (Zn)-Dissolved (mg/L) | 0.0018 | 0.0042 | 0.0011 | | 0.0012 |
| | Zirconium (Zr)-Dissolved (mg/L) | 0.00104 | 0.00101 | 0.00093 | | 0.00072 |
| **Speciated Metals** | Chromium (III)-Dissolved (mg/L) | | 0.00122 | | | |
| | Chromium (III)-Total (mg/L) | 0.00490 | 0.00390 | | | 0.00101 |
| | Hexavalent Chromium (mg/L) | <0.0010 | <0.0010 | | | <0.0010 |
| | Hexavalent Chromium-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 | L1816799-16 | L1816799-17 | L1816799-18 | L1816799-19 | L1816799-20 |
|---|---|---|---|---|---|---|
| | Description | Water | Water | Water | Water | Water |
| | Sampled Date | 20-AUG-16 | 20-AUG-16 | 18-AUG-16 | 20-AUG-16 | 20-AUG-16 |
| | Sampled Time | 08:50 | 13:05 | 11:35 | 14:45 | 10:10 |
| | Client ID | R9 | SL | E7 | E7 | E1(H) |
| **Grouping** | **Analyte** | | | | | |
| **WATER** | | | | | | |
| **Dissolved Metals** | Strontium (Sr)-Dissolved (mg/L) | 0.235 | 0.747 | 0.266 | | 0.314 |
| | Sulfur (S)-Dissolved (mg/L) | 51.3 | 166 | 51.4 | | 43.2 |
| | Thallium (Tl)-Dissolved (mg/L) | <0.000010 | 0.000015 | <0.000010 | | <0.000010 |
| | Tin (Sn)-Dissolved (mg/L) | <0.00010 | <0.00010 | <0.00010 | | <0.00010 |
| | Titanium (Ti)-Dissolved (mg/L) | 0.00273 | 0.00032 | 0.00137 | | 0.00123 |
| | Uranium (U)-Dissolved (mg/L) | 0.00115 | 0.00185 | 0.00134 | | 0.00185 |
| | Vanadium (V)-Dissolved (mg/L) | 0.00119 | <0.00050 | 0.00069 | | 0.00059 |
| | Zinc (Zn)-Dissolved (mg/L) | 0.0014 | <0.0010 | 0.0066 | | 0.0011 |
| | Zirconium (Zr)-Dissolved (mg/L) | 0.00131 | <0.00030 | 0.00096 | | 0.00121 |
| **Speciated Metals** | Chromium (III)-Dissolved (mg/L) | 0.00115 | | | | |
| | Chromium (III)-Total (mg/L) | 0.00627 | 0.00123 | 0.0108 | | |
| | Hexavalent Chromium (mg/L) | <0.0010 | <0.0010 | <0.0010 | | |
| | Hexavalent Chromium-Dissolved (mg/L) | <0.0010 | | | | |

* 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) |
|---|---|---|---|
| Matrix Spike | Dissolved Organic Carbon | MS-B | L1816799-1, -11, -12, -13, -3, -5, -7 |
| Matrix Spike | Dissolved Organic Carbon | MS-B | L1816799-1, -11, -12, -13, -3, -5, -7 |
| Matrix Spike | Dissolved Organic Carbon | MS-B | L1816799-15, -16, -18, -20 |
| Matrix Spike | Antimony (Sb)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Barium (Ba)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Barium (Ba)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Barium (Ba)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Copper (Cu)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Copper (Cu)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Molybdenum (Mo)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Molybdenum (Mo)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Sodium (Na)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Sodium (Na)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Strontium (Sr)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Silicon (Si)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Copper (Cu)-Total | MS-B | L1816799-1, -11, -12, -13, -14, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Manganese (Mn)-Total | MS-B | L1816799-1, -11, -12, -13, -14, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Nitrate (as N) | MS-B | L1816799-10, -11, -12, -13, -14, -15, -16, -17, -19, -2, -20, -4, -6, -8 |
| Matrix Spike | Phosphorus (P)-Total | MS-B | L1816799-1, -11, -3, -5, -7, -9 |
| Matrix Spike | Phosphorus (P)-Total | MS-B | L1816799-12, -13, -14, -15, -16, -17, -20 |
| Matrix Spike | Sulfur (S)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Sulfur (S)-Dissolved | MS-B | L1816799-1, -11, -12, -13, -15, -16, -17, -18, -20, -3, -5, -7, -9 |
| Matrix Spike | Sulfate (SO4) | MS-B | L1816799-10, -11, -12, -13, -14, -15, -16, -17, -19, -2, -20, -4, -6, -8 |

**Qualifiers for Individual Parameters Listed:**

| Qualifier | Description |
|---|---|
| DLDS | Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity. |
| DLM | Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity). |
| HTC | Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable). |
| 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** |
|---|---|---|---|
| **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.

# Reference Information

**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.

**CARBONS-DOC-VA** Water Dissolved organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

**CARBONS-TOC-VA** Water Total organic carbon by combustion APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

**CR-CR3-DIS-CALC-ED** Water Dissolved Trivalent Chromium in Water CALCULATION

Chromium (III)-Dissolved is calculated as the difference between the dissolved chromium and the dissolved hexavalent chromium (Cr(VI)) results.

**CR-CR3-TOT-CALC-ED** Water Total Trivalent Chromium in Water CALCULATION

Chromium (III)-Total is calculated as the difference between the total chromium and the hexavalent chromium (Cr(VI)) results.

**CR-CR6-ED** Water Chromium, Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on an un-filtered, field-preserved sample.

**CR6-D-IC-ED** Water Chromium, Dissolved Hexavalent (Cr +6) APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on a field-filtered, field-preserved sample.

**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.

**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 um), 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.

**MET-D-CCMS-VA** Water Dissolved Metals 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.

**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

# Reference Information

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).

| | | | |
|---|---|---|---|
| **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.

| | | | |
|---|---|---|---|
| **P-T-PRES-COL-VA** | Water | Total P in Water by Colour | APHA 4500-P Phosphorus |

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

| | | | |
|---|---|---|---|
| **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.

** 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 |
|---|---|
| ED | ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA |

# Reference Information

| | |
|---|---|
| WR | ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA |
| 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.*

Contact: Brent Mack
Company: ALS Environmental
Address: 8081 Lougheed HWY, Suite 100
Burnaby, BC V5A1W9

## REFERENCE DATA

Project / Location: L1816799
PO Number: L1816799
ALS Work Order: 1608846

TEM Water Narrative: Analysis performed on FEI Tecnai TEM with integrated EDXA capabilities. Morphology, EDXA, and SAED measurements used to determine fiber species. Representative EDXA spectra of each asbestos type detected included. Compliance samples must be received and filtered within 48 hours of collection. Collection is performed outside ALS and is the responsibility of the client. Samples disposed after 60 days. TEM grids archived 3 years. Results apply only to portions analyzed.

TEM Water Methods: "EPA 100.2" refers to drinking water samples filtered on 47mm, 0.22µm pore MCE filters. "EPA 100.1" refers to drinking water samples filtered on 47mm, 0.1µm pore Polycarbonate filters. No standard method for asbestos in nonpotable water exists. All TEM waters (potable and nonpotable) analyzed at >10,000x magnification for asbestos fibers >10µm long. Whenever possible, sufficient volume is analyzed to yield an AS of <0.20 MFL based on the detection of 1 confirmed asbestos fiber in the total area analyzed. However, the volume analyzed is dependent upon a filter loading of <25% particulate. Samples containing excessive suspended solids may not reach the recommended AS of <0.20 MFL. In any case, a minimum of 4 and a maximum of 10 openings are analyzed regardless of the AS reached or asbestos concentration detected. ALS will report results directly to state of origin only when;

a) the Chain of Custody clearly states "drinking water for state compliance",
b) the appropriate state drinking water form is submitted with the samples,
c) the state form is completely filled out by the client prior to submittal, and
d) the address to which the form is to be sent is provided.

NOTES: *NA=Not Applicable, ND=None Detected, AS=Analytical Sensitivity, MFL=Millions of Fibers per Liter. † Act-Tremolite concentrations include Actinolite as well as the Libby Amphiboles; Tremolite, Winchite, & Richterite.*

*OH Lab ID: #4077, Ohio Analysts; P. Johnson #2268, A. Sohn #3431*

*PA Lab ID: #68-01320, Cert. #003*

*NELAC accredited through New York ELAP, LAB #11371*

## TEM ANALYSIS DATA

EDXA Resolution (eV): <175
Accelerating Voltage (keV): 100
Prep Start Date: 8/25/2016
Calibration Constant (µm/cm): 0.74
Camera Constant (mm-Å): 129.25
Analysis Start Date: 8/26/2016

Pamela Johnson
ALS TEM Analyst

Shawn Smythe
ALS Project Manager

**IDENTIFICATION**

| | L1816799-11 |
|---|---|
| Client Sample ID: | R1 |
| ALS Sample ID: | 1608846-06 |
| Method: | EPA 100.2 |
| Date of Collection: | 8/19/2016 |
| Time of Collection: | Not Provided |

**FILTRATION & ANALYSIS**

| | |
|---|---|
| Date of Filtration: | 8/24/2016 |
| Time of Filtration: | 16:35 |
| Volume Filtered (L): | 0.003 |
| Openings Analyzed: | 10 |
| Avg. Opening Area ($mm^2$): | 0.0108 |
| AS (MFL): | 3.32 |

**ASBESTOS COUNT**

| | |
|---|---|
| Chrysotile: | 0 |
| Amosite: | 0 |
| Crocidolite: | 0 |
| Act-Tremolite†: | 0 |
| Anthophyllite: | 0 |
| Total Asbestos: | 0 |

**ASBESTOS CONCENTRATION (MFL)**

| | |
|---|---|
| Chrysotile: | <AS |
| Amosite: | <AS |
| Crocidolite: | <AS |
| Act-Tremolite†: | <AS |
| Anthophyllite: | <AS |
| **Total Asbestos:** | **<AS** |

**NOTES**

Sample L1816799-11 R1 contained excessive suspended solids prohibiting filtration of sufficient sample volume required to reach the recommended method AS of <0.20 MFL. Analysis terminated upon completion of the maximum 10 openings analyzed.

**EDXA SPECTRA**

*NOTE: Spurious peaks may originate from low background sample holder, column pole pieces, TEM grids, prep solutions or matrix materials.*

NONE: No asbestos detected.

**PHOTOMICROGRAPHS**

*Collected using Gatan Digital Micrograph.*

NONE: No asbestos detected.

31-Aug-2016

Brent Mack
ALS Environmental
8081 Lougheed HWY
Suite 100
Burnaby, BC V5A1W9

Tel: (604) 253-4188
Fax:

Re: L1816799 Work Order: **1608846**

Dear Brent,

ALS Environmental received 14 samples on 24-Aug-2016 10:01 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 21.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Shawn Smythe

Electronically approved by: Shawn Smythe

Shawn Smythe
Project Manager

# ALS Environmental

Date: 31-Aug-16

**Client:** ALS Environmental
**Project:** L1816799
**Work Order:** **1608846**

## Work Order Sample Summary

| Lab Samp ID | Client Sample ID | Matrix | Tag Number | Collection Date | Date Received | Hold |
|---|---|---|---|---|---|---|
| 1608846-01 | L1816799-1 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-02 | L1816799-3 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-03 | L1816799-5 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-04 | L1816799-7 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-05 | L1816799-9 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-06 | L1816799-11 | Water | | 8/19/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-07 | L1816799-12 | Water | | 8/19/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-08 | L1816799-13 | Water | | 8/20/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-09 | L1816799-14 | Water | | 8/22/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-10 | L1816799-15 | Water | | 8/19/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-11 | L1816799-16 | Water | | 8/20/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-12 | L1816799-17 | Water | | 8/20/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-13 | L1816799-18 | Water | | 8/18/2016 | 8/24/2016 10:01 | ☐ |
| 1608846-14 | L1816799-20 | Water | | 8/20/2016 | 8/24/2016 10:01 | ☐ |

## ALS Environmental

*Date: 31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799
**Work Order:** 1608846

# Case Narrative

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Results relate only to the items tested and are not blank corrected unless indicated.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-1 **Lab ID:** 1608846-01
**Collection Date:** 8/18/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **51** | | **2.0** | **mg/L** | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-3 **Lab ID:** 1608846-02
**Collection Date:** 8/18/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **77** | | **2.0** | **mg/L** | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-5 **Lab ID:** 1608846-03
**Collection Date:** 8/18/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **550** | | **2.0** | **mg/L** | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

| | | | |
|---|---|---|---|
| **Client:** | ALS Environmental | | |
| **Project:** | L1816799 | **Work Order:** | 1608846 |
| **Sample ID:** | L1816799-7 | **Lab ID:** | 1608846-04 |
| **Collection Date:** | 8/18/2016 | **Matrix:** | WATER |

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **56** | | **2.0** | **mg/L** | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-9 **Lab ID:** 1608846-05
**Collection Date:** 8/18/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | | 2.0 | mg/L | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-11 **Lab ID:** 1608846-06
**Collection Date:** 8/19/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **88** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-12 **Lab ID:** 1608846-07
**Collection Date:** 8/19/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **21** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-13 **Lab ID:** 1608846-08
**Collection Date:** 8/20/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | | 2.0 | mg/L | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-14 **Lab ID:** 1608846-09
**Collection Date:** 8/22/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| Total suspended solids | ND | | 2.0 | mg/L | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

| | | | |
|---|---|---|---|
| **Client:** | ALS Environmental | | |
| **Project:** | L1816799 | **Work Order:** | 1608846 |
| **Sample ID:** | L1816799-15 | **Lab ID:** | 1608846-10 |
| **Collection Date:** | 8/19/2016 | **Matrix:** | WATER |

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **2.3** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

| | | | |
|---|---|---|---|
| **Client:** | ALS Environmental | | |
| **Project:** | L1816799 | **Work Order:** | 1608846 |
| **Sample ID:** | L1816799-16 | **Lab ID:** | 1608846-11 |
| **Collection Date:** | 8/20/2016 | **Matrix:** | WATER |

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **93** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-17 **Lab ID:** 1608846-12
**Collection Date:** 8/20/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **4.9** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

**Client:** ALS Environmental
**Project:** L1816799 **Work Order:** 1608846
**Sample ID:** L1816799-18 **Lab ID:** 1608846-13
**Collection Date:** 8/18/2016 **Matrix:** WATER

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **120** | | **2.0** | **mg/L** | 1 | 8/24/2016 |

**Note:**

# ALS Environmental

**Date:** *31-Aug-16*

| | | | |
|---|---|---|---|
| **Client:** | ALS Environmental | | |
| **Project:** | L1816799 | **Work Order:** | 1608846 |
| **Sample ID:** | L1816799-20 | **Lab ID:** | 1608846-14 |
| **Collection Date:** | 8/20/2016 | **Matrix:** | WATER |

| Analyses | Result | Qual | Report Limit | Units | Dilution Factor | Date Analyzed |
|---|---|---|---|---|---|---|
| **TOTAL SUSPENDED SOLIDS** | | | **E160.2** | | | Analyst: **rmb** |
| **Total suspended solids** | **2.9** | | **2.0** | **mg/L** | 1 | 8/25/2016 |

**Note:**

**Client:** ALS Environmental

**Work Order:** 1608846

**Project:** L1816799

# QC BATCH REPORT

Batch ID: **R132323** Instrument ID: **WETCHEM** Method: **E160.2**

**MBLK** Sample ID: **MB-R132323-R132323** Units: **mg/L** Analysis Date: **8/24/2016**

Client ID: Run ID: **WETCHEM_160824D** SeqNo: **1344804** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | | | | | | | | |

**LCS** Sample ID: **LCS-R132323-R132323** Units: **mg/L** Analysis Date: **8/24/2016**

Client ID: Run ID: **WETCHEM_160824D** SeqNo: **1344805** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | 913.7 | 2.0 | 1000 | 0 | 91.4 | 70-130 | 0 | | | |

**DUP** Sample ID: **1608846-05A Dup** Units: **mg/L** Analysis Date: **8/24/2016**

Client ID: **L1816799-9** Run ID: **WETCHEM_160824D** SeqNo: **1344815** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | 0 | 0 | 0 | | 1.17 | 0 | | |

**The following samples were analyzed in this batch:**

| | | |
|---|---|---|
| 1608846-01A | 1608846-02A | 1608846-03A |
| 1608846-04A | 1608846-05A | 1608846-13A |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

**Client:** ALS Environmental
**Work Order:** 1608846
**Project:** L1816799

# QC BATCH REPORT

Batch ID: **R132325** Instrument ID: **WETCHEM** Method: **E160.2**

**MBLK** Sample ID: **MB-R132325-R132325** Units: **mg/L** Analysis Date: **8/25/2016**
Client ID: Run ID: **WETCHEM_160825B** SeqNo: **1344826** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | ND | 2.0 | | | | | | | | |

**LCS** Sample ID: **LCS-R132325-R132325** Units: **mg/L** Analysis Date: **8/25/2016**
Client ID: Run ID: **WETCHEM_160825B** SeqNo: **1344827** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | 860.8 | 2.0 | 1000 | 0 | 86.1 | 70-130 | 0 | | | |

**DUP** Sample ID: **1608846-14A Dup** Units: **mg/L** Analysis Date: **8/25/2016**
Client ID: **L1816799-20** Run ID: **WETCHEM_160825B** SeqNo: **1344836** Prep Date: DF: **1**

| Analyte | Result | PQL | SPK Val | SPK Ref Value | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
|---|---|---|---|---|---|---|---|---|---|---|
| Total suspended solids | 3.3 | 2.0 | 0 | 0 | 0 | | 2.87 | 13.9 | | |

**The following samples were analyzed in this batch:**

| | | |
|---|---|---|
| 1608846-06A | 1608846-07A | 1608846-08A |
| 1608846-09A | 1608846-10A | 1608846-11A |
| 1608846-12A | 1608846-14A | |

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.

# ALS Environmental

Date: 31-Aug-16

**Client:** ALS Environmental
**Project:** L1816799
**WorkOrder:** **1608846**

## QUALIFIERS, ACRONYMS, UNITS

| Qualifier | Description |
|---|---|
| * | Value exceeds Regulatory Limit |
| a | Not accredited |
| B | Analyte detected in the associated Method Blank above the Reporting Limit |
| E | Value above quantitation range |
| H | Analyzed outside of Holding Time |
| J | Analyte detected below quantitation limit |
| n | Not offered for accreditation |
| ND | Not Detected at the Reporting Limit |
| O | Sample amount is > 4 times amount spiked |
| P | Dual Column results percent difference > 40% |
| R | RPD above laboratory control limit |
| S | Spike Recovery outside laboratory control limits |
| U | Analyzed but not detected above the MDL |

| Acronym | Description |
|---|---|
| DUP | Method Duplicate |
| E | EPA Method |
| LCS | Laboratory Control Sample |
| LCSD | Laboratory Control Sample Duplicate |
| MBLK | Method Blank |
| MDL | Method Detection Limit |
| MQL | Method Quantitation Limit |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| PDS | Post Digestion Spike |
| PQL | Practical Quantitaion Limit |
| SDL | Sample Detection Limit |
| SW | SW-846 Method |

| Units Reported | Description |
|---|---|
| % | |
| mg/L | |

ALS Environmental

## Sample Receipt Checklist

Client Name: **ALS-VANCOUVER** Date/Time Received: **24-Aug-16 10:01**

Work Order: **1608846** Received by: **SNH**

Checklist completed by: Stephanie Harrington 24-Aug-16 Reviewed by: Shawn Smythe 25-Aug-16

eSignature | Date | eSignature | Date

Matrices:

Carrier name: FedEx

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shipping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | |
| Temperature(s)/Thermometer(s): | 2.7 | | |
| Cooler(s)/Kit(s): | | | |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH acceptable upon receipt? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted? | Yes ☐ | No ☐ | N/A ☑ |
| pH adjusted by: | - | | |

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction:

ALS Environmental

www.alsglobal.com

# Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1816799-COFC

COC Number: 1

Page 1 of 2

| Report To | | Report Format / Distribution | | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: | | R |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report | ☑ Yes ☐ No | P |
| Address: | 230 - 2237 2nd Avenue Whitehorse, YT | Select Distribution: | | E |
| | | | | E2 |
| Phone: | 867-456-4865 | Email 1 or Fax | nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 | chris@elr.ca | |

| Invoice To | Same as Report To | ☑ Yes ☐ No | Invoice Distribution | |
|---|---|---|---|---|
| | Copy of Invoice with Report | ☐ Yes ☑ No | Select Invoice Distribution: | |
| Company: | Hemmera Environchem Inc. | | Email 1 or Fax | nsandys@hemmera.com |
| Contact: | Natasha Sandys | | Email 2 | chris@elr.ca |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |
| ALS Lab Work Order # (lab use only) | | ALS Contact: | Sampler: GR / NB |

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

| ALS Sample # (lab use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | F/P Low Level Diss. Met (incl. Hg) and Hardness | P Low Level Tot. Met (incl. Hg) and Hardness | P Chromium Speciation (III/VI) - Total | F/P Chromium Speciation (III/VI) - Dissolved | P Ammonia - N | F/P Dissolved Organic Carbon (DOC) | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | E4 | 18-Aug-16 | 15:10 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 2 | E4 | 20-Aug-16 | 14:25 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 3 | E8 | 18-Aug-16 | 13:15 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 4 | E8 | 20-Aug-16 | 14:50 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 5 | R4 | 18-Aug-16 | 13:55 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 6 | R4 | 20-Aug-16 | 14:30 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 7 | R6 | 18-Aug-16 | 18:10 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 8 | R6 | 20-Aug-16 | 15:05 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 9 | GWCC-5 | 18-Aug-16 | 16:50 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 10 | GWCC-5 | 20-Aug-16 | 14:10 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 11 | R1 | 19-Aug-16 | 14:50 | Water | R | R | | | R | R | R | R | R | R | R | R | R | 11 |
| 12 | R2 | 19-Aug-16 | 16:35 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |

| Drinking Water (DW) Samples[1] (client use) | Special Instructions / Specify Criteria to add on report (client Use) |
|---|---|
| Are samples taken from a Regulated DW System? ☐ Yes ☑ No | Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results. |
| Are samples for human drinking water use? ☐ Yes ☑ No | |

SAMPLE CONDITION AS RECEIVED (lab use only)

| | | | | | |
|---|---|---|---|---|---|
| Frozen | ☐ | SIF Observations | Yes ☐ | No ☐ | |
| Ice packs | Yes ☑ | No ☐ | Custody seal intact | Yes ☐ | No ☐ |
| Cooling Initiated | ☑ | | | | |

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| 0.9 | 0.8 | 0.5 | 4 | 6 | 7 |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: | Time: |
| | | | | 22-AUG-16 | 10:15 |

| FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|
| Received by: | Date: | Time: |
| JC | AUG 23 2016 | 12:15 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY



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

# Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1816799-COFC

COC Number: 1

Page 2 of 2

| Report To | | Report Format / Distribution | | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: | ☑PDF ☑EXCEL ☑EDD (DIGITAL) | R ☑Regular (Standard TAT if received by 3 pm - business days) |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report | ☑ Yes ☐ No | P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT |
| Address: | 230 - 2237 2nd Avenue<br>Whitehorse, YT | ☐Criteria on Report - provide details below if box checked | | E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT |
| | | Select Distribution: | ☑EMAIL ☐MAIL ☐FAX | E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge |
| Phone: | 867-456-4865 | Email 1 or Fax | nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 | chris@elr.ca | |

| Invoice To | Same as Report To ☑ Yes ☐ No | Invoice Distribution | | |
|---|---|---|---|---|
| | Copy of Invoice with Report ☐ Yes ☑ No | Select Invoice Distribution: | ☑EMAIL ☑MAIL ☐FAX | |
| Company: | Hemmera Environchem Inc. | Email 1 or Fax | nsandys@hemmera.com | |
| Contact: | Natasha Sandys | Email 2 | chris@elr.ca | |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |
| ALS Lab Work Order # (lab use only) | | ALS Contact: | Sampler: GR / NB |

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

| ALS Sample # (lab use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | F/P Low Level Diss. Met (incl. Hg) and Hardness | P Low Level Tot. Met (incl. Hg) and Hardness | P Chromium Speciation (III/VI) - Total | F/P Chromium Speciation (III/VI) - Dissolved | P Ammonia - N | F/P Dissolved Organic Carbon (DOC) | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Dup-2 | 20-Aug-16 | 10:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 14 | Travel Blank | | | Water | | R | | | R | R | R | R | R | R | R | | R | 6 |
| 15 | R8 | 19-Aug-16 | 17:45 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 16 | R9 | 20-Aug-16 | 8:50 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 17 | SL | 20-Aug-16 | 13:05 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 18 | E7 | 18-Aug-16 | 11:35 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 19 | E7 | 20-Aug-16 | 14:45 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 20 | E1(H) | 20-Aug-16 | 10:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

**Drinking Water (DW) Samples[1] (client use)**

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

**Special Instructions / Specify Criteria to add on report (client Use)**

Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results.

**SAMPLE CONDITION AS RECEIVED (lab use only)**

| | | | | | |
|---|---|---|---|---|---|
| Frozen | ☐ | SIF Observations | Yes ☐ | No ☐ | |
| Ice packs | Yes ☑ | No ☐ | Custody seal intact | Yes ☐ | No ☐ |
| Cooling Initiated | ☐ | | | | |

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| 0.9 | 0.8 | 0.5 | 4 | 6 | 7 |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | | FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: | Time: | Received by: | Date: | Time: |
| | AUG 22 2016 | 10:17 | | 22-AUG-16 | 10:15 | JC | AUG 23 2016 | 12:15 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NA-FM-0326a v09 Front/04 January 2014

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

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

# Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1816799-COFC

COC Number: 1

Page 2 of 2

| Report To | | Report Format / Distribution | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: ☑PDF ☑EXCEL ☑EDD (DIGITAL) | R ☑Regular (Standard TAT if received by 3 pm - business days) |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report ☑Yes ☐No | P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT |
| Address: | 230 - 2237 2nd Avenue<br>Whitehorse, YT | ☐Criteria on Report - provide details below if box checked<br>Select Distribution: ☑EMAIL ☐MAIL ☐FAX | E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT<br>E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge |
| Phone: | 867-456-4865 | Email 1 or Fax nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 chris@elr.ca | |

| Invoice To | Same as Report To ☑Yes ☐No | Invoice Distribution | Analysis Request |
|---|---|---|---|
| | Copy of Invoice with Report ☐Yes ☑No | Select Invoice Distribution: ☑EMAIL ☑MAIL ☐FAX | Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below |
| Company: | Hemmera Environchem Inc. | Email 1 or Fax nsandys@hemmera.com | |
| Contact: | Natasha Sandys | Email 2 chris@elr.ca | |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |

| ALS Lab Work Order # (lab use only) | | ALS Contact: | Sampler: GR / NB |
|---|---|---|---|

| 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 | Low Level Diss. Met (incl. Hg) and Hardness | Low Level Tot. Met (incl. Hg) and Hardness | Chromium Speciation (III/VI) - Total | Chromium Speciation (III/VI) - Dissolved | Ammonia - N | Dissolved Organic Carbon (DOC) | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | F/P | P | P | F/P | P | F/P | | | | | | | | |
| 13 | Dup-2 | 20-Aug-16 | 10:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 14 | Travel Blank | | | Water | | R | | | R | R | R | R | R | R | R | | R | 6 |
| 15 | R8 | 19-Aug-16 | 17:45 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 16 | R9 | 20-Aug-16 | 8:50 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 17 | SL | 20-Aug-16 | 13:05 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| 18 | E7 | 18-Aug-16 | 11:35 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 19 | E7 | 20-Aug-16 | 14;45 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 20 | E1(H) | 20-Aug-16 | 10:10 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

**Drinking Water (DW) Samples[1] (client use)**

Are samples taken from a Regulated DW System? ☐Yes ☑No

Are samples for human drinking water use? ☐Yes ☑No

**Special Instructions / Specify Criteria to add on report (client Use)**

Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results.

**SAMPLE CONDITION AS RECEIVED (lab use only)**

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☑

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| 0.9 | 0.8 | 0.5 | 4 | 6 | 7 |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | | FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: | Time: | Received by: | Date: | Time: |
| | AUG 22 2016 | 10:7. | | 22-AUG-16 | 10:15 | JC | AUG 23 2016 | 12:15 |

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



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

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

# Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1816799-COFC

COC Number: 1

Page 1 of 2

| Report To | | Report Format / Distribution | | Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests) |
|---|---|---|---|---|
| Company: | Hemmera Environchem Inc. | Select Report Format: | | R |
| Contact: | Natasha Sandys | Quality Control (QC) Report with Report | ☑ Yes ☐ No | P |
| Address: | 230 - 2237 2nd Avenue Whitehorse, YT | Select Distribution: | | E |
| | | | | E2 |
| Phone: | 867-456-4865 | Email 1 or Fax | nsandys@hemmera.com | Specify Date Required for E2,E or P: |
| | | Email 2 | chris@elr.ca | |

| Invoice To | Same as Report To ☑ Yes ☐ No | Invoice Distribution | |
|---|---|---|---|
| | Copy of Invoice with Report ☐ Yes ☑ No | Select Invoice Distribution: | |
| Company: | Hemmera Environchem Inc. | Email 1 or Fax | nsandys@hemmera.com |
| Contact: | Natasha Sandys | Email 2 | chris@elr.ca |

| Project Information | | Oil and Gas Required Fields (client use) | |
|---|---|---|---|
| ALS Quote #: | Q56044 | Approver ID: | Cost Center: |
| Job #: | 1343-005.19 | GL Account: | Routing Code: |
| PO / AFE: | | Activity Code: | |
| LSD: | | Location: | |
| ALS Lab Work Order # (lab use only) | | ALS Contact: | Sampler: GR / NB |

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

| ALS Sample # (lab use only) | Sample Identification and/or Coordinates (This description will appear on the report) | Date (dd-mmm-yy) | Time (hh:mm) | Sample Type | Low Level Diss. Met (incl. Hg) and Hardness F/P | Low Level Tot. Met (incl. Hg) and Hardness P | Chromium Speciation (III/VI) - Total P | Chromium Speciation (III/VI) - Dissolved F/P | Ammonia - N P | Dissolved Organic Carbon (DOC) F/P | Nitrate-N | Nitrite - N | Total Phosphorus | Sulphate | pH, Conductivity | Asbestos-TEM-AD | Total Suspended Solids | Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | E4 | 18-Aug-16 | 15:10 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 2 | E4 | 20-Aug-16 | 14:25 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 3 | E8 | 18-Aug-16 | 13:15 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 4 | E8 | 20-Aug-16 | 14:50 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 5 | R4 | 18-Aug-16 | 13:55 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 6 | R4 | 20-Aug-16 | 14:30 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 7 | R8 | 18-Aug-16 | 18:10 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 8 | R6 | 20-Aug-16 | 15:05 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 9 | GWCC-5 | 18-Aug-16 | 16:50 | Water | R | R | | | R | R | | | | | | | R | 9 |
| 10 | GWCC-5 | 20-Aug-16 | 14:10 | Water | | | | | | | R | R | R | R | R | | | 1 |
| 11 | R1 | 19-Aug-16 | 14:50 | Water | R | R | | | R | R | R | R | R | R | R | R | R | 11 |
| 12 | R2 | 19-Aug-16 | 16:35 | Water | R | R | | | R | R | R | R | R | R | R | | R | 10 |

**Drinking Water (DW) Samples[1] (client use)**

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

**Special Instructions / Specify Criteria to add on report (client Use)**

Please hold samples for total and dissolved Chromium III/VI pending regular metals analysis results. Please supply ELR EQWIN EDD file with results.

**SAMPLE CONDITION AS RECEIVED (lab use only)**

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice packs Yes ☑ No ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☑

| INITIAL COOLER TEMPERATURES °C | | | FINAL COOLER TEMPERATURES °C | | |
|---|---|---|---|---|---|
| 0.9 | 0.8 | 0.5 | 4 | 6 | 7 |

| SHIPMENT RELEASE (client use) | | | INITIAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|---|---|---|
| Released by: | Date: | Time: | Received by: | Date: 22-AUG-16 | Time: 10:15 |

| FINAL SHIPMENT RECEPTION (lab use only) | | |
|---|---|---|
| Received by: JC | Date: AUG 23 2016 | Time: 12:15 |

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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ALS-FM-0326a v09 Front04 January 2014

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

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

# APPENDIX 2
## Water Quality Field Forms

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | E1 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | 16 AUG 2016 |
| **UTM Coordinates** | Z 7N E 0513653 N 7147107 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GARMIN Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~ 19°C Partly cloudy Light wind. |
| **Photos** | Cam GARMIN Nos. 7062 - 7065 | | | | |
| **Sample Time (24h)** | 1710 | | | | |
| **Field Blank Collected:** | ☒ Yes ☐ No Name FB1 | **Duplicate Collected:** | ☒ Yes ☐ No Name DUP 1 | | |

**Field Parameter Measurements** (note units if different than those stated)

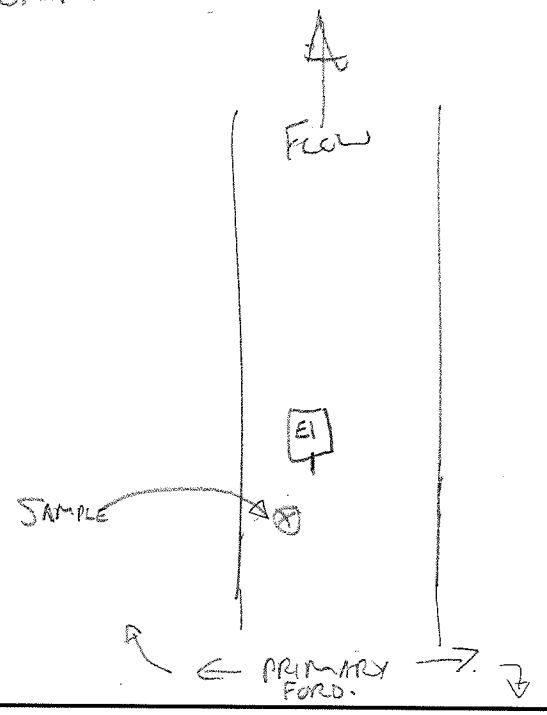
| | |
|---|---|
| **Station Status** | ~~Good~~ - TURBID! |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 12.8 |
| **pH (pH Units)** | 8.86 |
| **Cond. (µs/cm)** | 338.6 |
| **Specific Cond. (µs/cm)** | 441.5 |
| **Redox (mV)** | -28.3 |
| **DO (mg/L)** | ~~96.0~~ 10.17 |
| **DO (%)** | 96.0 |
| **Turbidity (NTU)** | TURBID. |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID! |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1716 |
| **Sample Time** | (hh:mm) 1710. |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other ____ |

**Site Sketch**

YSI TAKING TIME TO STABILIZE, ESPECIALLY ORP.



**Sample Site (Con't):** E1

**Sample Date (Con't):** AUG-16 2016

**Sample Time (Con't):** 1710

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) | |
|---|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time~~: FULL SAMPLE + DUP1 | 1 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | | 1 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | | 1 |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | | 1 |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | | 1 |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | | 1 |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | | 1 |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | | 1 |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | | 1 |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | | 1 |
| | | | | Total: | 10 | | 10 |

**General Notes:**

DUP 1 + FB1.

10 BOTTLES TOTAL IN DUP1.

3 FILTERS PER BOTTLE SET. (6 TOTAL)

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | EI(H) | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 20 2016 |
| **UTM Coordinates** | Z 7W E 0512850 N 7149423 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS Garmin Name ✓ | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~11°C SPOTS OF RAIN & WIND. |
| **Photos** | Cam Garmin Nos. 7182 - 7187 | | | | |
| **Sample Time (24h)** | 1010 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☒ Yes ☐ No Name DUP 2 | | |

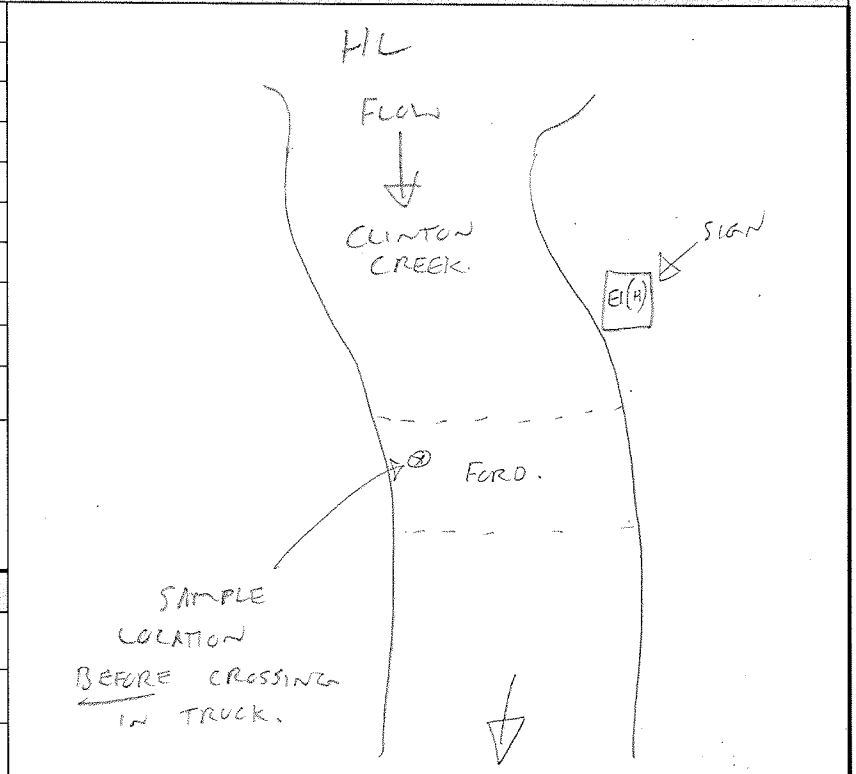
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD. SLIGHTLY TURBID. |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 12.1 |
| **pH (pH Units)** | 7.89 |
| **Cond. (µs/cm)** | 332.3 |
| **Specific Cond. (µs/cm)** | 441.0 |
| **Redox (mV)** | 117.1 |
| **DO (mg/L)** | 8.90 |
| **DO (%)** | 83.1 |
| **Turbidity (NTU)** | ✓ |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | SLIGHTLY TURBID. |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1011 |
| **Sample Time** | (hh:mm) 1010. |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

**Site Sketch**



**Sample Site (Con't):** EI(H)

**Sample Date (Con't):** AUG 20 2016

**Sample Time (Con't):** 1010

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) | |
|---|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☑ | 1 | Date/Time: AUG 20 2016 | DUP 2 / 1 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☑ | 1 | | 1 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☑ | 1 | | 1 |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☑ | 1 | | 1 |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☑ | 1 | | 1 |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☑ | 1 | | 1 |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | | 1 |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | | 1 |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | | 1 |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | | 1 |
| | | | | Total: | 10 | | 10 |

**General Notes:**

10 BOTTLES IN SAMPLE AND ~~[illegible]~~ DUPLICATE SET

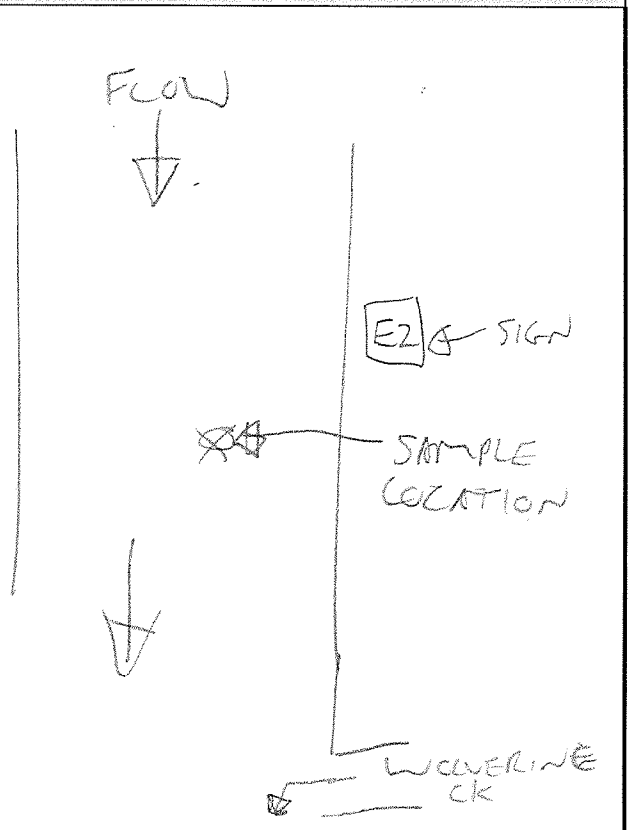
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | E2 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 17 2016 |
| **UTM Coordinates** | Z 07W E 0514168 N 7147077 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GARMIN Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~24°C MOSTLY BLUE SKIES. LIGHT WIND |
| **Photos** | Cam GARMIN Nos. 7103-7107 | | | | |
| **Sample Time (24h)** | 1420 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD. HIGH WATER |
| **Sample Depth (m)** | 0-1 |
| **Temperature (°C)** | 12.0 |
| **pH (pH Units)** | 7.76 |
| **Cond. (µs/cm)** | 411.1 |
| **Specific Cond. (µs/cm)** | 547.3 |
| **Redox (mV)** | 73.7 |
| **DO (mg/L)** | 10.11 |
| **DO (%)** | 93.8 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | SLIGHTLY TURBID. |

**Site Sketch**




**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1433 |
| **Sample Time** | (hh:mm) 1420 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Sample Site (Con't):** E2

**Sample Date (Con't):** AUG 17 2016

**Sample Time (Con't):** 1420

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time~~: FULL SET |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| 1 L (plastic) | Asbestos | Wrapped tightly in foil | - | ☒ | 1 | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 11 | |

**General Notes:**

NOTE TURBIDITY OF WOLVERINE CK AS IT ENTERS CLINTON CK. (SEE PHOTOS).

ORP TAKING TIME TO STABILIZE. > 10 MINS

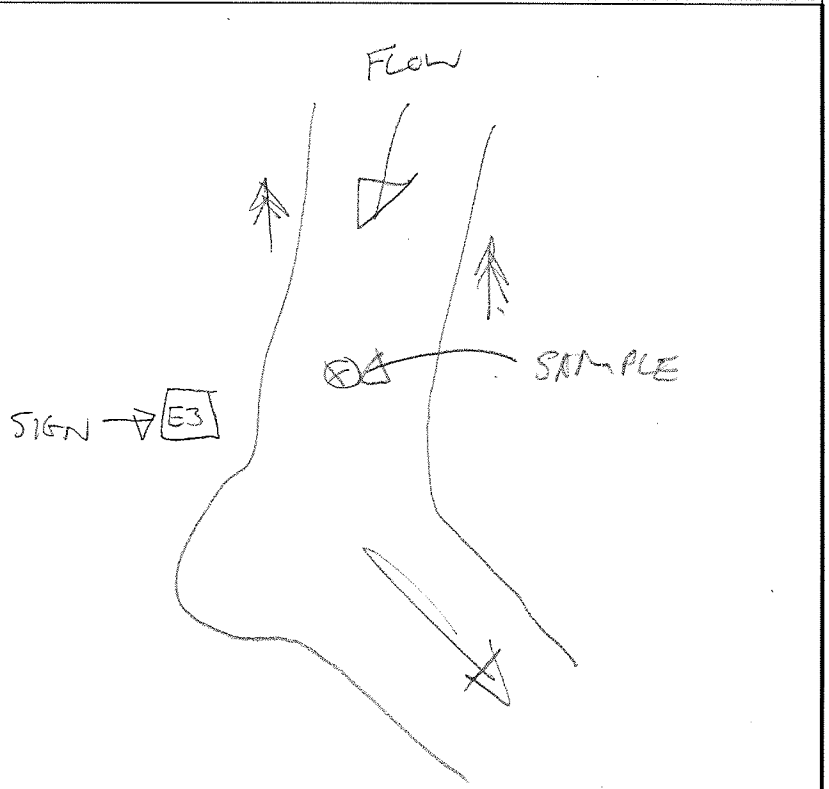
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | E3 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 16 2016 |
| **UTM Coordinates** | Z 07W E 0514774 N 7147189 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB. |
| **Waypoint** | GPS GARMIN Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~15°C PART CLOUDY. |
| **Photos** | Cam GARMIN Nos. 7059 - 7061 | | | | |
| **Sample Time (24h)** | 1610 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD TURBID! |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 5.8 |
| **pH (pH Units)** | ~~10.07~~ 11.96 |
| **Cond. (µs/cm)** | ~~2668~~ 272.6 |
| **Specific Cond. (µs/cm)** | ~~272.5~~ 430.1 |
| **Redox (mV)** | -100.4 |
| **DO (mg/L)** | ~~12.14~~ 12.20 |
| **DO (%)** | 97.6 |
| **Turbidity (NTU)** | - |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID! |

**Site Sketch**




**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1620. |
| **Sample Time** | (hh:mm) 1610. |
| **Unit Used** | ☐ Pro Plus ☐ Pen Unit Other |

**Sample Site (Con't):** E3

**Sample Date (Con't):** AUG 16 2016

**Sample Time (Con't):** 1610.

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: FULL SET |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | | ☒ | 1 | * ASBESTOS ✓ |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

TURBID. METER TOOK A WHILE TO STABILIZE.

USED 8 FILTERS. * ASBESTOS SAMPLE COLLECTED ON AUG 17 @ 0810.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | EQ | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 18 2016 |
| **UTM Coordinates** | Z 7V E 0515945 N 7145283 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GRMR Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | NZ 1°C SUNNY PART CLOUDY NO WIND |
| **Photos** | Cam GRMR Nos. 7124-7128 | | | | |
| **Sample Time (24h)** | 1510 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

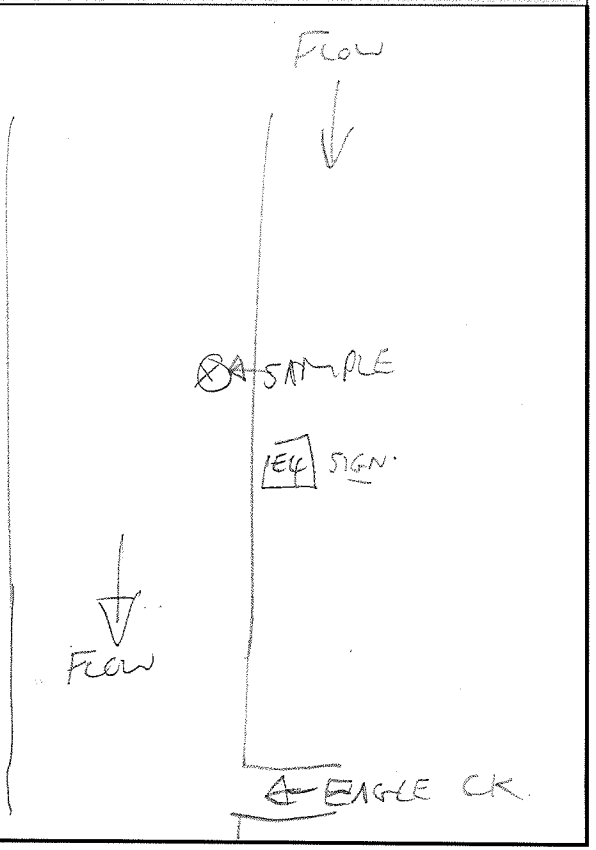
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD (TURBID) |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 12 |
| **pH (pH Units)** | 7.89 |
| **Cond. (µs/cm)** | 416.5 |
| **Specific Cond. (µs/cm)** | 554.1 |
| **Redox (mV)** | 125.5 |
| **DO (mg/L)** | 10.25 |
| **DO (%)** | 95.3 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID (BROWN) |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1515 |
| **Sample Time** | (hh:mm) 1510 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**



Sample Site (Con't): E4

Sample Date (Con't): AUG 18 2016

Sample Time (Con't): 1510

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 1425 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 9 | |

**General Notes:**

TURBID. DARK BROWN.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | E7 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 18 2016 |
| **UTM Coordinates** | Z 07W E 0519358 N 7142050 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS Garmin Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | N15°C SUNNY. |
| **Photos** | Cam Garmin Nos. 7112-7115 | | | | |
| **Sample Time (24h)** | 1125 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

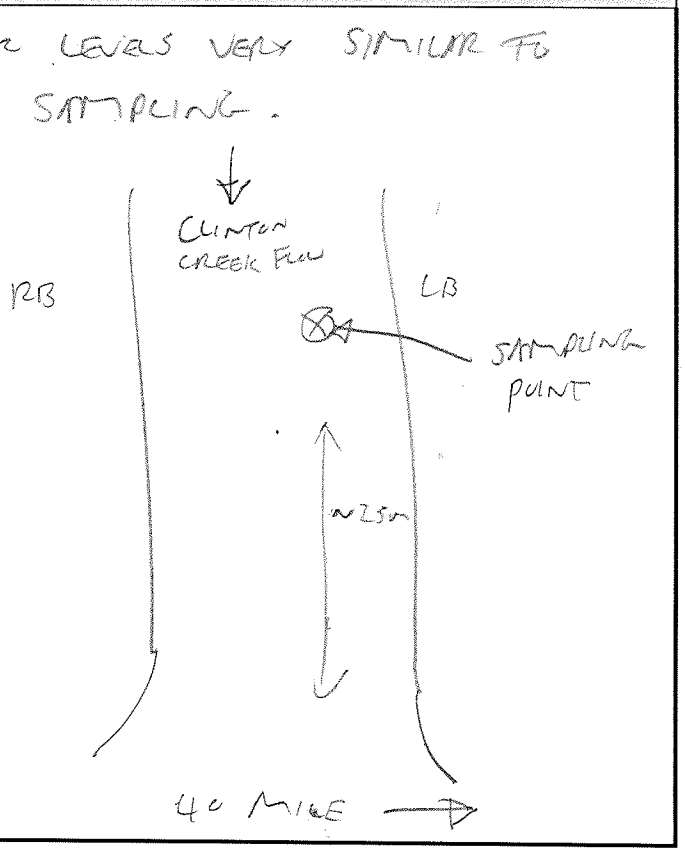
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD. WATER HIGH + TURBID |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 8.0 |
| **pH (pH Units)** | 7.98 |
| **Cond. (µs/cm)** | 353.7 |
| **Specific Cond. (µs/cm)** | 523.7 |
| **Redox (mV)** | 113.4 |
| **DO (mg/L)** | 11.12 |
| **DO (%)** | 94.2 |
| **Turbidity (NTU)** | |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | V. TURBID. (BROWN) |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1142 |
| **Sample Time** | (hh:mm) 1125 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

**Site Sketch**



**Sample Site (Con't):** E7

**Sample Date (Con't):** AUG 18 2016

**Sample Time (Con't):** 1125

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 1445 * |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

WATER VERY TURBID. BROWN.

ORP TAKING A LONG TIME TO STABILIZE (>10 MINS)

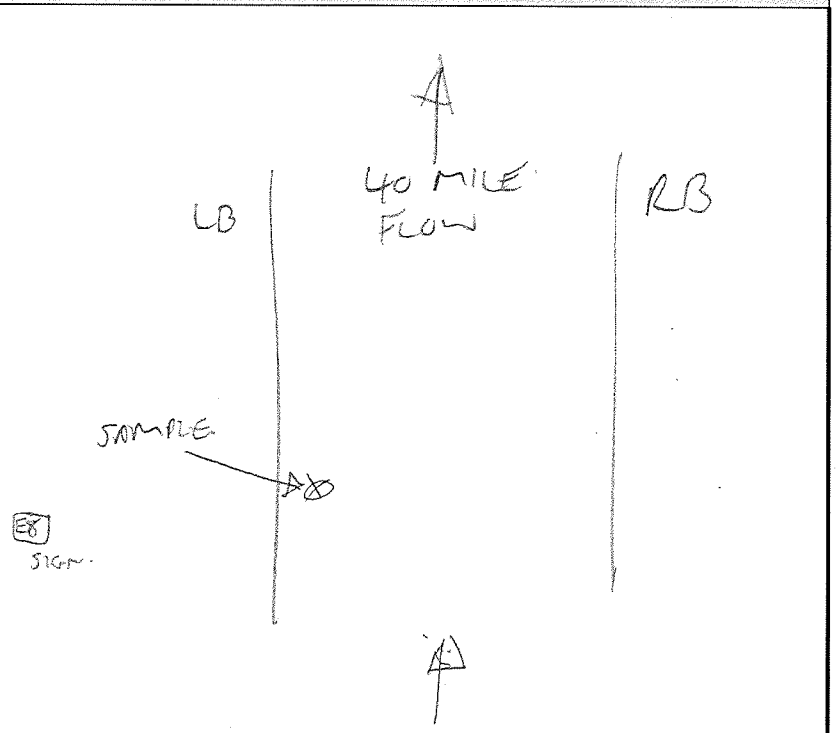
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | E8 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 18 2016 |
| **UTM Coordinates** | Z 7W E 0519451 N 7142793 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GPSR Name | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~18°C Sunny. Light Breeze |
| **Photos** | Cam GPSR Nos. 7116 - 7118 | | | | |
| **Sample Time (24h)** | 1315 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | Good |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 9.3 |
| **pH (pH Units)** | 8.36 |
| **Cond. (µs/cm)** | 119.3 |
| **Specific Cond. (µs/cm)** | 170.6 |
| **Redox (mV)** | 220.0 |
| **DO (mg/L)** | 11.12 |
| **DO (%)** | 96.6 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | V. TURBID. (BROWN) |

**Site Sketch**




**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1324 |
| **Sample Time** | (hh:mm) 1315 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

Sample Site (Con't): E8

Sample Date (Con't): AUG 18 2016

Sample Time (Con't): 1315 except Gen chem

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 1450 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | ~~-~~ | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | ~~8~~ 9 4 1 | |

**General Notes:**

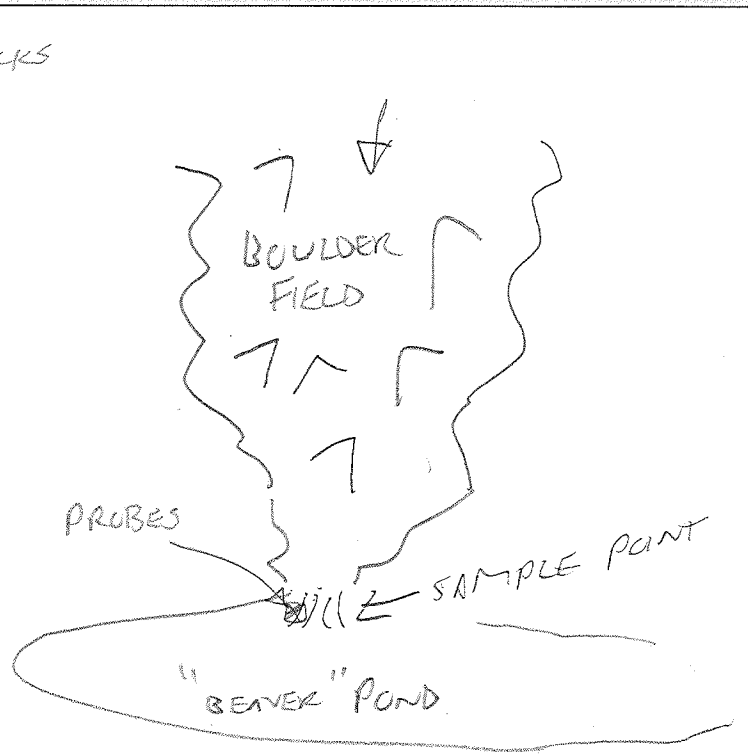
V. TURBID. 6 FILTERS USED

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | GLWCC-1 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 17 2016 |
| **UTM Coordinates** | Z 7W E 513900 N 7148960 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GRMR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~20°C PART CLOUD LIGHT WIND |
| **Photos** | Cam GRMR Nos. 7098 - 7102 | | | | |
| **Sample Time (24h)** | 1330 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD |
| **Sample Depth (m)** | FROM VERTICAL FLOW FROM ROCKS |
| **Temperature (°C)** | 7.7 |
| **pH (pH Units)** | 7.84 |
| **Cond. (µs/cm)** | 848 |
| **Specific Cond. (µs/cm)** | 1263 |
| **Redox (mV)** | 129.0 |
| **DO (mg/L)** | 7.93 |
| **DO (%)** | 66.8 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR |

**Site Sketch**




| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1239 |
| **Sample Time** | (hh:mm) 1330 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Sample Site (Con't):** GWCC-1

**Sample Date (Con't):** AUG 17 2016

**Sample Time (Con't):** 1330

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time~~: FULL SET |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | | |

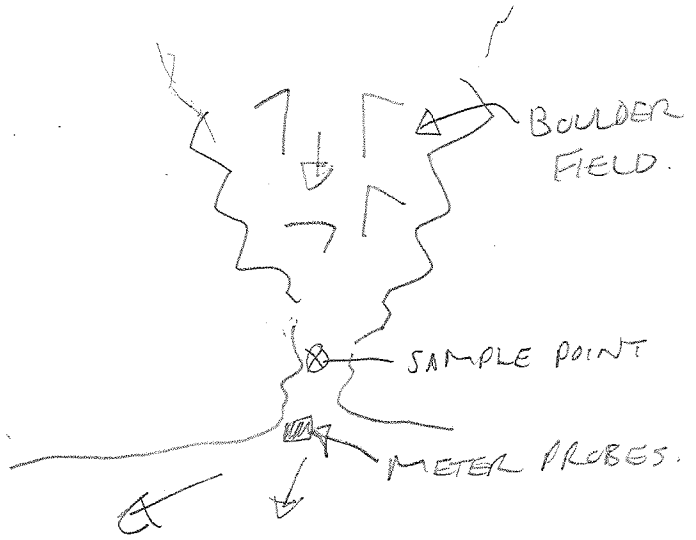
**General Notes:** LOTS OF WATER GUSHING FROM THE ROCKS.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | GWCC-2 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 17 2016 |
| **UTM Coordinates** | Z 07W E 0513906 N 7146971 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GPSMAP Name ✓ | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~19°C LIGHT WIND PART CLOUD |
| **Photos** | Cam GPSMAP Nos. 7095-7097 | | | | |
| **Sample Time (24h)** | 1310 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD. |
| **Sample Depth (m)** | COLLECTED DIRECTLY FROM VERTICAL FLOWING WATER |
| **Temperature (°C)** | 6.7 |
| **pH (pH Units)** | 8.24 |
| **Cond. (µs/cm)** | 1215 |
| **Specific Cond. (µs/cm)** | 1866 |
| **Redox (mV)** | 105.5 |
| **DO (mg/L)** | 7.81 |
| **DO (%)** | 64.3 |
| **Turbidity (NTU)** | |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR. ODOUR FROM AREA, NOT THE WATER. SLIGHT FAECES ODOUR. |

**Site Sketch**




| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1320 |
| **Sample Time** | (hh:mm) 1310. |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

Sample Site (Con't): GWCC-2

Sample Date (Con't): AUG 17 2016

Sample Time (Con't): 1310

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | | ~~Date~~/Time: FULL SET |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | ✓ | ✓ |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 4 | ✓ |
| | | | | Total: | 10 | |

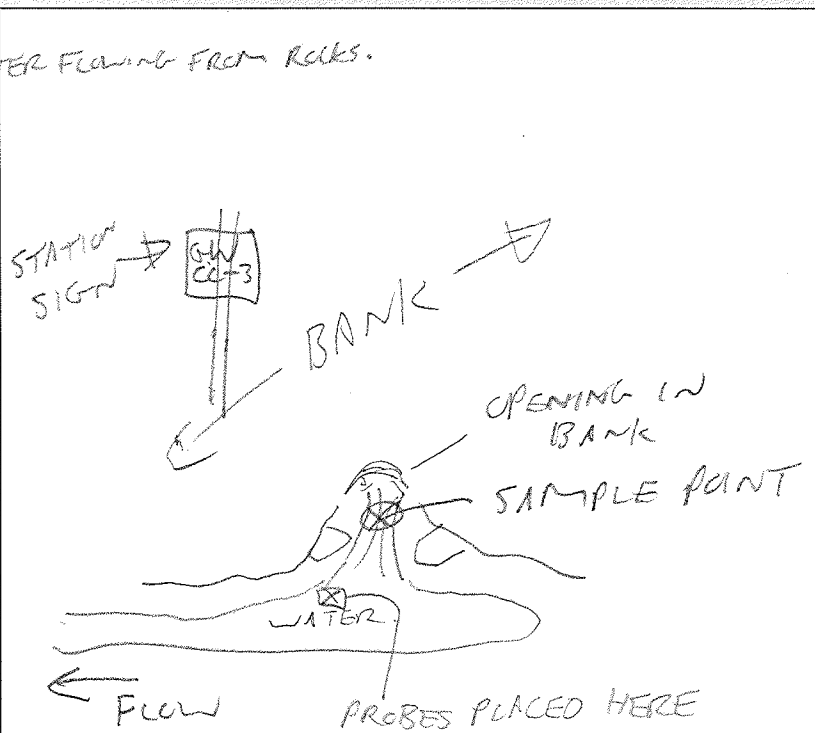
**General Notes:** ORP TOOK >10 MIN TO STABILIZE

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | GW CC-3 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 17 2016 |
| **UTM Coordinates** | Z 7W E 0513884 N 7147038 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + MB |
| **Waypoint** | GPS GMR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~19°C PART. CLOUDY Ø WIND |
| **Photos** | Cam GMR Nos. 7090-7094 | | | | |
| **Sample Time (24h)** | 1250 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD. |
| **Sample Depth (m)** | BOTTLES FILLED DIRECTLY FROM WATER FLOWING FROM ROCKS. |
| **Temperature (°C)** | 7.2 |
| **pH (pH Units)** | 7.76 |
| **Cond. (µs/cm)** | 1047 |
| **Specific Cond. (µs/cm)** | 1591 |
| **Redox (mV)** | ~~155.8~~ 162.9 |
| **DO (mg/L)** | 5.43 |
| **DO (%)** | 45.2 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR |

**Site Sketch**




| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1259 |
| **Sample Time** | (hh:mm) 1250 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Sample Site (Con't):** GWCC-3

**Sample Date (Con't):** AUG 17 2016

**Sample Time (Con't):** 1250

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time~~: FULL SET |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

ORP > 10 MINS TO STABILIZE

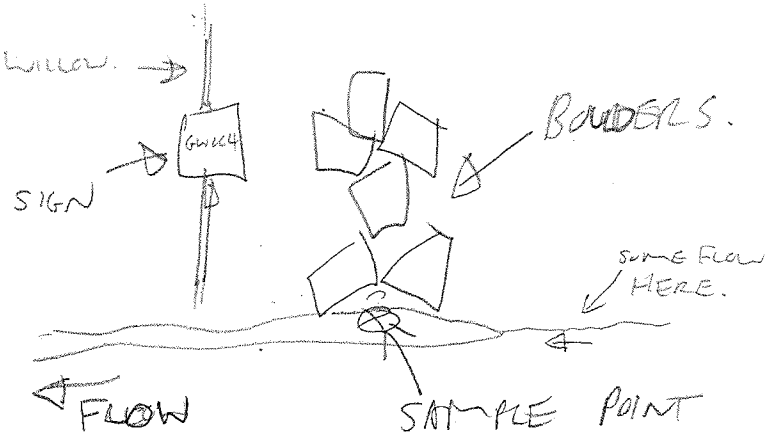
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | GWCC-4 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 17 2016 |
| **UTM Coordinates** | Z 7W E 0513876 N 7147063 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GMR Name ✓ | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~2 19 °C NO RAIN PART CLOUDY |
| **Photos** | Cam GMR Nos. 7085-7089 | | | | |
| **Sample Time (24h)** | 1225. | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD. |
| **Sample Depth (m)** | 0.02 |
| **Temperature (°C)** | 8.1 |
| **pH (pH Units)** | ~~7.47~~ 7.74 |
| **Cond. (µs/cm)** | 872 |
| **Specific Cond. (µs/cm)** | 1287 |
| **Redox (mV)** | 177.5 |
| **DO (mg/L)** | 4.77 |
| **DO (%)** | 40.6 |
| **Turbidity (NTU)** | ✓ |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR. |

**Site Sketch**




**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1242. |
| **Sample Time** | (hh:mm) 1225 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

**Sample Site (Con't):** GWCC-4

**Sample Date (Con't):** AUG 17 2016

**Sample Time (Con't):** 1225

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time:~~ FULL SET. |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:** ORP TOOK A LONG TIME TO STABILIZE > 10 MINS.

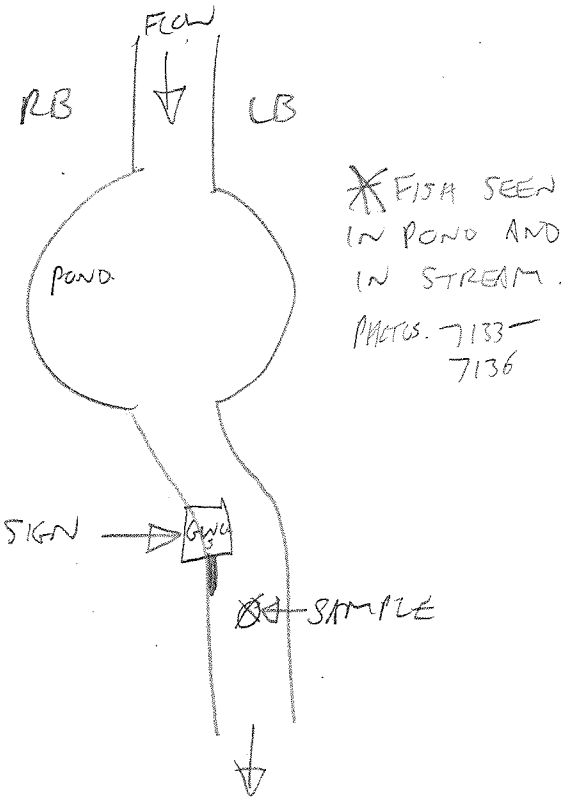
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | GWCC-5 | **Project Number:** | 16-240.3 Clinton Creek Water Program | **Date:** | AUG 18 2016 |
| **UTM Coordinates** | Z 07V E 0513984 N 7147128 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GWR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~20°C PART CLOUD. Ø WIND |
| **Photos** | Cam GWR Nos. 7137-7141 | | | | |
| **Sample Time (24h)** | 1650 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| Station Status | GOOD |
| Sample Depth (m) | 0.05 (SHALLOW WATER) |
| Temperature (°C) | 9.3 |
| pH (pH Units) | 7.64 |
| Cond. (µs/cm) | 703 |
| Specific Cond. (µs/cm) | 1004 |
| Redox (mV) | 154.0 |
| DO (mg/L) | 6.63 |
| DO (%) | 58 |
| Turbidity (NTU) | — |
| Appearance & Odour (Clear, Silty, HC odours, etc.) | CLEAR |

| **Field Measurements Log** | |
|---|---|
| YSI Logged? | ☒ Yes ☐ No |
| Time Logged on YSI | (hh:mm) ~~16-57~~ 16-57 |
| Sample Time | (hh:mm) 1650 |
| Unit Used | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**



**Sample Site (Con't):** GWCC-5

**Sample Date (Con't):** AUG 18 2016

**Sample Time (Con't):** 1650

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 1410 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | Date/Time: AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☒ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 9+1 | |

**General Notes:**

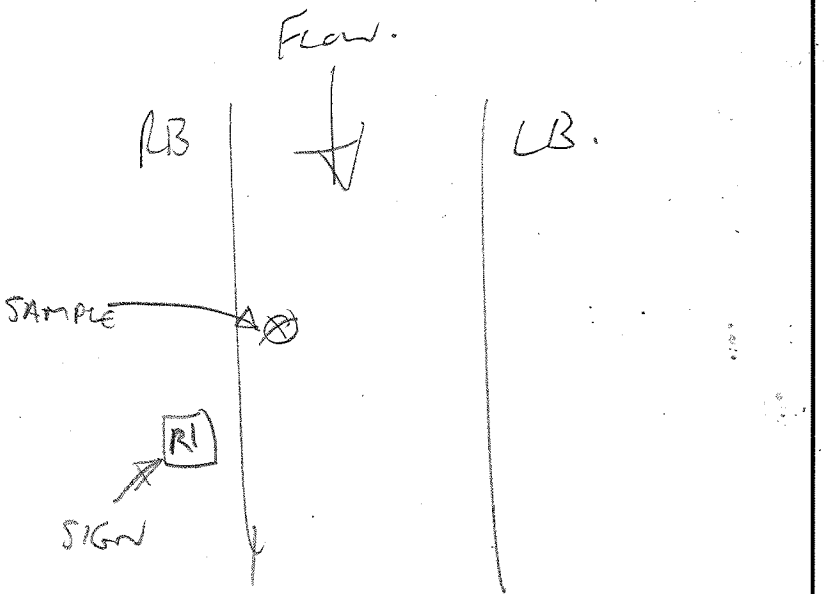
1 FILTER USED

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R1 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 19 2016 |
| **UTM Coordinates** | Zone E 0510604 N 7147490 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GMR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~16°C HIGH CLOUD BLUSTERY |
| **Photos** | Cam GMR Nos. 7161–7164 | | | | |
| **Sample Time (24h)** | 1450 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD. BUT TURBID. |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 6.8 |
| **pH (pH Units)** | 8.12 |
| **Cond. (µs/cm)** | 351.9 |
| **Specific Cond. (µs/cm)** | 539.5 |
| **Redox (mV)** | 67.5 |
| **DO (mg/L)** | 11.44 |
| **DO (%)** | 93.9 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID. (BROWN) |

**Site Sketch**




| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1500. |
| **Sample Time** | (hh:mm) 1450 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

Sample Site (Con't): R1

Sample Date (Con't): AUG 19 2016

Sample Time (Con't): 1450

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 19 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| 1 L (plastic) | Asbestos | Wrapped tightly in foil | - | ☒ | 1 | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 11 | |

**General Notes:**

WATER LEVEL A LITTLE LOWER THAN JULY EVENT.
TURBID.. 6 FILTERS USED.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R2 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 19 2016 |
| **UTM Coordinates** | Z 7 E 0512026 N 7148062 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GPSR Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~ 17°C OVERCAST. NO WIND. |
| **Photos** | Cam GoPro Nos. 7168 - 7171 | | | | |
| **Sample Time (24h)** | 1635 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

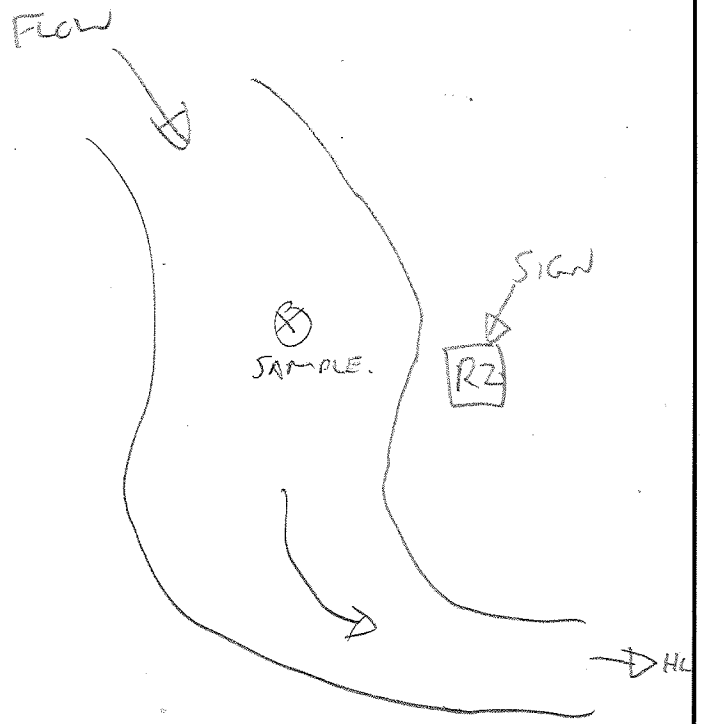
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | Good. |
| **Sample Depth (m)** | 0.1. |
| **Temperature (°C)** | 6.9 |
| **pH (pH Units)** | 8.93 |
| **Cond. (µs/cm)** | 260.5 |
| **Specific Cond. (µs/cm)** | 398.5 |
| **Redox (mV)** | 132.9 |
| **DO (mg/L)** | 11.62 |
| **DO (%)** | 95.6 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | BRACKISH |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1641 |
| **Sample Time** | (hh:mm) 1635 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**



Sample Site (Con't): R2

Sample Date (Con't): AUG 19 2016

Sample Time (Con't): ~~15~~ 1635

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 19 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

BRACKISH. 3 FILTERS

# SURFACE WATER SAMPLE COLLECTION SHEET

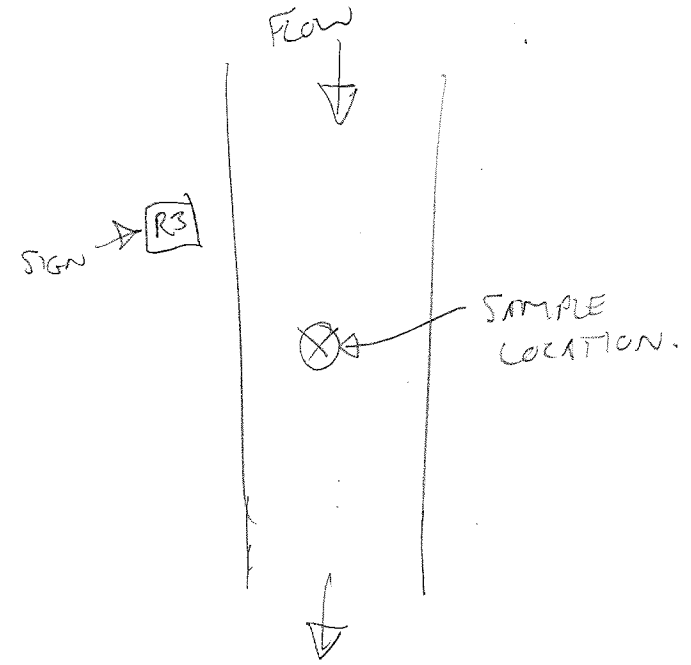
| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R3 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 16 2016 |
| **UTM Coordinates** | Z 7 E 0513948 N 7148677 | **Client:** | Yukon Government (AAM) | **Samplers:** | GRT NB. |
| **Waypoint** | GPS Garmin Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~15° C<br>CLOUD+<br>BLUE SKIES<br>WIND: Ø |
| **Photos** | Cam Garmin Nos. 7049 - 7052 | | | | |
| **Sample Time (24h)** | 1410. | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD BUT V. TURBID. |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 5.0 |
| **pH (pH Units)** | ~~9.78~~ 11.67 |
| **Cond. (µs/cm)** | ~~265.9~~ 264 |
| **Specific Cond. (µs/cm)** | ~~0270~~ 425.7 |
| **Redox (mV)** | −93. |
| **DO (mg/L)** | 12.38 |
| **DO (%)** | 97.1 |
| **Turbidity (NTU)** | / |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | V. TURBID.<br>NO ODOUR |

| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 14-17 |
| **Sample Time** | (hh:mm) 14-10 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

**Site Sketch**

YSI reading took a while to stabilize.



Sample Site (Con't): R3

Sample Date (Con't): AUG 16 2016

Sample Time (Con't): 14:10

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/~~Time~~: FULL SAMPLE INC. ASBESTOS |
| 125 ml (plastic) | Total Metals | - | ☐ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☐ Field Filtered | ☐ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☐ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☐ Field Filtered | ☐ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☐ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☐ Field Filtered | ☐ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☐ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☐ Field Filtered | ☐ NaOH | ☒ | 1 | |
| 1 L (plastic) | Asbestos | Wrapped tightly in foil | - | ☒ | 1 | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 11 | |

**General Notes:** V. TURBID.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R4 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG-18 2016 |
| **UTM Coordinates** | Z 7W E 0515985 N 7145352 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GARMIN Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~ 19 °C SUNNY |
| **Photos** | Cam GARMIN Nos. 7119-7121 | | | | |
| **Sample Time (24h)** | 1355 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

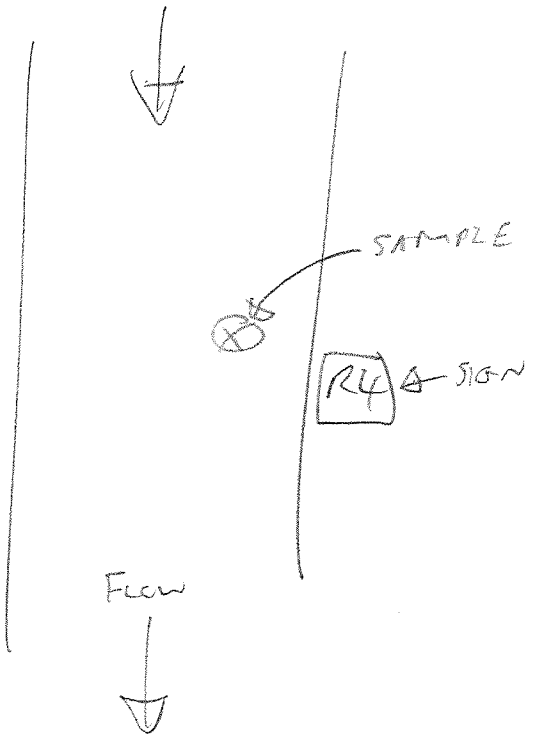
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD BUT TURBID. |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 4.4 |
| **pH (pH Units)** | 8.16 |
| **Cond. (µs/cm)** | 231.3 |
| **Specific Cond. (µs/cm)** | 381.0 |
| **Redox (mV)** | 142.9 |
| **DO (mg/L)** | 12.76 |
| **DO (%)** | 98.6 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | LIGHT BROWN TURBID. |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1402 |
| **Sample Time** | (hh:mm) 1355 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**



Sample Site (Con't): R4

Sample Date (Con't): AUG 18 2016

Sample Time (Con't): 1355

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 1430 * |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| 1 L (plastic) | Asbestos | Wrapped tightly in foil | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 9+1 | |

**General Notes:**

TURBID. 12 FILTERS USED.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R6 * | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 18 2016 |
| **UTM Coordinates** | Z 7 E 0518826 N 7141391 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS Garmin Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~17°C PART CLOUDY NO WIND |
| **Photos** | Cam Garmin Nos. 7144 - 7146 | | | | |
| **Sample Time (24h)** | 1810 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

**Field Parameter Measurements** (note units if different than those stated)

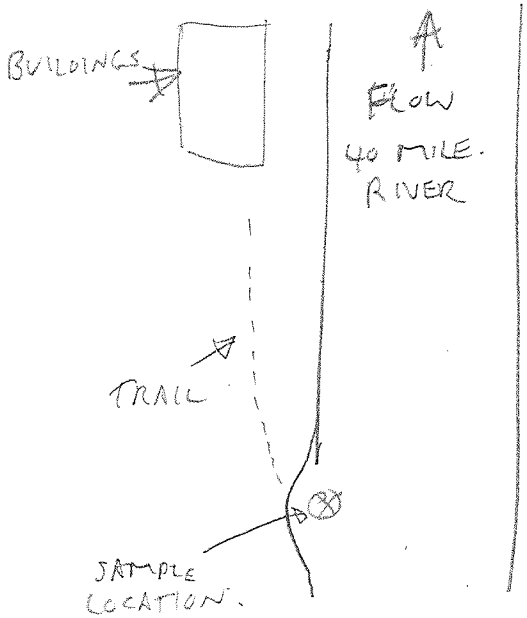
| | |
|---|---|
| **Station Status** | GOOD |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 9.9 |
| **pH (pH Units)** | 7.78 |
| **Cond. (µs/cm)** | 116.0 |
| **Specific Cond. (µs/cm)** | 163.0 |
| **Redox (mV)** | 142.8 |
| **DO (mg/L)** | 10.94 |
| **DO (%)** | 96.4 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID. (BROWN) |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1821 |
| **Sample Time** | (hh:mm) 1810 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**

* SAMPLE COLLECTED FROM CC TOWN SITE DUE TO HIGH WATER. THE NORMAL R6 LOCATION WAS NOT EASILY ACCESSIBLE. SAME LOCATION AS JULY EVENT



Sample Site (Con't): R6

Sample Date (Con't): AUG 18 2016

Sample Time (Con't): 1810

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: ~~AUG~~ AUG 26 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | AUG 18 2016 |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 9+1 | |

01505

**General Notes:**

TURBID. (BROWN). SEE OVER FOR SAMPLES LOCATION.

# SURFACE WATER SAMPLE COLLECTION SHEET

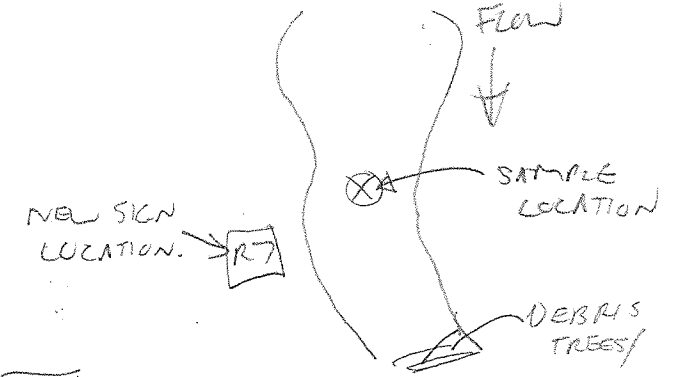
| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | ~~0513004~~ R7 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 27 2018 |
| **UTM Coordinates** | Zone E 0513003 N 7145649 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB. |
| **Waypoint** | GPS GMR Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~14° C MISTY |
| **Photos** | Cam GMR Nos. 7072-7083 | | | | |
| **Sample Time (24h)** | 0940. | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name | **Duplicate Collected:** | ☐ Yes ☒ No Name | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | OK * |
| **Sample Depth (m)** | 0.05 |
| **Temperature (°C)** | 3.1 |
| **pH (pH Units)** | 8.07 |
| **Cond. (µs/cm)** | 126.8 |
| **Specific Cond. (µs/cm)** | 217.7 |
| **Redox (mV)** | 28.8 |
| **DO (mg/L)** | 12.60 |
| **DO (%)** | 94.0 |
| **Turbidity (NTU)** | / |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | TURBID. |

| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 10-01 |
| **Sample Time** | (hh:mm) 09-40. |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other |

**Site Sketch**

THREE BEAVERS SEEN SWIMMING IN POND ON ARRIVAL. ~~EG~~ > 10 LUNCC USING MINERAL LICK (PECKING). CAMERA PRESENT (NOT CHECKED)




* R7 SIGN MOVED UPSTREAM TO SAME LOCATION AS JULY SAMPLING EVENT. LOTS OF BEAVER ACTIVITY.

3 FILTERS USED.

Sample Site (Con't): ~~[illegible]~~ R7

Sample Date (Con't): AUG 17 2016

Sample Time (Con't): 0940

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time:~~ FULL SET NO ASBESTOS |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | Asbestos | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:** TURBID. R7 SIGN MOVED UPSTREAM. ~40M.

# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R8 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG-19 2016 |
| **UTM Coordinates** | Z 7W E 0511894 N 7147906 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GRMR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | OVERCAST. ~17°C SOME BLUE SKY |
| **Photos** | Cam GRMR Nos. 7172-7176 | | | | |
| **Sample Time (24h)** | 1745 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

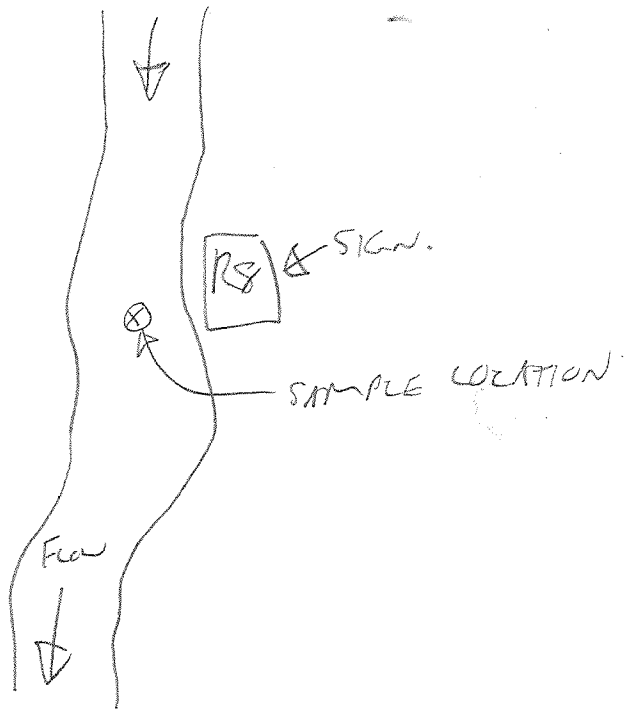
**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD |
| **Sample Depth (m)** | 0.05 (SHALLOW WATER) |
| **Temperature (°C)** | 6.2 |
| **pH (pH Units)** | 7.90 |
| **Cond. (µs/cm)** | 151.8 |
| **Specific Cond. (µs/cm)** | 237.2 |
| **Redox (mV)** | 134.9 |
| **DO (mg/L)** | 11.86 |
| **DO (%)** | 95.8 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR |

**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1747 |
| **Sample Time** | (hh:mm) 1745 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**



**Sample Site (Con't):** R8

**Sample Date (Con't):** AUG 19 2016

**Sample Time (Con't):** 1745

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 19 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

CLEAR WATER.

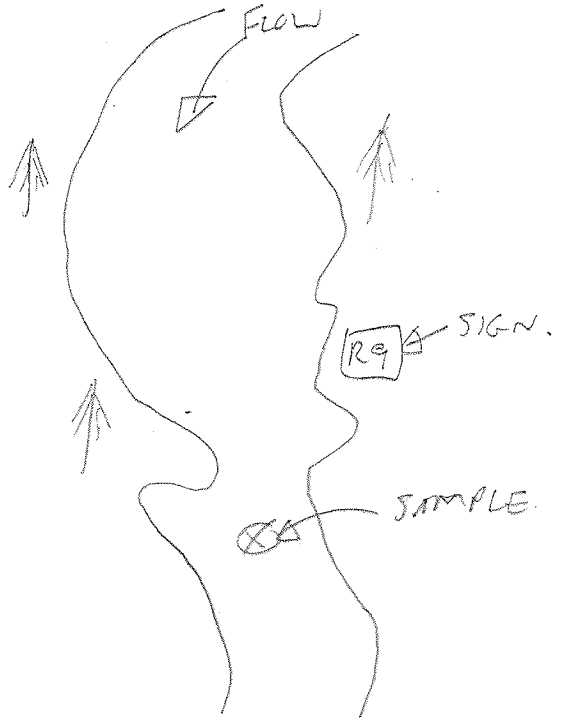
# SURFACE WATER SAMPLE COLLECTION SHEET

| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R9 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 20 2016 |
| **UTM Coordinates** | Z 7 W E 0512344 N 7146751 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GMR Name / | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~10% OVERCAST SPOTS OF RAIN NO WIND. ~ 10°C |
| **Photos** | Cam GMR Nos. 7177-7181 | | | | |
| **Sample Time (24h)** | 0850 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

**Field Parameter Measurements** (note units if different than those stated)

| | |
|---|---|
| **Station Status** | GOOD. |
| **Sample Depth (m)** | 0.05 SHALLOW WATER |
| **Temperature (°C)** | 3.5 |
| **pH (pH Units)** | 7.90 |
| **Cond. (µs/cm)** | 279.5 |
| **Specific Cond. (µs/cm)** | 474.0 |
| **Redox (mV)** | 22.4 |
| **DO (mg/L)** | 12.61 |
| **DO (%)** | 95.2 |
| **Turbidity (NTU)** | / |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | SLIGHTLY TURBID. |

**Site Sketch**




**Field Measurements Log**

| | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 0848 |
| **Sample Time** | (hh:mm) 0850. |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Sample Site (Con't):** RG

**Sample Date (Con't):** AUG 20 2016

**Sample Time (Con't):** 0850

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

# SURFACE WATER SAMPLE COLLECTION SHEET

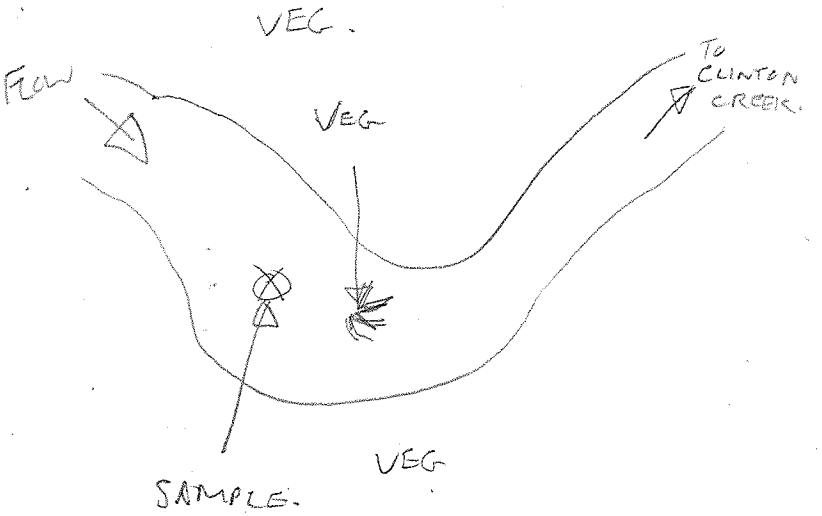
| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | R11 | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | Aug 16 2016 |
| **UTM Coordinates** | Z 7 W E 0514176 N 7147827 | **Client:** | Yukon Government (AAM) | **Samplers:** | GR + NB |
| **Waypoint** | GPS GRNR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | ~12°C. OVERCAST SOME BLUE SKY. |
| **Photos** | Cam GRNR Nos. 7046-7048 | | | | |
| **Sample Time (24h)** | 1230 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD BUT TURBID |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 2.9 |
| **pH (pH Units)** | 10.46 |
| **Cond. (µs/cm)** | 170.9 |
| **Specific Cond. (µs/cm)** | 295.5 |
| **Redox (mV)** | -52.0 |
| **DO (mg/L)** | 13.24 |
| **DO (%)** | 98.1 |
| **Turbidity (NTU)** | — |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | V. TURBID. NO ODOUR. |

| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1236 |
| **Sample Time** | (hh:mm) 1230 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**

WATER IS HIGH BUT INDICATION THAT WATER HAS BEEN HIGHER BETWEEN ~~JULY~~ + AUG EVENTS. (EG FLATTENED VEG & COMMS WITH LOCAL PEOPLE.



**Sample Site (Con't):** R11

**Sample Date (Con't):** AUG 16 2016

**Sample Time (Con't):** 1230

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | ~~Date/Time:~~ FULL SET. NO ASBESTOS |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | ~~1~~ | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

WATER V. TURBID.

# SURFACE WATER SAMPLE COLLECTION SHEET

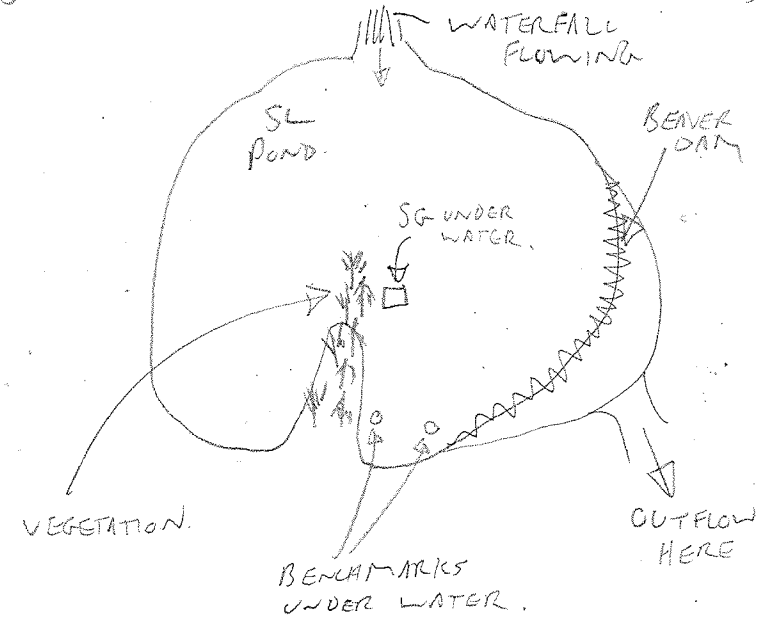
| | | | | | |
|---|---|---|---|---|---|
| **Sample Site:** | SL | **Project Number:** | 16-240.4 Clinton Creek Water Program | **Date:** | AUG 20 2016 |
| **UTM Coordinates** | Z 9W E 0513827 N 7146709 | **Client:** | Yukon Government (AAM) | **Samplers:** | CR + NB |
| **Waypoint** | GPS GMR Name — | **Project Name:** | Clinton Creek Surface Water Monitoring Program | **Weather/Temp:** | N 13°C OVERCAST Ø WIND |
| **Photos** | Cam GMR Nos. 7206 - 7214 | | | | |
| **Sample Time (24h)** | 1305 | | | | |
| **Field Blank Collected:** | ☐ Yes ☒ No Name _____ | **Duplicate Collected:** | ☐ Yes ☒ No Name _____ | | |

| **Field Parameter Measurements** (note units if different than those stated) | |
|---|---|
| **Station Status** | GOOD A LOT OF WATER. |
| **Sample Depth (m)** | 0.1 |
| **Temperature (°C)** | 8.2 |
| **pH (pH Units)** | 8.28 |
| **Cond. (µs/cm)** | 777 |
| **Specific Cond. (µs/cm)** | 1143 |
| **Redox (mV)** | 134.1 |
| **DO (mg/L)** | 11.0 |
| **DO (%)** | 93.6 |
| **Turbidity (NTU)** | |
| **Appearance & Odour (Clear, Silty, HC odours, etc.)** | CLEAR. |

| **Field Measurements Log** | |
|---|---|
| **YSI Logged?** | ☒ Yes ☐ No |
| **Time Logged on YSI** | (hh:mm) 1311 |
| **Sample Time** | (hh:mm) 1305 |
| **Unit Used** | ☒ Pro Plus ☐ Pen Unit Other _____ |

**Site Sketch**

VERY HIGH WATER. TOP OF STAFF GAUGE COVERED BY ~ 20cm WATER. BENCHMARKS ALSO UNDER WATER (~ 10cm)




THERE WAS WATER FLOWING UNDER THE ACCESS TRAIL ENROUTE TO SL. SEE PHOTOS 7215 - 7220. WPT OF TRAIL 11

**Sample Site (Con't):** SL

**Sample Date (Con't):** AUG 20 2016

**Sample Time (Con't):** 1305

| Bottle Type | Parameters Analyzed | Sample Treatment ☒ | Preservative Added ☒ | Collected ☒ | No. Bottles | Comments (note number of bottles in duplicate) |
|---|---|---|---|---|---|---|
| 500 ml (plastic) | General Chemistry | - | - | ☒ | 1 | Date/Time: AUG 20 2016 |
| 125 ml (plastic) | Total Metals | - | ☒ Nitric Acid | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Metals | ☒ Field Filtered | ☒ Nitric Acid | ☒ | 1 | |
| 40 ml (glass) | Total Mercury | | ☒ Hydrochloric Acid | ☒ | 1 | |
| 40 ml (glass) | Dissolved Mercury | ☒ Field Filtered | ☒ Hydrochloric Acid | ☒ | 1 | |
| 125 ml (amber) | Ammonia (NH3) | | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (amber) | Dissolved Organic Carbon (DOC) | ☒ Field Filtered | ☒ Sulfuric Acid | ☒ | 1 | |
| 125 ml (plastic) | Total Speciated Chromium – Cr(VI) and CR(III) | - | ☒ NaOH | ☒ | 1 | |
| 125 ml (plastic) | Dissolved Speciated Chromium – Cr(VI) and CR(III) | ☒ Field Filtered | ☒ NaOH | ☒ | 1 | |
| ~~1 L (plastic)~~ | ~~Asbestos~~ | ~~Wrapped tightly in foil~~ | - | ☐ | | |
| 500 ml (plastic) | TSS | - | - | ☒ | 1 | |
| | | | | Total: | 10 | |

**General Notes:**

HIGH WATER. SEE OVER.

# APPENDIX 3

## Hudgeon Lake *In-Situ* Profile Data

**Appendix 3: Hudgeon Lake In-Situ Profile Data**

| Site | Depth (m) | Date/Time | Conductivity (uS/cm) | Specific Conductance (uS/cm) | Dissolved Oxygen (mg/L) | ORP_1 (mV) | pH_1 (Units) | Temperature (C) | Salinity (ppt) |
|---|---|---|---|---|---|---|---|---|---|
| HL1 | 0.15 | 19/08/2016 13:06:35 | 339.2 | 443 | 9.51 | 27.8 | 7.9 | 12.7 | 0.21 |
| HL1 | 1 | 19/08/2016 13:13:38 | 332.8 | 441.5 | 9.56 | 38 | 7.88 | 12.1 | 0.21 |
| HL1 | 2 | 19/08/2016 13:19:05 | 330.7 | 469.9 | 10.18 | 47.2 | 7.87 | 9.5 | 0.23 |
| HL1 | 3 | 19/08/2016 13:22:32 | 334.1 | 483.6 | 10.08 | 52.5 | 7.89 | 8.8 | 0.23 |
| HL1 | 4 | 19/08/2016 13:32:28 | 360 | 541 | 6.35 | 72.7 | 7.51 | 7.5 | 0.26 |
| HL1 | 5 | 19/08/2016 13:34:49 | 455.6 | 740 | 0.29 | 79.1 | 7.31 | 4.9 | 0.36 |
| HL1 | 6 | 19/08/2016 13:39:01 | 456.5 | 765 | 0.1 | 76.9 | 7.31 | 3.9 | 0.37 |
| HL1 | 7 | 19/08/2016 13:42:01 | 456.1 | 773 | 0.1 | 74.7 | 7.32 | 3.6 | 0.38 |
| HL1 | 8 | 19/08/2016 13:47:31 | 464.4 | 798 | 0.09 | 66.6 | 7.33 | 3.1 | 0.39 |
| HL1 | 9 | 19/08/2016 14:00:40 | 535 | 943 | 0.09 | -70.4 | 7.38 | 2.4 | 0.46 |
| HL1 | 10 | 19/08/2016 14:12:13 | 579 | 1036 | 0.11 | -107.2 | 7.39 | 1.9 | 0.51 |
| HL1 | 11.1 | 19/08/2016 14:14:40 | 589 | 1058 | 0.08 | -110.5 | 7.39 | 1.8 | 0.52 |
| HL2 | 0.15 | 19/08/2016 11:31:40 | 344.9 | 441.3 | 9.54 | 83.4 | 7.89 | 13.6 | 0.21 |
| HL2 | 1 | 19/08/2016 11:36:08 | 330 | 440.7 | 9.03 | 87.7 | 7.86 | 11.8 | 0.21 |
| HL2 | 2 | 19/08/2016 11:39:02 | 324.7 | 457.1 | 9.6 | 92.5 | 7.82 | 9.8 | 0.22 |
| HL2 | 3 | 19/08/2016 11:44:42 | 329.4 | 479.4 | 8.94 | 99.4 | 7.71 | 8.6 | 0.23 |
| HL2 | 4 | 19/08/2016 11:48:13 | 403 | 622 | 3.34 | 108.8 | 7.39 | 6.5 | 0.3 |
| HL2 | 5 | 19/08/2016 11:51:59 | 455.9 | 742 | 0.42 | 110.8 | 7.32 | 4.8 | 0.36 |
| HL2 | 6 | 19/08/2016 11:55:13 | 454.5 | 766 | 0.1 | 109.7 | 7.33 | 3.7 | 0.37 |
| HL2 | 7 | 19/08/2016 11:57:44 | 455.8 | 778 | 0.11 | 107.5 | 7.33 | 3.3 | 0.38 |
| HL2 | 8 | 19/08/2016 12:03:08 | 462.3 | 796 | 0.1 | 102.8 | 7.34 | 3 | 0.39 |
| HL2 | 9 | 19/08/2016 12:16:56 | 530 | 936 | 0.09 | -70.3 | 7.37 | 2.3 | 0.46 |
| HL2 | 10 | 19/08/2016 12:26:34 | 570 | 1017 | 0.09 | -107 | 7.38 | 2 | 0.5 |
| HL2 | 11 | 19/08/2016 12:31:48 | 588 | 1056 | 0.1 | -115.8 | 7.37 | 1.8 | 0.52 |
| HL2 | 12 | 19/08/2016 12:34:15 | 595 | 1072 | 0.11 | -116.6 | 7.36 | 1.7 | 0.53 |
| HL2 | 13 | 19/08/2016 12:37:33 | 603 | 1089 | 0.11 | -119.6 | 7.36 | 1.6 | 0.53 |
| HL2 | 14 | 19/08/2016 12:39:26 | 606 | 1096 | 0.12 | -119.9 | 7.35 | 1.6 | 0.54 |
| HL2 | 15 | 19/08/2016 12:42:21 | 612 | 1108 | 0.14 | -121.4 | 7.34 | 1.5 | 0.54 |
| HL2 | 16 | 19/08/2016 12:44:21 | 656 | 1199 | 0.17 | -124.7 | 7.36 | 1.3 | 0.59 |
| HL2 | 17 | 19/08/2016 12:46:29 | 665 | 1217 | 0.2 | -126.1 | 7.36 | 1.2 | 0.6 |
| HL2 | 18 | 19/08/2016 12:49:44 | 714 | 1318 | 0.27 | -128.3 | 7.36 | 1 | 0.65 |
| HL2 | 19.25 | 19/08/2016 12:52:05 | 715 | 1320 | 0.34 | -130.2 | 7.36 | 1 | 0.65 |
| HL3 | 0.15 | 19/08/2016 08:45:02 | 336 | 439.6 | 9.15 | 170.8 | 7.81 | 12.7 | 0.21 |
| HL3 | 1 | 19/08/2016 08:47:54 | 336.4 | 439.9 | 9.03 | 171 | 7.81 | 12.7 | 0.21 |
| HL3 | 2 | 19/08/2016 08:51:25 | 323.4 | 445.4 | 9.2 | 175.4 | 7.76 | 10.7 | 0.22 |
| HL3 | 3 | 19/08/2016 08:55:55 | 332.6 | 486 | 8.12 | 179.9 | 7.62 | 8.5 | 0.24 |
| HL3 | 4 | 19/08/2016 09:01:08 | 412.8 | 639 | 2.81 | 184.3 | 7.31 | 6.5 | 0.31 |
| HL3 | 5 | 19/08/2016 09:03:29 | 456 | 755 | 0.3 | 187.1 | 7.25 | 4.3 | 0.37 |
| HL3 | 6 | 19/08/2016 09:11:56 | 453.5 | 770 | 0.12 | 180.5 | 7.24 | 3.5 | 0.37 |
| HL3 | 7 | 19/08/2016 09:20:58 | 454.8 | 776 | 0.14 | 171.8 | 7.28 | 3.3 | 0.38 |
| HL3 | 8 | 19/08/2016 09:30:07 | 462 | 797 | 0.13 | 151.9 | 7.29 | 3 | 0.39 |
| HL3 | 9 | 19/08/2016 09:43:13 | 522 | 914 | 0.12 | -19.1 | 7.29 | 2.5 | 0.45 |
| HL3 | 10 | 19/08/2016 09:54:13 | 568 | 1005 | 0.09 | -79.2 | 7.31 | 2.2 | 0.49 |
| HL3 | 11 | 19/08/2016 10:04:05 | 588 | 1056 | 0.11 | -107.6 | 7.33 | 1.8 | 0.52 |
| HL3 | 12 | 19/08/2016 10:08:09 | 595 | 1069 | 0.09 | -112.4 | 7.37 | 1.7 | 0.52 |
| HL3 | 13 | 19/08/2016 10:15:00 | 602 | 1085 | 0.08 | -118.7 | 7.42 | 1.7 | 0.53 |
| HL3 | 14 | 19/08/2016 10:21:53 | 606 | 1095 | 0.13 | -121.9 | 7.42 | 1.6 | 0.54 |
| HL3 | 15 | 19/08/2016 10:24:29 | 618 | 1121 | 0.18 | -124.2 | 7.42 | 1.5 | 0.55 |
| HL3 | 16 | 19/08/2016 10:31:56 | 658 | 1200 | 0.41 | -129.4 | 7.45 | 1.4 | 0.59 |
| HL3 | 17 | 19/08/2016 10:36:54 | 665 | 1217 | 0.55 | -131.9 | 7.46 | 1.2 | 0.6 |
| HL3 | 18 | 19/08/2016 10:39:44 | 715 | 1318 | 0.55 | -130.8 | 7.45 | 1.1 | 0.65 |
| HL3 | 19 | 19/08/2016 10:42:00 | 718 | 1325 | 0.47 | -133.1 | 7.45 | 1 | 0.65 |
| HL3 | 20 | 19/08/2016 10:46:05 | 817 | 1511 | 0.39 | -132.7 | 7.43 | 0.9 | 0.75 |
| HL3 | 21 | 19/08/2016 10:49:48 | 895 | 1664 | 0.33 | -135.3 | 7.43 | 0.8 | 0.83 |
| HL3 | 22 | 19/08/2016 10:52:07 | 1019 | 1906 | 0.31 | -135.8 | 7.4 | 0.6 | 0.95 |
| HL3 | 23 | 19/08/2016 10:55:11 | 1113 | 2101 | 0.29 | -136.5 | 7.39 | 0.4 | 1.05 |
| HL3 | 24 | 19/08/2016 10:58:23 | 1178 | 2235 | 0.28 | -139 | 7.4 | 0.2 | 1.12 |
| HL3 | 24.9 | 19/08/2016 11:00:56 | 1235 | 2356 | 0.28 | -141.7 | 7.43 | 0.1 | 1.18 |

# APPENDIX 4

## Tabulated Stream Gauging Data

# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E1(H) |
| **Date and Time:** | Aug.20,2016 10:42 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0512850 7147423 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

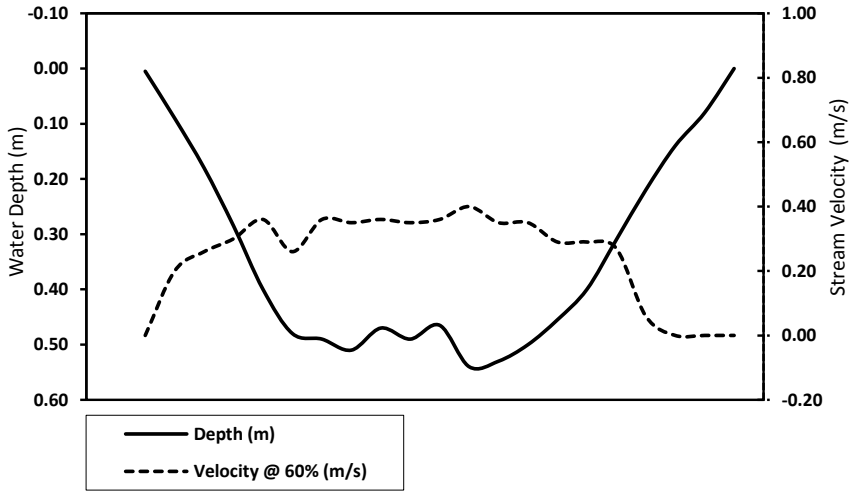
| | |
|---|---|
| **Left Bank** | 13.18 |
| **Right Bank** | 0.81 |
| **Wet.Width** | 12.37 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 13.18 | 0.300 | 0.01 | 0.00 | 0.002 | 0.0000 |
| 1 | 12.58 | 0.610 | 0.09 | 0.20 | 0.055 | 0.0110 |
| 2 | 11.96 | 0.620 | 0.18 | 0.26 | 0.112 | 0.0290 |
| 3 | 11.34 | 0.620 | 0.29 | 0.30 | 0.177 | 0.0530 |
| 4 | 10.72 | 0.620 | 0.40 | 0.36 | 0.248 | 0.0893 |
| 5 | 10.10 | 0.620 | 0.48 | 0.26 | 0.298 | 0.0774 |
| 6 | 9.48 | 0.620 | 0.49 | 0.36 | 0.304 | 0.1094 |
| 7 | 8.86 | 0.620 | 0.51 | 0.35 | 0.316 | 0.1107 |
| 8 | 8.24 | 0.620 | 0.47 | 0.36 | 0.291 | 0.1049 |
| 9 | 7.62 | 0.620 | 0.49 | 0.35 | 0.304 | 0.1063 |
| 10 | 7.00 | 0.620 | 0.47 | 0.36 | 0.288 | 0.1038 |
| 11 | 6.38 | 0.620 | 0.54 | 0.40 | 0.335 | 0.1339 |
| 12 | 5.76 | 0.620 | 0.53 | 0.35 | 0.329 | 0.1150 |
| 13 | 5.14 | 0.620 | 0.50 | 0.35 | 0.310 | 0.1085 |
| 14 | 4.52 | 0.620 | 0.46 | 0.29 | 0.282 | 0.0818 |
| 15 | 3.90 | 0.570 | 0.40 | 0.29 | 0.228 | 0.0661 |
| 16 | 3.38 | 0.570 | 0.31 | 0.27 | 0.177 | 0.0477 |
| 17 | 2.76 | 0.620 | 0.22 | 0.06 | 0.136 | 0.0082 |
| 18 | 2.14 | 0.620 | 0.14 | 0.00 | 0.087 | 0.0000 |
| 19 | 1.52 | 0.665 | 0.08 | 0.00 | 0.053 | 0.0000 |
| 20 | 0.81 | 0.355 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 0.81 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.34 |
| **Mean Velocity (m/s)** | 0.25 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 1.3560 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E1(H) |
| **Date and Time:** | Aug.20/2016 10:42 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0512850 7147423 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

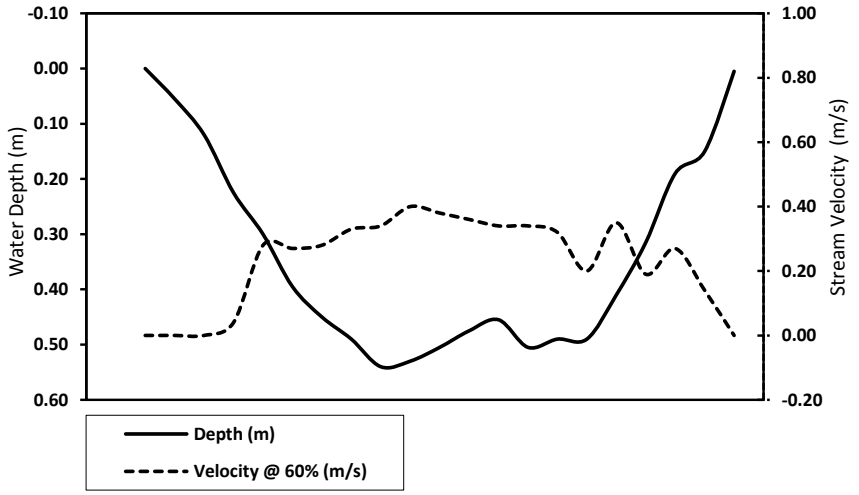
| | |
|---|---|
| **Left Bank** | 13.18 |
| **Right Bank** | 0.81 |
| **Wet.Width** | 12.37 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.81 | 0.310 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.43 | 0.620 | 0.06 | 0.00 | 0.034 | 0.0000 |
| 2 | 2.05 | 0.620 | 0.12 | 0.00 | 0.074 | 0.0000 |
| 3 | 2.67 | 0.620 | 0.23 | 0.04 | 0.140 | 0.0056 |
| 4 | 3.29 | 0.570 | 0.30 | 0.28 | 0.171 | 0.0479 |
| 5 | 3.81 | 0.570 | 0.40 | 0.27 | 0.225 | 0.0608 |
| 6 | 4.43 | 0.620 | 0.45 | 0.28 | 0.279 | 0.0781 |
| 7 | 5.05 | 0.620 | 0.49 | 0.33 | 0.304 | 0.1003 |
| 8 | 5.67 | 0.620 | 0.54 | 0.34 | 0.335 | 0.1138 |
| 9 | 6.29 | 0.570 | 0.53 | 0.40 | 0.302 | 0.1208 |
| 10 | 6.81 | 0.595 | 0.51 | 0.38 | 0.300 | 0.1142 |
| 11 | 7.48 | 0.645 | 0.48 | 0.36 | 0.306 | 0.1103 |
| 12 | 8.10 | 0.620 | 0.46 | 0.34 | 0.282 | 0.0959 |
| 13 | 8.72 | 0.620 | 0.51 | 0.34 | 0.313 | 0.1065 |
| 14 | 9.34 | 0.630 | 0.49 | 0.32 | 0.309 | 0.0988 |
| 15 | 9.98 | 0.630 | 0.49 | 0.20 | 0.309 | 0.0617 |
| 16 | 10.60 | 0.620 | 0.41 | 0.35 | 0.254 | 0.0890 |
| 17 | 11.22 | 0.620 | 0.32 | 0.19 | 0.195 | 0.0371 |
| 18 | 11.84 | 0.620 | 0.19 | 0.27 | 0.118 | 0.0318 |
| 19 | 12.46 | 0.670 | 0.15 | 0.14 | 0.101 | 0.0141 |
| 20 | 13.18 | 0.360 | 0.01 | 0.00 | 0.002 | 0.0000 |
| end | 13.18 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.34 |
| **Mean Velocity (m/s)** | 0.23 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 1.2866 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E2 |
| **Date and Time:** | Aug.17,2016 14:45 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514168 7147077 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

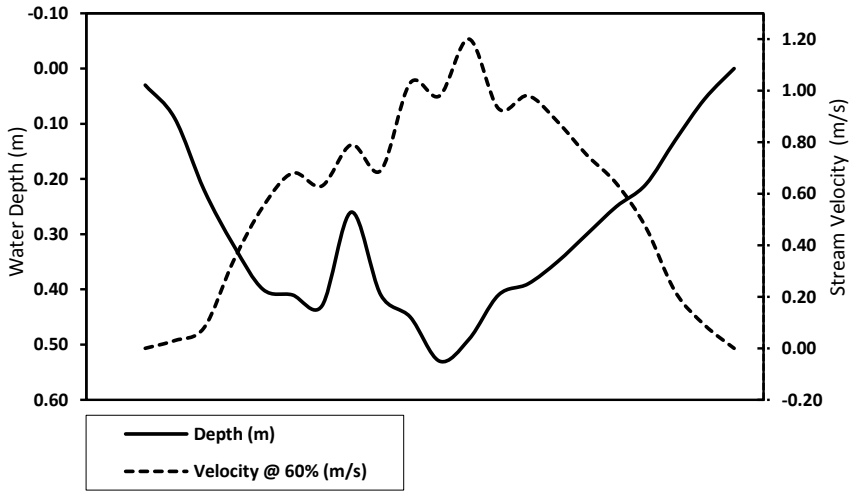
| | |
|---|---|
| **Left Bank** | 8.74 |
| **Right Bank** | 0.64 |
| **Wet.Width** | 8.1 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.64 | 0.200 | 0.03 | 0.00 | 0.006 | 0.0000 |
| 1 | 1.04 | 0.400 | 0.09 | 0.03 | 0.036 | 0.0011 |
| 2 | 1.44 | 0.400 | 0.22 | 0.08 | 0.088 | 0.0070 |
| 3 | 1.84 | 0.400 | 0.32 | 0.34 | 0.128 | 0.0435 |
| 4 | 2.24 | 0.400 | 0.40 | 0.55 | 0.160 | 0.0880 |
| 5 | 2.64 | 0.405 | 0.41 | 0.68 | 0.166 | 0.1129 |
| 6 | 3.05 | 0.410 | 0.43 | 0.63 | 0.176 | 0.1111 |
| 7 | 3.46 | 0.405 | 0.26 | 0.79 | 0.105 | 0.0832 |
| 8 | 3.86 | 0.400 | 0.41 | 0.69 | 0.164 | 0.1132 |
| 9 | 4.26 | 0.410 | 0.45 | 1.03 | 0.185 | 0.1900 |
| 10 | 4.68 | 0.410 | 0.53 | 0.98 | 0.217 | 0.2130 |
| 11 | 5.08 | 0.400 | 0.49 | 1.20 | 0.196 | 0.2352 |
| 12 | 5.48 | 0.400 | 0.41 | 0.93 | 0.164 | 0.1525 |
| 13 | 5.88 | 0.410 | 0.39 | 0.98 | 0.160 | 0.1567 |
| 14 | 6.30 | 0.410 | 0.35 | 0.88 | 0.144 | 0.1263 |
| 15 | 6.70 | 0.400 | 0.30 | 0.75 | 0.120 | 0.0900 |
| 16 | 7.10 | 0.410 | 0.25 | 0.64 | 0.103 | 0.0656 |
| 17 | 7.52 | 0.410 | 0.21 | 0.47 | 0.086 | 0.0405 |
| 18 | 7.92 | 0.410 | 0.13 | 0.22 | 0.053 | 0.0117 |
| 19 | 8.34 | 0.410 | 0.06 | 0.09 | 0.023 | 0.0020 |
| 20 | 8.74 | 0.200 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 8.74 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.29 |
| **Mean Velocity (m/s)** | 0.57 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 1.8435 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E2 |
| **Date and Time:** | Aug.17,2016 14:45 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514168 7147077 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

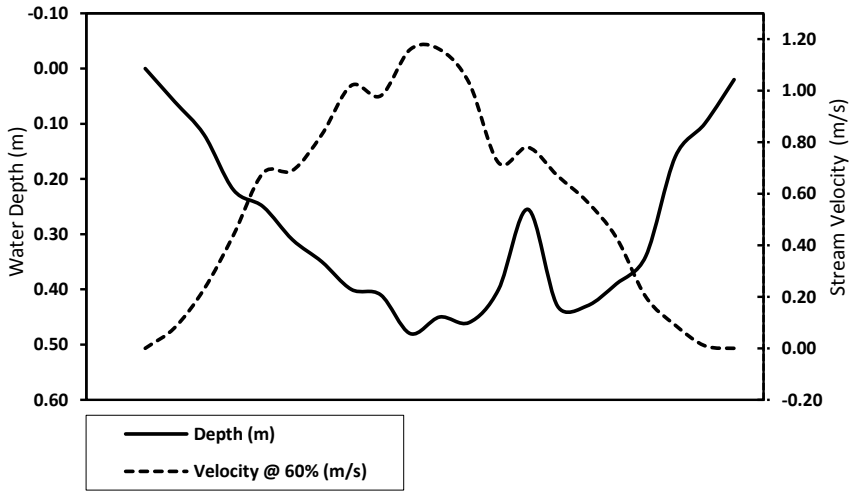
| | |
|---|---|
| **Left Bank** | 8.74 |
| **Right Bank** | 0.64 |
| **Wet.Width** | 8.1 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 8.74 | 0.200 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 8.34 | 0.410 | 0.06 | 0.08 | 0.025 | 0.0020 |
| 2 | 7.92 | 0.410 | 0.12 | 0.23 | 0.049 | 0.0113 |
| 3 | 7.52 | 0.410 | 0.22 | 0.44 | 0.090 | 0.0397 |
| 4 | 7.10 | 0.410 | 0.25 | 0.68 | 0.103 | 0.0697 |
| 5 | 6.70 | 0.410 | 0.31 | 0.69 | 0.127 | 0.0877 |
| 6 | 6.28 | 0.410 | 0.35 | 0.83 | 0.144 | 0.1191 |
| 7 | 5.88 | 0.400 | 0.40 | 1.02 | 0.160 | 0.1632 |
| 8 | 5.48 | 0.410 | 0.41 | 0.98 | 0.168 | 0.1647 |
| 9 | 5.06 | 0.410 | 0.48 | 1.16 | 0.197 | 0.2283 |
| 10 | 4.66 | 0.400 | 0.45 | 1.16 | 0.180 | 0.2088 |
| 11 | 4.26 | 0.410 | 0.46 | 1.03 | 0.189 | 0.1943 |
| 12 | 3.84 | 0.410 | 0.40 | 0.72 | 0.164 | 0.1181 |
| 13 | 3.44 | 0.400 | 0.26 | 0.78 | 0.102 | 0.0796 |
| 14 | 3.04 | 0.400 | 0.43 | 0.67 | 0.172 | 0.1152 |
| 15 | 2.64 | 0.410 | 0.43 | 0.57 | 0.176 | 0.1005 |
| 16 | 2.22 | 0.420 | 0.39 | 0.43 | 0.164 | 0.0704 |
| 17 | 1.80 | 0.420 | 0.34 | 0.20 | 0.143 | 0.0286 |
| 18 | 1.38 | 0.400 | 0.16 | 0.09 | 0.064 | 0.0058 |
| 19 | 1.00 | 0.370 | 0.10 | 0.01 | 0.037 | 0.0004 |
| 20 | 0.64 | 0.180 | 0.02 | 0.00 | 0.004 | 0.0000 |
| end | 0.64 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.29 |
| **Mean Velocity (m/s)** | 0.56 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 1.8073 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Wolverine Creek |
| **Station Name:** | E3(H) |
| **Date and Time:** | Aug.16,2016 9:35 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514183 7147592 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

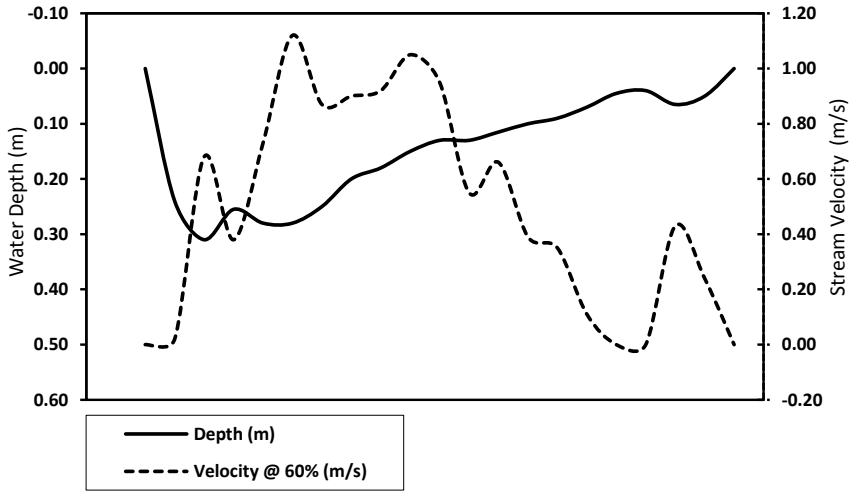
| | |
|---|---|
| **Left Bank** | 6.68 |
| **Right Bank** | 0.79 |
| **Wet.Width** | 5.89 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.79 | 0.150 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.09 | 0.295 | 0.24 | 0.02 | 0.071 | 0.0014 |
| 2 | 1.38 | 0.290 | 0.31 | 0.68 | 0.090 | 0.0611 |
| 3 | 1.67 | 0.290 | 0.26 | 0.38 | 0.074 | 0.0281 |
| 4 | 1.96 | 0.285 | 0.28 | 0.73 | 0.080 | 0.0583 |
| 5 | 2.24 | 0.285 | 0.28 | 1.12 | 0.080 | 0.0894 |
| 6 | 2.53 | 0.290 | 0.25 | 0.87 | 0.073 | 0.0631 |
| 7 | 2.82 | 0.290 | 0.20 | 0.90 | 0.058 | 0.0522 |
| 8 | 3.11 | 0.290 | 0.18 | 0.92 | 0.052 | 0.0480 |
| 9 | 3.40 | 0.340 | 0.15 | 1.05 | 0.051 | 0.0536 |
| 10 | 3.79 | 0.340 | 0.13 | 0.95 | 0.044 | 0.0420 |
| 11 | 4.08 | 0.290 | 0.13 | 0.55 | 0.038 | 0.0207 |
| 12 | 4.37 | 0.290 | 0.12 | 0.66 | 0.033 | 0.0220 |
| 13 | 4.66 | 0.290 | 0.10 | 0.39 | 0.029 | 0.0113 |
| 14 | 4.95 | 0.290 | 0.09 | 0.35 | 0.026 | 0.0091 |
| 15 | 5.24 | 0.290 | 0.07 | 0.11 | 0.020 | 0.0022 |
| 16 | 5.53 | 0.290 | 0.05 | 0.00 | 0.013 | 0.0000 |
| 17 | 5.82 | 0.290 | 0.04 | 0.00 | 0.012 | 0.0000 |
| 18 | 6.11 | 0.290 | 0.07 | 0.43 | 0.019 | 0.0081 |
| 19 | 6.40 | 0.285 | 0.05 | 0.24 | 0.014 | 0.0034 |
| 20 | 6.68 | 0.140 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 6.68 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.14 |
| **Mean Velocity (m/s)** | 0.49 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.5741 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Wolverine Creek |
| **Station Name:** | E3(H) |
| **Date and Time:** | Aug.16,2016 9:35 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514183 7147592 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

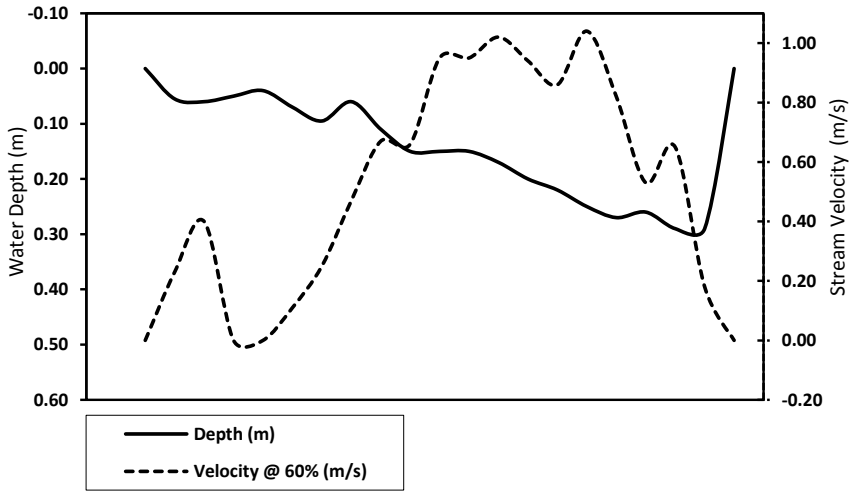
| | |
|---|---|
| **Left Bank** | 6.68 |
| **Right Bank** | 0.79 |
| **Wet.Width** | 5.89 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 6.68 | 0.145 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 6.39 | 0.290 | 0.06 | 0.23 | 0.016 | 0.0037 |
| 2 | 6.10 | 0.290 | 0.06 | 0.40 | 0.017 | 0.0070 |
| 3 | 5.81 | 0.290 | 0.05 | 0.00 | 0.015 | 0.0000 |
| 4 | 5.52 | 0.290 | 0.04 | 0.00 | 0.012 | 0.0000 |
| 5 | 5.23 | 0.290 | 0.07 | 0.11 | 0.020 | 0.0022 |
| 6 | 4.94 | 0.290 | 0.10 | 0.25 | 0.028 | 0.0069 |
| 7 | 4.65 | 0.290 | 0.06 | 0.47 | 0.017 | 0.0082 |
| 8 | 4.36 | 0.290 | 0.11 | 0.67 | 0.032 | 0.0214 |
| 9 | 4.07 | 0.290 | 0.15 | 0.66 | 0.044 | 0.0287 |
| 10 | 3.78 | 0.290 | 0.15 | 0.95 | 0.044 | 0.0413 |
| 11 | 3.49 | 0.285 | 0.15 | 0.95 | 0.043 | 0.0406 |
| 12 | 3.21 | 0.285 | 0.17 | 1.02 | 0.048 | 0.0494 |
| 13 | 2.92 | 0.290 | 0.20 | 0.94 | 0.058 | 0.0545 |
| 14 | 2.63 | 0.290 | 0.22 | 0.86 | 0.064 | 0.0549 |
| 15 | 2.34 | 0.290 | 0.25 | 1.04 | 0.073 | 0.0754 |
| 16 | 2.05 | 0.290 | 0.27 | 0.82 | 0.078 | 0.0642 |
| 17 | 1.76 | 0.290 | 0.26 | 0.53 | 0.075 | 0.0400 |
| 18 | 1.47 | 0.290 | 0.29 | 0.65 | 0.084 | 0.0547 |
| 19 | 1.18 | 0.340 | 0.29 | 0.18 | 0.099 | 0.0177 |
| 20 | 0.79 | 0.195 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 0.79 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.14 |
| **Mean Velocity (m/s)** | 0.51 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.5707 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

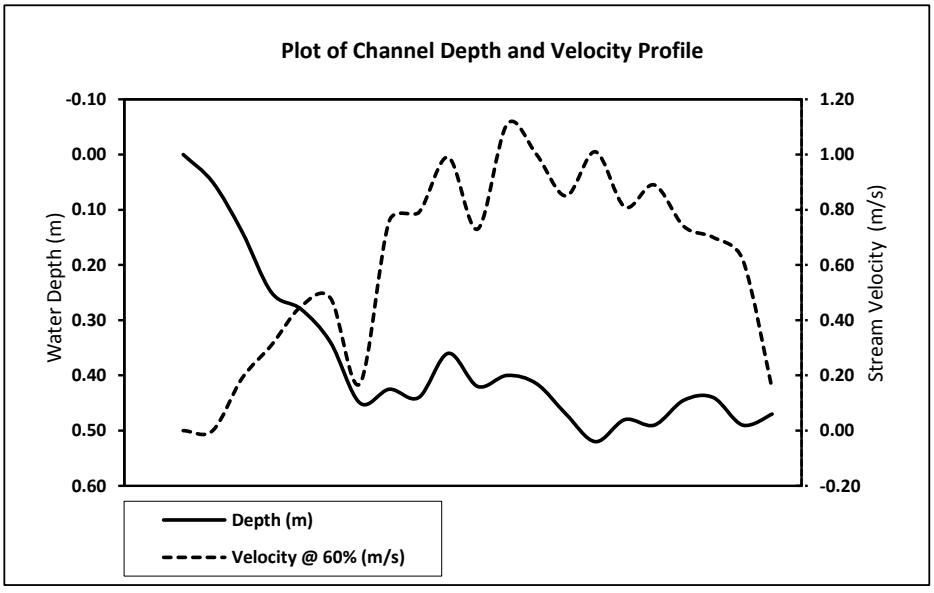
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E4 |
| **Date and Time:** | Aug.18,2016 15:33 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05159451 7145283 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

| | |
|---|---|
| **Left Bank** | 9.72 |
| **Right Bank** | 2 |
| **Wet.Width** | 7.72 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 2.00 | 0.200 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 2.40 | 0.400 | 0.05 | 0.00 | 0.020 | 0.0000 |
| 2 | 2.80 | 0.400 | 0.14 | 0.19 | 0.056 | 0.0106 |
| 3 | 3.20 | 0.400 | 0.25 | 0.31 | 0.100 | 0.0310 |
| 4 | 3.60 | 0.400 | 0.28 | 0.45 | 0.112 | 0.0504 |
| 5 | 4.00 | 0.400 | 0.34 | 0.48 | 0.136 | 0.0653 |
| 6 | 4.40 | 0.400 | 0.45 | 0.17 | 0.180 | 0.0306 |
| 7 | 4.80 | 0.400 | 0.43 | 0.76 | 0.170 | 0.1292 |
| 8 | 5.20 | 0.400 | 0.44 | 0.79 | 0.176 | 0.1390 |
| 9 | 5.60 | 0.400 | 0.36 | 0.99 | 0.144 | 0.1426 |
| 10 | 6.00 | 0.400 | 0.42 | 0.73 | 0.168 | 0.1226 |
| 11 | 6.40 | 0.400 | 0.40 | 1.11 | 0.160 | 0.1776 |
| 12 | 6.80 | 0.400 | 0.42 | 1.00 | 0.166 | 0.1660 |
| 13 | 7.20 | 0.400 | 0.47 | 0.85 | 0.188 | 0.1598 |
| 14 | 7.60 | 0.400 | 0.52 | 1.01 | 0.208 | 0.2101 |
| 15 | 8.00 | 0.400 | 0.48 | 0.81 | 0.192 | 0.1555 |
| 16 | 8.40 | 0.400 | 0.49 | 0.89 | 0.196 | 0.1744 |
| 17 | 8.80 | 0.400 | 0.45 | 0.74 | 0.178 | 0.1317 |
| 18 | 9.20 | 0.350 | 0.44 | 0.70 | 0.154 | 0.1078 |
| 19 | 9.50 | 0.260 | 0.49 | 0.62 | 0.127 | 0.0790 |
| 20 | 9.72 | 0.110 | 0.47 | 0.15 | 0.052 | 0.0078 |
| end | 9.72 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.37 |
| **Mean Velocity (m/s)** | 0.61 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 2.0911 |



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E4 |
| **Date and Time:** | Aug.18,2016 15:33 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05159451 7145283 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

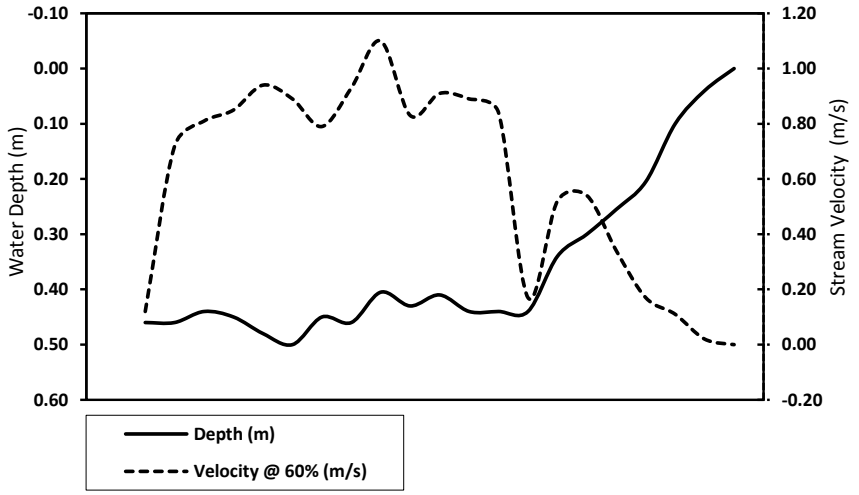
| | |
|---|---|
| **Left Bank** | 9.72 |
| **Right Bank** | 2 |
| **Wet.Width** | 7.72 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 9.72 | 0.200 | 0.46 | 0.12 | 0.092 | 0.0110 |
| 1 | 9.32 | 0.400 | 0.46 | 0.72 | 0.184 | 0.1325 |
| 2 | 8.92 | 0.400 | 0.44 | 0.81 | 0.176 | 0.1426 |
| 3 | 8.52 | 0.400 | 0.45 | 0.85 | 0.180 | 0.1530 |
| 4 | 8.12 | 0.400 | 0.48 | 0.94 | 0.192 | 0.1805 |
| 5 | 7.72 | 0.400 | 0.50 | 0.89 | 0.200 | 0.1780 |
| 6 | 7.32 | 0.400 | 0.45 | 0.79 | 0.180 | 0.1422 |
| 7 | 6.92 | 0.400 | 0.46 | 0.93 | 0.184 | 0.1711 |
| 8 | 6.52 | 0.400 | 0.41 | 1.10 | 0.162 | 0.1782 |
| 9 | 6.12 | 0.400 | 0.43 | 0.83 | 0.172 | 0.1428 |
| 10 | 5.72 | 0.400 | 0.41 | 0.91 | 0.164 | 0.1492 |
| 11 | 5.32 | 0.400 | 0.44 | 0.89 | 0.176 | 0.1566 |
| 12 | 4.92 | 0.400 | 0.44 | 0.84 | 0.176 | 0.1478 |
| 13 | 4.52 | 0.400 | 0.44 | 0.17 | 0.176 | 0.0299 |
| 14 | 4.12 | 0.400 | 0.34 | 0.52 | 0.136 | 0.0707 |
| 15 | 3.72 | 0.400 | 0.30 | 0.54 | 0.120 | 0.0648 |
| 16 | 3.32 | 0.400 | 0.26 | 0.34 | 0.102 | 0.0347 |
| 17 | 2.92 | 0.400 | 0.21 | 0.17 | 0.082 | 0.0139 |
| 18 | 2.52 | 0.340 | 0.10 | 0.11 | 0.034 | 0.0037 |
| 19 | 2.24 | 0.260 | 0.04 | 0.02 | 0.010 | 0.0002 |
| 20 | 2.00 | 0.120 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 2.00 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.36 |
| **Mean Velocity (m/s)** | 0.59 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 2.1036 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E7 |
| **Date and Time:** | Aug.18,2016 11:48 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0519358 7142050 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

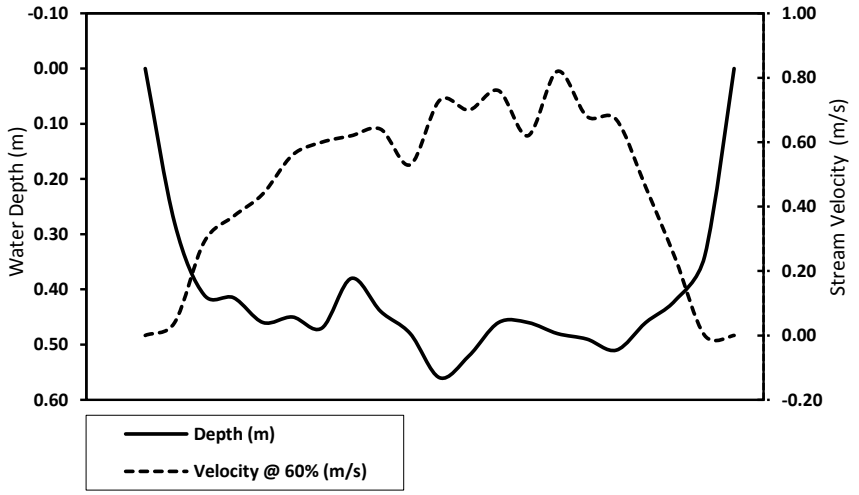
| | |
|---|---|
| **Left Bank** | 14.71 |
| **Right Bank** | 1.28 |
| **Wet.Width** | 13.43 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.28 | 0.350 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.98 | 0.700 | 0.28 | 0.04 | 0.196 | 0.0078 |
| 2 | 2.68 | 0.700 | 0.41 | 0.29 | 0.287 | 0.0832 |
| 3 | 3.38 | 0.700 | 0.42 | 0.37 | 0.291 | 0.1075 |
| 4 | 4.08 | 0.700 | 0.46 | 0.44 | 0.322 | 0.1417 |
| 5 | 4.78 | 0.700 | 0.45 | 0.56 | 0.315 | 0.1764 |
| 6 | 5.48 | 0.700 | 0.47 | 0.60 | 0.329 | 0.1974 |
| 7 | 6.18 | 0.700 | 0.38 | 0.62 | 0.266 | 0.1649 |
| 8 | 6.88 | 0.700 | 0.44 | 0.64 | 0.308 | 0.1971 |
| 9 | 7.58 | 0.700 | 0.48 | 0.53 | 0.336 | 0.1781 |
| 10 | 8.28 | 0.700 | 0.56 | 0.73 | 0.392 | 0.2862 |
| 11 | 8.98 | 0.700 | 0.52 | 0.70 | 0.364 | 0.2548 |
| 12 | 9.68 | 0.700 | 0.46 | 0.76 | 0.322 | 0.2447 |
| 13 | 10.38 | 0.700 | 0.46 | 0.62 | 0.322 | 0.1996 |
| 14 | 11.08 | 0.700 | 0.48 | 0.82 | 0.336 | 0.2755 |
| 15 | 11.78 | 0.700 | 0.49 | 0.68 | 0.343 | 0.2332 |
| 16 | 12.48 | 0.700 | 0.51 | 0.67 | 0.357 | 0.2392 |
| 17 | 13.18 | 0.700 | 0.46 | 0.46 | 0.322 | 0.1481 |
| 18 | 13.88 | 0.590 | 0.42 | 0.24 | 0.248 | 0.0595 |
| 19 | 14.36 | 0.415 | 0.34 | 0.00 | 0.141 | 0.0000 |
| 20 | 14.71 | 0.175 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 14.71 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.40 |
| **Mean Velocity (m/s)** | 0.47 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 3.1950 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

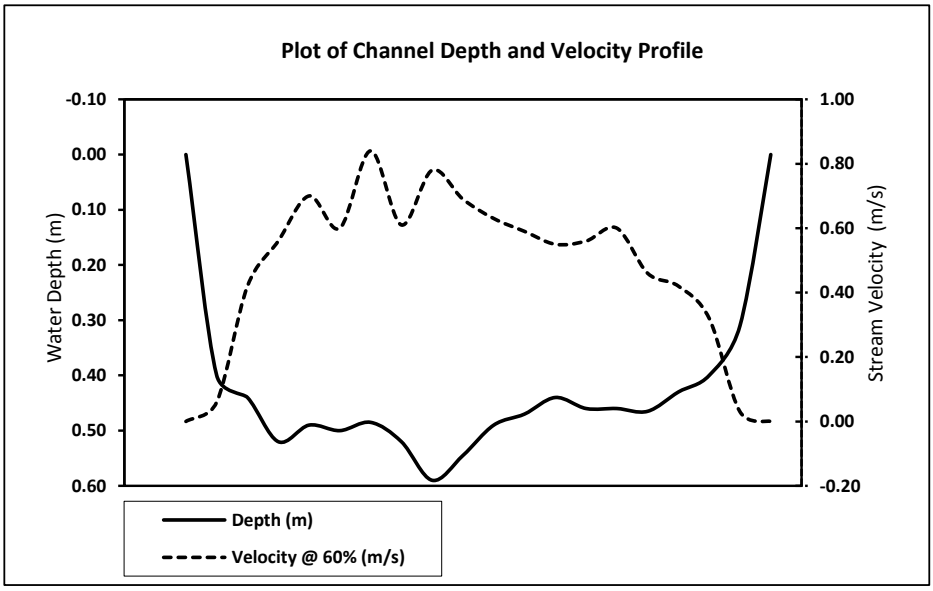
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Clinton Creek |
| **Station Name:** | E7 |
| **Date and Time:** | Aug.18,2016 11:48 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0519358 7142050 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

| | |
|---|---|
| **Left Bank** | 14.71 |
| **Right Bank** | 1.26 |
| **Wet.Width** | 13.45 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 14.71 | 0.350 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 14.01 | 0.700 | 0.40 | 0.06 | 0.280 | 0.0168 |
| 2 | 13.31 | 0.700 | 0.44 | 0.42 | 0.308 | 0.1294 |
| 3 | 12.61 | 0.700 | 0.52 | 0.56 | 0.364 | 0.2038 |
| 4 | 11.91 | 0.700 | 0.49 | 0.70 | 0.343 | 0.2401 |
| 5 | 11.21 | 0.700 | 0.50 | 0.60 | 0.350 | 0.2100 |
| 6 | 10.51 | 0.700 | 0.49 | 0.84 | 0.340 | 0.2852 |
| 7 | 9.81 | 0.700 | 0.52 | 0.61 | 0.364 | 0.2220 |
| 8 | 9.11 | 0.700 | 0.59 | 0.78 | 0.413 | 0.3221 |
| 9 | 8.41 | 0.700 | 0.55 | 0.69 | 0.382 | 0.2632 |
| 10 | 7.71 | 0.700 | 0.49 | 0.63 | 0.343 | 0.2161 |
| 11 | 7.01 | 0.700 | 0.47 | 0.59 | 0.329 | 0.1941 |
| 12 | 6.31 | 0.700 | 0.44 | 0.55 | 0.550 | 0.3025 |
| 13 | 5.61 | 0.700 | 0.46 | 0.56 | 0.560 | 0.3136 |
| 14 | 4.91 | 0.700 | 0.46 | 0.60 | 0.600 | 0.3600 |
| 15 | 4.21 | 0.700 | 0.47 | 0.46 | 0.460 | 0.2116 |
| 16 | 3.51 | 0.700 | 0.43 | 0.42 | 0.420 | 0.1764 |
| 17 | 2.81 | 0.700 | 0.40 | 0.32 | 0.320 | 0.1024 |
| 18 | 2.11 | 0.775 | 0.31 | 0.03 | 0.030 | 0.0009 |
| 19 | 1.26 | 0.425 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 1.26 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.42 |
| **Mean Velocity (m/s)** | 0.47 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 3.7703 |



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Groundwater Seepage |
| **Station Name:** | GWCC-5 |
| **Date and Time:** | Aug.18,2016 17:09 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05139841 7142128 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

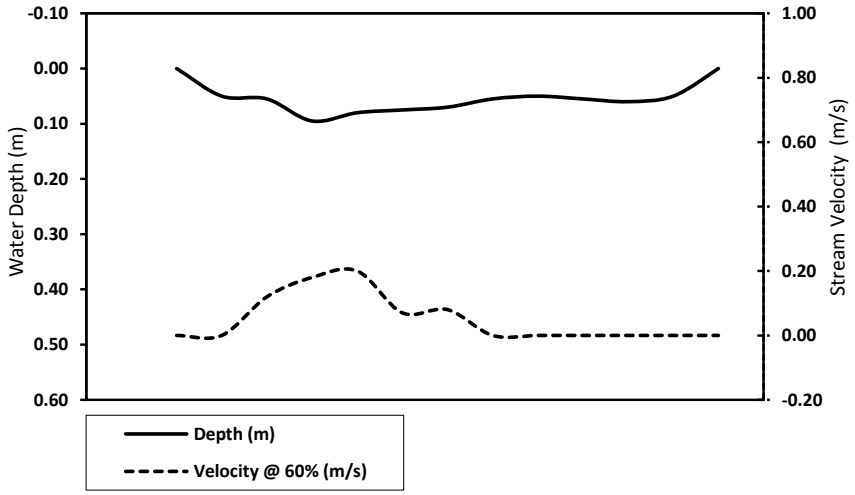
| | |
|---|---|
| **Left Bank** | 3.42 |
| **Right Bank** | 1.22 |
| **Wet.Width** | 2.2 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.22 | 0.095 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.41 | 0.190 | 0.05 | 0.00 | 0.010 | 0.0000 |
| 2 | 1.60 | 0.190 | 0.06 | 0.12 | 0.010 | 0.0013 |
| 3 | 1.79 | 0.190 | 0.10 | 0.18 | 0.018 | 0.0032 |
| 4 | 1.98 | 0.190 | 0.08 | 0.20 | 0.015 | 0.0030 |
| 5 | 2.17 | 0.190 | 0.08 | 0.07 | 0.014 | 0.0010 |
| 6 | 2.36 | 0.190 | 0.07 | 0.08 | 0.013 | 0.0011 |
| 7 | 2.55 | 0.190 | 0.06 | 0.00 | 0.010 | 0.0000 |
| 8 | 2.74 | 0.190 | 0.05 | 0.00 | 0.010 | 0.0000 |
| 9 | 2.93 | 0.190 | 0.06 | 0.00 | 0.010 | 0.0000 |
| 10 | 3.12 | 0.190 | 0.06 | 0.00 | 0.011 | 0.0000 |
| 11 | 3.31 | 0.150 | 0.05 | 0.00 | 0.008 | 0.0000 |
| 12 | 3.42 | 0.055 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 3.42 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.05 |
| **Mean Velocity (m/s)** | 0.05 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0096 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

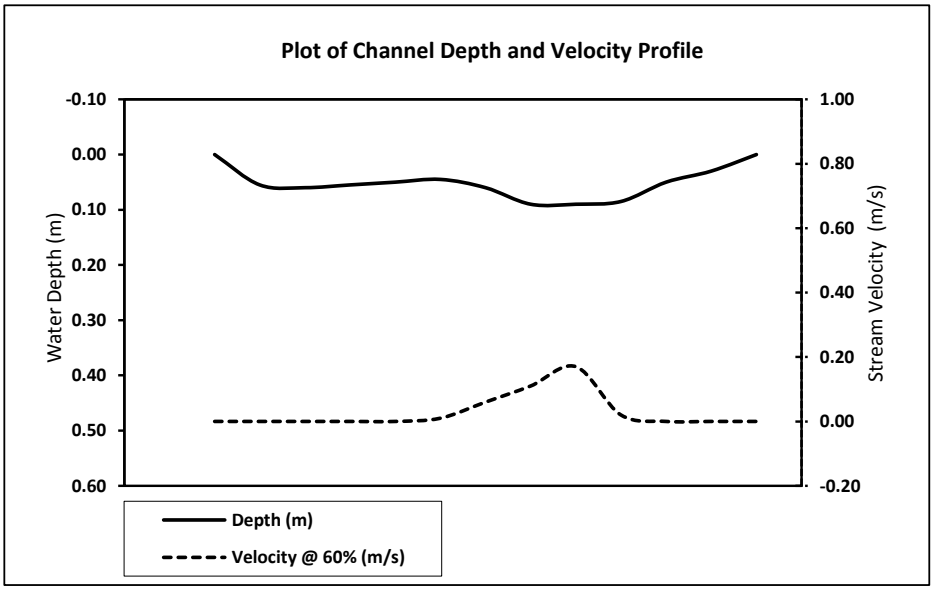
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Groundwater Seepage |
| **Station Name:** | GWCC-5 |
| **Date and Time:** | Aug.18,2016 17:09 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05139841 7142128 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

| | |
|---|---|
| **Left Bank** | 3.42 |
| **Right Bank** | 1.22 |
| **Wet.Width** | 2.2 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 3.42 | 0.095 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 3.23 | 0.190 | 0.06 | 0.00 | 0.010 | 0.0000 |
| 2 | 3.04 | 0.190 | 0.06 | 0.00 | 0.011 | 0.0000 |
| 3 | 2.85 | 0.190 | 0.06 | 0.00 | 0.010 | 0.0000 |
| 4 | 2.66 | 0.190 | 0.05 | 0.00 | 0.010 | 0.0000 |
| 5 | 2.47 | 0.190 | 0.05 | 0.01 | 0.009 | 0.0001 |
| 6 | 2.28 | 0.190 | 0.06 | 0.06 | 0.011 | 0.0007 |
| 7 | 2.09 | 0.190 | 0.09 | 0.11 | 0.017 | 0.0019 |
| 8 | 1.90 | 0.190 | 0.09 | 0.17 | 0.017 | 0.0029 |
| 9 | 1.71 | 0.190 | 0.09 | 0.02 | 0.016 | 0.0003 |
| 10 | 1.52 | 0.165 | 0.05 | 0.00 | 0.008 | 0.0000 |
| 11 | 1.38 | 0.150 | 0.03 | 0.00 | 0.005 | 0.0000 |
| 12 | 1.22 | 0.080 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 1.22 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.05 |
| **Mean Velocity (m/s)** | 0.03 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0059 |



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Upper Clinton Creek |
| **Station Name:** | R1 |
| **Date and Time:** | Aug.19,2016 15:10 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05810604 7147490 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

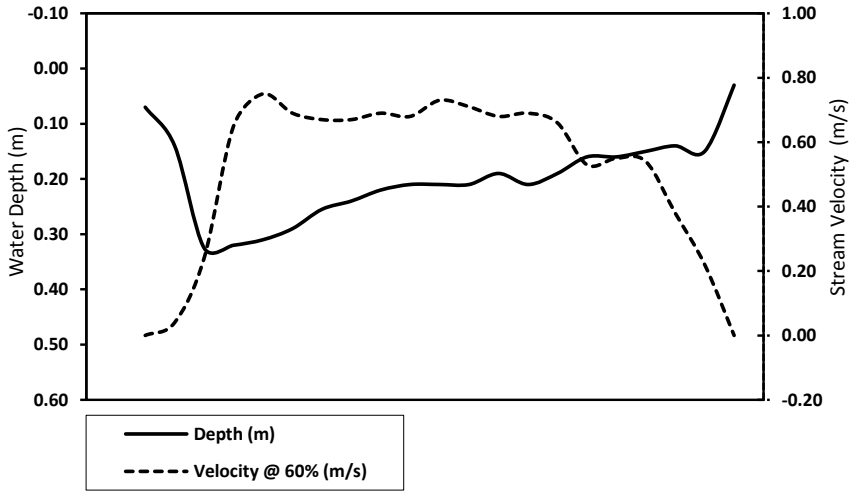
| | |
|---|---|
| **Left Bank** | 0.74 |
| **Right Bank** | 8 |
| **Wet.Width** | 7.26 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.74 | 0.180 | 0.07 | 0.00 | 0.013 | 0.0000 |
| 1 | 1.10 | 0.360 | 0.14 | 0.04 | 0.050 | 0.0020 |
| 2 | 1.46 | 0.360 | 0.33 | 0.24 | 0.117 | 0.0281 |
| 3 | 1.82 | 0.360 | 0.32 | 0.65 | 0.115 | 0.0749 |
| 4 | 2.18 | 0.310 | 0.31 | 0.75 | 0.096 | 0.0721 |
| 5 | 2.44 | 0.310 | 0.29 | 0.69 | 0.090 | 0.0620 |
| 6 | 2.80 | 0.360 | 0.26 | 0.67 | 0.092 | 0.0615 |
| 7 | 3.16 | 0.360 | 0.24 | 0.67 | 0.086 | 0.0579 |
| 8 | 3.52 | 0.360 | 0.22 | 0.69 | 0.079 | 0.0546 |
| 9 | 3.88 | 0.360 | 0.21 | 0.68 | 0.076 | 0.0514 |
| 10 | 4.24 | 0.360 | 0.21 | 0.73 | 0.076 | 0.0552 |
| 11 | 4.60 | 0.360 | 0.21 | 0.71 | 0.076 | 0.0537 |
| 12 | 4.96 | 0.360 | 0.19 | 0.68 | 0.068 | 0.0465 |
| 13 | 5.32 | 0.360 | 0.21 | 0.69 | 0.076 | 0.0522 |
| 14 | 5.68 | 0.360 | 0.19 | 0.66 | 0.068 | 0.0451 |
| 15 | 6.04 | 0.360 | 0.16 | 0.53 | 0.058 | 0.0305 |
| 16 | 6.40 | 0.360 | 0.16 | 0.55 | 0.058 | 0.0317 |
| 17 | 6.76 | 0.360 | 0.15 | 0.54 | 0.054 | 0.0292 |
| 18 | 7.12 | 0.360 | 0.14 | 0.38 | 0.050 | 0.0192 |
| 19 | 7.48 | 0.440 | 0.15 | 0.22 | 0.066 | 0.0145 |
| 20 | 8.00 | 0.260 | 0.03 | 0.00 | 0.008 | 0.0000 |
| end | 8.00 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.20 |
| **Mean Velocity (m/s)** | 0.51 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.8423 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Upper Clinton Creek |
| **Station Name:** | R1 |
| **Date and Time:** | Aug.19,2016 15:10 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05810604 7147490 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

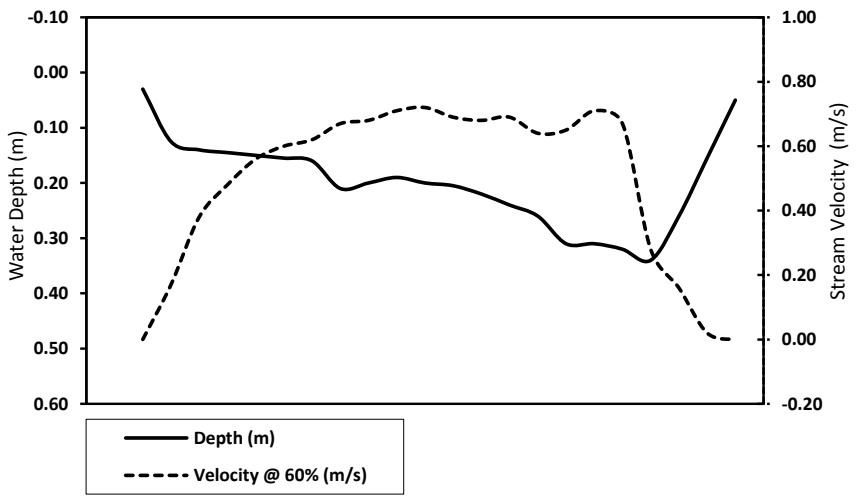
| | |
|---|---|
| **Left Bank** | 0.74 |
| **Right Bank** | 8 |
| **Wet.Width** | 7.26 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 8.00 | 0.180 | 0.03 | 0.00 | 0.005 | 0.0000 |
| 1 | 7.64 | 0.360 | 0.13 | 0.17 | 0.045 | 0.0077 |
| 2 | 7.28 | 0.360 | 0.14 | 0.38 | 0.050 | 0.0192 |
| 3 | 6.92 | 0.360 | 0.15 | 0.48 | 0.052 | 0.0251 |
| 4 | 6.56 | 0.360 | 0.15 | 0.56 | 0.054 | 0.0302 |
| 5 | 6.20 | 0.360 | 0.16 | 0.60 | 0.056 | 0.0335 |
| 6 | 5.84 | 0.360 | 0.16 | 0.62 | 0.058 | 0.0357 |
| 7 | 5.48 | 0.360 | 0.21 | 0.67 | 0.076 | 0.0507 |
| 8 | 5.12 | 0.360 | 0.20 | 0.68 | 0.072 | 0.0490 |
| 9 | 4.76 | 0.360 | 0.19 | 0.71 | 0.068 | 0.0486 |
| 10 | 4.40 | 0.360 | 0.20 | 0.72 | 0.072 | 0.0518 |
| 11 | 4.04 | 0.360 | 0.21 | 0.69 | 0.074 | 0.0509 |
| 12 | 3.68 | 0.360 | 0.22 | 0.68 | 0.079 | 0.0539 |
| 13 | 3.32 | 0.360 | 0.24 | 0.69 | 0.086 | 0.0596 |
| 14 | 2.96 | 0.360 | 0.26 | 0.64 | 0.094 | 0.0599 |
| 15 | 2.60 | 0.360 | 0.31 | 0.65 | 0.112 | 0.0725 |
| 16 | 2.24 | 0.360 | 0.31 | 0.71 | 0.112 | 0.0792 |
| 17 | 1.88 | 0.360 | 0.32 | 0.67 | 0.115 | 0.0772 |
| 18 | 1.52 | 0.310 | 0.34 | 0.28 | 0.105 | 0.0295 |
| 19 | 1.26 | 0.260 | 0.26 | 0.16 | 0.068 | 0.0108 |
| 20 | 1.00 | 0.260 | 0.16 | 0.02 | 0.040 | 0.0008 |
| 21 | 0.74 | 0.130 | 0.05 | 0.00 | 0.007 | 0.0000 |
| end | 0.74 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.20 |
| **Mean Velocity (m/s)** | 0.49 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.8457 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Easter Creek |
| **Station Name:** | R2 |
| **Date and Time:** | Aug.19,2016 16:52 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0512028 7148062 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

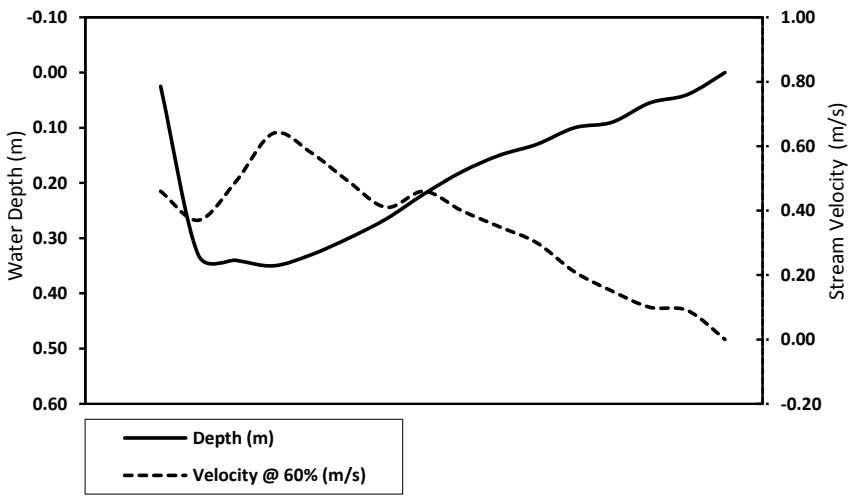
| | |
|---|---|
| **Left Bank** | 0.51 |
| **Right Bank** | 3.24 |
| **Wet.Width** | 2.73 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.51 | 0.090 | 0.03 | 0.46 | 0.002 | 0.0010 |
| 1 | 0.69 | 0.180 | 0.33 | 0.37 | 0.059 | 0.0220 |
| 2 | 0.87 | 0.180 | 0.34 | 0.49 | 0.061 | 0.0300 |
| 3 | 1.05 | 0.180 | 0.35 | 0.64 | 0.063 | 0.0403 |
| 4 | 1.23 | 0.180 | 0.33 | 0.58 | 0.059 | 0.0345 |
| 5 | 1.41 | 0.180 | 0.30 | 0.49 | 0.054 | 0.0265 |
| 6 | 1.59 | 0.180 | 0.27 | 0.41 | 0.048 | 0.0196 |
| 7 | 1.77 | 0.180 | 0.22 | 0.46 | 0.040 | 0.0182 |
| 8 | 1.95 | 0.180 | 0.18 | 0.40 | 0.032 | 0.0130 |
| 9 | 2.13 | 0.180 | 0.15 | 0.35 | 0.027 | 0.0095 |
| 10 | 2.31 | 0.180 | 0.13 | 0.30 | 0.023 | 0.0070 |
| 11 | 2.49 | 0.180 | 0.10 | 0.21 | 0.018 | 0.0038 |
| 12 | 2.67 | 0.180 | 0.09 | 0.15 | 0.016 | 0.0024 |
| 13 | 2.85 | 0.180 | 0.06 | 0.10 | 0.010 | 0.0010 |
| 14 | 3.03 | 0.195 | 0.04 | 0.09 | 0.008 | 0.0007 |
| 15 | 3.24 | 0.105 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 3.24 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.18 |
| **Mean Velocity (m/s)** | 0.34 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.2293 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Easter Creek |
| **Station Name:** | R2 |
| **Date and Time:** | Aug.19,2016 16:52 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0512028 7148062 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

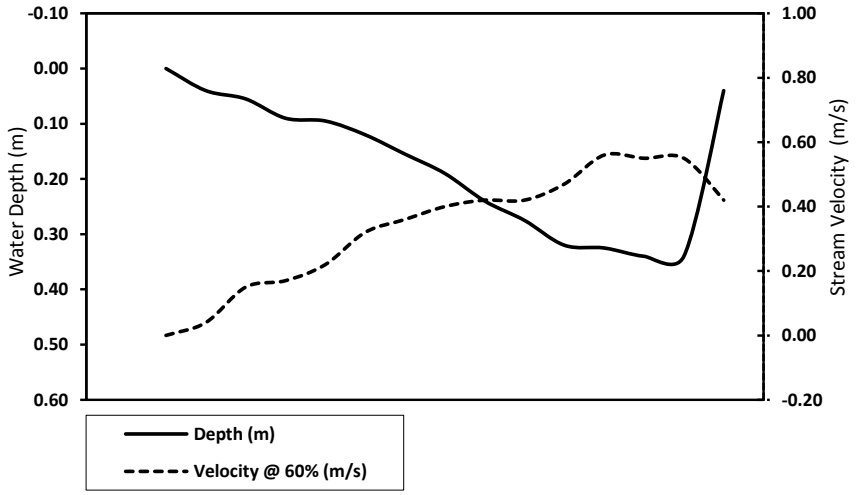
| | |
|---|---|
| **Left Bank** | 0.54 |
| **Right Bank** | 3.24 |
| **Wet.Width** | 2.7 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 3.24 | 0.080 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 3.08 | 0.180 | 0.04 | 0.04 | 0.007 | 0.0003 |
| 2 | 2.88 | 0.190 | 0.06 | 0.15 | 0.010 | 0.0016 |
| 3 | 2.70 | 0.180 | 0.09 | 0.17 | 0.016 | 0.0028 |
| 4 | 2.52 | 0.230 | 0.10 | 0.22 | 0.022 | 0.0048 |
| 5 | 2.24 | 0.230 | 0.12 | 0.32 | 0.028 | 0.0088 |
| 6 | 2.06 | 0.180 | 0.16 | 0.36 | 0.028 | 0.0100 |
| 7 | 1.88 | 0.180 | 0.19 | 0.40 | 0.034 | 0.0137 |
| 8 | 1.70 | 0.180 | 0.24 | 0.42 | 0.043 | 0.0181 |
| 9 | 1.52 | 0.180 | 0.28 | 0.42 | 0.050 | 0.0208 |
| 10 | 1.34 | 0.180 | 0.32 | 0.47 | 0.058 | 0.0271 |
| 11 | 1.16 | 0.180 | 0.33 | 0.56 | 0.059 | 0.0328 |
| 12 | 0.98 | 0.190 | 0.34 | 0.55 | 0.065 | 0.0355 |
| 13 | 0.78 | 0.220 | 0.34 | 0.55 | 0.075 | 0.0411 |
| 14 | 0.54 | 0.120 | 0.04 | 0.42 | 0.005 | 0.0020 |
| end | 0.54 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.18 |
| **Mean Velocity (m/s)** | 0.34 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.2194 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Wolverine Creek |
| **Station Name:** | R3 |
| **Date and Time:** | Aug.16,2016 14:30 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0513948 7148677 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

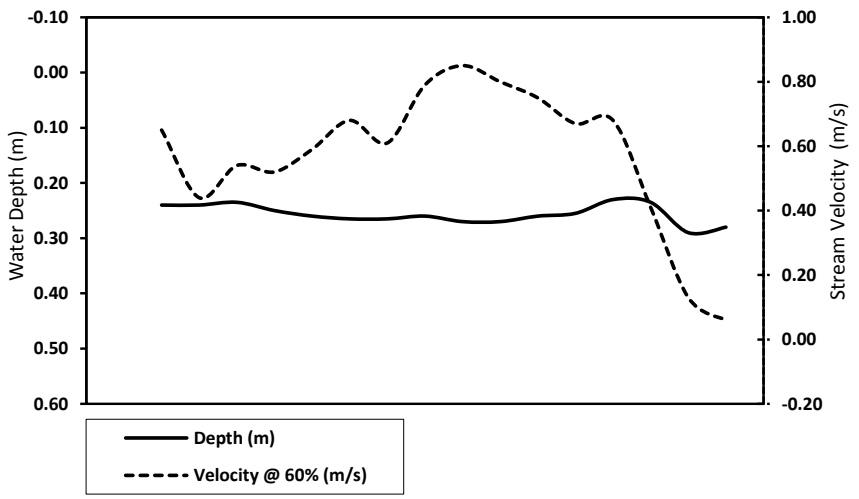
| | |
|---|---|
| **Left Bank** | 3.57 |
| **Right Bank** | 1 |
| **Wet.Width** | 2.57 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.00 | 0.085 | 0.24 | 0.65 | 0.020 | 0.0133 |
| 1 | 1.17 | 0.170 | 0.24 | 0.44 | 0.041 | 0.0180 |
| 2 | 1.34 | 0.170 | 0.24 | 0.54 | 0.040 | 0.0216 |
| 3 | 1.51 | 0.170 | 0.25 | 0.52 | 0.043 | 0.0221 |
| 4 | 1.68 | 0.170 | 0.26 | 0.59 | 0.044 | 0.0261 |
| 5 | 1.85 | 0.170 | 0.27 | 0.68 | 0.045 | 0.0306 |
| 6 | 2.02 | 0.170 | 0.27 | 0.61 | 0.045 | 0.0275 |
| 7 | 2.19 | 0.170 | 0.26 | 0.79 | 0.044 | 0.0349 |
| 8 | 2.36 | 0.170 | 0.27 | 0.85 | 0.046 | 0.0390 |
| 9 | 2.53 | 0.170 | 0.27 | 0.80 | 0.046 | 0.0367 |
| 10 | 2.70 | 0.170 | 0.26 | 0.75 | 0.044 | 0.0332 |
| 11 | 2.87 | 0.170 | 0.26 | 0.67 | 0.043 | 0.0290 |
| 12 | 3.04 | 0.170 | 0.23 | 0.68 | 0.039 | 0.0266 |
| 13 | 3.21 | 0.170 | 0.24 | 0.41 | 0.040 | 0.0164 |
| 14 | 3.38 | 0.180 | 0.29 | 0.13 | 0.052 | 0.0068 |
| 15 | 3.57 | 0.095 | 0.28 | 0.06 | 0.027 | 0.0016 |
| end | 3.57 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.26 |
| **Mean Velocity (m/s)** | 0.57 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.3833 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

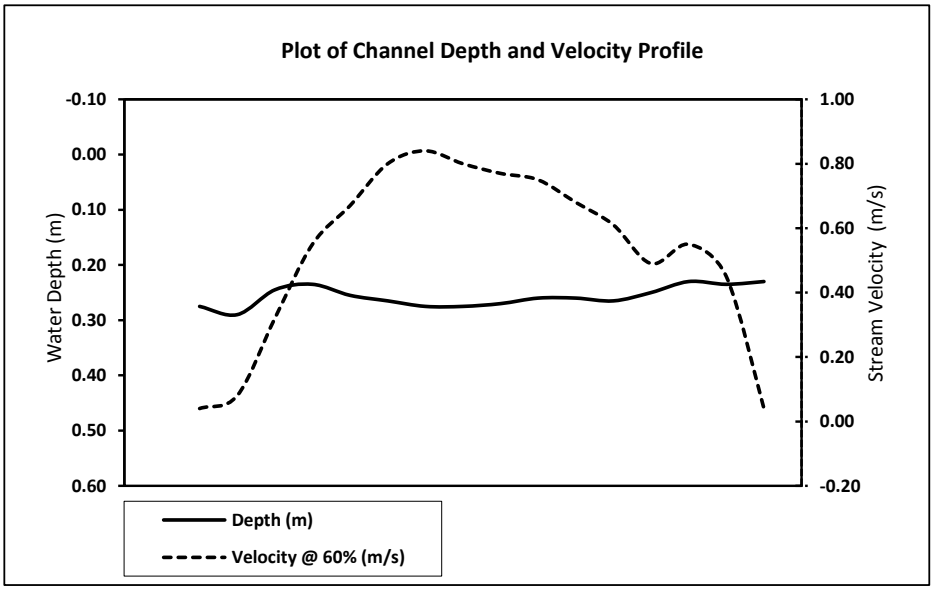
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Wolverine Creek |
| **Station Name:** | R3 |
| **Date and Time:** | Aug.16,2016 14:30 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0513948 7148677 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

| | |
|---|---|
| **Left Bank** | 3.57 |
| **Right Bank** | 1 |
| **Wet.Width** | 2.57 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 3.57 | 0.085 | 0.28 | 0.04 | 0.023 | 0.0009 |
| 1 | 3.40 | 0.170 | 0.29 | 0.08 | 0.049 | 0.0039 |
| 2 | 3.23 | 0.170 | 0.25 | 0.32 | 0.042 | 0.0133 |
| 3 | 3.06 | 0.170 | 0.24 | 0.55 | 0.040 | 0.0220 |
| 4 | 2.89 | 0.170 | 0.26 | 0.67 | 0.043 | 0.0290 |
| 5 | 2.72 | 0.170 | 0.27 | 0.80 | 0.045 | 0.0360 |
| 6 | 2.55 | 0.170 | 0.28 | 0.84 | 0.047 | 0.0393 |
| 7 | 2.38 | 0.170 | 0.28 | 0.80 | 0.047 | 0.0374 |
| 8 | 2.21 | 0.170 | 0.27 | 0.77 | 0.046 | 0.0353 |
| 9 | 2.04 | 0.170 | 0.26 | 0.75 | 0.044 | 0.0332 |
| 10 | 1.87 | 0.170 | 0.26 | 0.68 | 0.044 | 0.0301 |
| 11 | 1.70 | 0.170 | 0.27 | 0.61 | 0.045 | 0.0275 |
| 12 | 1.53 | 0.170 | 0.25 | 0.49 | 0.043 | 0.0208 |
| 13 | 1.36 | 0.170 | 0.23 | 0.55 | 0.039 | 0.0215 |
| 14 | 1.19 | 0.180 | 0.24 | 0.45 | 0.042 | 0.0190 |
| 15 | 1.00 | 0.095 | 0.23 | 0.04 | 0.022 | 0.0009 |
| end | 1.00 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.26 |
| **Mean Velocity (m/s)** | 0.53 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.3702 |



# Stream Flow & Discharge Calculation

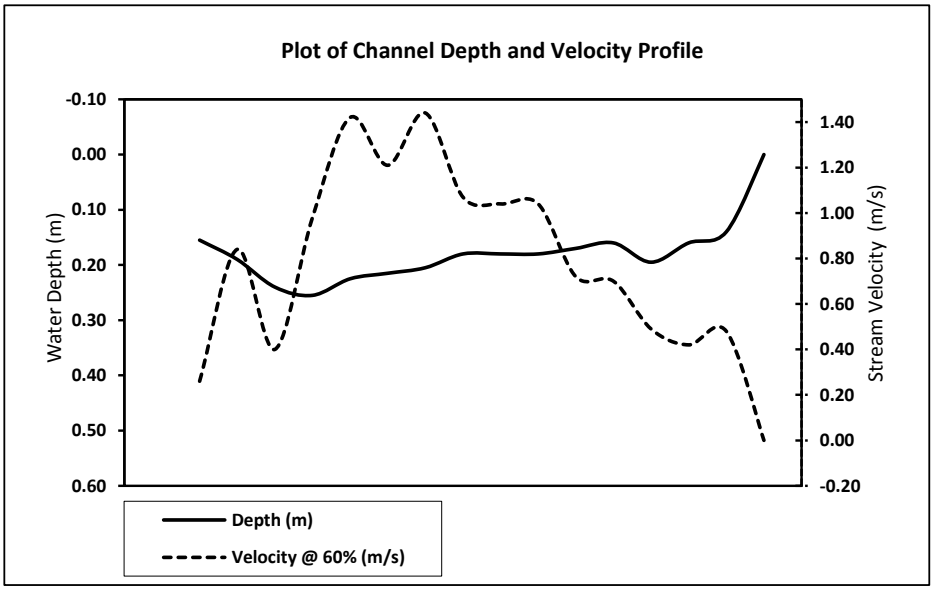
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Eagle Creek |
| **Station Name:** | R4 |
| **Date and Time:** | Aug.18,2016 14:18 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0515985 7145352 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

| | |
|---|---|
| **Left Bank** | 2.44 |
| **Right Bank** | 0.4 |
| **Wet.Width** | 2.04 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.40 | 0.075 | 0.16 | 0.26 | 0.012 | 0.0030 |
| 1 | 0.55 | 0.145 | 0.19 | 0.84 | 0.028 | 0.0231 |
| 2 | 0.69 | 0.140 | 0.24 | 0.40 | 0.034 | 0.0134 |
| 3 | 0.83 | 0.140 | 0.26 | 0.98 | 0.036 | 0.0350 |
| 4 | 0.97 | 0.140 | 0.23 | 1.42 | 0.032 | 0.0447 |
| 5 | 1.11 | 0.140 | 0.22 | 1.21 | 0.030 | 0.0364 |
| 6 | 1.25 | 0.140 | 0.21 | 1.44 | 0.029 | 0.0413 |
| 7 | 1.39 | 0.140 | 0.18 | 1.07 | 0.025 | 0.0270 |
| 8 | 1.53 | 0.140 | 0.18 | 1.04 | 0.025 | 0.0262 |
| 9 | 1.67 | 0.140 | 0.18 | 1.04 | 0.025 | 0.0262 |
| 10 | 1.81 | 0.140 | 0.17 | 0.72 | 0.024 | 0.0171 |
| 11 | 1.95 | 0.140 | 0.16 | 0.70 | 0.022 | 0.0157 |
| 12 | 2.09 | 0.140 | 0.20 | 0.49 | 0.027 | 0.0134 |
| 13 | 2.23 | 0.140 | 0.16 | 0.42 | 0.022 | 0.0094 |
| 14 | 2.37 | 0.105 | 0.14 | 0.48 | 0.015 | 0.0071 |
| 15 | 2.44 | 0.035 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 2.44 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.18 |
| **Mean Velocity (m/s)** | 0.78 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.3391 |



# Stream Flow & Discharge Calculation

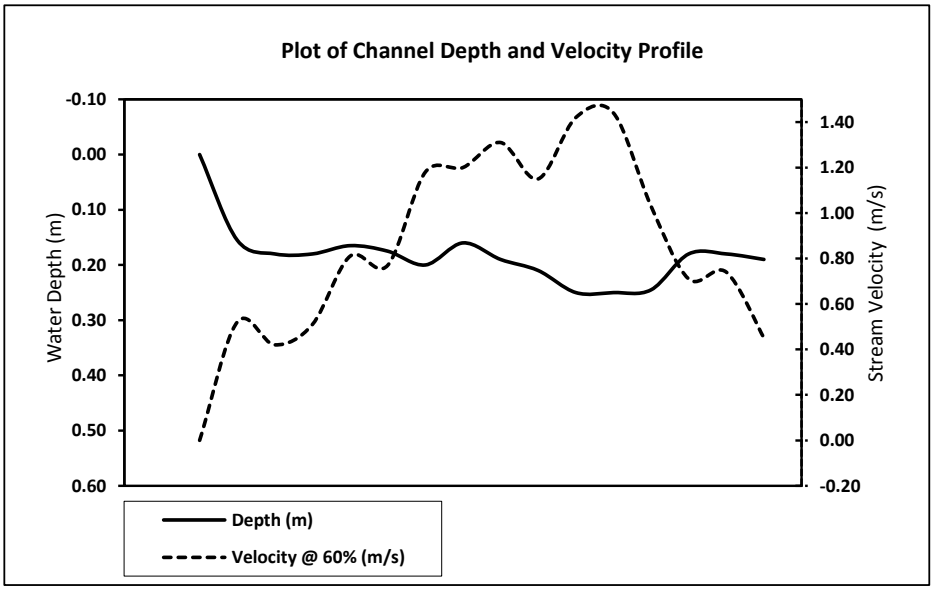
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Eagle Creek |
| **Station Name:** | R4 |
| **Date and Time:** | Aug.18,2016 14:18 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0515985 7145352 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

| | |
|---|---|
| **Left Bank** | 2.44 |
| **Right Bank** | 0.4 |
| **Wet.Width** | 2.04 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 2.44 | 0.070 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 2.30 | 0.140 | 0.16 | 0.52 | 0.022 | 0.0113 |
| 2 | 2.16 | 0.140 | 0.18 | 0.42 | 0.025 | 0.0106 |
| 3 | 2.02 | 0.140 | 0.18 | 0.51 | 0.025 | 0.0129 |
| 4 | 1.88 | 0.140 | 0.17 | 0.81 | 0.023 | 0.0187 |
| 5 | 1.74 | 0.140 | 0.18 | 0.77 | 0.025 | 0.0189 |
| 6 | 1.60 | 0.140 | 0.20 | 1.18 | 0.028 | 0.0330 |
| 7 | 1.46 | 0.140 | 0.16 | 1.20 | 0.022 | 0.0269 |
| 8 | 1.32 | 0.140 | 0.19 | 1.31 | 0.027 | 0.0348 |
| 9 | 1.18 | 0.140 | 0.21 | 1.15 | 0.029 | 0.0338 |
| 10 | 1.04 | 0.140 | 0.25 | 1.42 | 0.035 | 0.0497 |
| 11 | 0.90 | 0.140 | 0.25 | 1.44 | 0.035 | 0.0504 |
| 12 | 0.76 | 0.140 | 0.25 | 1.03 | 0.034 | 0.0353 |
| 13 | 0.62 | 0.130 | 0.18 | 0.71 | 0.023 | 0.0166 |
| 14 | 0.50 | 0.110 | 0.18 | 0.74 | 0.020 | 0.0147 |
| 15 | 0.40 | 0.050 | 0.19 | 0.45 | 0.010 | 0.0043 |
| end | 0.40 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.18 |
| **Mean Velocity (m/s)** | 0.85 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.3718 |



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Porcupine Creek |
| **Station Name:** | R7 |
| **Date and Time:** | Aug.17,2016 10:11 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0513003 7145649 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

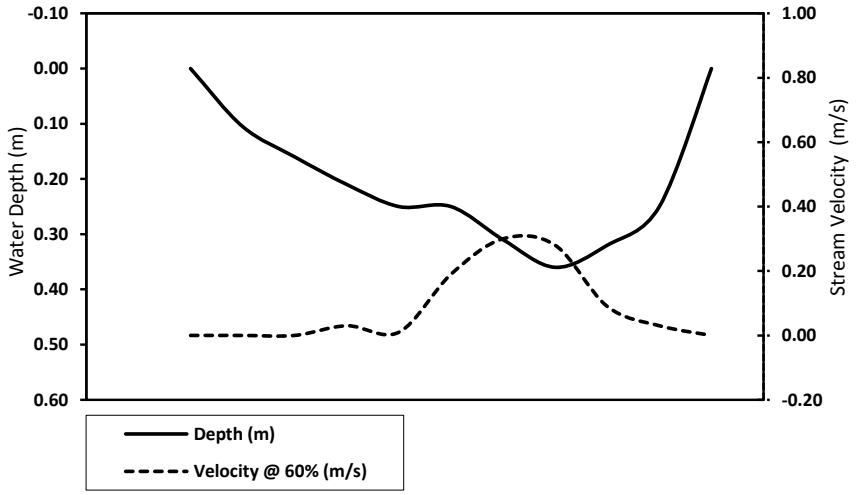
| | |
|---|---|
| **Left Bank** | 1.27 |
| **Right Bank** | 0.46 |
| **Wet.Width** | 0.81 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.46 | 0.040 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 0.54 | 0.080 | 0.11 | 0.00 | 0.008 | 0.0000 |
| 2 | 0.62 | 0.080 | 0.16 | 0.00 | 0.013 | 0.0000 |
| 3 | 0.70 | 0.080 | 0.21 | 0.03 | 0.017 | 0.0005 |
| 4 | 0.78 | 0.080 | 0.25 | 0.01 | 0.020 | 0.0002 |
| 5 | 0.86 | 0.080 | 0.25 | 0.19 | 0.020 | 0.0038 |
| 6 | 0.94 | 0.080 | 0.31 | 0.30 | 0.025 | 0.0074 |
| 7 | 1.02 | 0.080 | 0.36 | 0.28 | 0.029 | 0.0081 |
| 8 | 1.10 | 0.080 | 0.32 | 0.09 | 0.026 | 0.0023 |
| 9 | 1.18 | 0.085 | 0.25 | 0.03 | 0.021 | 0.0006 |
| 10 | 1.27 | 0.045 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 1.27 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.20 |
| **Mean Velocity (m/s)** | 0.08 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0229 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Porcupine Creek |
| **Station Name:** | R7 |
| **Date and Time:** | Aug.17,2016 10:11 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0513003 7145649 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

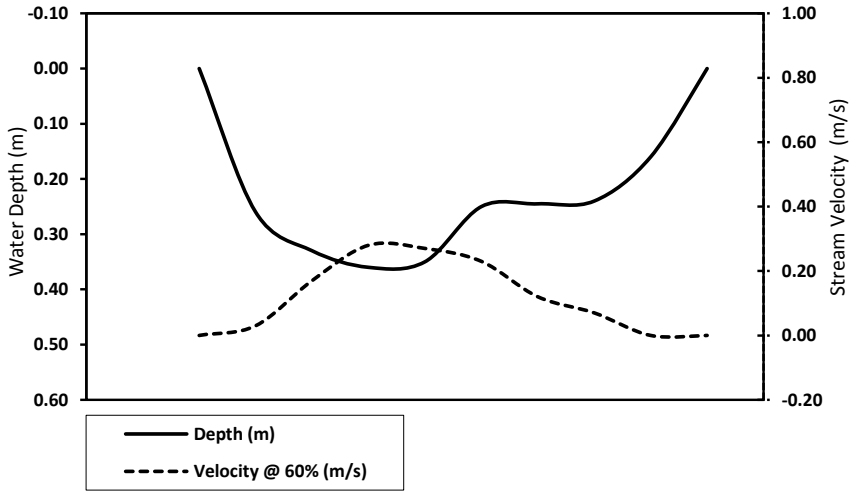
| | |
|---|---|
| **Left Bank** | 1.27 |
| **Right Bank** | 0.47 |
| **Wet.Width** | 0.8 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.27 | 0.040 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.19 | 0.080 | 0.26 | 0.03 | 0.021 | 0.0006 |
| 2 | 1.11 | 0.080 | 0.33 | 0.17 | 0.026 | 0.0045 |
| 3 | 1.03 | 0.080 | 0.36 | 0.28 | 0.029 | 0.0081 |
| 4 | 0.95 | 0.080 | 0.35 | 0.27 | 0.028 | 0.0076 |
| 5 | 0.87 | 0.080 | 0.25 | 0.23 | 0.020 | 0.0046 |
| 6 | 0.79 | 0.080 | 0.25 | 0.12 | 0.020 | 0.0024 |
| 7 | 0.71 | 0.080 | 0.24 | 0.07 | 0.019 | 0.0013 |
| 8 | 0.63 | 0.120 | 0.16 | 0.00 | 0.019 | 0.0000 |
| 9 | 0.47 | 0.080 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 0.47 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.22 |
| **Mean Velocity (m/s)** | 0.12 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0290 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R8 |
| **Date and Time:** | Aug.19,2016 17:57 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0511894 7147906 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

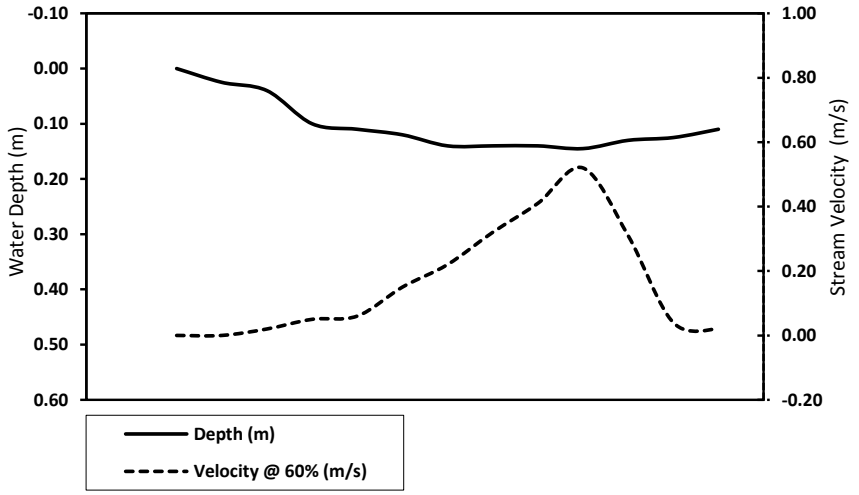
| | |
|---|---|
| **Left Bank** | 1.93 |
| **Right Bank** | 0.93 |
| **Wet.Width** | 1 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.93 | 0.040 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.01 | 0.080 | 0.03 | 0.00 | 0.002 | 0.0000 |
| 2 | 1.09 | 0.085 | 0.04 | 0.02 | 0.003 | 0.0001 |
| 3 | 1.18 | 0.085 | 0.10 | 0.05 | 0.009 | 0.0004 |
| 4 | 1.26 | 0.085 | 0.11 | 0.06 | 0.009 | 0.0006 |
| 5 | 1.35 | 0.085 | 0.12 | 0.15 | 0.010 | 0.0015 |
| 6 | 1.43 | 0.085 | 0.14 | 0.22 | 0.012 | 0.0026 |
| 7 | 1.52 | 0.085 | 0.14 | 0.32 | 0.012 | 0.0038 |
| 8 | 1.60 | 0.080 | 0.14 | 0.41 | 0.011 | 0.0046 |
| 9 | 1.68 | 0.085 | 0.15 | 0.52 | 0.012 | 0.0064 |
| 10 | 1.77 | 0.085 | 0.13 | 0.31 | 0.011 | 0.0034 |
| 11 | 1.85 | 0.080 | 0.13 | 0.04 | 0.010 | 0.0004 |
| 12 | 1.93 | 0.040 | 0.11 | 0.02 | 0.004 | 0.0001 |
| end | 1.93 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.10 |
| **Mean Velocity (m/s)** | 0.16 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0239 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R8 |
| **Date and Time:** | Aug.19,2016 17:57 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0511894 7147906 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

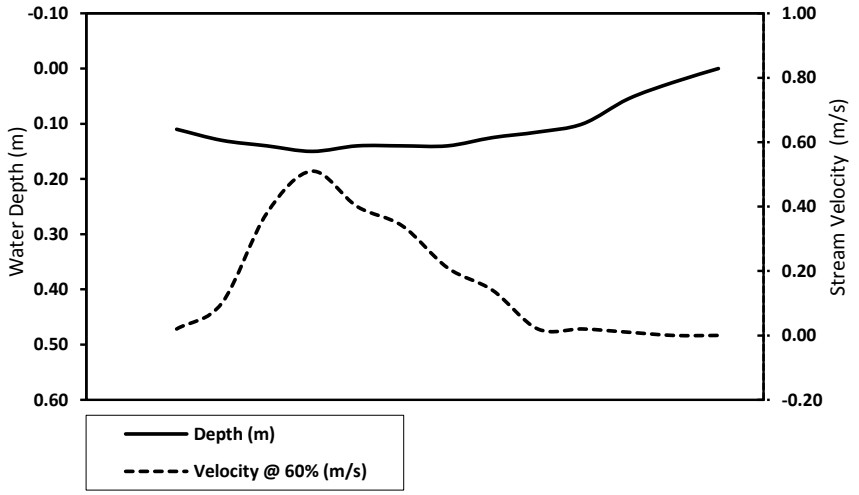
| | |
|---|---|
| **Left Bank** | 1.93 |
| **Right Bank** | 0.93 |
| **Wet.Width** | 1 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.93 | 0.040 | 0.11 | 0.02 | 0.004 | 0.0001 |
| 1 | 1.85 | 0.080 | 0.13 | 0.10 | 0.010 | 0.0010 |
| 2 | 1.77 | 0.085 | 0.14 | 0.38 | 0.012 | 0.0045 |
| 3 | 1.68 | 0.085 | 0.15 | 0.51 | 0.013 | 0.0065 |
| 4 | 1.60 | 0.080 | 0.14 | 0.40 | 0.011 | 0.0045 |
| 5 | 1.52 | 0.085 | 0.14 | 0.34 | 0.012 | 0.0040 |
| 6 | 1.43 | 0.090 | 0.14 | 0.21 | 0.013 | 0.0026 |
| 7 | 1.34 | 0.085 | 0.13 | 0.14 | 0.011 | 0.0015 |
| 8 | 1.26 | 0.085 | 0.12 | 0.02 | 0.010 | 0.0002 |
| 9 | 1.17 | 0.085 | 0.10 | 0.02 | 0.009 | 0.0002 |
| 10 | 1.09 | 0.080 | 0.06 | 0.01 | 0.004 | 0.0000 |
| 11 | 1.01 | 0.080 | 0.03 | 0.00 | 0.002 | 0.0000 |
| 12 | 0.93 | 0.040 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 0.93 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.11 |
| **Mean Velocity (m/s)** | 0.17 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0252 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R9 |
| **Date and Time:** | Aug.20,2016 9:02 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05123441 7146751 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

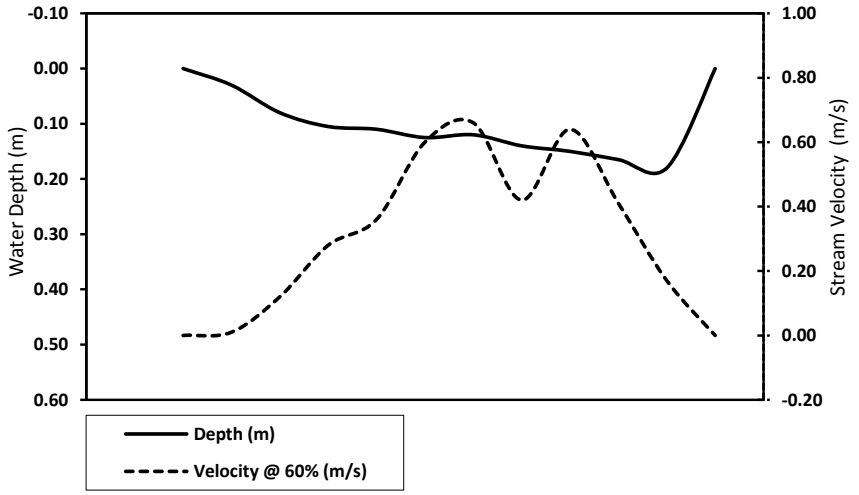
| | |
|---|---|
| **Left Bank** | 3.04 |
| **Right Bank** | 1.76 |
| **Wet.Width** | 1.28 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 1.76 | 0.085 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 1.93 | 0.150 | 0.03 | 0.01 | 0.005 | 0.0000 |
| 2 | 2.06 | 0.115 | 0.08 | 0.12 | 0.009 | 0.0011 |
| 3 | 2.16 | 0.100 | 0.11 | 0.28 | 0.011 | 0.0029 |
| 4 | 2.26 | 0.100 | 0.11 | 0.36 | 0.011 | 0.0040 |
| 5 | 2.36 | 0.100 | 0.13 | 0.60 | 0.013 | 0.0075 |
| 6 | 2.46 | 0.100 | 0.12 | 0.66 | 0.012 | 0.0079 |
| 7 | 2.56 | 0.100 | 0.14 | 0.42 | 0.014 | 0.0059 |
| 8 | 2.66 | 0.100 | 0.15 | 0.64 | 0.015 | 0.0096 |
| 9 | 2.76 | 0.100 | 0.17 | 0.41 | 0.017 | 0.0068 |
| 10 | 2.86 | 0.140 | 0.18 | 0.17 | 0.025 | 0.0043 |
| 11 | 3.04 | 0.090 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 3.04 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.10 |
| **Mean Velocity (m/s)** | 0.31 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0500 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R9 |
| **Date and Time:** | Aug.20,2016 9:02 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 05123441 7146751 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

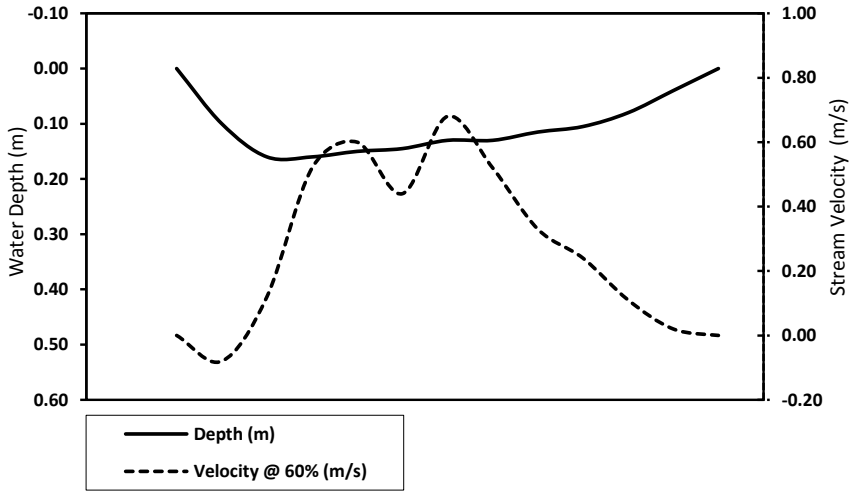
| | |
|---|---|
| **Left Bank** | 3.05 |
| **Right Bank** | 1.76 |
| **Wet.Width** | 1.29 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 3.05 | 0.050 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 2.95 | 0.100 | 0.10 | -0.08 | 0.010 | -0.0008 |
| 2 | 2.85 | 0.100 | 0.16 | 0.12 | 0.016 | 0.0019 |
| 3 | 2.75 | 0.100 | 0.16 | 0.52 | 0.016 | 0.0083 |
| 4 | 2.65 | 0.100 | 0.15 | 0.60 | 0.015 | 0.0090 |
| 5 | 2.55 | 0.100 | 0.15 | 0.44 | 0.015 | 0.0064 |
| 6 | 2.45 | 0.100 | 0.13 | 0.68 | 0.013 | 0.0088 |
| 7 | 2.35 | 0.100 | 0.13 | 0.52 | 0.013 | 0.0068 |
| 8 | 2.25 | 0.100 | 0.12 | 0.33 | 0.012 | 0.0038 |
| 9 | 2.15 | 0.100 | 0.11 | 0.24 | 0.011 | 0.0025 |
| 10 | 2.05 | 0.100 | 0.08 | 0.11 | 0.008 | 0.0009 |
| 11 | 1.95 | 0.145 | 0.04 | 0.02 | 0.006 | 0.0001 |
| 12 | 1.76 | 0.095 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 1.76 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.10 |
| **Mean Velocity (m/s)** | 0.27 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.0477 |

**Plot of Channel Depth and Velocity Profile**



# Stream Flow & Discharge Calculation

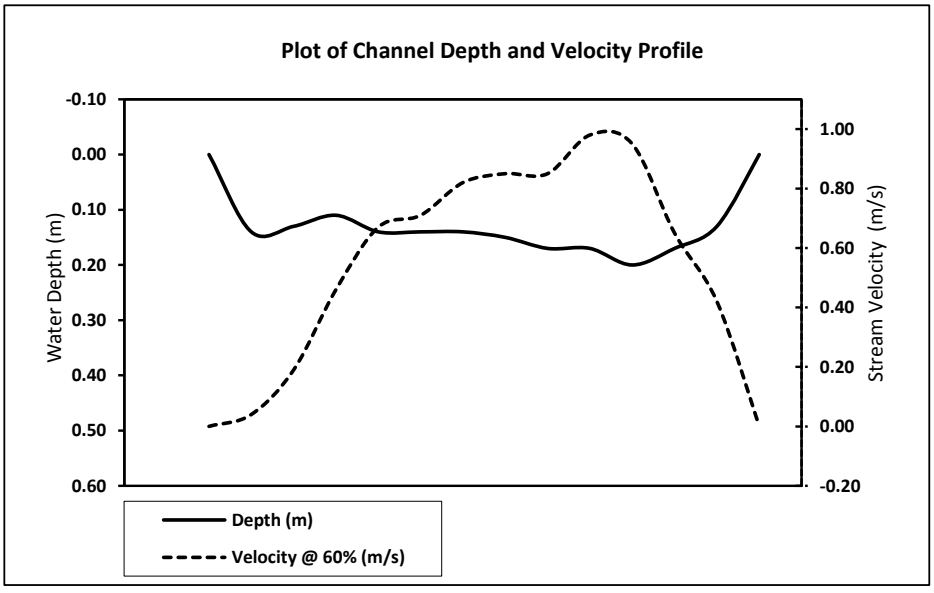
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R11(H) |
| **Date and Time:** | Aug.16,2016 11:48 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514161 7147784 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 1 |

| | |
|---|---|
| **Left Bank** | 2.41 |
| **Right Bank** | 0.49 |
| **Wet.Width** | 1.92 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 2.41 | 0.075 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 2.26 | 0.150 | 0.14 | 0.04 | 0.021 | 0.0008 |
| 2 | 2.11 | 0.150 | 0.13 | 0.19 | 0.020 | 0.0037 |
| 3 | 1.96 | 0.150 | 0.11 | 0.46 | 0.017 | 0.0076 |
| 4 | 1.81 | 0.150 | 0.14 | 0.67 | 0.021 | 0.0141 |
| 5 | 1.66 | 0.150 | 0.14 | 0.71 | 0.021 | 0.0149 |
| 6 | 1.51 | 0.150 | 0.14 | 0.82 | 0.021 | 0.0172 |
| 7 | 1.36 | 0.150 | 0.15 | 0.85 | 0.023 | 0.0191 |
| 8 | 1.21 | 0.150 | 0.17 | 0.85 | 0.026 | 0.0217 |
| 9 | 1.06 | 0.150 | 0.17 | 0.98 | 0.026 | 0.0250 |
| 10 | 0.91 | 0.150 | 0.20 | 0.95 | 0.030 | 0.0285 |
| 11 | 0.76 | 0.150 | 0.17 | 0.65 | 0.026 | 0.0166 |
| 12 | 0.61 | 0.135 | 0.13 | 0.42 | 0.018 | 0.0074 |
| 13 | 0.49 | 0.060 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 0.49 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.13 |
| **Mean Velocity (m/s)** | 0.54 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.1766 |



# Stream Flow & Discharge Calculation

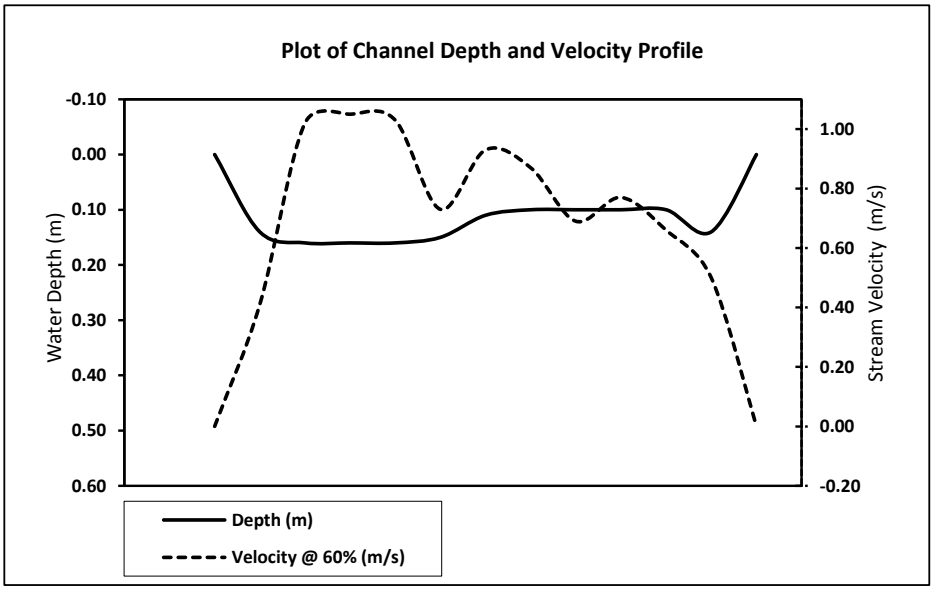
| | |
|---|---|
| **ELR Project No.** | 16-240.4 |
| **Site / Location:** | Clinton Creek Site |
| **Stream Name:** | Unnamed Creek |
| **Station Name:** | R11(H) |
| **Date and Time:** | Aug.16,2016 11:48 |
| **Staff:** | GR,NB |
| **UTM Coordinates:** | 07w 0514161 7147784 |
| **Technique:** | Swoffer |
| **Temp., Water/Air (°C)** | N/A |
| **Crossing Number** | 2 |

| | |
|---|---|
| **Left Bank** | 2.39 |
| **Right Bank** | 0.49 |
| **Wet.Width** | 1.9 |

| Station No. | Distance (m) | Station Width (m) | Depth (m) | Velocity @ 60% (m/s) | Panel Area ($m^2$) | Panel Discharge ($m^3/s$) |
|---|---|---|---|---|---|---|
| 0 | 0.49 | 0.075 | 0.00 | 0.00 | 0.000 | 0.0000 |
| 1 | 0.64 | 0.150 | 0.14 | 0.41 | 0.021 | 0.0086 |
| 2 | 0.79 | 0.150 | 0.16 | 1.02 | 0.024 | 0.0245 |
| 3 | 0.94 | 0.150 | 0.16 | 1.05 | 0.024 | 0.0252 |
| 4 | 1.09 | 0.150 | 0.16 | 1.03 | 0.024 | 0.0247 |
| 5 | 1.24 | 0.150 | 0.15 | 0.73 | 0.023 | 0.0164 |
| 6 | 1.39 | 0.150 | 0.11 | 0.93 | 0.017 | 0.0153 |
| 7 | 1.54 | 0.150 | 0.10 | 0.87 | 0.015 | 0.0131 |
| 8 | 1.69 | 0.150 | 0.10 | 0.69 | 0.015 | 0.0104 |
| 9 | 1.84 | 0.150 | 0.10 | 0.77 | 0.015 | 0.0116 |
| 10 | 1.99 | 0.150 | 0.10 | 0.66 | 0.015 | 0.0099 |
| 11 | 2.14 | 0.200 | 0.14 | 0.50 | 0.028 | 0.0140 |
| 12 | 2.39 | 0.125 | 0.00 | 0.00 | 0.000 | 0.0000 |
| end | 2.39 | | | | | |

| | |
|---|---|
| **Mean Depth (m)** | 0.11 |
| **Mean Velocity (m/s)** | 0.67 |

| | |
|---|---|
| **Discharge ($m^3/s$)** | 0.1736 |



# APPENDIX 5
## Survey Data

**HL Instruments**

| | Jul-15 | | | Sep-15 | | | Jan-16 | | | Jun-16 | | | Jul-16 | | | Aug-16 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m | | | m | | | m | | | m | | | m | | | m | | |
| | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean |
| **BM 1** | 3.222 | 3.221 | 3.222 | 3.082 | 3.080 | 3.081 | 2.971 | 2.970 | 2.971 | 2.765 | 2.763 | 2.764 | 3.147 | 3.148 | 3.148 | 3.193 | 3.194 | 3.194 |
| **BM 2** | 2.659 | 2.658 | 2.659 | 2.519 | 2.520 | 2.520 | 2.408 | 2.407 | 2.408 | 2.119 | 2.119 | 2.119 | 2.502 | 2.502 | 2.502 | 2.550 | 2.549 | 2.550 |
| **BM3** | | | | | | | | | | | | | 2.058 | 2.058 | 2.058 | 2.104 | 2.103 | 2.104 |
| **Staff Gauge (SG)** | 4.130 | 4.129 | 4.130 | 3.994 | 4.000 | 3.997 | 4.011 | 4.012 | 4.012 | 3.478 | 3.479 | 3.479 | 3.864 | 3.864 | 3.864 | 3.910 | 3.910 | 3.910 |
| **Station Casing (SC)** | 3.616 | 3.616 | 3.616 | 1.316 | 1.316 | 1.316 | 3.419 | 3.418 | 3.419 | 3.188 | 3.188 | 3.188 | 3.569 | 3.569 | 3.569 | 3.616 | 3.616 | 3.616 |
| **BM1-BM2 difference** | | | 0.563 | | | 0.562 | | | 0.563 | | | 0.645 | | | 0.646 | | | 0.644 |
| **BM1-BM3 difference** | | | - | | | - | | | - | | | - | | | 1.090 | | | 1.090 |
| **BM2-BM3 difference** | | | - | | | - | | | - | | | - | | | 0.444 | | | 0.446 |
| **SG-BM1 difference** | | | 0.908 | | | 0.916 | | | 1.041 | | | 0.715 | | | 0.717 | | | 0.717 |
| **SG-BM2 difference** | | | 1.471 | | | 1.478 | | | 1.604 | | | 1.360 | | | 1.362 | | | 1.361 |
| **SG-BM3 difference** | | | - | | | - | | | - | | | - | | | 1.806 | | | 1.807 |
| **SC-BM1 difference** | | | 0.395 | | | 1.765 | | | 0.448 | | | 0.424 | | | 0.422 | | | 0.423 |
| **SC-BM2 difference** | | | 0.958 | | | 1.204 | | | 1.011 | | | 1.069 | | | 1.067 | | | 1.067 |
| **SC-BM3 difference** | | | - | | | - | | | - | | | - | | | 1.511 | | | 1.513 |

**WC Instruments**

| | Oct-15 | | | Jul-15 | | | Jan-16 | | | Jun-16 | | | Jul-16 | | | Aug-16 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m | | | m | | | m | | | m | | | m | | | m | | |
| | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean |
| **BM 1** | 1.304 | 1.304 | 1.304 | 0.947 | 0.948 | 0.948 | 1.119 | 1.119 | 1.119 | 0.951 | 0.952 | 0.952 | 0.944 | 0.946 | 0.945 | 1.052 | 1.053 | 1.053 |
| **BM 2** | 0.691 | 0.691 | 0.691 | 0.332 | 0.331 | 0.332 | 0.518 | 0.518 | 0.518 | 0.340 | 0.341 | 0.341 | 0.334 | 0.335 | 0.335 | 0.441 | 0.440 | 0.441 |
| **BM3** | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Staff Gauge (SG)** | 1.595 | 1.597 | 1.596 | 1.248 | 1.249 | 1.249 | 1.415 | 1.414 | 1.415 | 1.234 | 1.233 | 1.234 | 1.230 | 1.231 | 1.231 | 1.339 | 1.339 | 1.339 |
| **Station casing (SC)** | 0.694 | 0.694 | 0.694 | 0.337 | 0.337 | 0.337 | 0.520 | 0.521 | 0.521 | 0.357 | 0.357 | 0.357 | 0.348 | 0.349 | 0.349 | 0.458 | 0.458 | 0.458 |
| **BM1-BM2 Difference** | | | 0.613 | | | 0.616 | | | 0.601 | | | 0.611 | | | 0.611 | | | 0.612 |
| **BM1-BM3 difference** | | | - | | | - | | | - | | | - | | | - | | | - |
| **BM2-BM3 difference** | | | - | | | - | | | - | | | - | | | - | | | - |
| **SG-BM1 difference** | | | 0.292 | | | 0.301 | | | 0.296 | | | 0.282 | | | 0.286 | | | 0.287 |
| **SG-BM2 difference** | | | 0.905 | | | 0.917 | | | 0.897 | | | 0.893 | | | 0.896 | | | 0.899 |
| **SG-BM3 difference** | | | - | | | - | | | - | | | - | | | - | | | - |
| **SC-BM1 difference** | | | 0.610 | | | 0.611 | | | 0.599 | | | 0.595 | | | 0.597 | | | 0.595 |
| **SC-BM2 difference** | | | 0.003 | | | 0.006 | | | 0.002 | | | 0.017 | | | 0.014 | | | 0.018 |
| **SC-BM3 difference** | | | - | | | - | | | - | | | - | | | - | | | - |

**SL Instruments**

| | Oct-15 | | | Jul-15 | | | Jan-16 | | | Jun-16 | | | Jul-16 | | | Aug-16 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m | | | m | | | m | | | m | | | m | | | m | | |
| | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean | Pass 1 | Pass 2 | Mean |
| **BM 1** | 1.383 | 1.383 | 1.383 | 1.372 | 1.372 | 1.372 | 1.210 | 1.209 | 1.210 | 1.272 | 1.272 | 1.272 | 0.574 | 0.574 | 0.574 | 1.901 | 1.902 | 1.902 |
| **BM 2** | 1.295 | 1.294 | 1.295 | 1.282 | 1.282 | 1.282 | 1.122 | 1.122 | 1.122 | 1.182 | 1.182 | 1.182 | 0.484 | 0.484 | 0.484 | 1.812 | 1.812 | 1.812 |
| **Staff Gauge (SG)** | 1.38 | 1.387 | 1.384 | 1.369 | 1.368 | 1.369 | 1.202 | 1.202 | 1.202 | 1.267 | 1.269 | 1.268 | 0.568 | 0.569 | 0.569 | | | |
| **Water Surface** | 2.895 | 2.873 | 2.884 | - | - | 0.994 | - | - | - | 3.070 | 3.070 | 3.070 | 1.962 | 1.963 | 1.963 | | | |
| **BM1-BM2 Difference** | | | 0.089 | | | 0.090 | | | 0.087 | | | 0.090 | | | 0.090 | | | 0.089 |
| **SG-BM1 difference** | | | 0.000 | | | 0.004 | | | 0.008 | | | 0.004 | | | 0.005 | | | |
| **SG-BM2 difference** | | | 0.089 | | | 0.087 | | | 0.080 | | | 0.086 | | | 0.085 | | | |
| **SG-Water Difference** | | | -1.501 | | | 0.375 | | | - | | | -1.802 | | | -1.394 | | | 0.200 |

| **SG Reading** | **Reading (m)** | |
|---|---|---|
| **July 30, 2015** | 0.375 | |
| **October 1, 2015** | -0.501 | Water level below bottom of gauge |
| **June 17, 2016** | -0.802 | Water level below bottom of gauge |
| **July 24, 2016** | -0.394 | Water level below bottom of gauge (measured after four days of heavy rain) |
| **August 20, 2016** | 1.200 | Approximate. Water level was above the top of the SG. Lots of recent rain. Possible beaver activity. Unsafe to to obtain survey reading from SG. |

# APPENDIX 6

## Response to Client's Comment

## Response to Comments from Draft Report Version (as Received November 9, 2016)

| Comment No. | Page | Comment | Response |
|---|---|---|---|
| 1 | 6 | I noticed that throughout this table, some values are fully reported, while some are rounded. There doesn't appear to be consistency with respect to which values are rounded and which are not. I haven't noticed this in previous reports. For consistency between reports, and to complete the picture of water chemistry, I've entered the original values. | The issue with rounding of values was a process of this table creation – this is a technical issue that has now been resolved. |
| 2 | 6 | Any insight on the high field pH values for R3, R11 and E3? These are different stations from the ones that had high field pH during the July event. Field pH for these three stations in July ranged from 8.11 to 8.27. Lab pH appears to be within the expected range for August. Just wondering why we keep getting these seemingly anomalous field pH readings. | These high pH values appear to be the result of a field instrument issue at specific sites. Based on our review, we have opted to remove these data from the overall dataset. |