

**RAMP**  
Regional Aquatics  
Monitoring Program



**2013 TECHNICAL REPORT**  
APPENDICES



# REGIONAL AQUATICS MONITORING PROGRAM

## 2013 Technical Report – Appendices

*FINAL*

*Prepared for:*

**RAMP STEERING COMMITTEE  
IN SUPPORT OF THE JOSMP**

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**Appendix A**

**Estimating Area of Land Change  
for the RAMP Focus Study Area**

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## **A ESTIMATING AREA OF LAND CHANGE FOR THE RAMP FOCUS STUDY AREA**

### **A.1 INTRODUCTION**

This appendix documents the methodology used to quantify the location, extent, and type of land change in the RAMP Focus Study Area (FSA) as of 2013 related to:

- focal projects (i.e., those projects owned by 2013 RAMP industry members, which were under construction or operational in 2013 in the RAMP FSA); and
- oil sands projects within the RAMP FSA that were under active development in 2013 by companies that were not members of RAMP in 2013.

This land change information was used to designate RAMP sampling stations and locations as *baseline* and *test* and to provide information to the hydrologic analysis of potential effects of focal project activities.

### **A.2 METHODOLOGY**

#### **A.2.1 Satellite Imagery Acquisition**

A total of twelve SPOT-5 10-meter resolution scenes (five north of Fort McMurray and seven south of Fort McMurray) were obtained by RAMP (Figure A.2-1); these images were acquired on August 1, August 2, August 10, August 23, September 1, September 5, and September 8, 2013.

#### **A.2.2 Ortho-Rectification of Image Data**

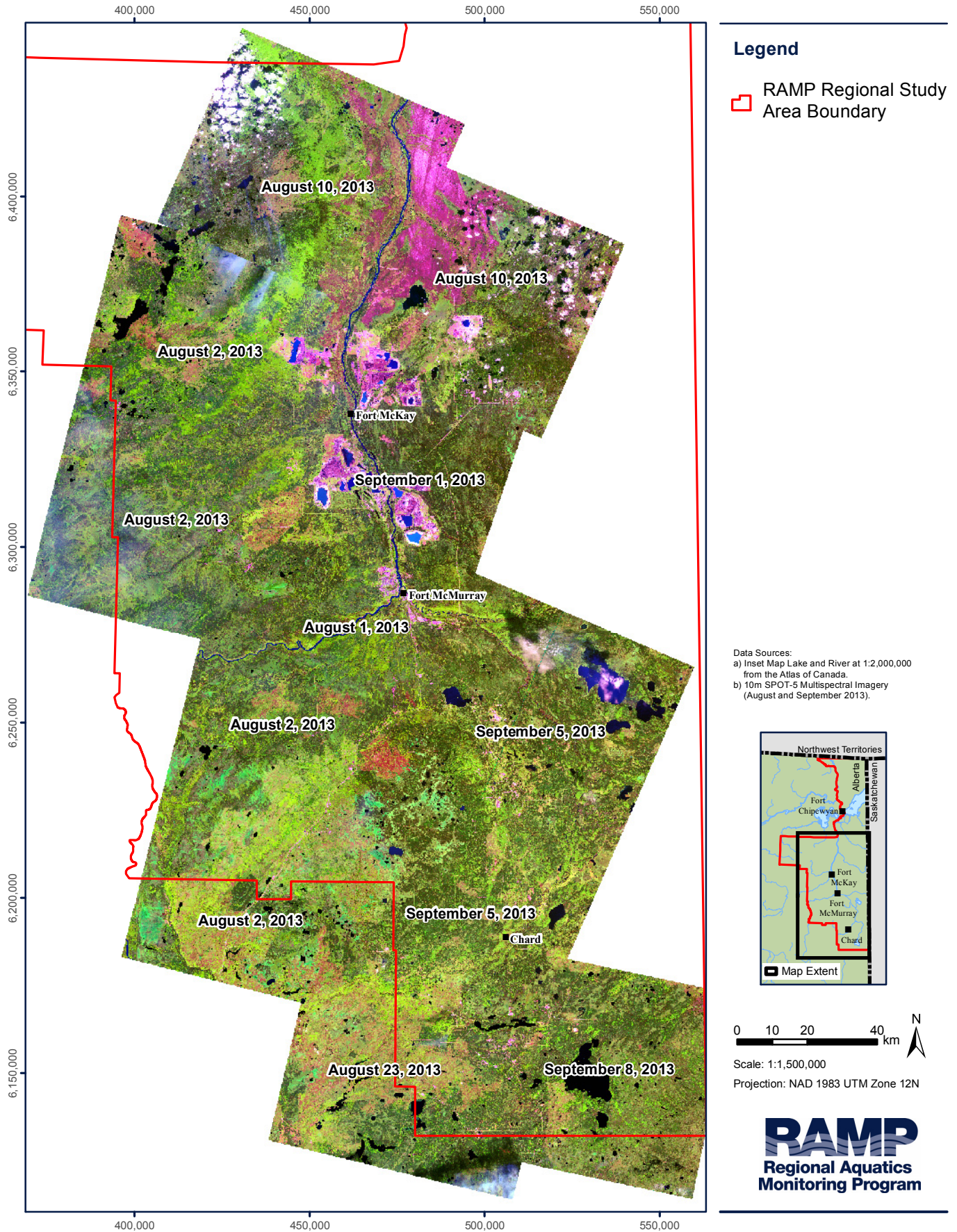
To ensure that the assessments made from the earth observation (EO) imagery were spatially correct, the imagery was first geometrically corrected. The procedure was undertaken using PCI Geomatica® image processing software and entailed the alignment of the image data to a known map projection, essentially georeferencing all pixel values in the data to a known location on the Earth's surface.

The procedure for ortho-rectifying the image data to a map projection involved the application of previously-collected control points, topographic maps, existing ortho-rectified satellite imagery and a digital elevation model (DEM)<sup>1</sup> to identify common ground control points (GCPs, known reference locations that can be identified on the satellite image). A total of 20 to 30 GCPs for each satellite image were identified to provide enough input values for the image processing software to solve the ortho-rectification algorithm. Once the collection of GCPs was complete, the ortho-rectification model was executed, creating a copy of the image, with the new positions, aligned to the reference maps and the elevation data.

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<sup>1</sup> Geobase 1:50,000 scale Digital Elevation Model.

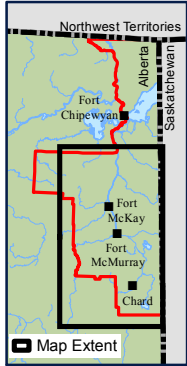
**Figure A.2-1 Illustration of the SPOT-5 scenes acquired in 2013.**



**Legend**

□ RAMP Regional Study Area Boundary

Data Sources:  
 a) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 b) 10m SPOT-5 Multispectral Imagery (August and September 2013).



0 10 20 40 km

Scale: 1:1,500,000  
 Projection: NAD 1983 UTM Zone 12N



### **A.2.3 Atmospheric Correction**

Atmospheric correction<sup>2</sup> was applied to the SPOT-5 images using an automated routine within the PCI Geomatica image processing software, as well as a spatially-adaptive atmospheric correction model for flat terrain.

### **A.2.4 Classification of Land Change**

The 2013 areas of land change were digitized beginning with the results of the 2012 classification (RAMP 2013, Appendix A). New land change areas were added and changed areas were modified based on 2013 SPOT-5 images, and the digitized polygons were coded to one of two land change classes: closed-circuited; or not closed-circuited. Draft land change maps were then distributed to members of the RAMP Technical Program Committee in fall 2013 for review and comment, and a final set of land change maps was then prepared.

A GIS overlay analysis was performed to estimate the area of each land change class in each of the RAMP FSA watersheds. The results of the overlay analysis were exported to MS Excel<sup>®</sup> for data summary.

## **A.3 RESULTS**

Table A.3-1 and Table A.3-2 provide tabular summaries of the land change in each of the main watersheds by each land change type, for focal projects, and non-RAMP member oil sands projects within the RAMP FSA. These land change areas are also shown in Figure A.3-1 and Figure A.3-2 for the area north of Fort McMurray and in Figure A.3-3 and Figure A.3-4 for the area south of Fort McMurray.

Land change as of 2013 within the RAMP FSA was estimated at approximately 117,850 ha for focal projects and 900 ha for oil sands projects operated by oil sands companies that were not members of RAMP in 2013, for a total of approximately 118,750 ha. This area represents approximately 3.3% of the total RAMP FSA. The percentage of the area of watersheds with land change as of 2013 varied from less than 1% for many watersheds (MacKay, Christina, Hangingstone, Horse, and Upper Beaver watersheds), to 1% to 5% for the Steepbank, Calumet, Firebag, and Ells watersheds, to more than 10% for the Muskeg River, Fort Creek, Mills Creek, Tar River, Shipyard Lake, Poplar Creek, and McLean Creek watersheds, as well as for the smaller Athabasca River tributaries between Fort McMurray and the confluence of the Firebag River.

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<sup>2</sup> Optical satellite imagery captures solar radiation reflected from the earth's surface. As visible light is susceptible to interference created by the presence of water vapor in the atmosphere, it is necessary to correct the imagery to remove these effects.

**Table A.3-1 Area of watersheds with land change as of 2013, summarized by land change type.**

Watershed	Total Watershed Area (ha) <sup>4</sup>	Watershed Area with Land Change (ha)						Watershed Total (ha and %)	
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total			
		Not-Closed Circuited (ha)	Closed-Circuited (ha)	Not-Closed Circuited (ha)	Closed-Circuited (ha)	Not-Closed Circuited (ha)	Closed-Circuited (ha)		
Muskeg	143,304	9,995	12,835	-	-	9,995	12,835	22,830	15.93
Steepbank	136,395	4,882	538	-	-	4,882	538	5,420	3.97
MacKay <sup>4</sup>	556,871	3,431	711	445	-	3,876	711	4,587	0.82
Tar	33,264	1,306	9,836	13	-	1,319	9,836	11,155	33.53
Calumet	17,522	129	70	-	-	129	70	199	1.14
Firebag	568,190	5,366	1,358	-	-	5,366	1,358	6,724	1.18
Ells	270,944	3,022	355	17	-	3,039	355	3,394	1.25
Christina	1,312,160	10,568	1,343	358	-	10,926	1,343	12,269	0.93
Hangingstone	106,572	402	32	-	-	402	32	434	0.41
Mills Creek	1,424	244	664	-	-	244	664	908	63.74
Shipyard Lake	5,113	15	4,629	-	-	15	4,629	4,643	90.82
Fort Creek	6,640	3,671	1,792	-	-	3,671	1,792	5,463	82.28
Horse	215,740	1,273	97	67	-	1,340	97	1,437	0.67
McLean	4,643	192	1,071	-	-	192	1,071	1,262	27.19
Original Poplar <sup>1</sup>	28,388	1,567	3,790	-	-	1,567	3,790	5,357	18.87
Upper Beaver	18,796	39	80	-	-	39	80	119	0.63
Minor Athabasca River Tributaries <sup>2</sup>	135,132	5,727	26,822	-	-	5,727	26,822	32,549	24.09
<b>Total</b>	<b>3,561,097</b>	<b>51,827</b>	<b>66,021</b>	<b>899</b>	<b>0</b>	<b>52,727</b>	<b>66,021</b>	<b>118,748</b>	<b>3.33</b>
Lac La Biche <sup>4</sup>	863,473	521	-	-	-	521	0	521	0.06

<sup>1</sup> Original Poplar refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps provided in Syncrude Canada Ltd. (1977).

<sup>2</sup> Refers to Athabasca River tributaries from upstream of Fort McMurray to the mouth of the Firebag River excluding the watersheds explicitly listed in this table.

<sup>3</sup> The total watershed areas were updated using data from AESRD. The MacKay River watershed area is now larger compared to the old boundary, which makes the total watershed area of the FSA larger than previous years using older data sources. Other watersheds have slight differences in size compared to the old boundaries.

<sup>4</sup> The Lac La Biche watershed was added in 2011 given some of the Canadian Natural Kirby project is located within this watershed. The Lac La Biche watershed is not part of the RAMP FSA.

**Table A.3-2 Percentage of total watershed area with land change as of 2013, summarized by type of land change.**

Watershed	Total Watershed Area (ha) <sup>3</sup>	Watershed Area with Land Change (%)						Watershed Total (%)
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total		
		Not-Closed Circuited (%)	Closed-Circuited (%)	Not-Closed Circuited (%)	Closed-Circuited (%)	Not-Closed Circuited (%)	Closed-Circuited (%)	
Muskeg	143,304	6.97	8.96	-	-	6.97	8.96	15.93
Steepbank	136,395	3.58	0.39	-	-	3.58	0.39	3.97
MacKay <sup>3</sup>	556,871	0.62	0.13	0.08	-	0.70	0.13	0.82
Tar	33,264	3.92	29.57	0.04	-	3.97	29.57	33.53
Calumet	17,522	0.74	0.40	-	-	0.74	0.40	1.14
Firebag	568,190	0.94	0.24	-	-	0.94	0.24	1.18
Ells	270,944	1.12	0.13	0.01	-	1.12	0.13	1.25
Christina	1,312,160	0.81	0.10	0.03	-	0.83	0.10	0.93
Hangingstone	106,572	0.38	0.03	-	-	0.38	0.03	0.41
Mills Creek	1,424	17.12	46.62	-	-	17.12	46.62	63.74
Shipyard Lake	5,113	0.29	90.53	-	-	0.29	90.53	90.82
Fort Creek	6,640	55.29	26.99	-	-	55.29	26.99	82.28
Horse	215,740	0.59	0.04	0.03	-	0.62	0.04	0.67
McLean	4,643	4.13	23.06	-	-	4.13	23.06	27.19
Original Poplar <sup>1</sup>	28,388	5.52	13.35	-	-	5.52	13.35	18.87
Upper Beaver <sup>1</sup>	18,796	0.21	0.42	-	-	0.21	0.42	0.63
Minor Athabasca River Tributaries <sup>2</sup>	135,132	4.24	19.85	-	-	4.24	19.85	24.09
<b>Total</b>	<b>3,561,097</b>	<b>1.46</b>	<b>1.85</b>			<b>1.48</b>	<b>1.85</b>	<b>3.33</b>
Lac La Biche <sup>4</sup>	863,473	0.06	-	-	-	0.06	-	0.06

<sup>1</sup> Original Poplar refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps provided in Syncrude Canada Ltd. (1977).

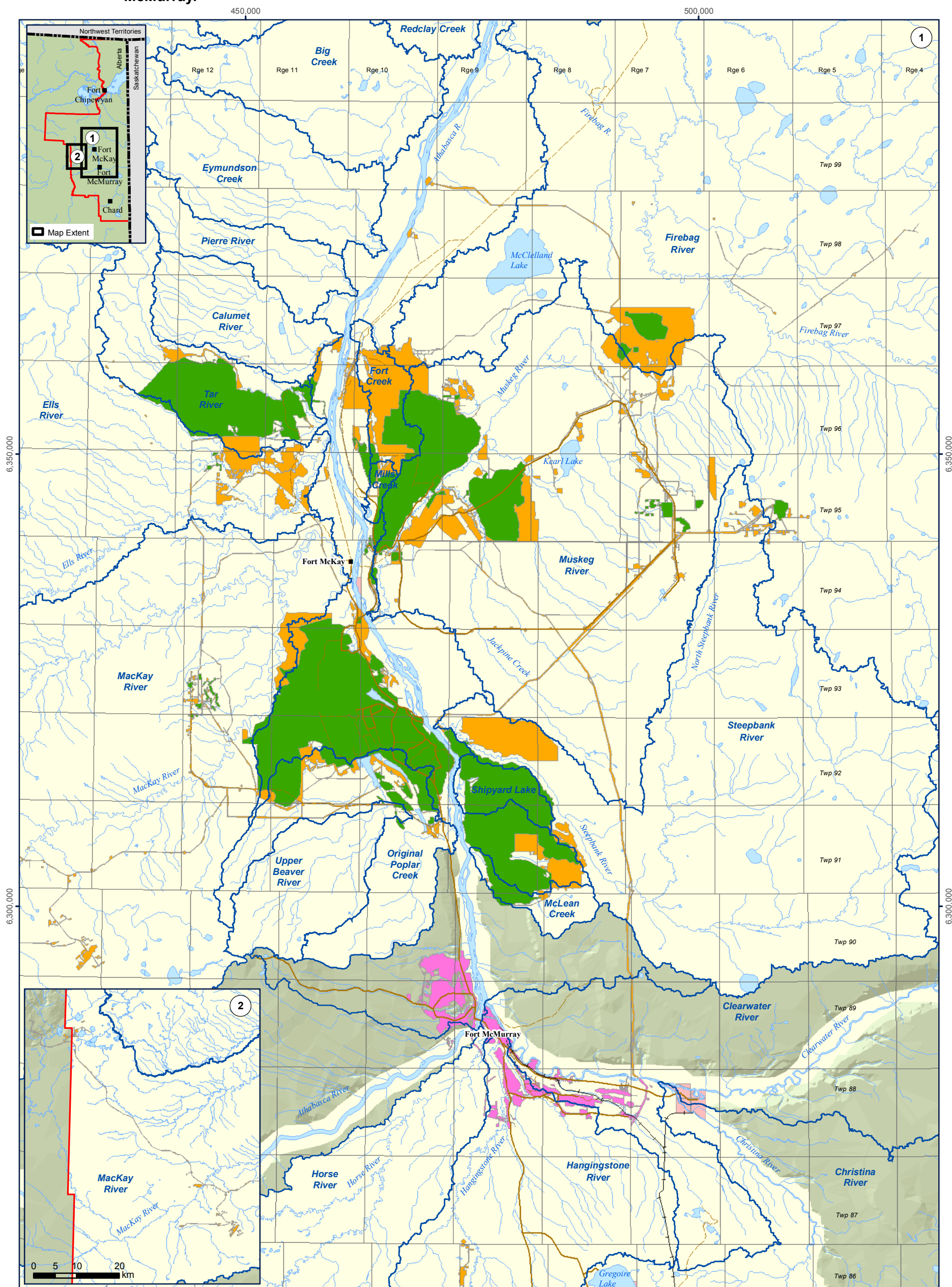
<sup>2</sup> Refers to Athabasca River tributaries from upstream of Fort McMurray to the mouth of the Firebag River excluding the watersheds explicitly listed in this table.

<sup>3</sup> The total watershed areas were updated using data from AESRD. The MacKay River watershed area is now larger compared to the old boundary, which makes the total watershed area of the FSA larger than previous years using older data sources. Other watersheds have slight differences in size compared to the old boundaries.

<sup>4</sup> The Lac La Biche watershed was added in 2011 given some of the Canadian Natural Kirby project is located within this watershed. The Lac La Biche watershed is not part of the RAMP FSA.

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**Figure A.3-1 RAMP land change classes derived from SPOT-5 (August and September 2013) satellite imagery, north of Fort McMurray.**



**Legend**

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- RAMP Regional Study Area Boundary
- RAMP Focus Study Area
- Town of Fort McMurray
- Land Change Area as of 2013<sup>d</sup>**
  - Not Hydrologically Closed-Circuited
  - Hydrologically Closed-Circuited

Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.

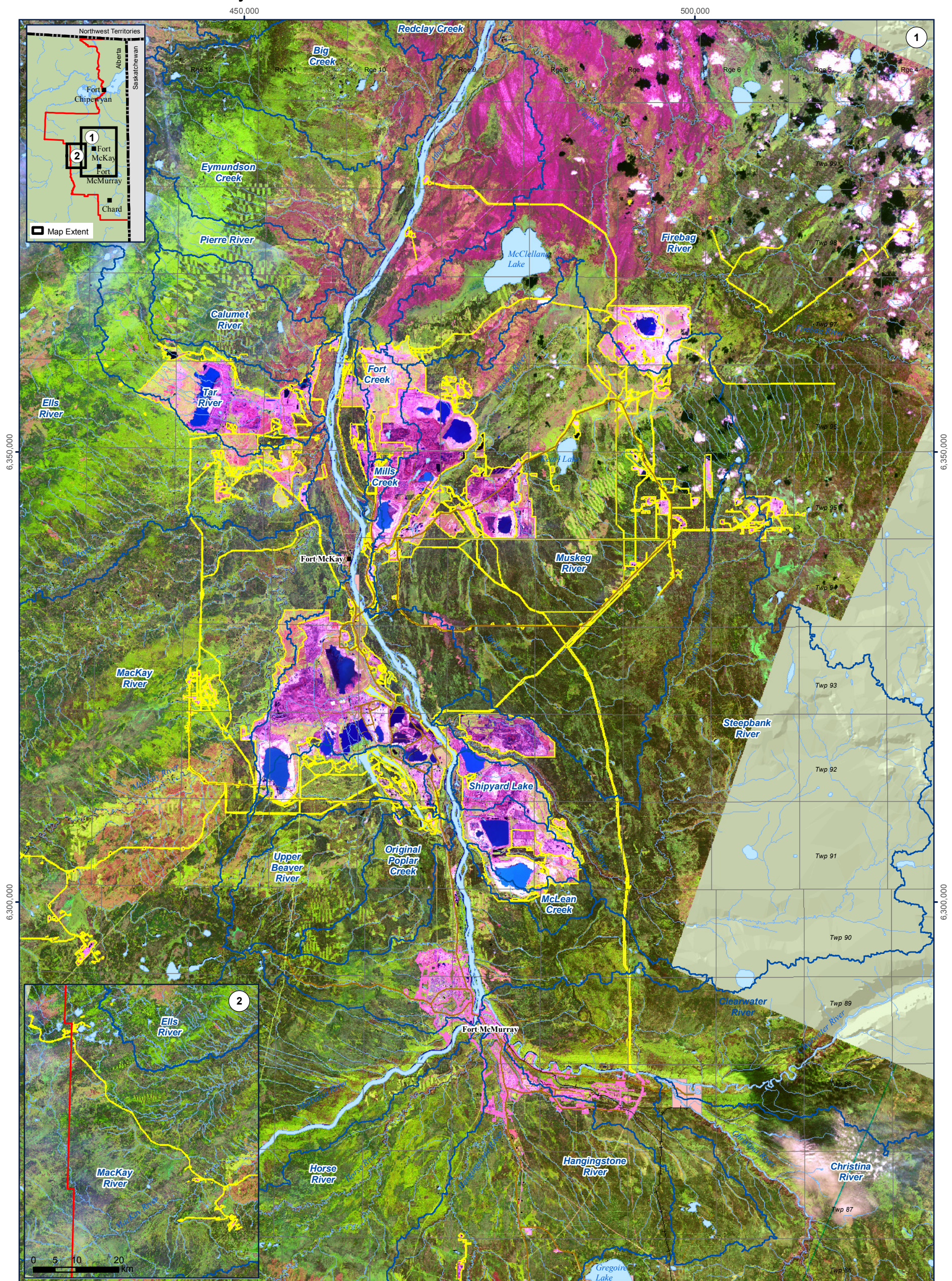
Township and Range designations are relative to W4M

0 2 4 8 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N















**Figure A.3-2 RAMP land change classes overlaid on mosaics of SPOT-5 (August and September 2013) satellite imagery, north of Fort McMurray.**



**Legend**

-  Lake/Pond
-  River/Stream
-  Watershed Boundary
-  Major Road
-  Secondary Road
-  Railway
-  First Nations Reserve
-  RAMP Regional Study Area Boundary
-  Town of Fort McMurray
-  Land Change Area as of 2013<sup>d</sup>

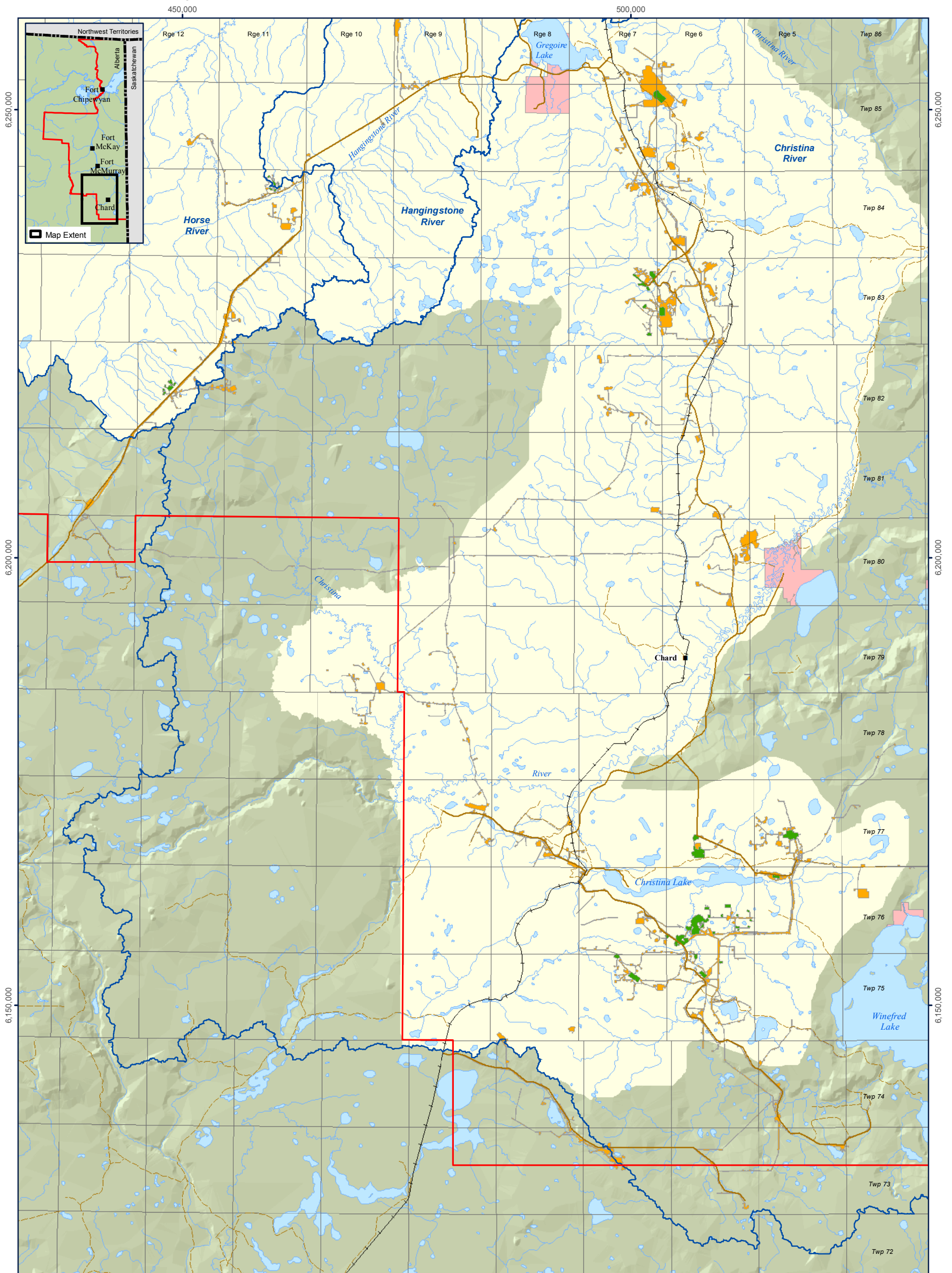
Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.

Township and Range designations are relative to W4M

0 2 4 8 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N



**Figure A.3-3 RAMP land change classes derived from SPOT-5 (August and September 2013) satellite imagery, south of Fort McMurray.**



- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - RAMP Regional Study Area Boundary
  - RAMP Focus Study Area
  - Land Change Area as of 2013<sup>d</sup>**
  - Not Hydrologically Closed-Circuited
  - Hydrologically Closed-Circuited

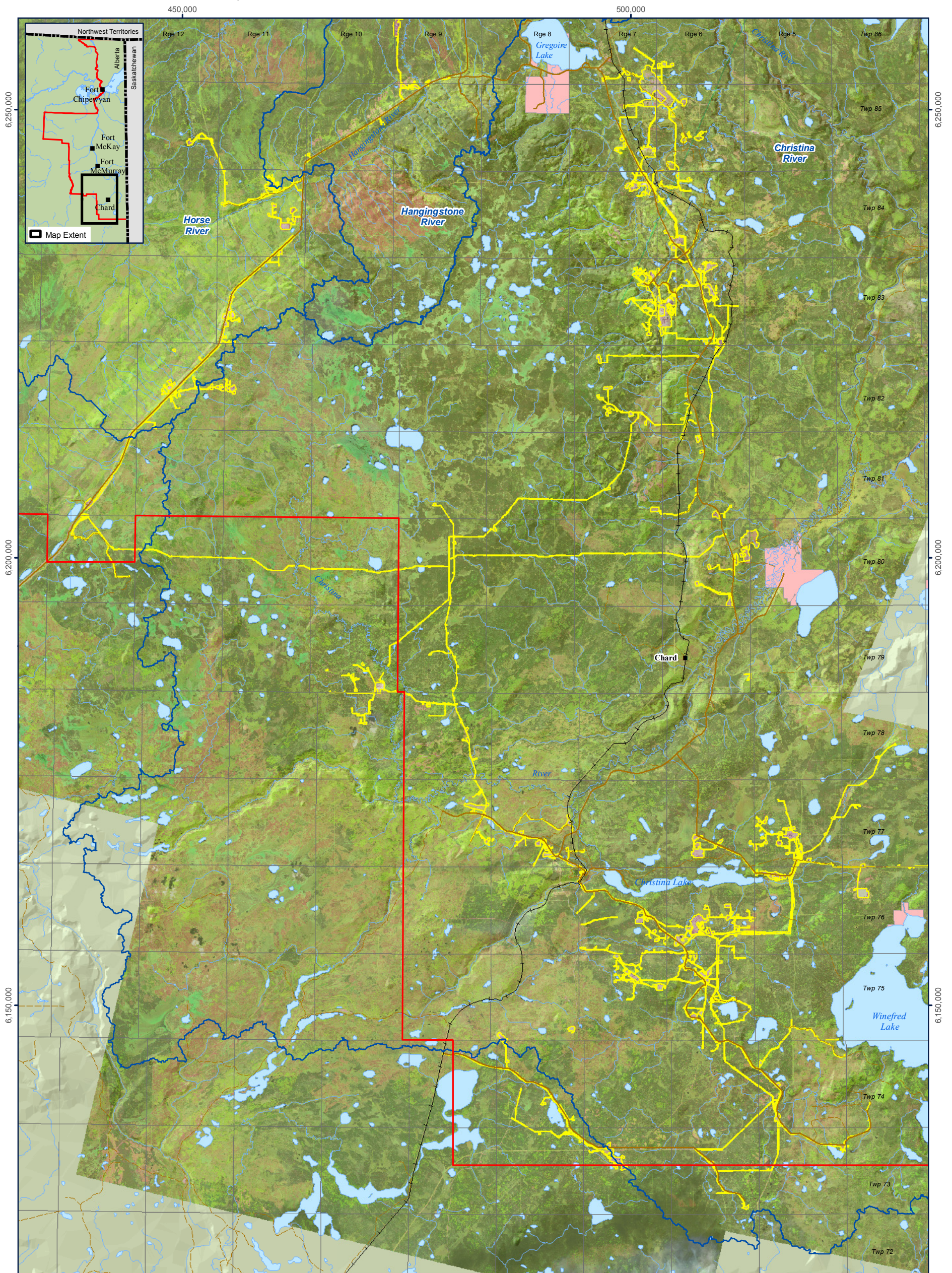
Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.

Township and Range designations are relative to W4M











0 2 4 8 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N



**Figure A.3-4 RAMP land change classes overlaid on mosaics of SPOT-5 (August and September 2013) satellite imagery, south of Fort McMurray.**



**Legend**

-  Lake/Pond
-  River/Stream
-  Watershed Boundary
-  Major Road
-  Secondary Road
-  Railway
-  First Nations Reserve
-  RAMP Regional Study Area Boundary
-  Town of Fort McMurray
-  Land Change Area as of 2013<sup>d</sup>

Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development, Land Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.

Township and Range designations are relative to W4M

0 2 4 8 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N



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**Appendix B**

**Quality Assurance and Quality  
Control Procedures for 2013**

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## **B QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2013**

### **B.1 QUALITY ASSURANCE PROCEDURES**

Each technical component under RAMP is required to complete a series of procedures to facilitate the collection of a high level of data quality. Environment Canada (2010) defines quality assurance (QA) as:

*Plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure that the collection of data of known quality matches the intended use of the data.*

The following sections present the general procedures used by the RAMP implementation team for all RAMP-related data collection, handling, and management. More detailed information regarding quality control for each technical component of RAMP follows the presentation of this general information.

A more detailed explanation of the sampling procedures used by the RAMP implementation team can be found in Appendix A4 of the RAMP Technical Design and Rationale document (RAMP 2009b or [www.ramp-alberta.org](http://www.ramp-alberta.org)).

#### **B.1.1 Field Staff Training**

All personnel participating in 2013 field studies were professional biologists/engineers or technicians with specific training in the subject-matter area in which they were involved. Field crews were assembled based on level of expertise and seniority; although qualifications varied based on level of experience, crews typically included a field crew leader who may be either a B.Sc.- or Master's- level professional and a trained environmental field technician (B.Sc. or Dip. Tech.). All 2013 field-crew members had experience conducting data collection in support of scientifically defensible environmental monitoring programs.

Field crew responsibilities were clearly established prior to beginning fieldwork through the use of Field Work Instructions (FWIs) prepared by the component or task leader. FWIs contained detailed information regarding sampling locations (e.g., coordinate location, access method), appropriate collection methodology, and required supporting variables (e.g., water velocity, field water chemistry). FWIs were prepared and discussed prior to each field sampling trip (typically when the crew was still in the office).

2013 crew members had been trained in field sampling techniques through traditional education (i.e., university or college), work experience, and participation in workshops/seminars. In addition, crews had training in Standard First Aid and CPR, as well as any oil sands-specific site training that may have been necessary to access mine sites. In many cases, field personnel have additional training on the Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG) Regulations, Pleasure Craft Operator certification (as required by the Federal government), swift water rescue, ice safety training, and wilderness first aid.

## **B.1.2 Field Operations**

### **B.1.2.1 Equipment**

Sampling gear and equipment used for the RAMP field programs were maintained at the offices of the respective RAMP team members (i.e., Hatfield – Fort McMurray and North Vancouver). Each RAMP component manager (i.e., lead consultant responsible for a RAMP component) controlled specialized field equipment used to complete field studies. When necessary, routine maintenance was conducted according to manufacturer's instructions to ensure valid data collection.

General field equipment/materials used during field surveys (all components) included:

- Provincial sampling permits (e.g., fish collection permits from Alberta Environment and Sustainable Resource Development);
- Waterproof paper/data sheets, waterproof labels, indelible markers, pencils, pens, and other stationery (for recording data);
- Topographical maps, hydrographic charts, and/or aerial photos of the oil sands area;
- Garmin 60CSx, 62s, 76CSx Global Positioning System (GPS) for obtaining data on sampling station position (latitude and longitude; accurate to approximately  $\pm 15$  m);
- Digital camera (to record sampling areas, specimens captured, unusual features in the environment, etc.);
- Instruments for measuring the following water quality variables in situ: temperature, dissolved oxygen, conductivity, pH, water velocity, and depth;
- Miscellaneous equipment: tarpaulin, rope, measuring tape, coolers, plastic buckets, and tool box;
- Waterproof clothing, including rain suits, rubber boots, etc.;
- Floater jackets and/or survival suits, first aid kit, and other safety equipment (including boat safety equipment); and
- Publications and previous reports for reference.

Field operations were coordinated through the Hatfield Fort McMurray office. This role included coordination of personnel, sample handling and shipping, and end-of-day safety check-ins for field crews.

Information regarding specialized field equipment used for the RAMP program is provided in the following sections and in Appendices C to F for specific components.

### **B.1.2.2 Data Collection, Data Tracking and Field Data Sheets**

Prior to every field program, fieldwork instructions (FWIs) were prepared by the Component Manager. These FWIs provided technical detail on all field data collection activities planned for the program and were reviewed by all members of the field crew prior to starting the field program. The following general data were typically recorded for field sampling activities conducted for RAMP (with some minor variability among technical components):

- Date and time of sampling;
- Sample numbers;
- Station location (UTM coordinate, datum, zone);
- Initials of field crew members;
- Sampling methods/gear used;
- Number of samples collected (water/sediment/benthos), number of specimens retained/ released/dissected/archived (biota), number of measurements taken (climate and hydrology);
- Volume of sample collected (water/sediment);
- Number of samples in a composite sample;
- Handling techniques, preservation methods, sampling containers used; and
- Photographs of sampling stations.

Field data collection was conducted according to procedures used for all previous RAMP studies (as described in RAMP 2009b).

### **B.1.3 Laboratory Analyses**

Laboratories used to analyze water, sediment, and fish tissue samples collected under RAMP are required to be accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Responsibilities associated with this accreditation include participation in an annual performance evaluation assessment of the laboratory's procedures, methods, and internal quality control.

Other samples, such as benthic invertebrate sorting and taxonomy, fish tissue analyses, and fish ageing, are conducted for RAMP by small independent laboratories or boutique consulting companies. These laboratories and companies are required to conduct QA/QC procedures that are considered industry standard for the respective disciplines. For example, QA/QC procedures for benthic invertebrate taxonomy meet or exceed guidelines established by Environment Canada (2010) for environmental effects monitoring (EEM) studies.

### **B.1.4 Data Management**

Field data were entered into Microsoft Excel® spreadsheets to facilitate production of tables, figures, etc., for reports.

Information on samples collected (biota/benthos/sediment/water) were carefully recorded on field data sheets, and secured at the end of each field day. All data sheets, field notes, photographs, maps, and other supporting documentation were filed within appropriate team members' secure offices. All hard-copy information will be retained for five years after the sampling date.

All products of field sampling (e.g., field notes, analytical results) were checked upon receipt for errors, analytical limits, and reasonable results and, prior to data analysis and reporting, entered data were checked for transcription errors.

### **B.1.5 Sample Management**

All samples were handled (including preservation, storage, and shipping) in accordance with established procedures (RAMP 2009b) and with guidelines from respective laboratories. Sample tracking was conducted by field crew leaders (or Fort McMurray-based team members).

Detailed lists of samples shipped to analytical laboratories were made, such that samples could be tracked from point of shipment to the laboratory (water/sediment/benthic taxonomy). Chain of Custody (COC) forms (commonly issued by the receiving laboratory) were used to notify receiving laboratories of the number and type of samples that were being shipped. Data provided on this sheet included date, project, sample type (fish, sediment, water, benthic invertebrates, etc.), sampling location, sender's name, and any preservation added/required. Sample numbers of all specimens/containers collected, corresponding to field sample numbers, were listed. A description of each sample shipped was provided (i.e., station number, sediment, date and time collected, analyses to be performed). The receiver was required to check the shipping list to ensure all samples were accounted for and in good condition, and confirm (via fax and/or e-mail) samples received, date, and analyses to be performed. To facilitate this process, a standard RAMP COC form was used by the Hatfield team, which simplified the management of sample processing and analysis.

### **B.1.6 RAMP Quality Assurance Plan**

In 2002, a formal RAMP-specific Quality Assurance Plan (QAP) was developed and implemented to cover all routine QA-related activities for the project. These methods were used in 2013 by the Hatfield RAMP team to ensure consistency of methods among years. Activities covered in the RAMP QAP include:

- Pre-field meetings to discuss field methods (i.e., FWIs) and specifics of field tasks;
- Post-field meetings to discuss results of the field activities and identify areas for improvement in future;
- Routine check-ins with component leaders (24 or 48-hour interval) or the RAMP project manager during field work, as required;
- Designation of a staff member for each component/trip (i.e., water quality, fall field trip) to track sample handling, labeling (including COC forms), shipping, and to confirm timely receipt of samples by the analytical laboratory;
- Internal check of COC forms by component leaders upon the return of the field crew (to confirm analyses requested were correct);
- Internal check of data upon receipt from external labs; and
- Internal check of entered field data for transcription errors.

## **B.2 QUALITY CONTROL PROCEDURES**

Quality control (QC) is a component of QA that pertains to internal techniques used to measure and assess data quality (APHA 1989, in RAMP 2009b). QC activities for each RAMP technical component used in 2012 are described below.



## **B.2.1 Climate and Hydrology Component**

### **B.2.1.1 Quality Control Activities – Field**

Climatic and hydrologic data collection and processing were subject to the following quality control field procedures to ensure that the published data were as accurate as possible:

- Stream discharge measurements and water level surveys were performed in accordance with standard procedures. Each discharge measurement was qualified according to the criteria presented in the standard operating procedures in RAMP (2009b), based on observations of station conditions and analysis of the collected data;
- Sensors from climatic and hydrologic monitoring stations were calibrated on a regular basis. Sensors at climatic stations have been rotated with spare units on a two-year frequency and the units retrieved from the field were recalibrated by the manufacturer. Calibration curves for pressure transducers were verified prior to installation. Consistency between water level surveys and pressure transducer readings was checked during every field visit for all stations. Pressure transducers were exchanged with calibrated sensors after being installed for two years at year-round stations unless a deviation from surveyed water levels was observed at which time sensors were exchanged prior to the standard two-year service;
- Manual discharge measurements and concurrent water levels were compared on a plot of stage versus discharge, to check for consistency between measurements and consistency with previously established stage-discharge relationships. Rating curve shifts due to changes in channel geometry, beaver dams and obstructions or roughness changes were accounted for by revision of stage-discharge rating curves or application of backwater shift corrections; and
- Snow course surveys were performed according to standard protocols as presented in RAMP (2009b).

### **B.2.1.2 Quality Control Activities – Office**

Climatic and hydrologic data collection and processing were subject to the following quality control office procedures to ensure that the published data were as accurate as possible:

- Apparent transducer elevations were calculated after each field visit as the difference between the surveyed water surface elevation and the sensor reading. The history of apparent transducer elevations was plotted for each station to check for physical sensor movement or calibration drift. Continuous water levels measured by the transducer were subsequently converted to elevations, adjusting for movement or drift.
- Rainfall, snowfall, air temperature, humidity, and wind speed data from automated climate sensors were compared to other local and regional records, as well as manual observations recorded during station visits.
- All discharge measurements and site visit records were prepared by one person and checked by another.

- Velocity distributions at measurement cross sections were plotted and reviewed to ensure reasonable variation in velocity with flow depth and bed roughness.
- Hydrographs computed from continuous water level measurements and the stage-discharge rating curve were compared with manual measurements on the same plot. The resulting hydrographs were reviewed for consistency.
- Anomalies in the hydrographs, such as rapid changes in water level or discharge, were examined in detail to confirm authenticity. In cases where the data were inconsistent with other local and regional data (for instance, an isolated high water reading, without a subsequent recession curve), they were interpreted or discarded.
- Hydrographs computed for different stations in the same region were compared to identify anomalies and verify similarity in the timing and magnitude of runoff responses. Hydrographs were also analyzed to ensure anticipated effects such as time lag, attenuation by river or lake routing and increments in discharge with drainage area were apparent in the records.

## **B.2.2 Water Quality Component**

### **B.2.2.1 Methods**

#### ***Field Collections***

The following precautions were used in the field to prevent sample contamination:

- All sample bottles used were provided to the RAMP sampling team as “certified clean” by labs (ultra-trace mercury bottles were pre-filled using specific procedures stipulated by AITF);
- Grab samples were collected upstream of the boat and/or the person collecting the sample to avoid disturbing the substrate or otherwise contaminating the sample;
- Powder-free latex or nitrile gloves were worn during sample collection;
- Sample containers were kept covered during collection of composite samples;
- Winter samples were collected from approximately 20 cm below the ice where possible to minimize potential contamination from auger disturbance, using a peristaltic pump with fresh tubing at each station. Where conditions were too cold to sample using a peristaltic pump (i.e., water in tubes froze during sampling), a grab sample was taken directly from the hole. All intermediate sampling equipment was triple-rinsed prior to final sample collection; and
- Samples for analysis of dissolved metals and nutrients were filtered in the lab instead of in the field, following laboratory direction.

Potential contamination of samples during collection, handling, and transport was assessed using field blanks and trip blanks. Field blanks were used to assess potential contamination from sample handling, and were prepared in the field by filling sample bottles with de-ionized water provided by the lab. Trip blanks were prepared in the analytical laboratory prior to sampling and kept sealed for the duration of the sampling trip; these were used to evaluate potential contamination from the sample container and

the efficacy of storage conditions. Field blanks and trip blanks were utilized in all months of sampling, and were analyzed for the same variables as RAMP samples. Field and trip blanks were labeled with dummy RAMP-style codes (i.e., BAR-1, DAR-1), but identified as blanks or duplicates for the analytical laboratories following guidelines from the federal/provincial Laboratory Proficiency Testing group convened under the Joint Oil Sands Monitoring Plan (JOSMP).

Analytical results from the field and trip blanks were compared to analytical detection limits. Analyte concentrations greater than five times the detection limit in the blank samples may demonstrate potential contamination of samples during sample collection or analysis or analytical error. Blanks with analyte concentrations below or near detection limits represent samples that were collected, handled, and analyzed without contamination or potential errors.

One duplicate sample was collected from a random location each month, with the exception of fall in which three duplicate samples were collected. Duplicate samples were taken to assess environmental heterogeneity and laboratory precision. Analytical results for duplicate samples were compared, and the relative percent difference (RPD, difference between data values/mean of data values, multiplied by 100%) was calculated for each analyte. Relative percent differences greater than 20% were noted as potentially unacceptable levels of precision. However, because precision decreases as the analyte concentration approaches the detection limits, relative percent differences greater than 20% were considered to be of significance only if analyte concentrations in both samples were greater than five times the detection limit. This target of 20% RPD between duplicates is identical to QA thresholds used internally by contracted laboratories for most variables measured, although acceptable internal laboratory RPDs for some organic compounds (e.g., CCME hydrocarbons, some PAHs, etc.) may be higher (e.g., 30 or 40%).

### **Sample Analysis**

Chemical laboratories analyzed a number of their own QA/QC samples to ensure that sample contamination did not occur during analysis and that results reported were precise and accurate. A method blank, consisting of a de-ionized water sample prepared at the initiation of the analysis, was used to assess potential contamination during analyses. A sample split into two aliquots (split sample, also called a laboratory duplicate) was used to assess the precision of the analyses. Spiked samples, reference standards, and other controls were used by the analytical laboratories to establish the accuracy and precision of the analyses.

All laboratory QA/QC samples were assessed using in-house laboratory protocols to identify potential contamination and determine the precision and accuracy of the analyses, where these data were provided with analytical results (all laboratories used by RAMP for water- and sediment-quality analyses reported internal QA/QC results, with the exception of AITF). Any deviations from QA/QC criteria were identified in the laboratory reports and are noted in the results section that follows.

Any anomalous values identified in laboratory reports were followed up with the laboratory to determine if the value was a measurable value or due to a transcription or analytical error.

## **B.2.2.2 Results and Discussion**

### ***Field and Trip Blanks***

Field blanks and trip blanks were completed during all sampling months; one of each during each sampling month and three of each during the September (fall) sampling event. Concentrations of all conventional variables, major ions, nutrients, hydrocarbons, dissolved and total metals, and polycyclic aromatic hydrocarbons (PAHs) in field and trip blanks were less than five times the detection limit during all sampling events in 2013 (Table B.2-1 and Table B.2-2), with the exception of conductivity in April, July, August, November, and December; total phenolics in July in the trip blanks; conductivity in July and December, and acenaphthene, fluorene, and naphthalene in November in the field blanks.

### ***Duplicate Samples***

There were 14 duplicate samples taken in 2013, one in each month and three during the September sampling event. Concentrations of conventional variables, major ions, nutrients, and hydrocarbon were generally similar between duplicate samples during all sampling events. The RPD for all conventional variables, major ions, nutrients, and hydrocarbons was less than 20% for those analytes where concentrations in both samples were greater than five times the detection limit (Table B.2-3 to Table B.2-8), with the following exceptions:

- Sulphide and total Kjeldahl nitrogen in January;
- Naphthenic acids in March;
- Chloride, sulphate, and dissolved phosphorus in April;
- Total suspended solids in June;
- Calcium in July;
- Total suspended solids in August;
- Total phosphorus for station ELR-3, dissolved phosphorus for station HHR-1, and naphthenic acids for station BER-2 in September;
- Total alkalinity, bicarbonate, and naphthenic acids in October; and
- Sulphide and total phenolics in November.

The number of metal concentrations with RPD >20% in duplicate samples varied among stations, suggesting that different rivers or seasons (ATR-DC-W during summer in particular) exhibited varying degrees of environmental heterogeneity, or that analytical precision differed among sampling events. Additionally, differences in total metals (and other variables, e.g., PAHs) may relate to variations in total suspended solids measured between the duplicate samples. The RPD was less than 20% for all analytes where one or both samples were greater than five times the detection limit, with the following exceptions:

- Dissolved zinc, and total aluminum, titanium, and zinc in March;
- Dissolved zinc, total aluminum, titanium, vanadium, and zinc in April;

- Dissolved copper in May;
- Total aluminum, chromium, iron, total mercury (ultra-trace), silver, titanium, and vanadium in July;
- Dissolved copper and lithium and total aluminum, chromium, lead, lithium, titanium, and vanadium in August;
- Total aluminum, chromium, titanium, and vanadium for station HHR-1 and total titanium for station BER-2 in September;
- Dissolved aluminum, arsenic, and barium and total titanium in October;
- Total aluminum, copper, titanium, and vanadium in November; and
- Dissolved zinc and total aluminum, magnesium, nickel, and zinc in December.

The RPD of most PAHs from monthly sampling events were below 20% for all analytes where one or both samples were greater than five times the detection limit (Table B.2-2 and Table B.2-3, Table B.2-6 to Table B.2-8), with the following exceptions:

- Acenaphthene and phenanthrene in April;
- C2-Benzo[a]anthracenes/chrysenes in May;
- Benz[a]anthracene, benzo[b,j,k]fluoranthene, benzo[g,h,i]perylene, C2-Benzo[a]anthracenes/chrysenes, and pyrene in July; and
- C2-Benzo[a]anthracenes/chrysenes, C2-Fluoranthenes/pyrenes, and C4-phenanthrenes/anthracenes in August.

### **B.2.2.3 Conclusions and Recommendations**

Results from the QA/QC evaluation of water quality data indicated that overall, data collected for the water quality component were of high quality. The results of trip and field blank analyses suggested that laboratory-generated concentrations were reliable. While the analysis of duplicate samples indicated some variability within stations, this was likely related to local-scale heterogeneity among samples.

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**Table B.2-1 Results of analysis of field blanks prepared during RAMP Water quality surveys, 2013.**

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
<b>Conventional Variables</b>																	
Conductivity	ALS	µS/cm	0.2	0.8	0.5	0.9	<0.2	0.59	0.42	#	0.84	1.27	0.67	0.54	<0.2	0.94	#
Dissolved Organic Carbon	ALS	mg/L	1	<1.0	<1.0	1.1	<1.0	<1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	ALS	pH units	0.1	5.9	6.0	5.3	5.8	6.1	6.0	6.0	5.5	5.8	5.1	5.0	5.2	5.4	4.7
Total Alkalinity	ALS	mg/L	5	<5.0	<5.0	<5.0	<5.0	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2
Total Dissolved Solids	ALS	mg/L	10	<10.0	<10.0	<10.0	12.0	<12.0	<12	15.0	<12	<10	<10	<10	<10	<10	<10
Total Dissolved Solids (Calculated)	ALS	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total Organic Carbon	ALS	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Suspended Solids	ALS	mg/L	3	<3.0	<3.0	<3.0	<3.0	3.0	<3	<3	<3	<3	<3	<3	<3	<3	<3
True Colour	ALS	T.C.U.	2	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2	<2	<2	<2	<2	<2	2.80	<2
<b>Major Ions</b>																	
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Calcium (Ca)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Magnesium (Mg)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
<b>Nutrients and BOD</b>																	
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorophyll a	ALS	mg/L	0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071
Phosphorus, dissolved	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<b>Hydrocarbons</b>																	
Naphthenic Acids	ARC	mg/L	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
OilSands Acid Extractable	ARC	mg/L	0.1	<0.100	<0.100	<0.100	<0.100	<0.100	<0.1	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Phenolics	ALS	mg/L	0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	0.0049	0.0039	<0.001	<0.001	<0.001
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
<b>Hydrocarbons and Organic Compounds</b>																	
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00062	<0.0005	<0.0005	<0.0005	<0.0005	0.00072
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0010	<0.0005	<0.0005	<0.0005	0.00083	0.00095
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	0.00072

# Indicates sample concentration is greater than five times the detection limit.





**Table B.2-1 (Cont'd.)**

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
<b>Total Metals (Cont'd.)</b>																	
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Manganese (Mn)	AITF	mg/L	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	<0.6	<0.6	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	0.16	<0.1	<0.1	0.16	<0.1	
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000029	0.000021	<0.00001	<0.00001	
Strontium (Sr)	AITF	mg/L	0.0001	<0.000100	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	0.00014	<0.0001	<0.0001	
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Zinc (Zn)	AITF	mg/L	0.0002	<0.0002	<0.0002	0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	0.00025	0.00028	<0.0002	0.00025	0.00033	
<b>PAHs</b>																	
Acenaphthene	AXYS	ng/L	0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	0.706	2.02	<0.370
Acenaphthylene	AXYS	ng/L	0.280	0.29	0.45	<0.280	<0.280	<0.280	<0.280	0.340	<0.280	<0.280	<0.280	<0.280	<0.280	0.654	<0.280
Anthracene	AXYS	ng/L	0.153	0.18	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	
Benz[a]anthracene	AXYS	ng/L	0.154	0.19	<0.154	<0.154	0.16	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	
Benzo[a]pyrene	AXYS	ng/L	0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.297	0.41	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	
Benzo[g,h,i]perylene	AXYS	ng/L	0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	
Biphenyl	AXYS	ng/L	0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	1.470	<0.960	<0.960	<0.960	1.990	2.180	1.420	
C1-Acenaphthenes	AXYS	ng/L	0.669	<0.669	1.54	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.324	<0.324	0.53	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.359	<0.324	<0.324	
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	
C1-Biphenyls	AXYS	ng/L	4.069	<4.069	<4.069	<4.069	<4.069	<4.069	5.440	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	
C1-Dibenzothiophenes	AXYS	ng/L	0.310	<0.310	0.57	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	
C1-Fluorenes	AXYS	ng/L	5.110	<5.110	17.50	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	
C1-Naphthalenes	AXYS	ng/L	8.477	19.70	<8.477	<8.477	<8.477	<8.477	9.680	<8.477	9.870	<8.477	<8.477	<8.477	11.300	22.900	
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.371	<0.371	0.60	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	0.373	<0.371	<0.371	
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	
C2-Biphenyls	AXYS	ng/L	20.788	<20.788	<20.788	<20.788	<20.788	<20.788	25.100	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788	
C2-Dibenzothiophenes	AXYS	ng/L	1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	1.710	<1.495	<1.495	
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	
C2-Fluorenes	AXYS	ng/L	3.121	<3.121	<3.121	4.53	<3.121	<3.121	3.540	<3.121	<3.121	<3.121	<3.121	<3.121	<3.121	<3.121	
C2-Naphthalenes	AXYS	ng/L	4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	5.990	7.480	<4.254	
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	2.634	<2.634	<2.634	<2.634	<2.634	<2.634	<2.634	3.650	<2.634	<2.634	<2.634	<2.634	<2.634	<2.634	

# Indicates sample concentration is greater than five times the detection limit.

**Table B.2-1 (Cont'd.)**

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
<b>PAHs</b>																	
C3-Dibenzothiophenes	AXYS	ng/L	1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	3.240	<1.848	<1.848
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916
C3-Fluorenes	AXYS	ng/L	3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	13.300	<3.897
C3-Naphthalenes	AXYS	ng/L	3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507
C4-Dibenzothiophenes	AXYS	ng/L	2.523	4.33	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	3.230
C4-Naphthalenes	AXYS	ng/L	5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	7.55	<5.061	<5.061
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	4.98	<2.929	<2.929
Chrysene	AXYS	ng/L	0.295	0.35	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295
Dibenz[a,h]anthracene	AXYS	ng/L	0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780
Dibenzothiophene	AXYS	ng/L	0.497	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	0.498	<0.497	<0.497	<0.497	0.678	<0.497
Fluoranthene	AXYS	ng/L	0.736	0.84	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736
Fluorene	AXYS	ng/L	0.337	0.45	0.54	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	0.354	<0.337	<0.337	0.636	1.94	<0.337
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.287	<0.287	0.37	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287
Naphthalene	AXYS	ng/L	15.162	20.10	<15.162	<15.162	<15.162	<15.162	16.500	<15.162	18.500	<15.162	<15.162	<15.162	38.20	78.10	<15.16
Phenanthrene	AXYS	ng/L	1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	4.270	<1.689
Pyrene	AXYS	ng/L	0.527	0.69	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527
Retene	AXYS	ng/L	0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	0.685	<0.669	<0.669	<0.669

#

Indicates sample concentration is greater than five times the detection limit.

**Table B.2-2 Results of analysis of trip blanks prepared during RAMP water quality surveys, 2013.**

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
<b>Conventional Variables</b>																	
Conductivity	ALS	µS/cm	0.2	0.76	0.49	0.68	# 1.15	0.75	0.49	# 2.45	# 2.43	0.97	0.84	0.55	<0.2	# 1.23	# 1.66
Dissolved Organic Carbon	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	ALS	pH units	0.1	5.67	5.9	5.19	6.37	6.12	5.95	5.94	5.67	5.53	5.1	4.97	4.90	4.93	4.77
Total Alkalinity	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<2
Total Dissolved Solids	ALS	mg/L	10	<10	<10	<10	12	<12	<12	11	12	<10	<10	<10	<10	10	<10
Total Dissolved Solids (calculated)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Organic Carbon	ALS	mg/L	1	<1	<1.0	1.30	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Suspended Solids	ALS	mg/L	3	3	<3	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
True Colour	ALS	T.C.U.	2	<2	<2	<2	<2	<2	<2	2.6	<2	<2	<2	<2	<2	3.1	<2
<b>Major Ions</b>																	
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Calcium (Ca)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Magnesium (Mg)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.05	<1
Sulfate (SO <sub>4</sub> )	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
<b>Nutrients and BOD</b>																	
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	<2	<2	2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorophyll a	ALS	mg/L	0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071
Phosphorus, dissolved	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<b>General Organics</b>																	
Naphthenic Acids	AITF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
OilSands Acid Extractable	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Phenolics	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	# 0.006	<0.001	<0.001	0.0011	0.0016	<0.001	<0.001	<0.001
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
<b>Hydrocarbons and Organic Compounds</b>																	
Benzene		mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071

# Indicates sample concentration is greater than five times the detection limit.

**Table B.2-2 (Cont'd.)**

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank												
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13
<b>Dissolved Metals</b>																
Aluminum (Al)	AITF	mg/L	0.001	<0.001	<0.001	<0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	AITF	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.00091	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	<0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	AITF	mg/L	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.000505	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000013	0.000012	<0.00001	<0.00001
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	0.00025	<0.0002	<0.0002	0.00026	<0.0002	<0.0002	0.000369	0.000360	0.000214	0.000262
<b>Total Metals</b>																
Aluminum (Al)	AITF	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.0030
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	AITF	mg/L	0.0008	<0.0008	0.001	<0.0008	<0.0008	0.0008	0.0008	0.000971	<0.0008	<0.0008	<0.0008	0.0008	<0.0008	<0.0008
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	AITF	mg/L	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

# Indicates sample concentration is greater than five times the detection limit.

**Table B.2-2 (Cont'd.)**

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
<b>Total Metals (Cont'd.)</b>																	
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00058	<0.0002	<0.0002	<0.0002	<0.0002	
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	<0.6	<0.6	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	0.23000	<0.08	<0.08	0.09	<0.1	
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	0.00001	<0.00001	<0.00001	
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00013	<0.0001	<0.0001	<0.0001	
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Zinc (Zn)	AITF	mg/L	0.0002	0.0002	<0.0002	<0.0003	0.0003	<0.0002	0.0002	0.0003	<0.0002	0.00026	0.00039	0.00040	0.00028	0.00027	
<b>PAHs</b>																	
Acenaphthene	AXYS	ng/L	0.37	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	0.521	<0.370
Acenaphthylene	AXYS	ng/L	0.28	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280	<0.280
Anthracene	AXYS	ng/L	0.15	0.183	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153
Benz[a]anthracene	AXYS	ng/L	0.15	0.210	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154
Benzo[a]pyrene	AXYS	ng/L	0.25	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	<0.251	0.286	<0.251	<0.251	<0.251	<0.251	<0.251
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.30	0.408	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297	<0.297
Benzo[g,h,i]perylene	AXYS	ng/L	0.17	<0.167	<0.176	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167
Biphenyl	AXYS	ng/L	0.96	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	<0.960	1.480	1.420
C1-Acenaphthenes	AXYS	ng/L	0.67	<0.669	0.91	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.32	<0.324	0.40	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324	<0.324
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.91	<0.912	1.00	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912	<0.912
C1-Biphenyls	AXYS	ng/L	4.07	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069	<4.069
C1-Dibenzothiophenes	AXYS	ng/L	0.31	<0.310	0.38	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310	<0.310
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	1.41	<1.414	1.74	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414	<1.414
C1-Fluorenes	AXYS	ng/L	5.11	<5.110	5.59	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110	<5.110
C1-Naphthalenes	AXYS	ng/L	8.48	<8.477	<8.477	<8.477	<8.477	<8.477	<8.477	9.51	<8.477	<8.477	<8.477	<8.477	<8.477	20.100	<8.477
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.98	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984	<0.984
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.37	<0.371	0.39	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	1.22	<1.218	1.67	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218	<1.218
C2-Biphenyls	AXYS	ng/L	20.79	<20.788	<20.788	<20.788	<20.788	20.80	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788	<20.788
C2-Dibenzothiophenes	AXYS	ng/L	1.49	<1.495	1.78	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495	<1.495
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	1.61	<1.608	1.83	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608	<1.608
C2-Fluorenes	AXYS	ng/L	3.12	<3.121	<3.121	<3.121	<3.121	<3.121	<3.121	3.23	<3.121	<3.121	<3.121	<3.121	<3.121	<3.121	<3.121

# Indicates sample concentration is greater than five times the detection limit.

**Table B.2-2 (Cont'd.)**

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				7-Jan-13	8-Feb-13	6-Mar-13	3-Apr-13	13-May-13	6-Jun-13	8-Jul-13	12-Aug-13	3-Sep-13	18-Sep-13	19-Sep-13	17-Oct-13	6-Nov-13	3-Dec-13
C2-Naphthalenes	AXYS	ng/L	4.25	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	<4.254	4.570	<4.254
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	2.63	<2.634	<2.634	<2.634	<2.634	<2.634	<2.634	<2.634	3.62	<2.634	<2.634	<2.634	<2.634	<2.634	<2.634
C3-Dibenzothiophenes	AXYS	ng/L	1.85	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	<1.848	2.280	<1.848	<1.848
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.92	<0.916	1.11	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916	<0.916
C3-Fluorenes	AXYS	ng/L	3.90	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	<3.897	4.100	<3.897
C3-Naphthalenes	AXYS	ng/L	3.12	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	<3.115	3.130	<3.115	<3.115
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	1.51	<1.507	1.94	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507	<1.507
C4-Dibenzothiophenes	AXYS	ng/L	2.52	<2.523	2.89	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	<2.523	3.23
C4-Naphthalenes	AXYS	ng/L	5.06	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	<5.061	5.940	<5.061	<5.061
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	2.93	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929	<2.929
Chrysene	AXYS	ng/L	0.30	0.344	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295	<0.295
Dibenz[a,h]anthracene	AXYS	ng/L	0.78	<0.780	<1.140	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780	<0.780
Dibenzothiophene	AXYS	ng/L	0.50	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	<0.497	0.591	<0.497	<0.497	<0.497	<0.497	<0.497
Fluoranthene	AXYS	ng/L	0.74	0.867	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736	<0.736
Fluorene	AXYS	ng/L	0.34	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	0.343	<0.337	<0.337	<0.337	0.834	<0.337
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.29	<0.287	0.36	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287	<0.287
Naphthalene	AXYS	ng/L	15.16	<15.162	<15.162	<15.162	<15.162	<15.162	<15.162	16.50	<15.162	<15.162	<15.162	<15.162	<15.162	35.90	<15.162
Phenanthrene	AXYS	ng/L	1.69	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	<1.689	1.740	<1.689	<1.689	<1.689	1.800	<1.689
Pyrene	AXYS	ng/L	0.53	0.576	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527	<0.527
Retene	AXYS	ng/L	0.67	<0.669	0.75	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669

#

Indicates sample concentration is greater than five times the detection limit.

**Table B.2-3 Relative percent difference between duplicate water quality samples collected from the MacKay River (MAR-2), January 2013.**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 07-Jan-13	Duplicate 07-Jan-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	396	396	0.0
Dissolved Organic Carbon	ALS	mg/L	1	31.1	30.7	1.3
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	155	163	5.0
pH	ALS	pH units	0.1	7.96	7.96	0.0
Total Alkalinity	ALS	mg/L	5	178	178	0.0
Total Dissolved Solids	ALS	mg/L	12	298	299	0.3
Total Organic Carbon	ALS	mg/L	1	31.3	31.7	1.3
Total Suspended Solids	ALS	mg/L	3	<3	3	0.0
True Colour	ALS	T.C.U.	2	143	140	2.1
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	217	217	0.0
Calcium (Ca)	ALS	mg/L	0.5	38.3	40.7	6.1
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	1.9	1.69	11.7
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	14.3	14.8	3.4
Potassium (K)	ALS	mg/L	0.5	1.46	1.55	6.0
Sodium (Na)	ALS	mg/L	1	27.8	27.8	0.0
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	27.1	26.6	1.9
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0121	0.0033	<b>114.3</b>
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	0.221	0.205	7.5
Phosphorus, dissolved	ALS	mg/L	0.001	0.0591	0.0646	8.9
Phosphorus, total	ALS	mg/L	0.001	0.0911	0.0920	1.0
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	1.02	2.13	<b>70.5</b>
Total Nitrogen	ALS	mg/L	-	1.241	2.335	61.2
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.87	0.76	n/a
Oil Sands Acid Extractable	AITF	mg/L	0.1	0.6	0.58	n/a
Total Phenolics	ALS	mg/L	0.001	<1	<1	0.0
Total Rec. Hydrocarbons	ALS	mg/L	1	0.01	0.01	5.8
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.

# Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-3 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 07-Jan-13	Duplicate 07-Jan-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0247	0.0253	2.4
Antimony (Sb)	AITF	mg/L	0.00005	0.00005	0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000707	0.000705	0.3
Barium (Ba)	AITF	mg/L	0.0001	0.0222	0.0219	1.4
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.105	0.105	0.0
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	43.4	43.1	0.7
Chlorine (Cl)	AITF	mg/L	0.3	1.53	1.51	1.3
Chromium (Cr)	AITF	mg/L	0.0003	0.00030	<0.00030	0.0
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.8
Copper (Cu)	AITF	mg/L	0.0001	0.00059	0.000693	16.1
Iron (Fe)	AITF	mg/L	0.004	1.640	1.64	0.0
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0302	0.0301	0.3
Manganese (Mn)	AITF	mg/L	0.0001	0.02070	0.0206	0.5
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000331	0.000333	0.6
Nickel (Ni)	AITF	mg/L	0.0001	0.00057	<0.00058	1.2
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.216	0.216	0.0
Sulphur (S)	AITF	mg/L	2	10.40	10.4	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00242	0.00256	5.6
Uranium (U)	AITF	mg/L	0.0001	0.000283	0.000282	0.4
Vanadium (V)	AITF	mg/L	0.0001	0.000284	0.000294	3.5
Zinc (Zn)	AITF	mg/L	0.0002	0.001090	0.00119	8.8
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.181	0.182	0.6
Antimony (Sb)	AITF	mg/L	0.00005	0.00005	0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000878	0.000886	0.9
Barium (Ba)	AITF	mg/L	0.0001	0.0251	0.0255	1.6
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-3 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 07-Jan-13	Duplicate 07-Jan-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.111	0.11	0.9
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	44.8	45.1	0.7
Chlorine (Cl)	AITF	mg/L	0.3	1.54	1.54	0.0
Chromium (Cr)	AITF	mg/L	0.0003	<0.00030	0.000304	0.0
Cobalt (Co)	AITF	mg/L	0.0001	0.000163	<0.0002	4.2
Copper (Cu)	AITF	mg/L	0.0001	0.000664	0.000701	5.4
Iron (Fe)	AITF	mg/L	0.004	2.24	2.26	0.9
Lead (Pb)	AITF	mg/L	0.0001	0.000156	0.000185	17.0
Lithium (Li)	AITF	mg/L	0.0002	0.0311	0.0313	0.6
Manganese (Mn)	AITF	mg/L	0.0001	0.0261	0.0261	0.0
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	1.6	1.6	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000344	0.000335	2.7
Nickel (Ni)	AITF	mg/L	0.0001	0.000641	0.000600	6.6
Selenium (Se)	AITF	mg/L	0.0003	<0.000300	0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.224	0.228	1.8
Sulphur (S)	AITF	mg/L	2	10.70	10.8	0.9
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00487	0.00435	11.3
Uranium (U)	AITF	mg/L	0.0001	0.000298	0.000285	4.5
Vanadium (V)	AITF	mg/L	0.0001	0.000664	0.000683	2.8
Zinc (Zn)	AITF	mg/L	0.0002	0.00163	0.00176	7.7
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	<0.370	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.280	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	0.179	0.205	13.5
Benz[a]anthracene	AXYS	mg/L	0.154	0.312	0.294	5.9
Benzo[a]pyrene	AXYS	mg/L	0.251	<0.251	<0.251	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	0.549	<0.297	<b>59.5</b>
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	0.170	<0.167	0.0
Biphenyl	AXYS	mg/L	0.960	<0.960	<0.960	0.0
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	0.580	0.432	<b>29.2</b>
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	0.973	1.550	<b>45.7</b>
C1-Biphenyls	AXYS	mg/L	4.069	<4.069	<4.069	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.310	0.430	<0.310	<b>32.6</b>
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	<1.414	<1.414	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-3 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 07-Jan-13	Duplicate 07-Jan-13	Relative Percent Difference (%)
<b>PAHs (cont'd).</b>						
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	<5.110	0.0
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	<0.984	<0.984	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	0.703	0.654	7.2
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	<1.218	<1.218	0.0
C2-Biphenyls	AXYS	mg/L	20.788	<20.788	<20.788	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.495	<1.495	<1.495	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	2.310	1.900	19.5
C2-Fluorenes	AXYS	mg/L	3.121	<3.121	<3.121	0.0
C2-Naphthalenes	AXYS	mg/L	4.254	<4.254	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	<2.634	<2.634	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.848	<1.848	<1.848	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	1.450	0.988	<b>37.9</b>
C3-Fluorenes	AXYS	mg/L	3.897	<3.897	<3.897	0.0
C3-Naphthalenes	AXYS	mg/L	3.115	<3.115	<3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	<1.507	<1.507	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.523	<2.523	<2.523	0.0
C4-Naphthalenes	AXYS	mg/L	5.061	<5.061	<5.061	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	6.040	3.220	<b>60.9</b>
Chrysene	AXYS	mg/L	0.295	0.443	0.432	2.5
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	<0.736	<0.736	0.0
Fluorene	AXYS	mg/L	0.337	0.338	<0.337	0.3
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	<0.287	<0.287	0.0
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	0.566	0.558	1.4
Retene	AXYS	mg/L	0.669	0.974	1.110	13.1

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-4 Relative percent difference between duplicate water quality samples collected from the Clearwater River (CLR-1), February 2013.**

Analyte	Laboratory	Unit	Detection Limit	CLR-1 5-Feb-13	Duplicate 5-Feb-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	287	288	0.3
Dissolved Organic Carbon	ALS	mg/L	1	7.9	8.2	3.7
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	68	66.2	2.7
pH	ALS	pH units	0.1	7.55	7.57	0.3
Total Alkalinity	ALS	mg/L	5	67.9	68.2	0.4
Total Dissolved Solids	ALS	mg/L	10	176	179	1.7
Total Organic Carbon	ALS	mg/L	1	7.8	7.7	1.3
Total Suspended Solids	ALS	mg/L	3	<3	5	0.0
True Colour	ALS	T.C.U.	2	36.9	36.7	0.5
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	82.9	83.2	0.4
Calcium (Ca)	ALS	mg/L	0.5	17.2	17.6	2.3
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	40.2	40.6	1.0
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	6.09	5.41	11.8
Potassium (K)	ALS	mg/L	0.5	0.98	1.02	4.0
Sodium (Na)	ALS	mg/L	1	30	28.9	3.7
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	7.58	7.63	0.7
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0022	0.0025	12.8
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	0.06	0.12	<b>68.9</b>
Biochemical Oxygen Demand	ALS	mg/L	2	<2	2.10	4.9
Nitrate+Nitrite	ALS	mg/L	0.071	0.15	0.15	3.4
Phosphorus, dissolved	ALS	mg/L	0.001	0.026	0.03	0.8
Phosphorus, total	ALS	mg/L	0.001	0.0452	0.0455	0.7
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.31	0.27	13.8
Total Nitrogen	ALS	mg/L	-	0.456	0.421	8.0
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.05	0.09	<b>57.1</b>
Oil Sands Acid Extractable	AITF	mg/L	0.1	0.27	0.14	<b>63.4</b>
Total Phenolics	ALS	mg/L	0.001	0.0027	0.0024	11.8
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.2500	<0.2500	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-4 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-1 5-Feb-13	Duplicate 5-Feb-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0124	0.0129	4.0
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000266	0.000308	14.6
Barium (Ba)	AITF	mg/L	0.0001	0.0195	0.0196	0.5
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0318	0.0328	3.1
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	16.8	17.2	2.4
Chlorine (Cl)	AITF	mg/L	0.3	39.8	41.1	3.2
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	0.0005	0.0
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.000292	0.000303	3.7
Iron (Fe)	AITF	mg/L	0.004	0.518	0.536	3.4
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	0.0001	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.00582	0.00593	1.9
Manganese (Mn)	AITF	mg/L	0.0001	0.01	0.0106	5.8
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000125	0.00013	3.9
Nickel (Ni)	AITF	mg/L	0.0001	0.000172	0.000162	6.0
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.104	0.108	3.8
Sulphur (S)	AITF	mg/L	2	2.41	2.86	17.1
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00159	0.00179	11.8
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.000255	0.000281	9.7
Zinc (Zn)	AITF	mg/L	0.0002	0.000807	0.000686	16.2
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.207	0.219	5.6
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000426	0.000403	5.5
Barium (Ba)	AITF	mg/L	0.0001	0.021	0.0222	5.6

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-4 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-1 5-Feb-13	Duplicate 5-Feb-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd).</b>						
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0322	0.0333	3.4
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	16.9	17.3	2.3
Chlorine (Cl)	AITF	mg/L	0.3	40.2	41.6	3.4
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	0.000543	0.0
Cobalt (Co)	AITF	mg/L	0.0001	0.000105	0.000104	1.0
Copper (Cu)	AITF	mg/L	0.0001	0.000295	0.000306	3.7
Iron (Fe)	AITF	mg/L	0.004	0.91	0.95	4.3
Lead (Pb)	AITF	mg/L	0.0001	0.000118	0.000112	5.2
Lithium (Li)	AITF	mg/L	0.0002	0.00588	0.00596	1.4
Manganese (Mn)	AITF	mg/L	0.0001	0.0242	0.0248	2.4
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	0.7	1	<b>35.3</b>
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000127	0.000165	<b>26.0</b>
Nickel (Ni)	AITF	mg/L	0.0001	0.000284	0.000398	<b>33.4</b>
Selenium (Se)	AITF	mg/L	0.0003	0.0004	0.0004	8.9
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.105	0.109	3.7
Sulphur (S)	AITF	mg/L	2	2.44	2.89	16.9
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00524	0.0049	6.7
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.000632	0.000682	7.6
Zinc (Zn)	AITF	mg/L	0.0002	0.000816	0.000694	16.2
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	<0.370	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.280	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	<0.153	<0.153	0.0
Benz[a]anthracene	AXYS	mg/L	0.154	<0.154	<0.154	0.0
Benzo[a]pyrene	AXYS	mg/L	0.251	<0.332	<0.254	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	<0.297	<0.297	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	<0.171	<0.244	0.0
Biphenyl	AXYS	mg/L	0.960	<0.960	<0.960	0.0
C1-Acenaphthenes	AXYS	mg/L	0.669	1.17	1.54	<b>27.3</b>
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	0.66	0.78	17.2
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	<0.912	1.49	0.0
C1-Biphenyls	AXYS	mg/L	4.069	<4.069	<4.069	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.310	<0.310	<0.310	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-4 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-1 5-Feb-13	Duplicate 5-Feb-13	Relative Percent Difference (%)
<b>PAHs (Cont'd.)</b>						
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	1.77	3.01	<b>51.9</b>
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	<5.110	0.0
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	<0.984	<0.984	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	0.579	1.010	<b>54.2</b>
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	<1.218	1.970	0.0
C2-Biphenyls	AXYS	mg/L	20.788	<20.788	<20.788	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.495	1.700	<1.495	12.9
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	2.960	3.610	19.8
C2-Fluorenes	AXYS	mg/L	3.121	<3.121	<3.121	0.0
C2-Naphthalenes	AXYS	mg/L	4.254	<4.254	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	<2.634	<2.634	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.848	<1.848	<1.848	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	2.160	1.960	9.7
C3-Fluorenes	AXYS	mg/L	3.897	<3.897	9.730	0.0
C3-Naphthalenes	AXYS	mg/L	3.115	<3.115	<3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	<1.507	3.210	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.523	2.960	<2.523	0.0
C4-Naphthalenes	AXYS	mg/L	5.061	<5.061	<5.061	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	4.830	5.860	19.3
Chrysene	AXYS	mg/L	0.295	0.328	0.573	<b>54.4</b>
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	<0.736	0.915	0.0
Fluorene	AXYS	mg/L	0.337	<0.337	<0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	<0.287	<0.287	0.0
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	<0.527	0.770	0.0
Retene	AXYS	mg/L	0.669	0.937	1.750	<b>60.5</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-5 Relative percent difference between duplicate water quality samples collected from the MacKay River (MAR-2), March 2013.**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 6-Mar-13	Duplicate 6-Mar-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	511	514	0.6
Dissolved Organic Carbon	ALS	mg/L	1	25	25	0.0
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	190	190	0.0
pH	ALS	pH units	0.1	8.06	8.08	0.2
Total Alkalinity	ALS	mg/L	5	230	229	0.4
Total Dissolved Solids	ALS	mg/L	10	341	357	4.6
Total Organic Carbon	ALS	mg/L	1	24.9	25.5	2.4
Total Suspended Solids	ALS	mg/L	3	<3	<3	0.0
True Colour	ALS	T.C.U.	2	107	108	0.9
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	281	280	0.4
Calcium (Ca)	ALS	mg/L	0.5	48.4	48.1	0.6
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	2.82	2.75	2.5
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	16.8	16.9	0.6
Potassium (K)	ALS	mg/L	0.5	2	2.02	1.0
Sodium (Na)	ALS	mg/L	1	38.9	39.8	2.3
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	42.4	41.8	1.4
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0103	0.0114	10.1
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	0.447	0.445	0.4
Phosphorus, dissolved	ALS	mg/L	0.001	0.0526	0.0457	14.0
Phosphorus, total	ALS	mg/L	0.001	0.109	0.109	0.0
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.84	0.86	2.4
Total Nitrogen	ALS	mg/L	-	1.287	1.305	1.4
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.16	0.23	35.9
Oil Sands Acid Extractable	AITF	mg/L	0.1	0.27	0.31	13.8
Total Phenolics	ALS	mg/L	0.001	0.0067	0.0078	15.2
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-5 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 6-Mar-13	Duplicate 6-Mar-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0518	0.0424	20.0
Antimony (Sb)	AITF	mg/L	0.00005	0.0000577	0.000059	2.2
Arsenic (As)	AITF	mg/L	0.0001	0.000771	0.000744	3.6
Barium (Ba)	AITF	mg/L	0.0001	0.0269	0.0269	0.0
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.145	0.146	0.7
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	49.8	48.5	2.6
Chlorine (Cl)	AITF	mg/L	0.3	2.77	2.85	2.8
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	0.00039	0.0
Cobalt (Co)	AITF	mg/L	0.0001	0.00015	0.00013	9.4
Copper (Cu)	AITF	mg/L	0.0001	0.00074	0.000765	3.3
Iron (Fe)	AITF	mg/L	0.004	1.68	1.49	12.0
Lead (Pb)	AITF	mg/L	0.0001	0.000148	<0.0001	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0316	0.0321	1.6
Manganese (Mn)	AITF	mg/L	0.0001	0.0163	0.0155	5.0
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00046	0.000463	0.7
Nickel (Ni)	AITF	mg/L	0.0001	0.000489	0.000335	<b>37.4</b>
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.228	0.232	1.7
Sulphur (S)	AITF	mg/L	2	12.6	12.5	0.8
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00345	0.00329	4.7
Uranium (U)	AITF	mg/L	0.0001	0.000418	0.000415	0.7
Vanadium (V)	AITF	mg/L	0.0001	0.000534	0.000381	<b>33.4</b>
Zinc (Zn)	AITF	mg/L	0.0002	0.00189	0.00243	<b>25.0</b>
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.124	0.166	<b>29.0</b>
Antimony (Sb)	AITF	mg/L	0.00005	0.0000583	0.0000597	2.4
Arsenic (As)	AITF	mg/L	0.0001	0.000923	0.00093	0.8
Barium (Ba)	AITF	mg/L	0.0001	0.0289	0.0295	2.1
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-5 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 6-Mar-13	Duplicate 6-Mar-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd).</b>						
Boron (B)	AITF	mg/L	0.0008	0.147	0.148	0.7
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	50.1	49	2.2
Chlorine (Cl)	AITF	mg/L	0.3	2.8	2.88	2.8
Chromium (Cr)	AITF	mg/L	0.0003	<0.00030	0.000396	0.0
Cobalt (Co)	AITF	mg/L	0.0001	0.000155	0.000156	0.6
Copper (Cu)	AITF	mg/L	0.0001	0.000748	0.000774	3.4
Iron (Fe)	AITF	mg/L	0.004	2.32	2.28	1.7
Lead (Pb)	AITF	mg/L	0.0001	0.000161	0.000193	18.1
Lithium (Li)	AITF	mg/L	0.0002	0.032	0.0322	0.6
Manganese (Mn)	AITF	mg/L	0.0001	0.0212	0.0209	1.4
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000465	0.000468	0.6
Nickel (Ni)	AITF	mg/L	0.0001	0.000512	0.000458	11.1
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.231	0.235	1.7
Sulphur (S)	AITF	mg/L	2	12.7	12.6	0.8
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00349	0.00526	<b>40.5</b>
Uranium (U)	AITF	mg/L	0.0001	0.000437	0.000448	2.5
Vanadium (V)	AITF	mg/L	0.0001	0.000583	0.000664	13.0
Zinc (Zn)	AITF	mg/L	0.0002	0.00191	0.00246	<b>25.2</b>
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	<0.370	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.280	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	<0.153	<0.159	0.0
Benz[a]anthracene	AXYS	mg/L	0.154	<0.154	<0.154	0.0
Benzo[a]pyrene	AXYS	mg/L	0.251	<0.251	<0.251	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	<0.297	<0.297	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	<0.167	<0.167	0.0
Biphenyl	AXYS	mg/L	0.960	<0.960	<0.960	0.0
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	0.358	<0.324	0.0
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	1.680	1.220	<b>31.7</b>
C1-Biphenyls	AXYS	mg/L	4.069	6.970	6.000	15.0
C1-Dibenzothiophenes	AXYS	mg/L	0.310	<0.310	<0.310	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	<1.414	<1.414	0.0
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	<5.110	0.0
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-5 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 6-Mar-13	Duplicate 6-Mar-13	Relative Percent Difference (%)
<b>PAHs (Cont'd.)</b>						
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	<0.984	<0.984	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	0.432	0.384	11.8
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	<1.218	<1.218	0.0
C2-Biphenyls	AXYS	mg/L	20.788	36.80	31.90	14.3
C2-Dibenzothiophenes	AXYS	mg/L	1.495	<1.495	<1.495	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	<1.608	1.640	0.0
C2-Fluorenes	AXYS	mg/L	3.121	<3.121	<3.121	0.0
C2-Naphthalenes	AXYS	mg/L	4.254	4.610	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	<2.634	<2.634	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.848	<1.848	<1.848	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	<0.916	1.030	0.0
C3-Fluorenes	AXYS	mg/L	3.897	<3.897	7.160	0.0
C3-Naphthalenes	AXYS	mg/L	3.115	<3.115	<3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	<1.507	<1.507	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.523	<2.523	<2.523	0.0
C4-Naphthalenes	AXYS	mg/L	5.061	<5.061	<5.061	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	3.530	4.060	14.0
Chrysene	AXYS	mg/L	0.295	<0.295	<0.295	0.0
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	<0.736	<0.736	0.0
Fluorene	AXYS	mg/L	0.337	<0.337	<0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	<0.287	<0.287	0.0
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	<0.527	<0.527	0.0
Retene	AXYS	mg/L	0.669	0.898	0.901	0.3

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-6 Relative percent differences between duplicate water quality samples collected from the Mackay River (MAR-2), April 2013.**

Analyte	Unit	Laboratory	Detection Limit	MAR-2 3-Apr-13	Duplicate 3-Apr-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	µS/cm	ALS	0.2	532	534	0.4
Dissolved Organic Carbon	mg/L	ALS	1	6.7	6.4	4.6
Hardness (as CaCO <sub>3</sub> )	mg/L	ALS	-	208	200	3.9
pH	pH units	ALS	0.1	8.09	8.11	0.2
Total Alkalinity	mg/L	ALS	5	227	229	0.9
Total Dissolved Solids	mg/L	ALS	12	370	355	4.1
Total Organic Carbon	mg/L	ALS	1	22	21.8	0.9
Total Suspended Solids	mg/L	ALS	3	6	14	<b>80.0</b>
True Colour	T.C.U.	ALS	2	76.1	78	2.5
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	mg/L	ALS	5	276	280	1.4
Calcium (Ca)	mg/L	ALS	0.5	55	51.6	6.4
Carbonate (CO <sub>3</sub> )	mg/L	ALS	5	<5	<5	0.0
Chloride (Cl)	mg/L	ALS	0.5	6.33	3.34	<b>61.8</b>
Hydroxide (OH)	mg/L	ALS	5	<5	<5	0.0
Magnesium (Mg)	mg/L	ALS	0.1	17.2	17.2	0.0
Potassium (K)	mg/L	ALS	0.5	2.32	2.32	0.0
Sodium (Na)	mg/L	ALS	1	42.4	42.4	0.0
Sulphate (SO <sub>4</sub> )	mg/L	ALS	0.5	47.8	24.0	<b>66.3</b>
Sulphide (S <sub>2</sub> )	mg/L	ALS	0.002	0.0046	0.0063	<b>31.2</b>
<b>Nutrients and BOD</b>						
Ammonia-N	mg/L	ALS	0.05	<0.05	0.054	0.0
Biochemical Oxygen Demand	mg/L	ALS	2	<2	<2	0.0
Chlorophyll a	mg/L	ALS	2			
Nitrate+Nitrite	mg/L	ALS	0.071	0.392	0.193	<b>68.0</b>
Phosphorus, dissolved	mg/L	ALS	0.001	0.0367	0.0223	<b>48.8</b>
Phosphorus, total	mg/L	ALS	0.001	0.105	0.0923	12.9
Total Kjeldahl Nitrogen	mg/L	ALS	0.2	0.69	0.53	<b>26.2</b>
Total Nitrogen	mg/L	ALS	-	1.082	0.723	39.8
<b>Hydrocarbons</b>						
Naphthenic Acids	mg/L	AITF	0.02	0.38	0.38	0.0
Oil Sands Acid Extractable	mg/L	AITF	-	0.51	0.42	19.4
Total Phenolics	mg/L	ALS	0.001	0.0072	0.0075	4.1
Total Rec. Hydrocarbons	mg/L	ALS	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	mg/L	ALS	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	mg/L	ALS	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	mg/L	ALS	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	mg/L	ALS	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	mg/L	ALS	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	mg/L	ALS	0.25	<0.25	<0.25	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-6 (Cont'd.)**

Analyte	Unit	Laboratory	Detection Limit	MAR-2 3-Apr-13	Duplicate 3-Apr-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
Ethylbenzene	mg/L	ALS	0.0005	<0.0005	<0.0005	0.0
m+p-Xylene	mg/L	ALS	0.0005	<0.0005	<0.0005	0.0
o-Xylene	mg/L	ALS	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	ALS	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	ALS	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	mg/L	AITF	0.001	0.014	0.013	3.0
Antimony (Sb)	mg/L	AITF	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	AITF	0.0001	0.000602	0.000545	9.9
Barium (Ba)	mg/L	AITF	0.0001	0.0355	0.0368	3.6
Beryllium (Be)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	AITF	0.0008	0.171	0.168	1.8
Cadmium (Cd)	mg/L	AITF	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	AITF	0.1	51.9	51.3	1.2
Chlorine (Cl)	mg/L	AITF	0.3	6.08	7.31	18.4
Chromium (Cr)	mg/L	AITF	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	AITF	0.0001	0.0002	0.0002	0.6
Copper (Cu)	mg/L	AITF	0.0001	0.0007	0.0008	0.1
Iron (Fe)	mg/L	AITF	0.004	0.7850	0.6900	12.9
Lead (Pb)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	mg/L	AITF	0.0002	0.0351	0.0342	2.6
Manganese (Mn)	mg/L	AITF	0.0001	0.0262	0.0279	6.3
Mercury (Hg)	mg/L	AITF	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	AITF	0.0001	0.000538	0.000513	4.8
Nickel (Ni)	mg/L	AITF	0.0001	0.00068	0.00070	3.1
Selenium (Se)	mg/L	AITF	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	AITF	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	AITF	0.0001	0.315	0.315	0.0
Sulphur (S)	mg/L	AITF	2	19.8	19.0	4.1
Thallium (Tl)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	AITF	0.0001	0.00185	0.00177	4.4
Uranium (U)	mg/L	AITF	0.0001	0.00056	0.00054	2.6
Vanadium (V)	mg/L	AITF	0.0001	0.00026	0.00023	12.0
Zinc (Zn)	mg/L	AITF	0.0002	0.00219	0.00179	<b>20.1</b>
<b>Total Metals</b>						
Aluminum (Al)	mg/L	AITF	0.003	0.476	0.636	<b>28.8</b>
Antimony (Sb)	mg/L	AITF	0.00005	<0.00005	0.00005	0.0
Arsenic (As)	mg/L	AITF	0.0001	0.00102	0.00104	1.9
Barium (Ba)	mg/L	AITF	0.0001	0.042	0.0445	5.8

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-6 (Cont'd.)**

Analyte	Unit	Laboratory	Detection Limit	MAR-2 3-Apr-13	Duplicate 3-Apr-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Beryllium (Be)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	AITF	0.0008	0.173	0.171	1.2
Cadmium (Cd)	mg/L	AITF	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	AITF	0.1	52	51.4	1.2
Chlorine (Cl)	mg/L	AITF	0.3	6.15	7.39	18.3
Chromium (Cr)	mg/L	AITF	0.0003	0.0009	0.0011	<b>24.6</b>
Cobalt (Co)	mg/L	AITF	0.0001	0.0003	0.0004	17.2
Copper (Cu)	mg/L	AITF	0.0001	0.00101	0.00107	5.8
Iron (Fe)	mg/L	AITF	0.004	2.48	2.68	7.8
Lead (Pb)	mg/L	AITF	0.0001	0.000307	0.000375	19.9
Lithium (Li)	mg/L	AITF	0.0002	0.0355	0.0346	2.6
Manganese (Mn)	mg/L	AITF	0.0001	0.0377	0.0429	12.9
Mercury (Hg)	mg/L	AITF	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	AITF	0.6	1.9	2	5.1
Molybdenum (Mo)	mg/L	AITF	0.0001	0.000538	0.000519	3.6
Nickel (Ni)	mg/L	AITF	0.0001	0.0010	0.0012	13.7
Selenium (Se)	mg/L	AITF	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	AITF	0.00001	<0.00001	0.00001	0.0
Strontium (Sr)	mg/L	AITF	0.0001	0.319	0.316	0.9
Sulphur (S)	mg/L	AITF	2	19.8	19.1	3.6
Thallium (Tl)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	AITF	0.0001	0.00012	0.00015	<b>21.1</b>
Tin (Sn)	mg/L	AITF	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	AITF	0.0001	0.0166	0.0234	<b>34.0</b>
Uranium (U)	mg/L	AITF	0.0001	0.00061	0.00059	3.0
Vanadium (V)	mg/L	AITF	0.0001	0.00167	0.00221	<b>27.8</b>
Zinc (Zn)	mg/L	AITF	0.0002	0.00305	0.00416	<b>30.8</b>
<b>PAHs</b>						
Acenaphthene	mg/L	AXYS	0.370	2.420	3.390	<b>33.4</b>
Acenaphthylene	mg/L	AXYS	0.280	<0.280	<0.280	0.0
Anthracene	mg/L	AXYS	0.153	0.634	0.909	<b>35.6</b>
Benz[a]anthracene	mg/L	AXYS	0.154	0.178	0.218	<b>20.2</b>
Benzo[a]pyrene	mg/L	AXYS	0.251	<0.251	<0.251	0.0
Benzo[b,j,k]fluoranthene	mg/L	AXYS	0.297	0.376	0.429	13.2
Benzo[g,h,i]perylene	mg/L	AXYS	0.167	<0.219	0.251	0.0
Biphenyl	mg/L	AXYS	0.960	1.120	1.020	9.3
C1-Acenaphthenes	mg/L	AXYS	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	mg/L	AXYS	0.324	1.840	1.440	<b>24.4</b>
C1-Benzofluoranthenes/Benzopyrenes	mg/L	AXYS	0.912	1.720	1.920	11.0
C1-Biphenyls	mg/L	AXYS	4.069	4.500	4.140	8.3
C1-Dibenzothiophenes	mg/L	AXYS	0.310	2.410	2.570	6.4
C1-Fluoranthenes/Pyrenes	mg/L	AXYS	1.414	4.170	5.200	<b>22.0</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-6 (Cont'd.)**

Analyte	Unit	Laboratory	Detection Limit	MAR-2 3-Apr-13	Duplicate 3-Apr-13	Relative Percent Difference (%)
<b>PAHs (Cont'd).</b>						
C1-Fluorenes	mg/L	AXYS	5.110	<5.110	<5.110	0.0
C1-Naphthalenes	mg/L	AXYS	8.477	8.910	9.700	8.5
C1-Phenanthrenes/Anthracenes	mg/L	AXYS	0.984	3.340	4.130	<b>21.2</b>
C2-Benzo[a]anthracenes/Chrysenes	mg/L	AXYS	0.371	1.790	1.880	4.9
C2-Benzofluoranthenes/Benzopyrenes	mg/L	AXYS	1.218	1.550	<1.218	0.0
C2-Biphenyls	mg/L	AXYS	20.788	<20.788	<20.788	0.0
C2-Dibenzothiophenes	mg/L	AXYS	1.495	5.780	5.700	1.4
C2-Fluoranthenes/Pyrenes	mg/L	AXYS	1.608	6.820	6.340	7.3
C2-Fluorenes	mg/L	AXYS	3.121	4.640	5.480	16.6
C2-Naphthalenes	mg/L	AXYS	4.254	5.950	7.340	<b>20.9</b>
C2-Phenanthrenes/Anthracenes	mg/L	AXYS	2.634	3.610	4.060	11.7
C3-Dibenzothiophenes	mg/L	AXYS	1.848	6.050	4.980	19.4
C3-Fluoranthenes/Pyrenes	mg/L	AXYS	0.916	4.960	3.630	<b>31.0</b>
C3-Fluorenes	mg/L	AXYS	3.897	18.700	20.800	10.6
C3-Naphthalenes	mg/L	AXYS	3.115	5.730	6.310	9.6
C3-Phenanthrenes/Anthracenes	mg/L	AXYS	1.507	3.880	4.620	17.4
C4-Dibenzothiophenes	mg/L	AXYS	2.523	5.020	5.960	17.1
C4-Naphthalenes	mg/L	AXYS	5.061	7.670	5.790	<b>27.9</b>
C4-Phenanthrenes/Anthracenes	mg/L	AXYS	2.929	10.500	11.900	12.5
Chrysene	mg/L	AXYS	0.295	1.100	1.100	0.0
Dibenz[a,h]anthracene	mg/L	AXYS	0.780	<0.780	<0.780	0.0
Dibenzothiophene	mg/L	AXYS	0.497	1.080	1.370	<b>23.7</b>
Fluoranthene	mg/L	AXYS	0.736	5.100	5.590	9.2
Fluorene	mg/L	AXYS	0.337	1.670	2.420	<b>36.7</b>
Indeno[1,2,3-c,d]-pyrene	mg/L	AXYS	0.287	<0.287	<0.287	0.0
Naphthalene	mg/L	AXYS	15.162	16.300	17.900	9.4
Phenanthrene	mg/L	AXYS	1.689	12.100	16.000	<b>27.8</b>
Pyrene	mg/L	AXYS	0.527	2.500	2.950	16.5
Retene	mg/L	AXYS	0.669	1.000	1.130	12.2

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-7 Relative percent difference between duplicate water quality samples collected from the Mackay River (MAR-2), May 2013.**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 13-May-13	Duplicate 13-May-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	93.3	93.2	0.1
Dissolved Organic Carbon	ALS	mg/L	1	26.4	26.8	1.5
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	36.5	36.4	0.3
pH	ALS	pH units	0.1	7.78	7.76	0.3
Total Alkalinity	ALS	mg/L	5	39.9	40.1	0.5
Total Dissolved Solids	ALS	mg/L	10	138	136	1.5
Total Organic Carbon	ALS	mg/L	5	24.5	24	2.1
Total Suspended Solids	ALS	mg/L	3	201	234	15.2
True Colour	ALS	T.C.U.	2	168	167	0.6
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	48.7	49	0.6
Calcium (Ca)	ALS	mg/L	0.5	9.42	9.38	0.4
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	<0.5	<0.5	0.0
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	3.15	3.14	0.3
Potassium (K)	ALS	mg/L	0.5	1.51	1.49	1.3
Sodium (Na)	ALS	mg/L	1	6.8	6.8	0.0
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	5.53	5.49	0.7
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0205	0.0194	5.5
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	3.2	3.4	6.1
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.0364	0.0359	1.4
Phosphorus, total	ALS	mg/L	0.001	0.267	0.254	5.0
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	1.32	1.3	1.5
Total Nitrogen	ALS	mg/L	-	1.391	1.371	1.4
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.43	0.37	15.0
Oilsands Acid Extractable	AITF	mg/L	0.1	0.5	0.42	17.4
Total Phenolics	ALS	mg/L	0.001	0.0107	0.0105	1.9
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-7 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 13-May-13	Duplicate 13-May-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.116	0.123	5.9
Antimony (Sb)	AITF	mg/L	0.00005	0.0000957	0.000095	0.7
Arsenic (As)	AITF	mg/L	0.0001	0.00054	0.000548	1.5
Barium (Ba)	AITF	mg/L	0.0001	0.0174	0.0174	0.0
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0425	0.0438	3.0
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	8.61	8.61	0.0
Chlorine (Cl)	AITF	mg/L	0.3	0.3	0.3	0.0
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	0.0003	0.0
Cobalt (Co)	AITF	mg/L	0.0001	0.000241	0.000225	6.9
Copper (Cu)	AITF	mg/L	0.0001	0.000911	0.000736	<b>21.3</b>
Iron (Fe)	AITF	mg/L	0.004	0.445	0.436	2.0
Lead (Pb)	AITF	mg/L	0.0001	0.000233	0.000196	17.2
Lithium (Li)	AITF	mg/L	0.0002	0.00577	0.00626	8.1
Manganese (Mn)	AITF	mg/L	0.0001	0.017	0.015	12.5
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000132	0.000133	0.8
Nickel (Ni)	AITF	mg/L	0.0001	0.00134	0.00118	12.7
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.0000106	0.0000139	<b>26.9</b>
Strontium (Sr)	AITF	mg/L	0.0001	0.057	0.0558	2.1
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0103	0.00973	5.7
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.000548	0.000547	0.2
Zinc (Zn)	AITF	mg/L	0.0002	0.00105	0.000873	18.4
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	9.57	10.4	8.3
Antimony (Sb)	AITF	mg/L	0.00005	0.000098	0.0000961	2.0
Arsenic (As)	AITF	mg/L	0.0001	0.00231	0.00233	0.9
Barium (Ba)	AITF	mg/L	0.0001	0.0902	0.0947	4.9

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-7 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 13-May-13	Duplicate 13-May-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Beryllium (Be)	AITF	mg/L	0.0001	0.000296	0.000285	3.8
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0576	0.0592	2.7
Cadmium (Cd)	AITF	mg/L	0.00001	0.0000406	0.000043	6.0
Calcium (Ca)	AITF	mg/L	0.1	10.2	10.2	0.0
Chlorine (Cl)	AITF	mg/L	0.3	<0.30	<0.30	0.0
Chromium (Cr)	AITF	mg/L	0.0003	0.00918	0.00962	4.7
Cobalt (Co)	AITF	mg/L	0.0001	0.0026	0.00252	3.1
Copper (Cu)	AITF	mg/L	0.0001	0.00472	0.00468	0.9
Iron (Fe)	AITF	mg/L	0.004	7.16	7.23	1.0
Lead (Pb)	AITF	mg/L	0.0001	0.00389	0.00398	2.3
Lithium (Li)	AITF	mg/L	0.0002	0.0173	0.0175	1.1
Manganese (Mn)	AITF	mg/L	0.0001	0.146	0.136	7.1
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	6.2	5.9	5.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000133	0.000134	0.7
Nickel (Ni)	AITF	mg/L	0.0001	0.00632	0.00618	2.2
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.000105	0.000116	10.0
Strontium (Sr)	AITF	mg/L	0.0001	0.0666	0.0684	2.7
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.00132	0.00143	8.0
Tin (Sn)	AITF	mg/L	0.0001	0.000139	0.000141	1.4
Titanium (Ti)	AITF	mg/L	0.0001	0.139	0.149	6.9
Uranium (U)	AITF	mg/L	0.0001	0.000447	0.00046	2.9
Vanadium (V)	AITF	mg/L	0.0001	0.0174	0.0184	5.6
Zinc (Zn)	AITF	mg/L	0.0002	0.0172	0.0179	4.0
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	1.260	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.280	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	<0.153	0.168	0.0
Benz[a]anthracene	AXYS	mg/L	0.154	0.476	0.433	9.5
Benzo[a]pyrene	AXYS	mg/L	0.251	2.340	2.030	14.2
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	3.330	1.020	<b>106.2</b>
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	2.220	2.090	6.0
Biphenyl	AXYS	mg/L	0.960	<0.960	0.961	0.0
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	11.900	10.700	10.6
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	13.100	12.300	6.3
C1-Biphenyls	AXYS	mg/L	4.069	<4.069	18.100	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.310	1.000	1.030	3.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-7 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 13-May-13	Duplicate 13-May-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	27.200	23.900	12.9
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	6.990	0.0
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	4.060	3.730	8.5
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	12.100	9.440	24.7
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	3.930	3.420	13.9
C2-Biphenyls	AXYS	mg/L	20.788	<20.788	114.000	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.495	6.260	5.830	7.1
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	36.100	34.200	5.4
C2-Fluorenes	AXYS	mg/L	3.121	6.020	5.450	9.9
C2-Naphthalenes	AXYS	mg/L	4.254	<4.254	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	7.410	7.190	3.0
C3-Dibenzothiophenes	AXYS	mg/L	1.848	9.480	8.960	5.6
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	13.800	16.000	14.8
C3-Fluorenes	AXYS	mg/L	3.897	9.490	9.830	3.5
C3-Naphthalenes	AXYS	mg/L	3.115	3.550	<3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	7.440	7.340	1.4
C4-Dibenzothiophenes	AXYS	mg/L	2.523	10.900	9.250	16.4
C4-Naphthalenes	AXYS	mg/L	5.061	7.220	14.200	65.2
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	65.400	73.400	11.5
Chrysene	AXYS	mg/L	0.295	2.180	2.120	2.8
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	1.760	1.700	3.5
Fluorene	AXYS	mg/L	0.337	<0.337	<0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	1.760	1.560	12.0
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	1.680	1.740	3.5
Retene	AXYS	mg/L	0.669	36.500	42.100	14.2

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-8 Relative percent difference between duplicate water quality samples collected from the Clearwater River (CLR-2), June 2013.**

Analyte	Laboratory	Unit	Detection Limit	CLR-2 6-Jun-13	Duplicate 6-Jun-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	169	167	1.2
Dissolved Organic Carbon	ALS	mg/L	1	10.4	10.1	2.9
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	45.3	44.4	2.0
pH	ALS	pH units	0.1	7.81	7.82	0.1
Total Alkalinity	ALS	mg/L	5	42	41.2	1.9
Total Dissolved Solids	ALS	mg/L	10	141	123	13.6
Total Organic Carbon	ALS	mg/L	5	9.8	10.3	5.0
Total Suspended Solids	ALS	mg/L	3	39	22	55.7
True Colour	ALS	T.C.U.	2	60.3	61.8	2.5
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	51.3	50.3	2.0
Calcium (Ca)	ALS	mg/L	0.5	11.6	11.4	1.7
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	23.7	23.4	1.3
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	3.97	3.87	2.6
Potassium (K)	ALS	mg/L	0.5	0.87	0.86	1.2
Sodium (Na)	ALS	mg/L	1	18.2	17.8	2.2
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	4.43	4.38	1.1
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0029	0.0025	14.8
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2.00	<2.00	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.0203	0.0206	1.5
Phosphorus, total	ALS	mg/L	0.001	0.0592	0.0659	10.7
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.48	0.4	18.2
Total Nitrogen	ALS	mg/L	-	0.551	0.471	15.7
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.04	0.04	0.0
Oilsands Acid Extractable	AITF	mg/L	0.1	0.1	0.13	26.1
Total Phenolics	ALS	mg/L	0.001	0.0023	0.0022	4.4
Total Rec. Hydrocarbons	ALS	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.

# Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-8 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-2 6-Jun-13	Duplicate 6-Jun-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0253	0.0298	16.3
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000361	0.000352	2.5
Barium (Ba)	AITF	mg/L	0.0001	0.0127	0.0127	0.0
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0214	0.0213	0.5
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	9.93	9.93	0.0
Chlorine (Cl)	AITF	mg/L	0.3	15.7	15.7	0.0
Chromium (Cr)	AITF	mg/L	0.0003	0.000726	0.00101	<b>32.7</b>
Cobalt (Co)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.000276	0.000257	7.1
Iron (Fe)	AITF	mg/L	0.004	0.459	0.458	0.2
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.00396	0.00399	0.8
Manganese (Mn)	AITF	mg/L	0.0001	0.00366	0.00431	16.3
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000126	0.000129	2.4
Nickel (Ni)	AITF	mg/L	0.0001	0.000327	0.000298	9.3
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.0000	<0.0000	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.0672	0.0673	0.1
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00202	0.00205	1.5
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.00035	0.000351	0.3
Zinc (Zn)	AITF	mg/L	0.0002	0.000254	<0.0002	0.0
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	1.61	1.48	8.4
Antimony (Sb)	AITF	mg/L	0.00005	<0.0001	<0.0001	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.000698	0.00063	10.2
Barium (Ba)	AITF	mg/L	0.0001	0.0231	0.0223	3.5
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-8 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-2 6-Jun-13	Duplicate 6-Jun-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0231	0.0225	2.6
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	10.1	9.97	1.3
Chlorine (Cl)	AITF	mg/L	0.3	15.90	15.90	0.0
Chromium (Cr)	AITF	mg/L	0.0003	0.00169	0.00145	15.3
Cobalt (Co)	AITF	mg/L	0.0001	0.00043	0.000395	8.5
Copper (Cu)	AITF	mg/L	0.0001	0.000869	0.000961	10.1
Iron (Fe)	AITF	mg/L	0.004	1.69	1.59	6.1
Lead (Pb)	AITF	mg/L	0.0001	0.000442	0.00044	0.5
Lithium (Li)	AITF	mg/L	0.0002	0.00505	0.00487	3.6
Manganese (Mn)	AITF	mg/L	0.0001	0.0711	0.0669	6.1
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	3.1	3.6	14.9
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00014	0.00013	7.4
Nickel (Ni)	AITF	mg/L	0.0001	0.00103	0.001	3.0
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.0000228	0.0000201	12.6
Strontium (Sr)	AITF	mg/L	0.0001	0.0698	0.0692	0.9
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.000166	0.000151	9.5
Tin (Sn)	AITF	mg/L	0.0001	<0.00010	0.000108	7.7
Titanium (Ti)	AITF	mg/L	0.0001	0.0234	0.0214	8.9
Uranium (U)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.00289	0.00268	7.5
Zinc (Zn)	AITF	mg/L	0.0002	0.00292	0.00294	0.7
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	<0.370	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.280	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	<0.153	<0.153	0.0
Benz[a]anthracene	AXYS	mg/L	0.154	<0.154	<0.154	0.0
Benzo[a]pyrene	AXYS	mg/L	0.251	<0.251	<0.251	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	<0.297	<0.297	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	0.188	<0.167	12.1
Biphenyl	AXYS	mg/L	0.960	0.996	<0.960	3.7
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	0.525	0.402	<b>26.5</b>
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	<0.912	<0.912	0.0
C1-Biphenyls	AXYS	mg/L	4.069	16.100	8.980	<b>56.8</b>
C1-Dibenzothiophenes	AXYS	mg/L	0.310	<0.310	<0.310	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	1.750	<1.414	0.0
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	<5.110	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-8 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CLR-2 6-Jun-13	Duplicate 6-Jun-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	<0.984	<0.984	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	0.415	0.628	<b>40.8</b>
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	<1.218	<1.218	0.0
C2-Biphenyls	AXYS	mg/L	20.788	81.500	39.000	<b>70.5</b>
C2-Dibenzothiophenes	AXYS	mg/L	1.495	<1.495	<1.495	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	1.930	1.860	3.7
C2-Fluorenes	AXYS	mg/L	3.121	<3.121	<3.121	0.0
C2-Naphthalenes	AXYS	mg/L	4.254	<4.254	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	<2.634	<2.634	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.848	<1.848	<1.848	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	1.110	<0.916	19.2
C3-Fluorenes	AXYS	mg/L	3.897	5.560	<3.897	<b>35.2</b>
C3-Naphthalenes	AXYS	mg/L	3.115	<3.115	<3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	<1.507	<1.507	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.523	<2.523	<2.523	0.0
C4-Naphthalenes	AXYS	mg/L	5.061	<5.061	<5.061	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	16.800	3.720	<b>127.5</b>
Chrysene	AXYS	mg/L	0.295	<0.295	<0.295	0.0
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	<0.736	<0.736	0.0
Fluorene	AXYS	mg/L	0.337	<0.337	<0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	<0.287	<0.287	0.0
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	<0.527	<0.527	0.0
Retene	AXYS	mg/L	0.669	12.900	2.230	<b>141.0</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-9 Relative percent difference between duplicate water quality samples collected from the Athabasca River (ATR-DC-W), July 2013.**

Analyte	Laboratory	Unit	Detection Limit	ATR-DC-W 8-Jul-13	Duplicate 8-Jul-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	247	248	0.4
Dissolved Organic Carbon	ALS	mg/L	1	10	9.6	4.1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	129	112	14.1
pH	ALS	pH units	0.1	7.96	7.96	0.0
Total Alkalinity	ALS	mg/L	5	101	102	1.0
Total Dissolved Solids	ALS	mg/L	10	188	188	0.0
Total Organic Carbon	ALS	mg/L	5	10.5	10.5	0.0
Total Suspended Solids	ALS	mg/L	3	235	215	8.9
True Colour	ALS	T.C.U.	2	50.1	50.7	1.2
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	124	125	0.8
Calcium (Ca)	ALS	mg/L	0.5	37.7	30.6	<b>20.8</b>
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	2.11	2.12	0.5
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	8.48	8.53	0.6
Potassium (K)	ALS	mg/L	0.5	1.06	1.07	0.9
Sodium (Na)	ALS	mg/L	1	7.2	7.3	1.4
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	21.4	21.4	0.0
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.003	0.0034	12.5
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2.00	<2.00	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.0164	0.0148	10.3
Phosphorus, total	ALS	mg/L	0.001	0.165	0.148	10.9
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.62	0.59	5.0
Total Nitrogen	ALS	mg/L	-	0.691	0.661	4.4
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.07	0.23	<b>106.7</b>
Oilsands Acid Extractable	AITF	mg/L	0.1	0.23	0.82	<b>112.4</b>
Total Phenolics	ALS	mg/L	0.001	0.004	0.0036	10.5
Total Rec. Hydrocarbons	ALS	mg/L	1	-	-	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-9 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ATR-DC-W 8-Jul-13	Duplicate 8-Jul-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0247	0.0287	15.0
Antimony (Sb)	AITF	mg/L	0.00005	0.00014	0.00012	12.6
Arsenic (As)	AITF	mg/L	0.0001	0.000563	0.000558	0.9
Barium (Ba)	AITF	mg/L	0.0001	0.0464	0.0448	3.5
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0207	0.0217	4.7
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	29	29.4	1.4
Chlorine (Cl)	AITF	mg/L	0.3	0.968	1.05	8.1
Chromium (Cr)	AITF	mg/L	0.0003	0.000579	0.000756	<b>26.5</b>
Cobalt (Co)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.00122	0.00123	0.8
Iron (Fe)	AITF	mg/L	0.004	0.126	0.131	3.9
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.00502	0.00564	11.6
Manganese (Mn)	AITF	mg/L	0.0001	0.00109	0.00115	5.4
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000567	0.000513	10.0
Nickel (Ni)	AITF	mg/L	0.0001	0.00137	0.00132	3.7
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.0000	<0.0000	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.278	0.282	1.4
Sulphur (S)	AITF	mg/L	2	5.36	5.75	7.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00237	0.00252	6.1
Uranium (U)	AITF	mg/L	0.0001	0.00043	0.00044	3.2
Vanadium (V)	AITF	mg/L	0.0001	0.000318	0.000289	9.6
Zinc (Zn)	AITF	mg/L	0.0002	0.000693	0.000743	0.0
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	7.04	5.58	<b>23.1</b>
Antimony (Sb)	AITF	mg/L	0.00005	0.00014	0.00012	12.5
Arsenic (As)	AITF	mg/L	0.0001	0.00184	0.00185	0.5
Barium (Ba)	AITF	mg/L	0.0001	0.118	0.105	11.7
Beryllium (Be)	AITF	mg/L	0.0001	0.00017	0.00017	1.2

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-9 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ATR-DC-W 8-Jul-13	Duplicate 8-Jul-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0244	0.0241	1.2
Cadmium (Cd)	AITF	mg/L	0.00001	0.000074	0.000071	4.7
Calcium (Ca)	AITF	mg/L	0.1	33.5	34.3	2.4
Chlorine (Cl)	AITF	mg/L	0.3	0.98	1.06	7.9
Chromium (Cr)	AITF	mg/L	0.0003	0.00514	0.00402	<b>24.5</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00167	0.0016	4.3
Copper (Cu)	AITF	mg/L	0.0001	0.00422	0.00429	1.6
Iron (Fe)	AITF	mg/L	0.004	6.31	3.72	<b>51.6</b>
Lead (Pb)	AITF	mg/L	0.0001	0.0025	0.00241	3.7
Lithium (Li)	AITF	mg/L	0.0002	0.00746	0.00792	6.0
Manganese (Mn)	AITF	mg/L	0.0001	0.11	0.112	1.8
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	9.4	11.6	<b>21.0</b>
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000573	0.000519	9.9
Nickel (Ni)	AITF	mg/L	0.0001	0.00504	0.00477	5.5
Selenium (Se)	AITF	mg/L	0.0003	0.000313	<0.0003	4.2
Silver (Ag)	AITF	mg/L	0.00001	0.0000738	0.000187	<b>86.8</b>
Strontium (Sr)	AITF	mg/L	0.0001	0.29	0.292	0.7
Sulphur (S)	AITF	mg/L	2	5.42	5.81	6.9
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.000884	0.000786	11.7
Tin (Sn)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0759	0.0217	<b>111.1</b>
Uranium (U)	AITF	mg/L	0.0001	0.00068	0.00065	5.6
Vanadium (V)	AITF	mg/L	0.0001	0.0105	0.00817	<b>25.0</b>
Zinc (Zn)	AITF	mg/L	0.0002	0.0141	0.014	0.7
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	0.737	0.836	12.6
Acenaphthylene	AXYS	mg/L	0.280	0.345	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	0.899	1.040	14.5
Benz[a]anthracene	AXYS	mg/L	0.154	0.949	1.670	<b>55.1</b>
Benzo[a]pyrene	AXYS	mg/L	0.251	1.240	2.660	<b>72.8</b>
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	4.280	6.790	<b>45.3</b>
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	2.370	3.020	<b>24.1</b>
Biphenyl	AXYS	mg/L	0.960	5.010	4.610	8.3
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	12.000	11.000	8.7
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	10.700	9.470	12.2
C1-Biphenyls	AXYS	mg/L	4.069	18.200	10.500	<b>53.7</b>
C1-Dibenzothiophenes	AXYS	mg/L	0.310	5.940	5.580	6.3
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	24.800	24.800	0.0
C1-Fluorenes	AXYS	mg/L	5.110	11.600	9.510	19.8

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-9 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ATR-DC-W 8-Jul-13	Duplicate 8-Jul-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.477	17.600	17.000	3.5
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	23.700	22.700	4.3
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	12.000	9.530	22.9
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	4.830	4.340	10.7
C2-Biphenyls	AXYS	mg/L	20.788	69.500	23.200	99.9
C2-Dibenzothiophenes	AXYS	mg/L	1.495	15.600	13.700	13.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	32.700	37.500	13.7
C2-Fluorenes	AXYS	mg/L	3.121	14.600	12.800	13.1
C2-Naphthalenes	AXYS	mg/L	4.254	26.300	25.800	1.9
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	22.700	19.700	14.2
C3-Dibenzothiophenes	AXYS	mg/L	1.848	21.800	21.200	2.8
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	17.300	19.900	14.0
C3-Fluorenes	AXYS	mg/L	3.897	19.500	20.200	3.5
C3-Naphthalenes	AXYS	mg/L	3.115	19.100	17.200	10.5
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	16.200	14.700	9.7
C4-Dibenzothiophenes	AXYS	mg/L	2.523	14.800	17.600	17.3
C4-Naphthalenes	AXYS	mg/L	5.061	13.500	12.600	6.9
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	54.900	52.200	5.0
Chrysene	AXYS	mg/L	0.295	6.600	7.060	6.7
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	1.520	1.750	14.1
Fluoranthene	AXYS	mg/L	0.736	2.360	6.460	93.0
Fluorene	AXYS	mg/L	0.337	1.630	1.330	20.3
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	1.250	2.090	50.3
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	12.000	13.400	11.0
Pyrene	AXYS	mg/L	0.527	3.760	7.280	63.8
Retene	AXYS	mg/L	0.669	11.30	11.10	1.8

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-10 Relative percent difference between duplicate water quality samples collected from the Christina River (CHR-1), August 2013.**

Analyte	Laboratory	Unit	Detection Limit	CHR-1 9-Aug-13	Duplicate 9-Aug-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	217	216	0.5
Dissolved Organic Carbon	ALS	mg/L	1	22.7	22	3.1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	87.2	84.6	3.0
pH	ALS	pH units	0.1	7.89	7.92	0.4
Total Alkalinity	ALS	mg/L	5	89.7	90.2	0.6
Total Dissolved Solids	ALS	mg/L	10	181	170	6.3
Total Organic Carbon	ALS	mg/L	5	21.4	22.2	3.7
Total Suspended Solids	ALS	mg/L	3	59	73	21.2
True Colour	ALS	T.C.U.	2	133	134	0.7
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	109	110	0.9
Calcium (Ca)	ALS	mg/L	0.5	23.3	22.4	3.9
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	10.6	10.6	0.0
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	7.04	6.97	1.0
Potassium (K)	ALS	mg/L	0.5	0.8	0.79	1.3
Sodium (Na)	ALS	mg/L	1	12.3	12.5	1.6
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	3.85	3.85	0.0
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0071	0.0058	20.2
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2.00	<2.00	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.0366	0.0379	3.5
Phosphorus, total	ALS	mg/L	0.001	0.125	0.121	3.3
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.86	0.78	9.8
Total Nitrogen	ALS	mg/L	-	0.931	0.851	9.0
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.15	0.16	6.5
Oilsands Acid Extractable	AITF	mg/L	0.1	0.32	0.33	3.1
Total Phenolics	ALS	mg/L	0.001	0.005	0.0054	7.7
Total Rec. Hydrocarbons	ALS	mg/L	1	-	-	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-10 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CHR-1 9-Aug-13	Duplicate 9-Aug-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0261	0.0237	9.6
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	0.000052	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00109	0.00105	3.7
Barium (Ba)	AITF	mg/L	0.0001	0.0236	0.0223	5.7
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0361	0.0319	12.4
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	22.2	20.8	6.5
Chlorine (Cl)	AITF	mg/L	0.3	7.64	7.04	8.2
Chromium (Cr)	AITF	mg/L	0.0003	0.000547	0.00034	46.7
Cobalt (Co)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.000805	0.000603	28.7
Iron (Fe)	AITF	mg/L	0.004	1.07	0.984	8.4
Lead (Pb)	AITF	mg/L	0.0001	0.000125	0.000131	4.7
Lithium (Li)	AITF	mg/L	0.0002	0.00707	0.00432	48.3
Manganese (Mn)	AITF	mg/L	0.0001	0.00417	0.00365	13.3
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000321	0.000313	2.5
Nickel (Ni)	AITF	mg/L	0.0001	0.000886	0.000771	13.9
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.0000	<0.0000	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.0895	0.0832	7.3
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	0.00017	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0033	0.00339	2.7
Uranium (U)	AITF	mg/L	0.0001	<0.0001	0.00010	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.000449	0.000426	5.3
Zinc (Zn)	AITF	mg/L	0.0002	0.00102	0.00087	16.4
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	1.66	3.06	59.3
Antimony (Sb)	AITF	mg/L	0.00005	<0.0001	0.000053	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00184	0.00184	0.0
Barium (Ba)	AITF	mg/L	0.0001	0.0476	0.0525	9.8
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-10 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CHR-1 9-Aug-13	Duplicate 9-Aug-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.0382	0.0356	7.0
Cadmium (Cd)	AITF	mg/L	0.00001	0.000028	0.000025	10.3
Calcium (Ca)	AITF	mg/L	0.1	23.1	22.3	3.5
Chlorine (Cl)	AITF	mg/L	0.3	7.72	7.12	8.1
Chromium (Cr)	AITF	mg/L	0.0003	0.00198	0.00282	<b>35.0</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.000912	0.000964	5.5
Copper (Cu)	AITF	mg/L	0.0001	0.00162	0.00175	7.7
Iron (Fe)	AITF	mg/L	0.004	3.26	3.45	5.7
Lead (Pb)	AITF	mg/L	0.0001	0.000886	0.00111	<b>22.4</b>
Lithium (Li)	AITF	mg/L	0.0002	0.00833	0.00613	<b>30.4</b>
Manganese (Mn)	AITF	mg/L	0.0001	0.162	0.148	9.0
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	4.2	4.4	4.7
Molybdenum (Mo)	AITF	mg/L	0.0001	0.000325	0.000317	2.5
Nickel (Ni)	AITF	mg/L	0.0001	0.0021	0.00223	6.0
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.000016	0.0000321	<b>66.9</b>
Strontium (Sr)	AITF	mg/L	0.0001	0.0942	0.0964	2.3
Sulphur (S)	AITF	mg/L	2	<2.0	<2.0	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.000342	0.00048	<b>33.6</b>
Tin (Sn)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.028	0.0667	<b>81.7</b>
Uranium (U)	AITF	mg/L	0.0001	0.000174	0.000205	16.4
Vanadium (V)	AITF	mg/L	0.0001	0.00372	0.00556	<b>39.7</b>
Zinc (Zn)	AITF	mg/L	0.0002	0.00618	0.00626	1.3
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.370	<0.370	<0.370	0.0
Acenaphthylene	AXYS	mg/L	0.280	<0.283	<0.280	0.0
Anthracene	AXYS	mg/L	0.153	<0.205	<0.153	<b>0.0</b>
Benz[a]anthracene	AXYS	mg/L	0.154	<0.164	<0.154	0.0
Benzo[a]pyrene	AXYS	mg/L	0.251	<0.427	<0.368	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.297	0.519	0.577	10.6
Benzo[g,h,i]perylene	AXYS	mg/L	0.167	0.678	0.646	4.8
Biphenyl	AXYS	mg/L	0.960	<0.960	<0.960	0.0
C1-Acenaphthenes	AXYS	mg/L	0.669	<0.669	<0.669	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.324	3.390	2.920	14.9
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.912	2.860	2.540	11.9
C1-Biphenyls	AXYS	mg/L	4.069	<4.069	<4.069	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.310	<0.310	<0.310	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.414	6.820	6.530	4.3
C1-Fluorenes	AXYS	mg/L	5.110	<5.110	<5.110	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-10 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	CHR-1 9-Aug-13	Duplicate 9-Aug-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.477	<8.477	<8.477	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.984	<0.984	1.210	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.371	5.460	3.900	33.3
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.218	2.110	1.880	11.5
C2-Biphenyls	AXYS	mg/L	20.788	<20.788	<20.788	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.495	4.490	3.980	12.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.608	16.200	13.000	21.9
C2-Fluorenes	AXYS	mg/L	3.121	<3.121	<3.121	0.0
C2-Naphthalenes	AXYS	mg/L	4.254	<4.254	<4.254	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.634	3.940	3.400	14.7
C3-Dibenzothiophenes	AXYS	mg/L	1.848	11.800	11.400	3.4
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.916	12.100	11.200	7.7
C3-Fluorenes	AXYS	mg/L	3.897	5.570	4.790	15.1
C3-Naphthalenes	AXYS	mg/L	3.115	<3.115	3.115	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.507	7.730	5.610	31.8
C4-Dibenzothiophenes	AXYS	mg/L	2.523	16.300	11.500	34.5
C4-Naphthalenes	AXYS	mg/L	5.061	<5.061	<5.061	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.929	31.200	23.500	28.2
Chrysene	AXYS	mg/L	0.295	1.140	0.882	25.5
Dibenz[a,h]anthracene	AXYS	mg/L	0.780	<0.780	<0.780	0.0
Dibenzothiophene	AXYS	mg/L	0.497	<0.497	<0.497	0.0
Fluoranthene	AXYS	mg/L	0.736	<0.736	<0.736	0.0
Fluorene	AXYS	mg/L	0.337	<0.337	<0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.287	0.568	0.540	5.1
Naphthalene	AXYS	mg/L	15.162	<15.162	<15.162	0.0
Phenanthrene	AXYS	mg/L	1.689	<1.689	<1.689	0.0
Pyrene	AXYS	mg/L	0.527	0.844	0.797	5.7
Retene	AXYS	mg/L	0.669	4.490	4.100	9.1

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-11 Relative percent difference between duplicate water quality samples collected from Ells River (ELR-3), September 2013.**

Analyte	Laboratory	Unit	Detection Limit	ELR-3 19-Sep-13	Duplicate 19-Sep-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	191	190	0.5
Dissolved Organic Carbon	ALS	mg/L	1	14	14	0.0
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	91	88	3.5
pH	ALS	pH units	0.1	8	8	0.3
Total Alkalinity	ALS	mg/L	2	85	85	0.0
Total Dissolved Solids	ALS	mg/L	10	133	138	3.7
Total Organic Carbon	ALS	mg/L	1	14	14	1.5
Total Suspended Solids	ALS	mg/L	3	<3	<3	0.0
True Colour	ALS	T.C.U.	2	48	49	0.4
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	104	104	0.0
Calcium (Ca)	ALS	mg/L	0.5	24.5	23.4	4.6
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	0.52	0.51	1.9
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	7.16	7.09	1.0
Potassium (K)	ALS	mg/L	0.5	1.15	1.16	0.9
Sodium (Na)	ALS	mg/L	1	8.70	8.60	1.2
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	12.10	12.10	0.0
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	<0.002	<0.002	0.0
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.014	0.013	9.5
Phosphorus, total	ALS	mg/L	0.001	0.020	0.028	<b>30.4</b>
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.50	0.51	2.0
Total Nitrogen	ALS	mg/L	-	0.571	0.581	1.7
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.23	0.21	9.1
Oilsands Acid Extractable	AITF	mg/L	0.1	0.27	0.31	13.8
Total Phenolics	ALS	mg/L	0.001	0.0037	0.0067	<b>57.7</b>
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.

# Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-11 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ELR-3 19-Sep-13	Duplicate 19-Sep-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0076	0.0076	0.0
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00063	0.00064	1.7
Barium (Ba)	AITF	mg/L	0.0001	0.0259	0.0260	0.4
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.043	0.045	5.7
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	19.60	20.10	2.5
Chlorine (Cl)	AITF	mg/L	0.3	0.4	0.4	9.1
Chromium (Cr)	AITF	mg/L	0.0003	0.00040	0.00033	19.3
Cobalt (Co)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.00052	0.00047	9.7
Iron (Fe)	AITF	mg/L	0.004	0.23	0.22	4.0
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0103	0.0105	1.9
Manganese (Mn)	AITF	mg/L	0.0001	0.00111	0.00108	2.7
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00057	0.00058	2.8
Nickel (Ni)	AITF	mg/L	0.0001	0.00070	0.00072	2.7
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.000013	0.000010	<b>20.7</b>
Strontium (Sr)	AITF	mg/L	0.0001	0.089	0.091	1.9
Sulphur (S)	AITF	mg/L	2	4.25	4.28	0.7
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00069	0.00078	11.9
Uranium (U)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.00016	0.00019	16.2
Zinc (Zn)	AITF	mg/L	0.0002	0.00051	0.00062	0.0
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.134	0.121	10.2
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.0008	0.0008	2.7
Barium (Ba)	AITF	mg/L	0.0001	0.0308	0.0305	1.0
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-11 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ELR-3 19-Sep-13	Duplicate 19-Sep-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.049	0.049	1.2
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	22.2	22.5	1.3
Chlorine (Cl)	AITF	mg/L	0.3	0.43	0.46	7.0
Chromium (Cr)	AITF	mg/L	0.0003	0.00044	0.00034	<b>26.1</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00015	0.00014	3.4
Copper (Cu)	AITF	mg/L	0.0001	0.00052	0.00048	9.8
Iron (Fe)	AITF	mg/L	0.004	0.47	0.47	1.3
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.01150	0.01180	2.6
Manganese (Mn)	AITF	mg/L	0.0001	0.01610	0.01630	1.2
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	0.9	1.0	10.8
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00064	0.00065	0.5
Nickel (Ni)	AITF	mg/L	0.0001	0.00090	0.00086	4.4
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.00003	0.00003	1.9
Strontium (Sr)	AITF	mg/L	0.0001	0.102	0.103	1.0
Sulphur (S)	AITF	mg/L	2	5	5	1.7
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0024	0.0020	19.7
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.00044	0.00044	0.7
Zinc (Zn)	AITF	mg/L	0.0002	0.00052	0.00071	<b>29.7</b>
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	<0.3696	<0.3696	0.0
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	0.2860	2.1
Anthracene	AXYS	mg/L	0.1525	<0.1525	<0.1525	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	<0.1544	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	<0.2972	<0.2972	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	<0.1665	<0.1665	0.0
Biphenyl	AXYS	mg/L	0.9597	<0.9597	<0.9597	0.0
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	<0.3240	0.3280	1.2
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	<0.9115	0.958	5.0
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	<4.0686	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	<0.3095	<0.3095	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	<1.4140	<1.4140	0.0
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	<5.1099	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-11 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	ELR-3 19-Sep-13	Duplicate 19-Sep-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.4772	<8.4772	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	<0.9835	<0.9835	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	<0.3707	0.4030	8.3
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.2177	<1.2177	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.7882	<20.7882	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	<1.4945	<1.4945	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	<1.6084	<1.6084	0.0
C2-Fluorenes	AXYS	mg/L	3.1208	<3.1208	<3.1208	0.0
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.2543	<4.2543	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	<2.6336	<2.6336	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	<1.8484	<1.8484	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	<0.9160	<0.9160	0.0
C3-Fluorenes	AXYS	mg/L	3.8970	<3.8970	<3.8970	0.0
C3-Naphthalenes	AXYS	mg/L	3.1153	<3.1153	<3.1153	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	<1.5072	<1.5072	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	<2.5229	<2.5229	0.0
C4-Naphthalenes	AXYS	mg/L	5.0606	<5.0606	<5.0606	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	<2.9292	3.050	4.0
Chrysene	AXYS	mg/L	0.2952	<0.2952	<0.2952	0.0
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	<0.4971	<0.4971	0.0
Fluoranthene	AXYS	mg/L	0.7358	<0.7358	<0.7358	0.0
Fluorene	AXYS	mg/L	0.3371	<0.3371	<0.3371	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	<0.2865	<0.2865	0.0
Naphthalene	AXYS	mg/L	15.1623	<15.1623	<15.1623	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.6890	<1.6890	0.0
Pyrene	AXYS	mg/L	0.5274	<0.5274	<0.5274	0.0
Retene	AXYS	mg/L	0.6694	1.220	1.460	17.9

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-12 Relative percent difference between duplicate water quality samples collected from High Hills River (HHR-1), September 2013.**

Analyte	Laboratory	Unit	Detection Limit	HHR-1 18-Sep-13	Duplicate 18-Sep-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	259	274	5.6
Dissolved Organic Carbon	ALS	mg/L	1	11	11	0.0
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	127	125	1.6
pH	ALS	pH units	0.1	8	8	0.0
Total Alkalinity	ALS	mg/L	5	135	136	0.7
Total Dissolved Solids	ALS	mg/L	10	174	164	5.9
Total Organic Carbon	ALS	mg/L	5	11	11	3.6
Total Suspended Solids	ALS	mg/L	3	36	32	11.8
True Colour	ALS	T.C.U.	2	65	63	2.7
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	165	166	0.6
Calcium (Ca)	ALS	mg/L	0.5	33.4	33.6	0.6
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	0.50	0.50	0.0
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	10.50	10.10	3.9
Potassium (K)	ALS	mg/L	0.5	0.94	0.93	1.1
Sodium (Na)	ALS	mg/L	1	9.00	8.90	1.1
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	4.40	4.36	0.9
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.002	0.002	0.0
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.050	0.064	24.1
Phosphorus, total	ALS	mg/L	0.001	0.122	0.109	11.3
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.38	0.42	10.0
Total Nitrogen	ALS	mg/L	-	0.451	0.491	8.5
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.24	0.23	4.3
Oilsands Acid Extractable	AITF	mg/L	0.1	0.28	0.23	19.6
Total Phenolics	ALS	mg/L	0.001	0.0019	0.0036	61.8
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.

# Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-12 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	HHR-1 18-Sep-13	Duplicate 18-Sep-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0171	0.0140	19.9
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00046	0.00043	6.1
Barium (Ba)	AITF	mg/L	0.0001	0.0271	0.0277	2.2
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.050	0.044	12.0
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	29.20	27.50	6.0
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	AITF	mg/L	0.0003	0.00052	0.00036	<b>35.5</b>
Cobalt (Co)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Copper (Cu)	AITF	mg/L	0.0001	0.00054	0.00054	0.4
Iron (Fe)	AITF	mg/L	0.004	0.38	0.40	4.1
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0068	0.0056	19.0
Manganese (Mn)	AITF	mg/L	0.0001	0.00436	0.00417	4.5
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00027	0.00027	1.9
Nickel (Ni)	AITF	mg/L	0.0001	0.00020	0.00033	<b>49.0</b>
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00002	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.088	0.087	1.3
Sulphur (S)	AITF	mg/L	2	2.00	2.00	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00355	0.00355	0.0
Uranium (U)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Vanadium (V)	AITF	mg/L	0.0001	0.00029	0.00031	6.4
Zinc (Zn)	AITF	mg/L	0.0002	0.00037	0.00074	<b>67.4</b>
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	3.570	2.400	<b>39.2</b>
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.0009	0.0008	10.2
Barium (Ba)	AITF	mg/L	0.0001	0.0483	0.0435	10.5
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-12 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	HHR-1 18-Sep-13	Duplicate 18-Sep-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.054	0.049	10.2
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	29.8	28.5	4.5
Chlorine (Cl)	AITF	mg/L	0.3	<0.30	<0.30	0.0
Chromium (Cr)	AITF	mg/L	0.0003	0.00217	0.00163	<b>28.4</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00060	0.00055	7.8
Copper (Cu)	AITF	mg/L	0.0001	0.00132	0.00124	6.3
Iron (Fe)	AITF	mg/L	0.004	1.98	1.81	9.0
Lead (Pb)	AITF	mg/L	0.0001	0.00070	0.00061	13.2
Lithium (Li)	AITF	mg/L	0.0002	0.00843	0.00743	12.6
Manganese (Mn)	AITF	mg/L	0.0001	0.07510	0.07020	6.7
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	3.2	3.3	3.1
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00027	0.00027	0.7
Nickel (Ni)	AITF	mg/L	0.0001	0.00126	0.00120	4.9
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.00004	0.00003	15.7
Strontium (Sr)	AITF	mg/L	0.0001	0.098	0.095	3.1
Sulphur (S)	AITF	mg/L	2	<2	<2	0.0
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.00025	0.00022	9.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0437	0.0338	<b>25.5</b>
Uranium (U)	AITF	mg/L	0.0001	0.00015	0.00014	4.9
Vanadium (V)	AITF	mg/L	0.0001	0.00440	0.00340	<b>25.6</b>
Zinc (Zn)	AITF	mg/L	0.0002	0.00415	0.00354	15.9
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	0.3696	0.370	0.0
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	<0.2801	0.0
Anthracene	AXYS	mg/L	0.1525	<0.1525	<0.1525	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	<0.1544	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	0.4840	0.4860	0.4
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	0.4250	0.4750	11.1
Biphenyl	AXYS	mg/L	0.9597	<0.9597	1.060	9.9
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	0.9350	0.8370	11.1
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	1.2800	1.640	<b>24.7</b>
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	<4.0686	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	<0.3095	<0.3095	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	2.00	2.08	3.9
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	<5.1099	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-12 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	HHR-1 18-Sep-13	Duplicate 18-Sep-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.4772	<8.4772	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	<0.9835	<0.9835	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	0.5580	0.5640	1.1
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.2177	<1.2177	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.7882	<20.7882	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	<1.4945	<1.4945	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	2.95	3.10	5.0
C2-Fluorenes	AXYS	mg/L	3.1208	<3.1208	<3.1208	0.0
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.2543	<4.2543	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	<2.6336	<2.6336	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	<1.8484	<1.8484	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	1.18	1.32	11.2
C3-Fluorenes	AXYS	mg/L	3.8970	<3.8970	<3.8970	0.0
C3-Naphthalenes	AXYS	mg/L	3.1153	<3.1153	<3.1153	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	<1.5072	<1.5072	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	<2.5229	<2.5229	0.0
C4-Naphthalenes	AXYS	mg/L	5.0606	<5.0606	<5.0606	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	7.170	3.090	<b>79.5</b>
Chrysene	AXYS	mg/L	0.2952	<0.2952	<0.2952	0.0
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	0.497	<0.4971	0.0
Fluoranthene	AXYS	mg/L	0.7358	<0.7358	<0.7358	0.0
Fluorene	AXYS	mg/L	0.3371	<0.3371	0.337	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	0.3310	0.3140	5.3
Naphthalene	AXYS	mg/L	15.1623	<15.1623	<15.1623	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.6890	<1.6890	0.0
Pyrene	AXYS	mg/L	0.5274	<0.5274	<0.5274	0.0
Retene	AXYS	mg/L	0.6694	4.580	1.880	<b>83.6</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-13 Relative percent difference between duplicate water quality samples collected from Beaver River (BER-2), September 2013.**

Analyte	Laboratory	Unit	Detection Limit	BER-2 03-Sep-13	Duplicate 03-Sep-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	413	414	0.2
Dissolved Organic Carbon	ALS	mg/L	1	26	26	1.1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	136	135	0.7
pH	ALS	pH units	0.1	8	8	0.2
Total Alkalinity	ALS	mg/L	5	214	217	1.4
Total Dissolved Solids	ALS	mg/L	10	333	331	0.6
Total Organic Carbon	ALS	mg/L	5	27	27	0.4
Total Suspended Solids	ALS	mg/L	3	9	9	0.0
True Colour	ALS	T.C.U.	2	165	148	10.9
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	262	265	1.1
Calcium (Ca)	ALS	mg/L	0.5	34.2	34.2	0.0
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	1.66	1.64	1.2
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	12.20	12.10	0.8
Potassium (K)	ALS	mg/L	0.5	1.56	1.56	0.0
Sodium (Na)	ALS	mg/L	1	44.60	44.10	1.1
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	15.30	15.40	0.7
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0115	0.0120	4.3
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.105	0.108	2.8
Phosphorus, total	ALS	mg/L	0.001	0.171	0.169	1.2
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.95	0.88	7.7
Total Nitrogen	ALS	mg/L	-	1.021	0.951	7.1
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.32	0.25	<b>24.6</b>
Oilsands Acid Extractable	AITF	mg/L	0.1	0.27	0.27	0.0
Total Phenolics	ALS	mg/L	0.001	0.01	0.01	9.5
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-13 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	BER-2 03-Sep-13	Duplicate 03-Sep-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0313	0.0349	10.9
Antimony (Sb)	AITF	mg/L	0.00005	0.0000519	<0.00005	3.7
Arsenic (As)	AITF	mg/L	0.0001	0.00147	0.00151	2.7
Barium (Ba)	AITF	mg/L	0.0001	0.0373	0.0374	0.3
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.263	0.265	0.8
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	33.70	34.60	2.6
Chlorine (Cl)	AITF	mg/L	0.3	1.05	1.07	1.9
Chromium (Cr)	AITF	mg/L	0.0003	0.00080	0.00069	14.7
Cobalt (Co)	AITF	mg/L	0.0001	0.00017	0.00018	3.5
Copper (Cu)	AITF	mg/L	0.0001	0.00103	0.00096	7.5
Iron (Fe)	AITF	mg/L	0.004	1.70	1.76	3.5
Lead (Pb)	AITF	mg/L	0.0001	0.00018	0.00017	1.1
Lithium (Li)	AITF	mg/L	0.0002	0.0284	0.0287	1.1
Manganese (Mn)	AITF	mg/L	0.0001	0.01140	0.01380	19.0
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00051	0.00051	0.4
Nickel (Ni)	AITF	mg/L	0.0001	0.00146	0.00148	1.4
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.212	0.213	0.5
Sulphur (S)	AITF	mg/L	2	5.43	5.56	2.4
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00396	0.00431	8.5
Uranium (U)	AITF	mg/L	0.0001	0.00028	0.00027	0.7
Vanadium (V)	AITF	mg/L	0.0001	0.00113	0.00117	3.5
Zinc (Zn)	AITF	mg/L	0.0002	0.00092	0.00093	0.0
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.950	0.927	2.5
Antimony (Sb)	AITF	mg/L	0.00005	0.0000525	0.0000505	3.9
Arsenic (As)	AITF	mg/L	0.0001	0.0019	0.0019	1.0
Barium (Ba)	AITF	mg/L	0.0001	0.0462	0.0461	0.2
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-13 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	BER-2 03-Sep-13	Duplicate 03-Sep-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd).</b>						
Boron (B)	AITF	mg/L	0.0008	0.266	0.268	0.7
Cadmium (Cd)	AITF	mg/L	0.00001	0.00001	0.00001	9.2
Calcium (Ca)	AITF	mg/L	0.1	33.9	34.8	2.6
Chlorine (Cl)	AITF	mg/L	0.3	1.06	1.08	1.9
Chromium (Cr)	AITF	mg/L	0.0003	0.00104	0.00119	13.5
Cobalt (Co)	AITF	mg/L	0.0001	0.00036	0.00036	0.8
Copper (Cu)	AITF	mg/L	0.0001	0.00104	0.00107	2.8
Iron (Fe)	AITF	mg/L	0.004	2.89	2.88	0.3
Lead (Pb)	AITF	mg/L	0.0001	0.00042	0.00041	1.9
Lithium (Li)	AITF	mg/L	0.0002	0.02870	0.02900	1.0
Manganese (Mn)	AITF	mg/L	0.0001	0.06360	0.06340	0.3
Mercury (Hg)	AITF	mg/L	0.00005	0.00005	0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	2.8	2.9	3.5
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00052	0.00052	0.4
Nickel (Ni)	AITF	mg/L	0.0001	0.00175	0.00178	1.7
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	0.00004	0.00004	15.5
Strontium (Sr)	AITF	mg/L	0.0001	0.213	0.213	0.0
Sulphur (S)	AITF	mg/L	2	5.490	5.620	2.3
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	0.00016	0.00015	3.8
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0241	0.0167	<b>36.3</b>
Uranium (U)	AITF	mg/L	0.0001	0.00029	0.00029	0.3
Vanadium (V)	AITF	mg/L	0.0001	0.00280	0.00278	0.7
Zinc (Zn)	AITF	mg/L	0.0002	0.00246	0.00249	1.2
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	0.3696	0.615	<b>49.8</b>
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	<0.2801	0.0
Anthracene	AXYS	mg/L	0.1525	<0.1525	<0.1525	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	<0.1544	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	<0.2972	<0.2972	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	<0.1665	<0.1665	0.0
Biphenyl	AXYS	mg/L	0.9597	<0.9597	1.260	0.0
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	0.4110	<0.3240	0.0
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	<0.9115	1.450	0.0
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	<4.0686	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	<0.3095	0.423	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	<1.4140	<1.4140	0.0
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	<5.1099	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-13 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	BER-2 03-Sep-13	Duplicate 03-Sep-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.4772	<8.4772	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	<0.9835	1.150	15.6
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	0.416	<0.3707	11.5
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.2177	<1.2177	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.7882	<20.7882	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	<1.4945	<1.4945	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	<1.6084	<1.6084	0.0
C2-Fluorenes	AXYS	mg/L	3.1208	<3.1208	<3.1208	0.0
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.2543	<4.2543	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	<2.6336	<2.6336	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	<1.8484	<1.8484	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	<0.9160	<0.9160	0.0
C3-Fluorenes	AXYS	mg/L	3.8970	<3.8970	<3.8970	0.0
C3-Naphthalenes	AXYS	mg/L	3.1153	<3.1153	<3.1153	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	<1.5072	<1.5072	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	<2.5229	<2.5229	0.0
C4-Naphthalenes	AXYS	mg/L	5.0606	<5.0606	<5.0606	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	4.160	3.990	4.2
Chrysene	AXYS	mg/L	0.2952	<0.2952	<0.2952	0.0
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	0.520	<0.4971	4.5
Fluoranthene	AXYS	mg/L	0.7358	<0.7358	<0.7358	0.0
Fluorene	AXYS	mg/L	0.3371	<0.3371	0.544	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	<0.2865	<0.2865	0.0
Naphthalene	AXYS	mg/L	15.1623	<15.1623	<15.1623	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.6890	2.380	0.0
Pyrene	AXYS	mg/L	0.5274	<0.5274	<0.5274	0.0
Retene	AXYS	mg/L	0.6694	1.850	2.090	12.2

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-14 Relative percent difference between duplicate water quality samples collected from Poplar Creek (POC-1), October 2013.**

Analyte	Laboratory	Unit	Detection Limit	POC-1 15-Oct-13	Duplicate 15-Oct-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	412	341	18.9
Dissolved Organic Carbon	ALS	mg/L	1	30	30	0.3
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	129	130	0.8
pH	ALS	pH units	0.1	8	8	2.2
Total Alkalinity	ALS	mg/L	2	153	125	<b>20.1</b>
Total Dissolved Solids	ALS	mg/L	10	300	306	2.0
Total Organic Carbon	ALS	mg/L	1	30	30	0.0
Total Suspended Solids	ALS	mg/L	3	<3	<3	0.0
True Colour	ALS	T.C.U.	2	152	142	6.8
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	187	152	<b>20.6</b>
Calcium (Ca)	ALS	mg/L	0.5	31.9	32.1	0.6
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	28.60	28.40	0.7
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	12.10	12.10	0.0
Potassium (K)	ALS	mg/L	0.5	1.38	1.40	1.4
Sodium (Na)	ALS	mg/L	1	37.80	36.80	2.7
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	18.00	18.00	0.0
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0076	0.0053	<b>35.7</b>
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.015	0.015	2.6
Phosphorus, total	ALS	mg/L	0.001	0.021	0.023	9.2
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.73	0.75	2.7
Total Nitrogen	ALS	mg/L	-	0.801	0.821	2.5
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.52	0.30	<b>53.7</b>
Oilsands Acid Extractable	AITF	mg/L	0.1	1.26	0.31	<b>121.0</b>
Total Phenolics	ALS	mg/L	0.001	0.0046	0.0048	4.3
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-14 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 15-Oct-13	Duplicate 15-Oct-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0161	1.6000	<b>196.0</b>
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	1.20000	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00063	0.16000	<b>198.4</b>
Barium (Ba)	AITF	mg/L	0.0001	0.0302	0.0900	<b>99.5</b>
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.086	0.088	1.5
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	30.40	30.90	1.6
Chlorine (Cl)	AITF	mg/L	0.3	13.7	13.6	0.7
Chromium (Cr)	AITF	mg/L	0.0003	0.00066	0.00052	<b>23.7</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00022	0.00022	3.2
Copper (Cu)	AITF	mg/L	0.0001	0.00062	0.00057	9.4
Iron (Fe)	AITF	mg/L	0.004	0.75	0.75	0.3
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0156	0.0164	5.0
Manganese (Mn)	AITF	mg/L	0.0001	0.03600	0.03520	2.2
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00018	0.00017	8.0
Nickel (Ni)	AITF	mg/L	0.0001	0.00089	0.00076	16.4
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.210	0.209	0.5
Sulphur (S)	AITF	mg/L	2	6.05	5.94	1.8
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00241	0.00221	8.7
Uranium (U)	AITF	mg/L	0.0001	0.00011	0.00011	1.8
Vanadium (V)	AITF	mg/L	0.0001	0.00036	0.00037	2.8
Zinc (Zn)	AITF	mg/L	0.0002	0.00108	0.00076	<b>34.8</b>
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.170	0.160	6.1
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.0007	0.0007	2.9
Barium (Ba)	AITF	mg/L	0.0001	0.0320	0.0316	1.3
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-14 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 15-Oct-13	Duplicate 15-Oct-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd).</b>						
Boron (B)	AITF	mg/L	0.0008	0.088	0.089	1.0
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	30.5	31.0	1.6
Chlorine (Cl)	AITF	mg/L	0.3	13.90	13.80	0.7
Chromium (Cr)	AITF	mg/L	0.0003	0.00067	0.00053	<b>23.6</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00024	0.00024	2.9
Copper (Cu)	AITF	mg/L	0.0001	0.00063	0.00057	9.5
Iron (Fe)	AITF	mg/L	0.004	0.99	0.97	1.5
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.01570	0.01640	4.4
Manganese (Mn)	AITF	mg/L	0.0001	0.04960	0.05020	1.2
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	1.3	1.3	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00019	0.00018	9.2
Nickel (Ni)	AITF	mg/L	0.0001	0.00096	0.00090	7.1
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	0.0003	3.6
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.212	0.211	0.5
Sulphur (S)	AITF	mg/L	2	6	6	1.8
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0049	0.0037	<b>26.0</b>
Uranium (U)	AITF	mg/L	0.0001	0.0001	0.0001	14.9
Vanadium (V)	AITF	mg/L	0.0001	0.00067	0.00064	5.7
Zinc (Zn)	AITF	mg/L	0.0002	0.00126	0.00100	<b>23.2</b>
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	0.8120	0.7330	10.2
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	<0.2801	0.0
Anthracene	AXYS	mg/L	0.1525	<0.1525	<0.1525	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	<0.1544	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	<0.2972	<0.2972	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	0.2530	<0.1665	<b>41.2</b>
Biphenyl	AXYS	mg/L	0.9597	<0.9597	<0.9597	0.0
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	1.3000	1.1100	15.8
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	<0.9115	<0.9115	0.0
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	<4.0686	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	1.8900	1.9300	2.1
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	4.2300	4.2700	0.9
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	<5.1099	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-14 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 15-Oct-13	Duplicate 15-Oct-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.4772	<8.4772	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	1.7900	1.5300	15.7
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	1.6200	1.4000	14.6
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.2177	<1.2177	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.7882	<20.7882	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	7.3700	7.4400	0.9
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	5.1200	5.5100	7.3
C2-Fluorenes	AXYS	mg/L	3.1208	3.4100	3.4200	0.3
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.2543	<4.2543	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	3.2600	2.9800	9.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	9.6500	8.1600	16.7
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	3.4700	4.0600	15.7
C3-Fluorenes	AXYS	mg/L	3.8970	5.0600	5.3700	5.9
C3-Naphthalenes	AXYS	mg/L	3.1153	5.3500	3.6700	<b>37.3</b>
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	4.2200	3.1100	<b>30.3</b>
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	5.2800	4.7300	11.0
C4-Naphthalenes	AXYS	mg/L	5.0606	11.2000	6.8900	<b>47.7</b>
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	9.3300	9.8100	5.0
Chrysene	AXYS	mg/L	0.2952	0.7770	0.6180	<b>22.8</b>
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	<0.4971	<0.4971	0.0
Fluoranthene	AXYS	mg/L	0.7358	<0.7358	<0.7358	0.0
Fluorene	AXYS	mg/L	0.3371	<0.3371	<0.3371	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	<0.2865	<0.2865	0.0
Naphthalene	AXYS	mg/L	15.1623	<15.1623	<15.1623	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.6890	<1.6890	0.0
Pyrene	AXYS	mg/L	0.5274	0.8450	0.8240	2.5
Retene	AXYS	mg/L	0.6694	0.693	<0.6694	3.5

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-15 Relative percent difference between duplicate water quality samples collected from MacKay River (MAR-2), November 2013.**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 06-Nov-13	Duplicate 06-Nov-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	224	224	0.0
Dissolved Organic Carbon	ALS	mg/L	1	32	32	1.6
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	92	89	3.1
pH	ALS	pH units	0.1	8	8	0.3
Total Alkalinity	ALS	mg/L	2	102	102	0.0
Total Dissolved Solids	ALS	mg/L	10	194	200	3.0
Total Organic Carbon	ALS	mg/L	1	33	31	4.1
Total Suspended Solids	ALS	mg/L	3	<3	4	0.0
True Colour	ALS	T.C.U.	2	158	157	0.6
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	124	124	0.0
Calcium (Ca)	ALS	mg/L	0.5	23.8	23.2	2.6
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	0.71	0.73	2.8
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	7.82	7.49	4.3
Potassium (K)	ALS	mg/L	0.5	0.69	0.69	0.0
Sodium (Na)	ALS	mg/L	1	14.00	14.30	2.1
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	13.00	1.02	<b>170.9</b>
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.016	13.300	<b>199.5</b>
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.030	0.030	0.7
Phosphorus, total	ALS	mg/L	0.001	0.047	0.045	5.2
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.95	1.02	7.1
Total Nitrogen	ALS	mg/L	-	1.021	0.088	168.4
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.13	0.13	0.0
Oilsands Acid Extractable	AITF	mg/L	0.1	0.38	0.36	5.4
Total Phenolics	ALS	mg/L	0.001	0.0065	0.0051	<b>24.1</b>
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-15 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 06-Nov-13	Duplicate 06-Nov-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0312	0.0321	2.8
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00063	0.00063	0.5
Barium (Ba)	AITF	mg/L	0.0001	0.0178	0.0176	1.1
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.055	0.056	1.4
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	21.40	21.40	0.0
Chlorine (Cl)	AITF	mg/L	0.3	0.5	0.4	5.6
Chromium (Cr)	AITF	mg/L	0.0003	0.00062	0.00093	40.1
Cobalt (Co)	AITF	mg/L	0.0001	<0.00021	<0.00024	11.5
Copper (Cu)	AITF	mg/L	0.0001	0.00081	0.00094	15.1
Iron (Fe)	AITF	mg/L	0.004	0.72	0.71	1.1
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	0.00022	75.8
Lithium (Li)	AITF	mg/L	0.0002	0.0117	0.0119	1.7
Manganese (Mn)	AITF	mg/L	0.0001	0.04890	0.04910	0.4
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00023	0.00024	5.6
Nickel (Ni)	AITF	mg/L	0.0001	0.00093	0.00088	5.9
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.000010	<0.000010	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.124	0.124	0.0
Sulphur (S)	AITF	mg/L	2	3.59	3.50	2.5
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00317	0.00326	2.8
Uranium (U)	AITF	mg/L	0.0001	0.00012	0.00013	0.8
Vanadium (V)	AITF	mg/L	0.0001	0.00036	0.00037	1.7
Zinc (Zn)	AITF	mg/L	0.0002	0.00121	0.00145	0.0
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.076	0.378	133.3
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.0008	0.0008	0.3
Barium (Ba)	AITF	mg/L	0.0001	0.0200	0.0206	3.0
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.



**Table B.2-15 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 06-Nov-13	Duplicate 06-Nov-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.059	0.058	0.5
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	21.5	21.7	0.9
Chlorine (Cl)	AITF	mg/L	0.3	0.46	0.44	5.8
Chromium (Cr)	AITF	mg/L	0.0003	0.00063	0.00094	40.0
Cobalt (Co)	AITF	mg/L	0.0001	0.00027	0.00028	3.3
Copper (Cu)	AITF	mg/L	0.0001	0.00140	0.00095	38.0
Iron (Fe)	AITF	mg/L	0.004	1.08	1.13	4.5
Lead (Pb)	AITF	mg/L	0.0001	0.00022	0.00023	0.4
Lithium (Li)	AITF	mg/L	0.0002	0.01180	0.01200	1.7
Manganese (Mn)	AITF	mg/L	0.0001	0.06880	0.06680	2.9
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	1.4	1.5	6.9
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00023	0.00025	7.6
Nickel (Ni)	AITF	mg/L	0.0001	0.00095	0.00097	1.9
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.125	0.125	0.0
Sulphur (S)	AITF	mg/L	2	4	4	2.5
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0034	0.0060	55.5
Uranium (U)	AITF	mg/L	0.0001	0.00013	0.00013	3.8
Vanadium (V)	AITF	mg/L	0.0001	0.00052	0.00084	46.6
Zinc (Zn)	AITF	mg/L	0.0002	0.00244	0.00209	15.5
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	<0.3696	<0.3696	0.0
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	0.2801	0.0
Anthracene	AXYS	mg/L	0.1525	<0.1525	<0.1525	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	<0.1544	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	<0.2972	<0.2972	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	<0.1665	<0.1665	0.0
Biphenyl	AXYS	mg/L	0.9597	<0.9597	<0.9597	0.0
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	0.446	0.552	21.2
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	<0.9115	<0.9115	0.0
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	<4.0686	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	<0.3095	<0.3095	0.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	<1.4140	1.690	0.0
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	<5.1099	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-15 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	MAR-2 06-Nov-13	Duplicate 06-Nov-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.4772	<8.4772	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	<0.9835	<0.9835	0.0
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	0.484	0.669	<b>32.1</b>
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.2177	<1.2177	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.7882	<20.7882	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	<1.4945	<1.4945	0.0
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	1.830	2.070	12.3
C2-Fluorenes	AXYS	mg/L	3.1208	<3.1208	<3.1208	0.0
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.2543	<4.2543	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	<2.6336	<2.6336	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	<1.8484	<1.8484	0.0
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	<0.9160	1.230	<b>29.3</b>
C3-Fluorenes	AXYS	mg/L	3.8970	<3.8970	<3.8970	0.0
C3-Naphthalenes	AXYS	mg/L	3.1153	<3.1153	<3.1153	0.0
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	<1.5072	<1.5072	0.0
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	<2.5229	<2.5229	0.0
C4-Naphthalenes	AXYS	mg/L	5.0606	<5.0606	<5.0606	0.0
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	4.870	6.220	<b>24.3</b>
Chrysene	AXYS	mg/L	0.2952	0.297	<0.2952	0.6
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	<0.4971	<0.4971	0.0
Fluoranthene	AXYS	mg/L	0.7358	<0.7358	<0.7358	0.0
Fluorene	AXYS	mg/L	0.3371	<0.3371	<0.3371	0.0
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	<0.2865	<0.2865	0.0
Naphthalene	AXYS	mg/L	15.1623	<15.1623	<15.1623	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.6890	<1.6890	0.0
Pyrene	AXYS	mg/L	0.5274	<0.5274	<0.5274	0.0
Retene	AXYS	mg/L	0.6694	2.850	3.750	<b>27.3</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-16 Relative percent difference between duplicate water quality samples collected from Poplar Creek (POC-1), December 2013.**

Analyte	Laboratory	Unit	Detection Limit	POC-1 03-Dec-13	Duplicate 03-Dec-13	Relative Percent Difference (%)
<b>Conventional Variables</b>						
Conductivity	ALS	µS/cm	0.2	899	904	0.6
Dissolved Organic Carbon	ALS	mg/L	1	25	26	6.3
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	207	209	1.0
pH	ALS	pH units	0.1	8	8	0.5
Total Alkalinity	ALS	mg/L	2	246	243	1.2
Total Dissolved Solids	ALS	mg/L	10	546	546	0.0
Total Organic Carbon	ALS	mg/L	1	24	25	2.4
Total Suspended Solids	ALS	mg/L	3	<3	<3	0.0
True Colour	ALS	T.C.U.	2	119	119	0.0
<b>Major Ions</b>						
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	300	296	1.3
Calcium (Ca)	ALS	mg/L	0.5	49.8	50.5	1.4
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	0.0
Chloride (Cl)	ALS	mg/L	0.5	127.00	127.00	0.0
Hydroxide (OH)	ALS	mg/L	5	<5	<5	0.0
Magnesium (Mg)	ALS	mg/L	0.1	20.1	20.1	0.0
Potassium (K)	ALS	mg/L	0.5	1.72	1.68	2.4
Sodium (Na)	ALS	mg/L	1	111.0	111.0	0.0
Sulphate (SO <sub>4</sub> )	ALS	mg/L	0.5	30.4	30.5	0.3
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	0.0027	<0.002	<b>29.8</b>
<b>Nutrients and BOD</b>						
Ammonia-N	ALS	mg/L	0.05	0.162	0.149	8.4
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	ALS	mg/L	0.001	0.026	0.025	3.9
Phosphorus, total	ALS	mg/L	0.001	0.036	0.036	0.8
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	0.98	0.84	15.4
Total Nitrogen	ALS	mg/L	-	1.051	0.911	14.3
<b>Hydrocarbons</b>						
Naphthenic Acids	AITF	mg/L	0.02	0.09	0.63	<b>150.0</b>
Oilsands Acid Extractable	AITF	mg/L	0.1	0.46	0.70	<b>41.4</b>
Total Phenolics	ALS	mg/L	0.001	0.0032	0.0032	0.0
<b>Hydrocarbons and Organic Compounds</b>						
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-16 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 03-Dec-13	Duplicate 03-Dec-13	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (Cont'd.)</b>						
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>						
Aluminum (Al)	AITF	mg/L	0.001	0.0144	0.0143	0.7
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.00066	0.00064	4.2
Barium (Ba)	AITF	mg/L	0.0001	0.0632	0.0631	0.2
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	AITF	mg/L	0.0008	0.113	0.114	0.9
Cadmium (Cd)	AITF	mg/L	0.00001	0.000010	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	44.20	45.00	1.8
Chlorine (Cl)	AITF	mg/L	0.3	111.0	109.0	1.8
Chromium (Cr)	AITF	mg/L	0.0003	0.00052	0.00037	<b>32.4</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00045	0.00044	3.6
Copper (Cu)	AITF	mg/L	0.0001	0.00084	0.00074	12.0
Iron (Fe)	AITF	mg/L	0.004	1.52	1.52	0.0
Lead (Pb)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Lithium (Li)	AITF	mg/L	0.0002	0.0293	0.0300	2.4
Manganese (Mn)	AITF	mg/L	0.0001	0.18000	0.17900	0.6
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00017	0.00016	5.9
Nickel (Ni)	AITF	mg/L	0.0001	0.00143	0.00132	8.0
Selenium (Se)	AITF	mg/L	0.0003	0.00044	0.00044	0.5
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.367	0.359	2.2
Sulphur (S)	AITF	mg/L	2	9.66	9.34	3.4
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.00292	0.00291	0.3
Uranium (U)	AITF	mg/L	0.0001	0.00024	0.00024	0.8
Vanadium (V)	AITF	mg/L	0.0001	0.00041	0.00035	14.7
Zinc (Zn)	AITF	mg/L	0.0002	0.00193	0.00125	<b>42.8</b>
<b>Total Metals</b>						
Aluminum (Al)	AITF	mg/L	0.003	0.144	0.195	<b>30.1</b>
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	AITF	mg/L	0.0001	0.0008	0.0008	1.5
Barium (Ba)	AITF	mg/L	0.0001	0.0660	0.0651	1.4
Beryllium (Be)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-16 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 03-Dec-13	Duplicate 03-Dec-13	Relative Percent Difference (%)
<b>Total Metals (Cont'd.)</b>						
Bismuth (Bi)	AITF	mg/L	0.0001	<0.00010	<0.00010	0.0
Boron (B)	AITF	mg/L	0.0008	0.113	0.115	1.8
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	AITF	mg/L	0.1	44.4	45.1	1.6
Chlorine (Cl)	AITF	mg/L	0.3	111.00	110.00	0.9
Chromium (Cr)	AITF	mg/L	0.0003	0.00052	0.00038	<b>32.2</b>
Cobalt (Co)	AITF	mg/L	0.0001	0.00047	0.00044	6.8
Copper (Cu)	AITF	mg/L	0.0001	0.00085	0.00075	12.0
Iron (Fe)	AITF	mg/L	0.004	1.98	1.91	3.6
Lead (Pb)	AITF	mg/L	0.0001	0.00011	0.00011	5.5
Lithium (Li)	AITF	mg/L	0.0002	0.02970	0.03040	2.3
Manganese (Mn)	AITF	mg/L	0.0001	0.24500	0.18100	<b>30.0</b>
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	1.3	0.9	<b>31.2</b>
Molybdenum (Mo)	AITF	mg/L	0.0001	0.00024	0.00017	<b>32.2</b>
Nickel (Ni)	AITF	mg/L	0.0001	0.00172	0.00134	<b>24.8</b>
Selenium (Se)	AITF	mg/L	0.0003	0.00071	0.00065	9.4
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	AITF	mg/L	0.0001	0.368	0.363	1.4
Sulphur (S)	AITF	mg/L	2	10	9	4.6
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	AITF	mg/L	0.0001	0.0044	0.0053	18.0
Uranium (U)	AITF	mg/L	0.0001	0.00024	0.00024	1.2
Vanadium (V)	AITF	mg/L	0.0001	0.00061	0.00064	5.9
Zinc (Zn)	AITF	mg/L	0.0002	0.00207	0.00127	<b>47.9</b>
<b>PAHs</b>						
Acenaphthene	AXYS	mg/L	0.3696	1.550	1.940	<b>22.3</b>
Acenaphthylene	AXYS	mg/L	0.2801	<0.2801	1.180	0.0
Anthracene	AXYS	mg/L	0.1525	<0.1660	0.7360	0.0
Benz[a]anthracene	AXYS	mg/L	0.1544	<0.1544	0.2170	0.0
Benzo[a]pyrene	AXYS	mg/L	0.2511	<0.2511	<0.2511	0.0
Benzo[b,j,k]fluoranthene	AXYS	mg/L	0.2972	<0.2972	0.3610	0.0
Benzo[g,h,i]perylene	AXYS	mg/L	0.1665	<0.1665	0.2250	0.0
Biphenyl	AXYS	mg/L	0.9597	1.130	2.830	<b>85.9</b>
C1-Acenaphthenes	AXYS	mg/L	0.6689	<0.6689	<0.6689	0.0
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3240	0.6730	3.920	<b>141.4</b>
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	0.9115	<0.9115	2.350	0.0
C1-Biphenyls	AXYS	mg/L	4.0686	<4.0686	4.710	0.0
C1-Dibenzothiophenes	AXYS	mg/L	0.3095	1.600	2.990	<b>60.6</b>
C1-Fluoranthenes/Pyrenes	AXYS	mg/L	1.4140	2.830	4.200	<b>39.0</b>
C1-Fluorenes	AXYS	mg/L	5.1099	<5.1099	7.370	0.0

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

#	Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.
#	Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

**Table B.2-16 (Cont'd.)**

Analyte	Laboratory	Unit	Detection Limit	POC-1 03-Dec-13	Duplicate 03-Dec-13	Relative Percent Difference (%)
<b>PAHs (Cont'd)</b>						
C1-Naphthalenes	AXYS	mg/L	8.4772	<8.477	14.90	0.0
C1-Phenanthrenes/Anthracenes	AXYS	mg/L	0.9835	1.630	5.940	<b>113.9</b>
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/L	0.3707	0.7190	6.010	<b>157.3</b>
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/L	1.2177	<1.218	1.440	0.0
C2-Biphenyls	AXYS	mg/L	20.7882	<20.79	<20.79	0.0
C2-Dibenzothiophenes	AXYS	mg/L	1.4945	6.430	5.010	<b>24.8</b>
C2-Fluoranthenes/Pyrenes	AXYS	mg/L	1.6084	3.250	8.250	<b>87.0</b>
C2-Fluorenes	AXYS	mg/L	3.1208	3.320	6.720	<b>67.7</b>
C2-Naphthalenes	AXYS	mg/L	4.2543	<4.254	12.10	0.0
C2-Phenanthrenes/Anthracenes	AXYS	mg/L	2.6336	<2.634	4.420	0.0
C3-Dibenzothiophenes	AXYS	mg/L	1.8484	8.550	4.560	<b>60.9</b>
C3-Fluoranthenes/Pyrenes	AXYS	mg/L	0.9160	1.570	5.320	<b>108.9</b>
C3-Fluorenes	AXYS	mg/L	3.8970	4.85	13.70	<b>95.4</b>
C3-Naphthalenes	AXYS	mg/L	3.1153	4.02	9.130	<b>77.7</b>
C3-Phenanthrenes/Anthracenes	AXYS	mg/L	1.5072	2.340	3.270	<b>33.2</b>
C4-Dibenzothiophenes	AXYS	mg/L	2.5229	5.650	3.470	<b>47.8</b>
C4-Naphthalenes	AXYS	mg/L	5.0606	7.160	10.30	<b>36.0</b>
C4-Phenanthrenes/Anthracenes	AXYS	mg/L	2.9292	6.000	10.90	<b>58.0</b>
Chrysene	AXYS	mg/L	0.2952	0.6020	1.160	<b>63.3</b>
Dibenz[a,h]anthracene	AXYS	mg/L	0.7801	<0.7801	<0.7801	0.0
Dibenzothiophene	AXYS	mg/L	0.4971	<0.497	1.540	0.0
Fluoranthene	AXYS	mg/L	0.7358	<0.736	1.090	0.0
Fluorene	AXYS	mg/L	0.3371	0.410	2.700	<b>147.3</b>
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/L	0.2865	<0.2865	<0.2865	0.0
Naphthalene	AXYS	mg/L	15.1623	<15.162	24.60	0.0
Phenanthrene	AXYS	mg/L	1.6890	<1.689	10.80	0.0
Pyrene	AXYS	mg/L	0.5274	0.782	1.330	<b>51.9</b>
Retene	AXYS	mg/L	0.6694	0.787	0.828	5.1

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicates but 1 or both concentrations are < 5 times the detection limit.

# Analytes differ by > 20% between duplicates and concentrations are > 5 times the detection limit.

## B.2.3 Benthic Invertebrate Communities Component

### B.2.3.1 Quality Control Activities – Field

Field methods used for benthic invertebrate collection are considered to follow accepted methods for environmental effects monitoring (Anderson 1990, Environment Canada 2012). Instruments used for measuring supporting variables (e.g., temperature, dissolved oxygen, conductivity, pH, water velocity, and depth) were calibrated according to manufacturer instructions (generally daily for water quality meters).

### B.2.3.2 Quality Control Activities – Laboratory

Taxonomic samples were sorted and identified by Dr. Jack Zloty of Summerland, BC, who has analyzed benthic invertebrate samples on behalf of RAMP consistently since the program began. Laboratory methods used by Dr. Zloty in 2013 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2013, a total of 20 samples were re-sorted. Sorted portions were verified by an independent analyst. As a result of large volumes of organic material and low abundance in some samples collected from depositional reaches, a minimum removal efficiency of 90% was considered acceptable (as for previous RAMP studies). This objective is considered acceptable by Environment Canada under current Environmental Effects Monitoring (EEM) strategies (Environment Canada 2012).

Data were received in electronic format (Microsoft Excel®) from the taxonomist. All data were checked upon data entry for transcription errors or other inconsistencies. Data analysis was conducted iteratively, using duplicate data files for processing. Original data were retained in back-up files for the project. Printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed.

### B.2.3.3 Quality Control Activities – Results

Results for quality control samples (5% re-sorts) from the 2013 RAMP benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-17).

Invertebrate sorting efficiency was always greater than 96.8%, with a mean of 98.3%. Based on the criterion of 90% sorting efficiency, these results were considered acceptable and additional QC activities were not required.

$$\text{sorting efficiency} = \left(1 - \frac{A}{A + B}\right) * 100$$

Where,

A is the number of animals found in the re-sorted sample; and

B is the number of animals found in the original sorting of that sample.

**Table B.2-17 Results of quality control checks on sorting efficiency of benthic invertebrate samples, 2013.**

Sample Number	% Sorting efficiency
BPC-1 #5	$[1-(0/(11+0))] * 100 = 100$
SHL-1 #4	$[1-(4/(305+4))] * 100 = 98.7$
KEL-1 #2	$[1-(3/(249+3))] * 100 = 98.8$
JOL-1 #7	$[1-(4/(143+4))] * 100 = 97.3$
BIC-D1 #5	$[1-(0/(18+0))] * 100 = 100$
PIR-E1 #7	$[1-(5/(164+5))] * 100 = 97.0$
CHR-D4 #6	$[1-(6/(392+6))] * 100 = 98.5$
BRC-D1 #4	$[1-(1/(69+1))] * 100 = 98.6$
UNC-D3 #7	$[1-(12/(406+12))] * 100 = 97.1$
SUC-D2 #8	$[1-(7/(244+7))] * 100 = 97.2$
BER-D2 #2	$[1-(0/(5+0))] * 100 = 100$
FIR-D1 #10	$[1-(4/(321+4))] * 100 = 98.7$
MUR-D2 #6	$[1-(12/(948+12))] * 100 = 98.8$
JAC-D1 #7	$[1-(2/(133+2))] * 100 = 98.5$
ELR-D1 #1	$[1-(2/(66+2))] * 100 = 97.1$
MAR-E2 #4	$[1-(13/(489+13))] * 100 = 97.4$
POC-D1 #6	$[1-(1/(92+1))] * 100 = 98.9$
FOC-D1 #5	$[1-(4/(213+4))] * 100 = 98.2$
TAR-E2 #3	$[1-(24/(716+24))] * 100 = 96.8$
SAC-D1 #5	$[1-(16/(856+16))] * 100 = 98.2$

Note: Mean efficiency – 98.3%; 20 samples - ~5% of all samples.

## B.2.4 Sediment Quality Component

The 2013 RAMP sediment quality QA/QC program was conducted to assess potential sample contamination during collection and analysis, the precision and accuracy of the chemical and toxicological analyses, and environmental heterogeneity.

### B.2.4.1 Methods

The following field procedures were used to prevent sample contamination:

- Sampling equipment was washed with Liquinox metals-free soap and rinsed with ambient site water, rinsed with hexane and then acetone, and triple-rinsed with ambient water prior to sample collection at a given station;
- Sample grabs were kept only if they contained no large foreign objects, obtained adequate sediment penetration depth, and were not overfilled or leaking; and
- Technicians wore powder-free latex gloves during equipment washing and sampling.



Split samples (in which a single, large sample was subsampled) and duplicate samples (in which two unique samples were taken from the same location) were collected from the Beaver River (station BER-D2) and Eymundson Creek (station EYC-D1).

Duplicate samples were taken to assess environmental heterogeneity. The relative percent difference (RPD, difference between data values/mean of data values, multiplied by 100%) in the results obtained for the split and duplicate samples was calculated. Analytes for which the relative percent difference between the duplicate/split sample and the station sample exceeded 20% (with concentrations greater than five times the detection limit in both samples) were considered to exhibit potentially unacceptable levels of imprecision.

In addition, two sampling-equipment rinsate blanks were collected in fall 2013. Sampling equipment (i.e., Ekman dredge, stainless-steel tray, and spoons) was washed with Liquinox soap, ambient water, hexane, acetone, and deionized water, as per the standard operating procedure at sampling locations. Rinsate samples were collected by washing down the dredge with deionized water, which was collected into the tray (containing spoons) and decanted into a sample analysis bottle. PAHs were analyzed in this rinsate (at ng/L) by AXYS Analytical Services (the same laboratory that analyzed PAHs in sediments); metals were analyzed in the rinsate (at mg/L) by AITF in Edmonton, AB. Concentrations of metals in sediments were compared against five times their analytical detection limit and PAHs were assessed against five times the laboratory blank concentration, to assess potential sample contamination related to equipment.

#### **B.2.4.2 Results and Discussion**

##### ***Duplicate Samples***

Concentrations of some metals and many PAHs differed by greater than 20% between the duplicate samples collected at stations BER-D2 and EYC-D1 (Table B.2-18 and Table B.2-19). These results suggested high within-location variability in concentrations of metals and PAHs, which has been observed historically in both laboratory-generated and field-collected duplicates. Concentrations of CCME hydrocarbon fractions and organic compounds were generally similar between duplicate samples collected at station BER-D2 (Table B.2-9). Several of these analytes showed greater than 20% variability between the samples collected at station EYC-D1 and were reported over the detection limits (Table B.2-10); the variability can be related to uneven distribution of hydrocarbons in sediments.

##### ***Split Samples***

Several variables in the split samples at stations BER-D2 and EYC-D1 differed by greater than 20% from the sample (Table B.2-9 and Table B.2-10); there was more variation in split samples analyzed for PAHs than for samples analyzed for metals. These results were consistent with split-sample analyses undertaken in previous years of RAMP, suggesting that although concentrations of metals are generally consistent within the sediment matrix in a given sample, PAHs were unevenly distributed in sediments, or within a single sample. As addressed above, concentrations of several CCME hydrocarbon fractions and organic compounds showed greater than 20% variability in the samples collected at station EYC-D1; however, this was again due to uneven distribution of hydrocarbons in sediments. The RPD showed no variance in concentrations of CCME hydrocarbons between the sample collected at station BER-D2 and the split sample (Table B.2-9).

### ***Rinsate Samples***

Several total and dissolved metals were detected at concentrations higher than five times the analytical detection limit in the rinsate samples collected in fall 2013 (Table B.2-20 and Table B.2-21). The PAHs results from the second rinsate sample (RIN-2) were all reported at less than five times the detection limits. The majority of PAHs from the first rinsate sample (RIN-1); however, measured greater than five times the detection limit for the majority of PAHs. Many of the PAHs were lighter, more soluble species. High PAH results were consistent with rinsate samples from previous years.

### **B.2.4.3 Conclusions and Recommendations**

Results of QA/QC samples collected for sediments by the RAMP program in 2013 were consistent with those collected in previous years of the RAMP. These samples generally indicated high variability of PAHs in sediments within a sampling location and that spatial variation can occur on a scale smaller than the Ekman dredge. Concentrations of metals were generally more consistent within samples and within locations, although some variability between samples from a given station occurred.

Some PAHs were present at low concentrations in rinsate blanks, which may suggest insufficient rinsing of sampling equipment with deionized water to remove all traces of ambient waters prior to decanting of deionized water for rinsate analysis, and/or insufficient scrubbing or solvent use in advance of sampling to remove all attached particulates from sampler/tray surfaces. Concentrations were generally very low relative to concentrations measured in sediment (e.g., for PAHs, parts per trillion in rinsate versus parts per million in sediment); therefore, these concentrations in a rinsate would not likely substantially affect measured concentrations in sediment. However, clean technique remains critical in sampling of sediments, particularly for strongly hydrophobic variables like many PAHs.

**Table B.2-18 Relative percent difference between duplicate and split sediment quality samples, upper Beaver River (BER-D2), September 2013.**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from BER-D2	
					Station	Split	Duplicate	Split	Duplicate
					BER-D2	SES-1	SED-1	SES-1	SED-1
<b>Organic Compounds</b>	Benzene	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	0.0	0.0
	CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<10	<10	0.0	0.0
	CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<10	<10	0.0	0.0
	CCME Fraction 2 (C10-C16)	ALS	mg/kg	20	<20	<20	<20	0.0	0.0
	CCME Fraction 3 (C16-C34)	ALS	mg/kg	20	<20	<20	<20	0.0	0.0
	CCME Fraction 4 (C34-C50)	ALS	mg/kg	20	<20	<20	<20	0.0	0.0
	Total Hydrocarbons (C6-C50)	ALS	mg/kg	20	<20	<20	<20	0.0	0.0
	Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.015	<0.015	0.0	0.0
	m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	o-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Toluene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Xylenes	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
<b>PAHs</b>	Acenaphthene	AXYS	mg/kg	-	0.000104	0.000065	0.000086	<b>46.2</b>	18.9
	Acenaphthylene	AXYS	mg/kg	-	<0.000083	<0.000057	<0.000090	<b>37.1</b>	8.1
	Anthracene	AXYS	mg/kg	-	<0.000031	<0.000042	<0.000037	<b>30.1</b>	17.6
	Benz[a]anthracene	AXYS	mg/kg	-	0.000055	<0.000048	0.000056	13.6	1.8
	Benzo[a]pyrene	AXYS	mg/kg	-	0.000183	0.000081	0.000114	<b>77.3</b>	<b>46.5</b>
	Benzo[b,j,k]fluoranthene	AXYS	mg/kg	-	0.000505	0.000366	0.000272	<b>31.9</b>	<b>60.0</b>
	Benzo[g,h,i]perylene	AXYS	mg/kg	-	0.000541	0.000301	0.000362	<b>57.0</b>	<b>39.6</b>
	Biphenyl	AXYS	mg/kg	-	0.00028	0.000161	0.000326	<b>54.0</b>	15.2
	C1-Acenaphthenes	AXYS	mg/kg	-	<0.000135	<0.000068	<0.000130	<b>66.0</b>	3.8
	C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.000415	0.000427	0.000418	2.9	0.7
	C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.0012	0.000688	0.000644	<b>54.2</b>	<b>60.3</b>
	C1-Biphenyls	AXYS	mg/kg	-	0.000626	0.000438	0.000395	<b>35.3</b>	<b>45.2</b>
	C1-Dibenzothiophenes	AXYS	mg/kg	-	0.000161	0.000045	0.000289	<b>112.6</b>	<b>56.9</b>
	C1-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.00107	0.00118	0.00103	9.8	3.8

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.

**Table B.2-18 (Cont'd.)**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from BER-D2	
					Station	Split	Duplicate	Split	Duplicate
					BER-D2	SES-1	SED-1	SES-1	SED-1
PAHs (Cont'd.)	C1-Fluorenes	AXYS	mg/kg	-	0.000145	0.000258	0.000185	<b>56.1</b>	<b>24.2</b>
	C1-Naphthalenes	AXYS	mg/kg	-	0.000593	0.000249	0.000546	<b>81.7</b>	8.3
	C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.000165	0.000138	0.000221	17.8	<b>29.0</b>
	C2-Benzof[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.000404	0.000482	0.000457	17.6	12.3
	C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.000765	0.000366	0.000469	<b>70.6</b>	<b>48.0</b>
	C2-Biphenyls	AXYS	mg/kg	-	0.00265	0.00191	0.00253	<b>32.5</b>	4.6
	C2-Dibenzothiophenes	AXYS	mg/kg	-	0.000592	0.000587	0.000719	0.8	19.4
	C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.00141	0.00129	0.0015	8.9	6.2
	C2-Fluorenes	AXYS	mg/kg	-	0.000354	0.000427	0.000244	18.7	<b>36.8</b>
	C2-Naphthalenes	AXYS	mg/kg	-	0.00279	0.00261	0.0022	6.7	<b>23.6</b>
	C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.000738	0.000497	0.000522	<b>39.0</b>	<b>34.3</b>
	C3-Dibenzothiophenes	AXYS	mg/kg	-	0.000877	0.000724	0.000853	19.1	2.8
	C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.00109	0.000867	0.000587	<b>22.8</b>	<b>60.0</b>
	C3-Fluorenes	AXYS	mg/kg	-	0.000975	0.000765	0.000666	<b>24.1</b>	<b>37.7</b>
	C3-Naphthalenes	AXYS	mg/kg	-	0.000889	0.000884	0.00116	0.6	<b>26.5</b>
	C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.000539	0.000333	0.000506	<b>47.2</b>	6.3
	C4-Dibenzothiophenes	AXYS	mg/kg	-	0.000876	0.000741	0.000955	16.7	8.6
	C4-Naphthalenes	AXYS	mg/kg	-	0.00186	0.000618	0.000825	<b>100.2</b>	<b>77.1</b>
	C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.00314	0.0033	0.00627	5.0	<b>66.5</b>
	Chrysene	AXYS	mg/kg	-	0.000118	0.000114	0.000138	3.4	15.6
	Dibenz[a,h]anthracene	AXYS	mg/kg	-	0.000175	<0.000081	<0.000088	<b>73.4</b>	<b>66.2</b>
	Dibenzothiophene	AXYS	mg/kg	-	0.000136	0.000163	0.000167	18.1	<b>20.5</b>
	Fluoranthene	AXYS	mg/kg	-	0.000116	0.000115	0.000122	0.9	5.0
	Fluorene	AXYS	mg/kg	-	<0.000055	<0.000052	<0.000043	5.6	<b>24.5</b>
	Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	0.000384	0.000294	0.000341	<b>26.5</b>	11.9
	Naphthalene	AXYS	mg/kg	-	0.00102	0.000585	0.000847	<b>54.2</b>	18.5
	Phenanthrene	AXYS	mg/kg	-	0.000267	0.000167	0.000239	<b>46.1</b>	11.1
Pyrene	AXYS	mg/kg	-	0.000126	0.000109	0.000152	14.5	18.7	
Retene	AXYS	mg/kg	-	0.00148	0.00158	0.00452	6.5	<b>101.3</b>	

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.

**Table B.2-18 (Cont'd.)**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from BER-D2	
					Station	Split	Duplicate	Split	Duplicate
					BER-D2	SES-1	SED-1	SES-1	SED-1
<b>Total Metals</b>	Total Aluminum (Al)	AITF	mg/kg	50	2470	2510	2420	1.6	2.0
	Total Antimony (Sb)	AITF	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
	Total Arsenic (As)	AITF	mg/kg	0.1	2.83	2.98	3.17	5.2	11.3
	Total Barium (Ba)	AITF	mg/kg	0.5	32.1	33.7	33.5	4.9	4.3
	Total Beryllium (Be)	AITF	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Bismuth (Bi)	AITF	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Cadmium (Cd)	AITF	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
	Total Calcium (Ca)	AITF	mg/kg	100	900	910	980	1.1	8.5
	Total Chromium (Cr)	AITF	mg/kg	0.5	5.41	5.5	5.21	1.6	3.8
	Total Cobalt (Co)	AITF	mg/kg	0.1	2.48	2.45	2.5	1.2	0.8
	Total Copper (Cu)	AITF	mg/kg	0.5	1.26	1.37	1.17	8.4	7.4
	Total Iron (Fe)	AITF	mg/kg	50	7180	7250	7350	1.0	2.3
	Total Lead (Pb)	AITF	mg/kg	0.5	2.07	2.13	2.19	2.9	5.6
	Total Lithium (Li)	AITF	mg/kg	0.5	2.93	2.98	2.86	1.7	2.4
	Total Magnesium (Mg)	AITF	mg/kg	20	1090	1100	1060	0.9	2.8
	Total Manganese (Mn)	AITF	mg/kg	1	58.3	57.7	64	1.0	9.3
	Total Mercury (Hg)	AITF	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Molybdenum (Mo)	AITF	mg/kg	0.1	<0.10	<0.10	0.15	0.0	<b>40.0</b>
	Total Nickel (Ni)	AITF	mg/kg	0.5	3.88	3.84	3.9	1.0	0.5
	Total Phosphorus (P)	AITF	mg/kg	50	255	254	262	0.4	2.7
	Total Potassium (K)	AITF	mg/kg	50	290	307	299	5.7	3.1
	Total Selenium (Se)	AITF	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Silver (Ag)	AITF	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Sodium (Na)	AITF	mg/kg	100	<100	<100	<100	0.0	0.0
	Total Strontium (Sr)	AITF	mg/kg	1	9.7	10.2	10.5	5.0	7.9
	Total Thallium (Tl)	AITF	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Tin (Sn)	AITF	mg/kg	2	<2	<2	<2	0.0	0.0
Total Titanium (Ti)	AITF	mg/kg	1	91.1	78.7	66.5	14.6	<b>31.2</b>	
Total Uranium (U)	AITF	mg/kg	0.05	0.198	0.182	0.235	8.4	17.1	
Total Vanadium (V)	AITF	mg/kg	0.2	10.7	10.6	10.2	0.9	4.8	
Total Zinc (Zn)	AITF	mg/kg	5	20.7	21.6	23.1	4.3	11.0	

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.

**Table B.2-19 Relative percent difference between duplicate and split sediment quality samples, Eymundson Creek (EYC-D1), September 2013.**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from EYC-D1	
					Station	Split	Duplicate	Split	Duplicate
					EYC-D1	SES-2	SED-2	SES-2	SED-2
<b>Organic Compounds<sup>2</sup></b>	Benzene	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	0.0	0.0
	CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<10	<10	0.0	0.0
	CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<10	<10	0.0	0.0
	CCME Fraction 2 (C10-C16)	ALS	mg/kg	20	25	<20	<20	<b>22.2</b>	<b>22.2</b>
	CCME Fraction 3 (C16-C34)	ALS	mg/kg	20	161	78	100	<b>69.5</b>	<b>46.7</b>
	CCME Fraction 4 (C34-C50)	ALS	mg/kg	20	97	33	51	<b>98.5</b>	<b>62.2</b>
	Total Hydrocarbons (C6-C50)	ALS	mg/kg	20	283	111	151	<b>87.3</b>	<b>60.8</b>
	Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.015	<0.015	0.0	0.0
	m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	o-Xylene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Toluene	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Xylenes	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
	<b>PAHs</b>	% Moisture_PAH sample	AXYS	mg/kg	-	26.3	29.9	30	12.8
Acenaphthene		AXYS	mg/kg	-	0.00357	0.00351	0.00395	1.7	10.1
Acenaphthylene		AXYS	mg/kg	-	<0.00019	<0.000083	<0.000171	<b>78.4</b>	10.5
Anthracene		AXYS	mg/kg	-	0.00063	0.000303	0.000392	<b>70.1</b>	<b>46.6</b>
Benz[a]anthracene		AXYS	mg/kg	-	0.00336	0.00309	0.00372	8.4	10.2
Benzo[a]pyrene		AXYS	mg/kg	-	0.0052	0.00467	0.0052	10.7	0.0
Benzo[b,j,k]fluoranthene		AXYS	mg/kg	-	0.0113	0.0179	0.0172	<b>45.2</b>	<b>41.4</b>
Benzo[g,h,i]perylene		AXYS	mg/kg	-	0.0124	0.013	0.0124	4.7	0.0
Biphenyl		AXYS	mg/kg	-	0.000574	0.000657	0.000751	13.5	<b>26.7</b>
C1-Acenaphthenes		AXYS	mg/kg	-	0.00113	0.000718	0.000836	<b>44.6</b>	<b>29.9</b>
C1-Benzo[a]anthracenes/Chrysenes		AXYS	mg/kg	-	0.0709	0.0446	0.0475	<b>45.5</b>	<b>39.5</b>
C1-Benzofluoranthenes/Benzopyrenes		AXYS	mg/kg	-	0.0757	0.0631	0.073	18.2	3.6
C1-Biphenyls		AXYS	mg/kg	-	0.000891	0.0006	0.000894	<b>39.0</b>	0.3
C1-Dibenzothiophenes		AXYS	mg/kg	-	0.0395	0.0238	0.0265	<b>49.6</b>	<b>39.4</b>
C1-Fluoranthenes/Pyrenes		AXYS	mg/kg	-	0.157	0.104	0.105	<b>40.6</b>	<b>39.7</b>
C1-Fluorenes		AXYS	mg/kg	-	0.0205	0.0122	0.0154	<b>50.8</b>	<b>28.4</b>
C1-Naphthalenes		AXYS	mg/kg	-	0.0035	0.00349	0.00392	0.3	11.3

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.

**Table B.2-19 (Cont'd.)**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from EYC-D1	
					Station	Split	Duplicate	Split	Duplicate
					EYC-D1	SES-2	SED-2	SES-2	SED-2
<b>PAHs (Cont'd.)</b>	C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.0303	0.0287	0.0298	5.4	1.7
	C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.0959	0.0563	0.0577	<b>52.0</b>	<b>49.7</b>
	C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.0317	0.0223	0.0278	<b>34.8</b>	13.1
	C2-Biphenyls	AXYS	mg/kg	-	0.00422	0.00329	0.00398	<b>24.8</b>	5.9
	C2-Dibenzothiophenes	AXYS	mg/kg	-	0.198	0.119	0.128	<b>49.8</b>	<b>42.9</b>
	C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.215	0.139	0.155	<b>42.9</b>	<b>32.4</b>
	C2-Fluorenes	AXYS	mg/kg	-	0.0739	0.0555	0.0581	<b>28.4</b>	<b>23.9</b>
	C2-Naphthalenes	AXYS	mg/kg	-	0.0216	0.0203	0.0225	6.2	4.1
	C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.086	0.0687	0.0713	<b>22.4</b>	18.7
	C3-Dibenzothiophenes	AXYS	mg/kg	-	0.365	0.183	0.197	<b>66.4</b>	<b>59.8</b>
	C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.154	0.093	0.113	<b>49.4</b>	<b>30.7</b>
	C3-Fluorenes	AXYS	mg/kg	-	0.13	0.0934	0.0978	<b>32.8</b>	<b>28.3</b>
	C3-Naphthalenes	AXYS	mg/kg	-	0.058	0.0504	0.0509	14.0	13.0
	C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.158	0.0958	0.109	<b>49.0</b>	<b>36.7</b>
	C4-Dibenzothiophenes	AXYS	mg/kg	-	0.283	0.129	0.133	<b>74.8</b>	<b>72.1</b>
	C4-Naphthalenes	AXYS	mg/kg	-	0.111	0.0968	0.104	13.7	6.5
	C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.488	0.24	0.235	<b>68.1</b>	<b>70.0</b>
	Chrysene	AXYS	mg/kg	-	0.0266	0.0182	0.0176	<b>37.5</b>	<b>40.7</b>
	Dibenz[a,h]anthracene	AXYS	mg/kg	-	0.00229	0.00209	0.00224	9.1	2.2
	Dibenzothiophene	AXYS	mg/kg	-	0.00341	0.00189	0.00212	<b>57.4</b>	<b>46.7</b>
	Fluoranthene	AXYS	mg/kg	-	0.00567	0.00593	0.00621	4.5	9.1
	Fluorene	AXYS	mg/kg	-	0.00145	0.0011	0.00105	<b>27.5</b>	<b>32.0</b>
	Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	0.00504	0.00545	0.00566	7.8	11.6
Naphthalene	AXYS	mg/kg	-	0.00144	0.00149	0.00163	3.4	12.4	
Phenanthrene	AXYS	mg/kg	-	0.00826	0.00569	0.00601	<b>36.8</b>	<b>31.5</b>	
Pyrene	AXYS	mg/kg	-	0.0144	0.0123	0.0124	15.7	14.9	
Retene	AXYS	mg/kg	-	0.057	0.0391	0.0393	<b>37.3</b>	<b>36.8</b>	
<b>Total Metals</b>	Total Aluminum (Al)	AITF	mg/kg	50	6920	8350	7350	18.7	6.0
	Total Antimony (Sb)	AITF	mg/kg	0.1	0.83	0.85	0.87	2.4	4.7
	Total Arsenic (As)	AITF	mg/kg	0.1	14.6	14.2	13	2.8	11.6

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.

**Table B.2-19 (Cont'd.)**

Category	Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from EYC-D1	
					Station	Split	Duplicate	Split	Duplicate
					EYC-D1	SES-2	SED-2	SES-2	SED-2
<b>Total Metals (Cont'd.)</b>	Total Barium (Ba)	AITF	mg/kg	0.5	262	283	258	7.7	1.5
	Total Beryllium (Be)	AITF	mg/kg	0.2	0.55	0.58	0.55	5.3	0.0
	Total Bismuth (Bi)	AITF	mg/kg	0.2	<0.2	0.23	0.24	14.0	18.2
	Total Cadmium (Cd)	AITF	mg/kg	0.1	0.6	0.77	0.79	<b>24.8</b>	<b>27.3</b>
	Total Calcium (Ca)	AITF	mg/kg	100	3120	3660	3550	15.9	12.9
	Total Chromium (Cr)	AITF	mg/kg	0.5	12.9	15.9	14.1	<b>20.8</b>	8.9
	Total Cobalt (Co)	AITF	mg/kg	0.1	11.4	10.8	10.7	5.4	6.3
	Total Copper (Cu)	AITF	mg/kg	0.5	19.9	30.6	28.7	<b>42.4</b>	<b>36.2</b>
	Total Iron (Fe)	AITF	mg/kg	50	20000	19900	19600	0.5	2.0
	Total Lead (Pb)	AITF	mg/kg	0.5	9.6	12	11.9	<b>22.2</b>	<b>21.4</b>
	Total Lithium (Li)	AITF	mg/kg	0.5	8.97	11.6	10.8	<b>25.6</b>	18.5
	Total Magnesium (Mg)	AITF	mg/kg	20	2350	2910	2730	<b>21.3</b>	15.0
	Total Manganese (Mn)	AITF	mg/kg	1	342	237	211	<b>36.3</b>	<b>47.4</b>
	Total Mercury (Hg)	AITF	mg/kg	0.05	0.068	0.081	0.084	17.4	<b>21.1</b>
	Total Molybdenum (Mo)	AITF	mg/kg	0.1	3.12	3.52	3.34	12.0	6.8
	Total Nickel (Ni)	AITF	mg/kg	0.5	28.8	32.4	31.7	11.8	9.6
	Total Phosphorus (P)	AITF	mg/kg	50	840	771	734	8.6	13.5
	Total Potassium (K)	AITF	mg/kg	50	1320	1570	1360	17.3	3.0
	Total Selenium (Se)	AITF	mg/kg	0.2	2	2.41	2.44	18.6	19.8
	Total Silver (Ag)	AITF	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Sodium (Na)	AITF	mg/kg	100	130	170	160	<b>26.7</b>	<b>20.7</b>
	Total Strontium (Sr)	AITF	mg/kg	1	51.4	61.2	57.9	17.4	11.9
	Total Thallium (Tl)	AITF	mg/kg	0.05	0.303	0.422	0.396	<b>32.8</b>	<b>26.6</b>
	Total Tin (Sn)	AITF	mg/kg	2	<2	<2	<2	0.0	0.0
	Total Titanium (Ti)	AITF	mg/kg	1	42.1	40.8	39.7	3.1	5.9
	Total Uranium (U)	AITF	mg/kg	0.05	1.71	2.17	2.08	<b>23.7</b>	19.5
Total Vanadium (V)	AITF	mg/kg	0.2	35.7	41.7	35.3	15.5	1.1	
Total Zinc (Zn)	AITF	mg/kg	5	92	107	105	15.1	13.2	

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

<sup>2</sup> PAH detection limits were variable and therefore are not displayed.

Precision is influenced by how close the analytical value is to the method detection limit. Thus, assessing percent mean differences is valid only for analytical values that are at least five times the detection limit.

# Analytes differ by > 20% between duplicate/split but 1 or both concentrations are < 5 times the detection limit.



**Table B.2-20 Concentration of metals in sediment sampling equipment rinsate blank, September 2013.**

Analyte	Laboratory	Units	DL	Rinsate Sample	
				RIN-1	RIN-2
<b>Dissolved Metals</b>					
Aluminum (Al)	AITF	mg/L	0.001	0.015	0.009
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001
Barium (Ba)	AITF	mg/L	0.0001	0.0006	0.0003
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001
Boron (B)	AITF	mg/L	0.0008	0.00999	0.00493
Cadmium (Cd)	AITF	mg/L	0.00001	<0.00001	<0.00001
Calcium (Ca)	AITF	mg/L	0.1	0.703	0.130
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3
Chromium (Cr)	AITF	mg/L	0.0003	0.0100	0.0007
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001
Copper (Cu)	AITF	mg/L	0.0001	0.0016	0.0018
Iron (Fe)	AITF	mg/L	0.004	<0.004	0.0069
Lead (Pb)	AITF	mg/L	0.0001	0.0002	<0.0001
Lithium (Li)	AITF	mg/L	0.0002	0.0032	<0.0002
Manganese (Mn)	AITF	mg/L	0.0001	0.0018	0.0012
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001
Nickel (Ni)	AITF	mg/L	0.0001	0.0001	0.0001
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001
Strontium (Sr)	AITF	mg/L	0.0001	0.0030	0.0005
Sulphur (S)	AITF	mg/L	2	<2	<2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001
Titanium (Ti)	AITF	mg/L	0.0001	0.0012	0.0003
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001
Zinc (Zn)	AITF	mg/L	0.0002	0.0312	0.0143
<b>Total Metals</b>					
Aluminum (Al)	AITF	mg/L	0.003	0.0537	0.0543
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001
Barium (Ba)	AITF	mg/L	0.0001	0.0011	0.0007
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001
Boron (B)	AITF	mg/L	0.0008	0.0116	0.0055
Cadmium (Cd)	AITF	mg/L	0.00001	0.00002	<0.00001

# Indicates the sample concentration was 5x greater than the sample detection limit (DL)

**Table B.2-20 (Cont'd.)**

Analyte	Laboratory	Units	DL	Rinsate Sample	
				RIN-1	RIN-2
Calcium (Ca)	AITF	mg/L	0.1	0.7370	0.1800
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3
Chromium (Cr)	AITF	mg/L	0.0003	0.0101	0.0007
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001
Copper (Cu)	AITF	mg/L	0.0001	0.0027	0.0029
Iron (Fe)	AITF	mg/L	0.004	0.0383	0.0492
Lead (Pb)	AITF	mg/L	0.0001	0.0018	0.0004
Lithium (Li)	AITF	mg/L	0.0002	0.0032	<0.0002
Manganese (Mn)	AITF	mg/L	0.0001	0.0025	0.0022
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001
Nickel (Ni)	AITF	mg/L	0.0001	0.0007	0.0007
Selenium (Se)	AITF	mg/L	0.0003	0.0005	<0.0003
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	0.00002
Strontium (Sr)	AITF	mg/L	0.0001	0.0034	0.0007
Sulphur (S)	AITF	mg/L	2	<2	<2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001
Titanium (Ti)	AITF	mg/L	0.0001	0.0015	0.0010
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001
Vanadium (V)	AITF	mg/L	0.0001	0.0001	0.0001
Zinc (Zn)	AITF	mg/L	0.0002	0.0401	0.0191

# Indicates the sample concentration was 5x greater than the sample detection limit (DL)

**Table B.2-21 Concentration of PAHs in sediment sampling equipment rinsate blank, September 2013.**

Analyte	Laboratory	Units	Rinsate Sample			
			RIN-1		RIN-2	
			DL	Rinsate	DL	Rinsate
Acenaphthene	AXYS	ng/L	0.3696	1.77	0.3696	0.593
Acenaphthylene	AXYS	ng/L	0.2801	0.751	0.2801	0.293
Anthracene	AXYS	ng/L	0.1525	0.87	0.1525	0.184
Benzo[a]anthracene	AXYS	ng/L	0.1544	0.423	0.1544	<0.1544
Benzo[a]pyrene	AXYS	ng/L	0.2511	0.853	0.2511	<0.2511
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.2972	1.3	0.2972	<0.2972
Benzo[g,h,i]perylene	AXYS	ng/L	0.1665	2.78	0.1665	0.413
Biphenyl	AXYS	ng/L	0.9597	5.27	0.9597	2.51
C1-Acenaphthenes	AXYS	ng/L	0.6689	<0.6689	0.6689	<0.6689
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.324	5.56	0.324	1.3
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.9115	3.27	0.9115	1.25
C1-Biphenyls	AXYS	ng/L	4.0686	9.99	4.0686	4.26
C1-Dibenzothiophenes	AXYS	ng/L	0.3095	5.46	0.3095	1.14
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	1.414	9.88	1.414	2.29
C1-Fluorenes	AXYS	ng/L	5.1099	13	5.1099	<5.1099
C1-Naphthalenes	AXYS	ng/L	8.4772	108	8.4772	31
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.9835	14.7	0.9835	3.1
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.3707	5.9	0.3707	1.45
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	1.2177	2.47	1.2177	<1.2177
C2-Biphenyls	AXYS	ng/L	20.7882	<20.7882	20.7882	<20.7882
C2-Dibenzothiophenes	AXYS	ng/L	1.4945	19.2	1.4945	3.89
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	1.6084	13.8	1.6084	3.63
C2-Fluorenes	AXYS	ng/L	3.1208	14.8	3.1208	5.24
C2-Naphthalenes	AXYS	ng/L	4.2543	36.5	4.2543	7.4
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	2.6336	16.7	2.6336	3.58
C3-Dibenzothiophenes	AXYS	ng/L	1.8484	29.9	1.8484	6.4
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.916	10.3	0.916	1.52
C3-Fluorenes	AXYS	ng/L	3.897	20.2	3.897	5.23
C3-Naphthalenes	AXYS	ng/L	3.1153	19.3	3.1153	4.27
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	1.5072	22.2	1.5072	3.04
C4-Dibenzothiophenes	AXYS	ng/L	2.5229	19.3	2.5229	3.39
C4-Naphthalenes	AXYS	ng/L	5.0606	7.59	5.0606	<5.0606
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	2.9292	34.4	2.9292	9.96
Chrysene	AXYS	ng/L	0.2952	2.56	0.2952	0.636
Dibenz[a,h]anthracene	AXYS	ng/L	0.7801	<0.7801	0.7801	<0.7801
Dibenzothiophene	AXYS	ng/L	0.4971	2.79	0.4971	0.724
Fluoranthene	AXYS	ng/L	0.7358	6.35	0.7358	0.977
Fluorene	AXYS	ng/L	0.3371	6.08	0.3371	1.1
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.2865	0.868	0.2865	<0.2865
Naphthalene	AXYS	ng/L	15.1623	103	15.1623	34.7
Phenanthrene	AXYS	ng/L	1.689	17.7	1.689	3.5
Pyrene	AXYS	ng/L	0.5274	16.7	0.5274	1.5
Retene	AXYS	ng/L	0.91	3.59	0.6694	0.964

\* Values shown for the detection limit are concentrations found in the lab blank.

# Indicates the sample concentration was 5x greater than the sample detection limit (DL)

## **B.2.5 Fish Populations Component**

### **B.2.5.1 Quality Control Activities – Field**

Fish and fish habitat sampling field activities were conducted in accordance with field methods considered to be standard scientific practice (e.g., Environment Canada 2010) and methods used in previous RAMP studies (RAMP 2009b). All field personnel were trained in the proper use of all field equipment to ensure accurate and safe data collection. Instruments used for measuring supporting field water quality variables (e.g., temperature, dissolved oxygen, conductivity, pH, water velocity, and depth) were calibrated according to recommendations from the respective manufacturer (as frequently as daily for pH and dissolved oxygen meters). Site and reach locations were recorded using a GPS unit. All sampling details (e.g., date, time, methods used, personnel, measurements) were recorded on project-specific field data sheets and/or in waterproof field books. Upon completion of the fieldwork, all datasheets and field books were stored in a fireproof cabinet in the Hatfield office.

Sample shipping (e.g., for fish tissues sent to Flett Research Ltd.) was conducted using Hatfield-provided Chain of Custody forms.

### **B.2.5.2 Quality Control Activities – Laboratory**

#### ***Fish Tissue***

Fish tissue analysis results from Flett Research Ltd. (Flett) included a description of QC techniques used. If relevant, comments on the results of the analyses are indicated on the printed results received from the laboratory. QC results must meet acceptable guidelines for the lab's own internal quality procedures (a condition of membership in the Canadian Association for Environmental Analytical Laboratories [CAEAL]). In the event alternate procedures were required to achieve a result, this information was also detailed on the laboratory output. QC procedures used by Flett included laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards. Duplicate samples for mercury analyses were completed for five individual tissue samples (Table B.2-22).

Data were received in electronic format (Microsoft Excel<sup>®</sup>) from the analytical laboratory or entered by hand for other field programs. All data were checked upon data entry for transcription errors or other inconsistencies. Analysis of collected data was done using an iterative approach, using duplicate data files for processing. Original data were retained in back-up files for the project. Where used, printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed.

Results of QA/QC laboratory duplicate samples indicated low variability between the original sample and the duplicate sample. The relative percent difference was less than 20% for all samples where QA/QC analyses were performed, indicating consistent laboratory procedures for analyzing mercury in fish tissue.

**Table B.2-22 Relative percent difference in mercury concentrations measured in duplicate fish tissue samples collected from Christina River and Namur Lake, fall 2013.**

Waterbody	Sample ID	Units	Sample Date	Sample	Duplicate	Relative Percent Difference	Type of Sample
Christina River	CL-16	ng/g wet weight	22-Oct-13	130	124	4.7	Duplicate
Christina River	CL-34	ng/g wet weight	22-Oct-13	614	617	0.5	Duplicate
Namur Lake	NL-8	ng/g wet weight	22-Oct-13	76.7	76.5	0.3	Duplicate
Namur Lake	NL-19	ng/g wet weight	22-Oct-13	171	171	0.0	Duplicate
Namur Lake	NL-30	ng/g wet weight	22-Oct-13	601	598	0.5	Duplicate

Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%.

### ***Fish Ageing***

Results of fish ageing analyses by North/South Consultants included a description of QC techniques used. All ageing structures were viewed (read) a minimum of two times. If both estimates were consistent, the final age was assigned; however, if the age estimates were not consistent, the ageing structure was read a third time. If consistency was not achieved following three readings, the aging structure was not deemed readable and no age was assigned. All readings were conducted independently from each other (i.e., each reading was conducted “blind” or without knowledge of the previous reading). Quality control and quality assurance was then conducted by an alternate ageing technician on at least 10% of randomly selected structures (unless readings one and two were conducted by different technicians, in which case the quality control and quality assurance was already completed). The QA/QC readings were also conducted “blind” to determine consistency and accuracy.

Data were received in electronic format (Microsoft Excel<sup>®</sup>) from the analytical laboratory. All data were checked upon data entry for transcription errors or other inconsistencies. Analysis of collected data was done using an iterative approach, using duplicate data files for processing. Original data were retained in back-up files for the project. Where used, printed output from statistical analyses was retained in project files in the event that analyses may be reviewed and reproduced if needed.

Estimates of age exhibited low variability between the two readings. Out of the 149 structures that had QA/QC analyses performed, 16 age estimate had a confidence rating of “good”; 131 age estimates had a confidence rating of “fair”; and two age estimates had a confidence rating of “poor, indicating consistent laboratory procedures for analyzing ages in fin ray samples (Table B.2-23). An explanation of the confidence index for analyzing fish ageing structures is provided in Table B.2-24.

**Table B.2-23 QA/QC results for age estimates of fish captured during the Athabasca and Clearwater Inventory, spring, summer, and fall 2013.**

Location	Season	Date	Structures	Species	Sample/Fish	Age	Confidence Index	QA/QC Age
<i>Athabasca River</i>								
11A	Spring	14-May-13	FR	LNSC	20	9	F	9
11A	Spring	14-May-13	FR	LNSC	21	8	F	9
11A	Spring	14-May-13	FR	WALL	23	13	F	13
11A	Spring	14-May-13	FR	WALL	24	8	F	8
10B	Spring	14-May-13	FR	GOLD	11	15	F	16
10B	Spring	14-May-13	FR	GOLD	12	17	F	17
10B	Spring	14-May-13	FR	GOLD	13	10	P	9
10B	Spring	14-May-13	FR	WHSC	14	11	F	13
10B	Spring	14-May-13	FR	LNSC	72	8	F	8
10B	Spring	14-May-13	FR	LKWH	81	14	F	13
10B	Spring	14-May-13	FR	GOLD	88	15	P	14
10B	Spring	14-May-13	FR	LNSC	103	17	F	17
16A	Spring	14-May-13	FR	GOLD	79	15	F	14
16A	Spring	14-May-13	FR	WALL	80	10	F	10
16A	Spring	14-May-13	FR	WALL	82	8	F	8
16A	Spring	14-May-13	FR	WALL	83	8	F	9
5A	Spring	16-May-13	FR	GOLD	5	15	F	15
5A	Spring	16-May-13	FR	WHSC	6	11	F	10
5A	Spring	16-May-13	FR	WALL	7	12	F	12
5A	Spring	16-May-13	FR	LNSC	8	13	F	14
-03B	Spring	17-May-13	FR	WALL	1	8	F	8
-03B	Spring	17-May-13	FR	WALL	2	11	F	12
-03B	Spring	17-May-13	FR	WALL	3	10	F	10
-03B	Spring	17-May-13	FR	WALL	4	7	F	8
00B	Spring	17-May-13	FR	NRPK	14	6	F	6
00B	Spring	17-May-13	FR	WALL	15	8	F	7
00B	Spring	17-May-13	FR	LNSC	16	10	F	11
00B	Spring	17-May-13	FR	GOLD	17	14	F	14
1A	Spring	17-May-13	FR	WALL	1	12	F	12
1A	Spring	17-May-13	FR	WALL	2	9	F	9
1A	Spring	17-May-13	FR	LNSC	3	11	F	11
1A	Spring	17-May-13	FR	WHSC	4	8	F	9
19A	Spring	14-May-13	FR	WHSC	6	6	F	6
19A	Spring	14-May-13	FR	WHSC	7	11	F	10
19A	Spring	14-May-13	FR	LNSC	8	10	F	10
19A	Spring	14-May-13	FR	LNSC	14	6	F	6
19B	Spring	14-May-13	FR	WHSC	9	12	F	12
19B	Spring	14-May-13	FR	WHSC	14	10	F	9
19B	Spring	14-May-13	FR	GOLD	19	6	F	6
19B	Spring	14-May-13	FR	WHSC	20	10	F	11
6A	Spring	16-May-13	FR	LNSC	5	13	F	13
6A	Spring	16-May-13	FR	LNSC	6	14	F	14
6A	Spring	16-May-13	FR	GOLD	7	14	F	13
6A	Spring	16-May-13	FR	LNSC	8	12	F	13
4A	Spring	16-May-13	FR	GOLD	13	9	F	8
4A	Spring	16-May-13	FR	GOLD	14	10	F	11
4A	Spring	16-May-13	FR	WALL	16	10	F	10
4A	Spring	16-May-13	FR	LNSC	17	9	F	9
-03B	Summer	24-Jul-13	FR	GOLD	24	9	F	9
-03B	Summer	24-Jul-13	FR	WALL	25	3	F	3
-03B	Summer	24-Jul-13	FR	WALL	42	4	F	4

Note: See Table B.2-15 for an explanation of the confidence index codes.

**Table B.2-23 (Cont'd.)**

Location	Season	Date	Structures	Species	Sample/Fish	Age	Confidence Index	QA/QC Age
<i>Athabasca River (Cont'd.)</i>								
-03B	Summer	24-Jul-13	FR	NRPK	43	1	F	1
01A	Summer	24-Jul-13	FR	NRPK	9	1	F	1
01A	Summer	24-Jul-13	FR	WALL	11	5	F	6
01A	Summer	24-Jul-13	FR	WALL	12	4	F	4
01A	Summer	24-Jul-13	FR	WALL	13	4	F	4
05A	Summer	25-Jul-13	FR	GOLD	13	5	F	5
05A	Summer	25-Jul-13	FR	GOLD	14	3	F	3
05A	Summer	25-Jul-13	FR	GOLD	17	2	F	2
11A	Summer	23-Jul-13	FR	GOLD	7	3	F	3
11A	Summer	23-Jul-13	FR	GOLD	9	4	F	3
11A	Summer	23-Jul-13	FR	WALL	10	5	F	5
11A	Summer	23-Jul-13	FR	GOLD	11	7	F	7
19B	Summer	22-Jul-13	FR	NRPK	1	1	F	1
19B	Summer	22-Jul-13	FR	GOLD	4	7	F	7
19B	Summer	22-Jul-13	FR	WALL	5	5	F	5
19B	Summer	22-Jul-13	FR	WALL	6	7	F	6
-03B	Fall	18-Sep-13	FR	GOLD	13	9	F	9
-03B	Fall	18-Sep-13	FR	GOLD	14	13	F	13
-03B	Fall	18-Sep-13	FR	GOLD	19	16	F	17
-03B	Fall	18-Sep-13	FR	LNESC	20	14	F	15
01A	Fall	18-Sep-13	FR	WHSC	19	4	F	4
01A	Fall	18-Sep-13	FR	WHSC	21	4	F	4
01A	Fall	18-Sep-13	FR	WHSC	22	3	F	3
01A	Fall	18-Sep-13	FR	LNESC	23	2	F	2
04B	Fall	19-Sep-13	FR	NRPK	14	1	F	1
04B	Fall	19-Sep-13	FR	GOLD	15	10	F	9
04B	Fall	19-Sep-13	FR	WHSC	16	6	F	6
06A	Fall	19-Sep-13	FR	WALL	1	9	F	10
06A	Fall	19-Sep-13	FR	WHSC	2	12	F	12
06A	Fall	19-Sep-13	FR	WHSC	3	3	F	3
06A	Fall	19-Sep-13	FR	WALL	4	13	F	12
10B	Fall	17-Sep-13	FR	GOLD	43	5	F	6
10B	Fall	17-Sep-13	FR	GOLD	44	2	F	2
10B	Fall	17-Sep-13	FR	GOLD	45	2	F	2
10B	Fall	17-Sep-13	FR	GOLD	47	3	G	3
10B	Fall	17-Sep-13	FR	GOLD	76	4	G	3
10B	Fall	17-Sep-13	FR	GOLD	82	5	G	5
11A	Fall	17-Sep-13	FR	WALL	73	10	F	11
11A	Fall	17-Sep-13	FR	NRPK	74	2	F	2
11A	Fall	17-Sep-13	FR	NRPK	80	5	F	5
11A	Fall	17-Sep-13	FR	WALL	81	10	F	10
16A	Fall	17-Sep-13	FR	WALL	127	6	F	6
16A	Fall	17-Sep-13	FR	GOLD	128	8	F	8
16A	Fall	17-Sep-13	FR	WALL	130	8	F	8
16A	Fall	17-Sep-13	FR	GOLD	132	6	F	6
19A	Fall	16-Sep-13	FR	WHSC	5	12	F	12
19A	Fall	16-Sep-13	FR	GOLD	6	15	F	16
19A	Fall	16-Sep-13	FR	GOLD	7	10	F	9
19A	Fall	16-Sep-13	FR	GOLD	8	14	F	14
00B	Fall	18-Sep-13	FR	LKWH	1	12	F	13
00B	Fall	18-Sep-13	FR	LKWH	2	9	F	9
00B	Fall	18-Sep-13	FR	LKWH	3	7	F	7
00B	Fall	18-Sep-13	FR	LKWH	4	7	F	7

Note: See Table B.2-15 for an explanation of the confidence index codes.

**Table B.2-23 (Cont'd.)**

Location	Season	Date	Structures	Species	Sample/Fish	Age	Confidence Index	QA/QC Age
<i>Clearwater</i>								
CR1B	Spring	29-May-13	FR	NRPK	1	9	F	9
CR1B	Spring	29-May-13	FR	WHSC	2	7	G	7
CR1B	Spring	29-May-13	FR	WHSC	3	6	G	6
CR1B	Spring	29-May-13	FR	WHSC	4	7	G	8
CR2A	Spring	29-May-13	FR	WHSC	30	2	G	2
CR2A	Spring	29-May-13	FR	LNSC	31	9	F	9
CR2A	Spring	29-May-13	FR	WHSC	32	4	G	4
CR2A	Spring	29-May-13	FR	WHSC	33	4	G	4
CR3B	Spring	30-May-13	FR	WHSC	1	14	F	15
CR3B	Spring	30-May-13	FR	NRPK	2	5	F	5
CR3B	Spring	30-May-13	FR	WALL	3	8	F	7
CR3B	Spring	30-May-13	FR	WALL	4	8	F	7
CR3B	Spring	30-May-13	FR	GOLD	29	11	F	11
CR3B	Spring	30-May-13	FR	WALL	32	14	F	13
CR-2A	Fall	24-Sep-13	FR	WALL	1	6	G	7
CR-2A	Fall	24-Sep-13	FR	WHSC	2	5	F	5
CR-2A	Fall	24-Sep-13	FR	WHSC	3	6	F	7
CR-2A	Fall	24-Sep-13	FR	WHSC	4	5	F	5
CR-2B	Fall	24-Sep-13	FR	WHSC	52	2	G	2
CR-2B	Fall	24-Sep-13	FR	WHSC	54	2	G	2
CR-2B	Fall	24-Sep-13	FR	NRPK	58	1	G	1
CR-2B	Fall	24-Sep-13	FR	WHSC	61	2	G	2
CR-3A	Fall	25-Sep-13	FR	LNSC	34	5	F	5
CR-3A	Fall	25-Sep-13	FR	WALL	35	4	F	4
CR-3A	Fall	25-Sep-13	FR	WHSC	36	8	F	7
CR-3A	Fall	25-Sep-13	FR	WALL	39	3	F	3
CR-3B	Fall	25-Sep-13	FR	LNSC	27	8	F	8
CR-3B	Fall	25-Sep-13	FR	LNSC	29	5	F	5
CR-1A	Summer	30-Jul-13	FR	NRPK	1	7	F	8
CR-1A	Summer	30-Jul-13	FR	NRPK	2	7	F	7
CR-1A	Summer	30-Jul-13	FR	NRPK	3	6	F	6
CR-2A	Summer	30-Jul-13	FR	WHSC	10	5	F	6
CR-2A	Summer	30-Jul-13	FR	GOLD	11	5	F	5
CR-2A	Summer	30-Jul-13	FR	NRPK	12	1	F	1
CR-2A	Summer	30-Jul-13	FR	WHSC	13	11	F	12
CR-2B	Summer	31-Jul-13	FR	WHSC	17	2	G	2
CR-2B	Summer	31-Jul-13	FR	GOLD	20	12	F	11
CR-2B	Summer	31-Jul-13	FR	WALL	21	2	F	2
CR-2B	Summer	31-Jul-13	FR	WHSC	24	2	G	2
CR-3A	Summer	31-Jul-13	FR	WALL	6	3	F	3
CR-3A	Summer	31-Jul-13	FR	WALL	7	4	F	3
CR-3A	Summer	31-Jul-13	FR	LNSC	8	10	F	11
CR-3A	Summer	31-Jul-13	FR	LNSC	9	8	F	8
CR-3B	Summer	31-Jul-13	FR	WHSC	8	5	F	6
CR-3B	Summer	31-Jul-13	FR	WHSC	9	9	F	11

Note: See Table B.2-15 for an explanation of the confidence index codes.



**Table B.2-24 Explanation of the index used to classify confidence in estimates of fish age.**

<b>Confidence Indices and Abbreviations</b>	<b>Qualitative Characteristics (Pattern Clarity)</b>	<b>Quantitative Characteristics (Repeatability)</b>
Very Good (VG)	annuli are clear with no interpretation problems	Reader always gets the same age
Good (G)	annuli are clear with a few easy interpretation problems	Reader would get the same age most of the time for fish <10 years, within one year for fish 11 to 20 years
Fair (F)	annuli are fairly clear with some areas presenting easy and moderate interpretation problems	Reader would be within 1 year most of the time for fish <10 years and 2 to 3 years for fish >10 years
Poor (P)	annuli are fairly unclear presenting a number of difficult interpretation problems	Reader would be within 2 to 3 years most of the time for fish <15 years and 4 to 5 years for fish >15 years
Very Poor (VP)	annuli are very unclear presenting significant interpretation problems	Reader has little confidence in repeatability of age within 4 to 5 years

## **B.2.6 Acid-Sensitive Lakes Component**

Field sampling under the Acid-Sensitive Lakes Component of RAMP is conducted by personnel from Alberta Environment and Sustainable Resource Development (AESRD). Water samples collected at each lake are analyzed by the University of Alberta Limnology Laboratory. The laboratory uses a series of set procedures, outlined in detail below, for analytical quality control; the procedures used are identical to those used in previous RAMP studies (e.g., RAMP 2013).

QA/QC samples were not collected during the sampling event for the Acid-Sensitive Lakes component in fall 2013.

### **B.2.6.1 Quality Control Activities – Field**

Water sample collection in the field utilizes standard practices for quality control of samples to avoid contamination. Field instruments (e.g., water quality meters) are cared for so as to maximize data quality (i.e., proper calibration according to manufacturer specifications). Procedures used include the following:

- Collection of samples away from the influence of the boat or float plane (i.e., to minimize chance of sample contamination from fuel that may be in the water);
- All sampling equipment is thoroughly cleaned between lakes;
- Sample containers are tripled-rinsed prior to filling (cap included);
- Sample containers are filled to the top (i.e., no head space);
- Samples are stored under cool (4°C) conditions and in the dark (i.e., in a refrigerator); and
- Samples are submitted to the appropriate analytical laboratory within established maximum holding period (typically 48 hours).

### **B.2.6.2 Quality Control Activities – Laboratory**

The University of Alberta Limnology Laboratory maintains an internal QA/QC program to maximize quality of analytical results. The programs include use of standard reference samples and periodic comparison samples (i.e., blanks) sent to other laboratories. In the event that QC objectives are not achieved, corrective actions are initiated to determine the cause. The laboratory prepares standard QC sample for each group of analyses from analytical grade chemicals or standard reference samples.

Annually, ten samples of known chemistry are submitted by Environment Canada's National Water Research Institute (NWRI) for blind analysis and comparison. Two times per year, quality control samples are sent to the University of Alberta Limnology Laboratory by the Norwegian Institute for Water Research for analysis and comparison.

In all cases, analytical samples are run along with standard laboratory reference samples to create a standard results curve. QC solutions are then run in duplicate. If results for control are consistent for a series of analyses, no additional QC testing is required. If results from QC samples are divergent from standards, corrective action is initiated to determine the cause and results that may be affected. When new QC samples are prepared, each one is tested against the previous QC sample (for a given variable) to assess comparability.

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**Appendix C**

**Climate and Hydrology  
Component**

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## C CLIMATE AND HYDROLOGY COMPONENT

This appendix summarizes the analysis of watershed boundaries conducted in 2013 as well as data collected for the RAMP Climate and Hydrology component in the 2013 water year (WY). The 2013 WY was defined as the period from November 1, 2012 to October 31, 2013. The appendix includes descriptions of the climate and hydrometric stations used to collect these data, along with other station-related information.

### C.1 WATERSHED BOUNDARY ANALYSIS

In 2013, a review of the watershed boundary data that have been used by RAMP in previous years (e.g., CEMA), was conducted given that new, updated datasets were available from AESRD. In 2011, the Alberta government completed their Atomic Watershed project and shared these data with RAMP as well as the River and Lake (scale of 1:20,000) datasets to redefine watershed boundaries in the RAMP RSA. Drainage Basin of Alberta data (scale of 1:1,000,000) were used only to estimate the large basin of the Athabasca River. When watersheds crossed into Saskatchewan, National Hydro Network boundaries (scale of 1:50,000) were used. With these new datasets, watershed boundaries were defined using the following process:

1. The location of each RAMP hydrometric station, near the mouth of each river, was plotted on the Atomic watershed and Alberta River/Lake datasets.
2. Each Atomic Watershed that showed it was contributing flow to the hydrometric station was combined to create a station-specific watershed. If watersheds extended outside of the RAMP RSA but were within Alberta, Drainage Basin of Alberta data were used to supplement the Atomic Watershed layer. However, if watersheds, were outside of Alberta, National Hydro Network data were used as supplementary data.
3. In some cases Atomic Watershed polygons were clipped to only include the watershed related to the hydrometric station (e.g., where a road may have limited the extent of the contributing watershed area).
4. For all stations that are jointly operated by RAMP and WSC, or where RAMP operates a hydrometric station where a WSC station previously existed, the watershed boundaries were compared and where possible watersheds were adjusted to match available boundaries. This information was used to assess the method used to calculate the watershed areas for all RAMP hydrometric stations.

To verify the results of the watershed analysis, watershed boundaries were compared with watershed boundaries of the Prairie Farm Rehabilitation Administration (PFRA) to ensure comparable results where possible. It should be noted that there are potential sources of error in delineating watershed boundaries in northeastern Alberta. The region is characterized by flat terrain, which can result in ambiguous interpretation of flow direction and potential uncertainty of the existence of some streams. The low relief in this region can also produce potentially dynamic watershed boundaries, due to beaver activity, land use change/development, and potential changes in groundwater supply. All of these can affect the routing of water and potentially change drainage basin boundaries.

The updated watershed boundaries were used for all maps and analyses for the RAMP 2013 Technical Report.

## C.2 2013 CLIMATE AND HYDROLOGY STATIONS

A list of the climate and hydrometric stations is provided in Table C.2-1.

**Table C.2-1 RAMP climate, hydrometric, and snowcourse stations monitored in 2013.**

RAMP Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
C1	Aurora Climate Station	475229	6344053	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, wind speed and direction
C2	Horizon Climate Station	443364	6360510	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C3	Steepbank Climate Station	473950	6320500	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C4	Pierre Climate Station	460898	6378737	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
C5	Surmont Climate Station	502542	6230964	all year	air temperature, total precipitation, relative humidity, solar radiation, snow on the ground, barometric pressure, wind speed and direction
L1	McClelland Lake	483398	6372186	all year	water level, total precipitation, relative humidity, air temperature, water temperature
L2	Kearl Lake	484815	6351080	all year	water level, total precipitation, relative humidity, air temperature, water temperature
L3	Isadore's Lake	463297	6342981	all year	water level, water temperature
L4	Namur Lake near the outlet	402886	6370260	all year	water level, discharge, water temperature
S2	Jackpine Creek at Canterra Road	474971	6344091	all year	water level, discharge, water temperature
S3	Iyininim Creek above Kearl Lake	489423	6345196	open-water	water level, discharge, rainfall, water temperature
S5	Muskeg River above Stanley Creek	479761	6356759	all year	water level, discharge, water temperature
S5A	Muskeg River above Muskeg Creek	476042	6351803	all year	water level, discharge, barometric pressure, water temperature
S6	Mills Creek at Highway 63	463755	6344927	all year	water level, discharge, water temperature

<sup>1</sup> WSC took over year round monitoring at these stations on January 1, 2013.

<sup>2</sup> Station began operation during the 2013 open-water season.

<sup>3</sup> Hydrometric station S20 was relocated approximately 1 km upstream, and designated as S20A in April 2013.

<sup>4</sup> WSC operated the station from March 1, 2013 to October 31, 2013.

**Table C.2-1 (Cont'd.)**

RAMP Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
S7	Muskeg River near Fort McKay (07DA008)	465552	6338804	winter <sup>1</sup>	water level, discharge, water temperature
S9	Kearl Lake Outlet	483983	6347020	all year	water level, discharge, water temperature
S10A	Wapasu Creek near the mouth	488573	6358554	all year	water level, discharge, water temperature
S11	Poplar Creek at Highway 63 (07DA007)	471972	6307825	all year	water level, discharge, water temperature
S12	Fort Creek at Highway 63	462620	6363554	open-water	water level, discharge, water temperature
S14A	Ells River at the CNRL Bridge	455738	6344944	all year	water level, discharge, water temperature
S15A	Tar River near the mouth	458458	6353439	open-water	water level, discharge, water temperature
S16A	Calumet River near the mouth	458096	6362020	open-water	water level, discharge, water temperature
S19	Tar River Lowland Tributary near the mouth	457372	6352880	open-water	water level, discharge, rainfall, water temperature
S20	Muskeg River Upland	492107	6355709	open-water	water level, discharge, water temperature
S20A	Muskeg River Upland	492230	6354940	open-water	water level, discharge, water temperature
S22	Muskeg Creek near the mouth	480969	6349071	open-water	water level, discharge, water temperature
S24	Athabasca River below Eymundson Creek	466305	6372764	all year	water level, discharge, water temperature
S25	Susan Lake Outlet	464513	6368477	open-water	water level, discharge, water temperature
S26	Mackay River near Fort McKay (07DB001)	458019	6341008	Winter <sup>1</sup>	discharge
S27	Firebag River near the mouth (07DC001)	487914	6389855	Winter <sup>1</sup>	discharge
S29	Christina River near Chard (07CE002)	508211	6187940	Winter <sup>1</sup>	discharge
S31	Hangingstone Creek at North Star Road	469812	6236089	open-water	water level, discharge, rainfall, water temperature
S32	Surmont Creek at Highway 881	490250	6254524	open-water	water level, discharge, water temperature
S33	Muskeg River at the Aurora North/MRM Boundary	474878	6350204	all year	water level, discharge, water temperature
S34	Tar River above CNRL Lake	440745	6361662	all year	water level, discharge, water temperature
S36	McClelland Lake Outlet above Firebag River	490635	6384056	open-water	water level, discharge, water temperature
S37	East Jackpine Creek near the 1300 ft. contour	487850	6325416	open-water	water level, discharge, water temperature
S38	Steepbank River near Fort McMurray (07DA006)	475296	6317398	Winter <sup>1</sup>	discharge

<sup>1</sup> WSC took over year round monitoring at these stations on January 1, 2013.

<sup>2</sup> Station began operation during the 2013 open-water season.

<sup>3</sup> Hydrometric station S20 was relocated approximately 1 km upstream, and designated as S20A in April 2013.

<sup>4</sup> WSC operated the station from March 1, 2013 to October 31, 2013.

**Table C.2-1 (Cont'd.)**

RAMP Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
S39	Beaver River above Syncrude (07DA018)	465560	6311437	Winter <sup>4</sup>	discharge
S40	Mackay River at Petro-Canada Bridge	444949	6314178	all year	water level, discharge, rainfall, water temperature
S42	Clearwater River above Christina River (07DC005)	504427	6279666	winter <sup>4</sup>	discharge
S43	Firebag River above Suncor Firebag	531704	6354796	open-water	water level, discharge, rainfall, water temperature
S44	Pierre River near Fort McKay (Formerly 07DA013)	460769	6369299	open-water	water level, discharge, water temperature
S45	Ells River above Joslyn Creek Diversion	440325	6342418	all year	water level, discharge, water temperature
S46	Athabasca River near Embarras Airport	470241	6463209	all year	water level, discharge, water temperature
S47	Christina River near the mouth	500697	6276412	all year	water level, discharge, water temperature
S48	Big Creek	470817	6389113	open-water	water level, discharge, water temperature
S49	Eymundson Creek near the mouth	465473	6372694	open-water	water level, discharge, water temperature
S50A	Red Clay Creek	474881	6400224	open-water	water level, discharge, water temperature
S51	High Hills River near the mouth	533925	6291921	all year	water level, discharge, water temperature
S53	Dover River near the mouth	451453	6337015	all year	water level, discharge, water temperature
S54	Dunkirk River near Fort MacKay	395815	6302066	all year	water level, discharge, water temperature
S55	Gregoire River near the mouth	510184	6259986	all year	water level, discharge, water temperature
S56	Jackfish River below Christina Lake	493741	6169693	all year	water level, discharge, water temperature
S57	Sunday Creek above Christina Lake	506210	6158391	all year	water level, discharge, water temperature
S58	Sawbones Creek above Christina Lake	511412	6167165	open-water	water level, discharge, water temperature
S60	Unnamed Creek South of Christina Lake	511145	6159877	open-water <sup>2</sup>	water level, discharge, water temperature
S61	Christina River Above Statoil Leismer	466037	6193791	all year <sup>2</sup>	water level, discharge, water temperature
S62	Birch Creek at Highway 881	492149	6163182	all year <sup>2</sup>	water level, discharge, water temperature
S63	Sunday Creek at Highway 881	494283	6157255	all year <sup>2</sup>	water level, discharge, water temperature
S64	Unnamed Creek East of Christina Lake	517644	6163643	open-water <sup>2</sup>	water level, discharge, water temperature
S65	North Green Stockings Creek at East Athabasca Highway	489845	6333039	open-water <sup>2</sup>	water level, water temperature

<sup>1</sup> WSC took over year round monitoring at these stations on January 1, 2013.

<sup>2</sup> Station began operation during the 2013 open-water season.

<sup>3</sup> Hydrometric station S20 was relocated approximately 1 km upstream, and designated as S20A in April 2013.

<sup>4</sup> WSC operated the station from March 1, 2013 to October 31, 2013.

**Table C.2-1 (Cont'd.)**

RAMP Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
CANR-JP-A		483996	6347096	winter	snow depth, snow water equivalent
CANR-MD-A		484720	6351034	winter	snow depth, snow water equivalent
CANR-FL-A		484780	6351200	winter	snow depth, snow water equivalent
CANR-OP-A		484961	6351023	winter	snow depth, snow water equivalent
NEX-OP-A		508424	6252327	winter	snow depth, snow water equivalent
NEX-FL-A		508410	6252086	winter	snow depth, snow water equivalent
NEX-JP-A		508747	6251781	winter	snow depth, snow water equivalent
NEX-MD-A		508954	6251566	winter	snow depth, snow water equivalent
CNRL-MD-A		443492	6360713	winter	snow depth, snow water equivalent
CNRL-OP-A		443019	6360667	winter	snow depth, snow water equivalent
CNRL-JP-A		440856	6361728	winter	snow depth, snow water equivalent
CNRL-FL-A		440918	6361759	winter	snow depth, snow water equivalent
MCLL-MD-A		483431	6372120	winter	snow depth, snow water equivalent
MCLL-OP-A		483350	6372121	winter	snow depth, snow water equivalent
MCLL-JP-A		482898	6369515	winter	snow depth, snow water equivalent
MCLL-FL-A		482843	6369496	winter	snow depth, snow water equivalent

<sup>1</sup> WSC took over year round monitoring at these stations on January 1, 2013.

<sup>2</sup> Station began operation during the 2013 open-water season.

<sup>3</sup> Hydrometric station S20 was relocated approximately 1 km upstream, and designated as S20A in April 2013.

<sup>4</sup> WSC operated the station from March 1, 2013 to October 31, 2013.

## C.3 CLIMATE DATA COLLECTED IN THE 2013 WATER YEAR

Climate data were collected in the region during the 2013 WY. Data were collected by RAMP, Environment Canada, and other organizations. This appendix focuses on RAMP data and incorporates data from government agencies to provide context and supplement the RAMP information.

### C.3.1 RAMP Climate Data

In the 2013 WY, RAMP collected climate data from five comprehensive climate stations, climate sensors at two RAMP lake stations, and through the use of four additional rainfall stations located in conjunction with select RAMP hydrometric stations. The following sections of this appendix present the data collected during the 2013 WY.



### C.3.1.1 Aurora Climate Station (C1)

The Aurora climate station (C1) monitored air temperature, wind speed and direction, total precipitation, solar radiation, and relative humidity during the 2013 WY. Table C.3-1 lists the data collected at the station. Monthly observations for the 2013 WY are summarized in Table C.3-2, and daily observations are provided in the RAMP database.

**Table C.3-1 Data collected at the RAMP Aurora Climate Station (C1), 2013 WY.**

Climate Element and Sensor	Variable	Units	Derivation
Air Temperature -Rotronic HC2-S3 thermistor	Minimum	(°C)	Minimum of 1 minute means from readings every 5 sec.
	Mean	(°C)	Mean of readings every 5 sec.
	Maximum	(°C)	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation -OTT Pluvio2 weighing precipitation gauge	Total	(mm)	Sum of 0.01 mm readings.
Depth of Snow on Ground -Campbell Scientific SR50 sonic level sensor	Total	(cm)	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity -Rotronic HC2-S3 humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Global Solar Radiation -Licor pyranometer	Mean	(W/m <sup>2</sup> )	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-19 wind vane and propeller	Mean Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	(km/h)	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	(km/h)	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	(km/h)	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	(km/h)	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
<b>Datalogger Type</b>		<b>Telemetry Type</b>	
Campbell Scientific CR1000		Raven CDMA Cellular Modem	

**Table C.3-2 Summary of monthly climate data collected at the RAMP Aurora Climate Station (C1) during the 2013 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Global Solar Radiation (W/m <sup>2</sup> )	Average Wind Speed (km/h)	Average Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)								2 min. (km/h)	10 min. (km/h)
Nov-2012	-35.0	-11.5	7.7	26.05	28.2	78.6	15.9	4.5	161	32.4	25.2	22.3
Dec-2012	-34.4	-20.1	-5.4	24.92	36.2	74.7	2.3	2.8	113	27.7	22.7	18.4
Jan-2013	-36.3	-17.8	1.1	22.49	59.8	75.0	11.0	4.1	156	35.5	28.8	23.9
Feb-2013	-27.2	-9.6	5.3	23.34	62.5	77.2	38.3	3.9	153	32.0	26.0	22.7
Mar-2013	-29.9	-9.5	7.3	12.63	66.2	65.1	103.4	5.5	145	49.3	29.7	24.0
Apr-2013	-17.5	-1.0	15.3	20.21	0.00	61.6	164.5	8.8	134	52.6	40.3	32.0
May-2013	-11.7	13.7	28.8	22.70	0.00	50.7	232.6	6.6	160	65.9	40.7	33.8
Jun-2013	7.5	17.1	30.0	120.09	0.00	70.9	198.8	5.9	170	49.7	34.2	29.7
Jul-2013	4.6	17.3	34.5	64.26	0.00	64.9	197.6	5.5	195	44.7	32.1	26.1
Aug-2013	6.9	17.7	30.1	31.23	0.00	69.8	167.7	4.2	169	38.5	30.0	23.5
Sep-2013	-1.9	13.4	31.2	51.97	0.00	69.7	107.5	4.7	189	43.0	28.3	23.8
Oct-2013	-11.6	3.7	15.4	24.44	0.00	78.8	39.7	5.2	188	46.4	30.3	24.7
2013 WY Annual	-36.3	1.1	34.5	444.33	-	69.7	106.6	5.1	161	65.9	40.7	33.8

Note: E = Estimated; M = Missing; P = Partial; See additional notes in sections C.3.1.1 and C.3.1.7.

### C.3.1.2 Horizon Climate Station (C2)

The Horizon climate station (C2) was established in October 2008 and became fully operational in June 2009. The Horizon station monitored air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation during the 2013 WY. Table C.3-3 lists the data collected at the station. Monthly observations for 2013 WY are summarized in Table C.3-4, and daily observations are provided in the RAMP database.

**Table C.3-3 Data collected at the RAMP Horizon Climate Station (C2), 2013 WY.**

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature -HMP45C212 thermistor	Minimum	(°C)	Minimum of 1 minute means from readings every 5 seconds.
	Mean	(°C)	Mean of readings every 5 seconds.
	Maximum	(°C)	Maximum of 1 minute means from readings every 5 seconds.
Total Precipitation -Geonor weighing precipitation gauge	Total	(mm)	Sum of 0.05 mm readings every 15 minutes.
Depth of Snow on Ground -Campbell Scientific SR50 sonic level sensor	Total	(cm)	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity -HMP45C212 humidity sensor	Mean	(%)	Mean of readings every 5 seconds.
Global Solar Radiation -Kipp and Zonen SP Lite 2 pyranometer	Mean	(kW/m <sup>2</sup> )	Mean of readings every 5 seconds.
Barometric pressure -RM Young 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 seconds.
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Mean Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 seconds.
	Mean Speed	(km/h)	Daily mean wind speed from readings averaged every 5 seconds.
	Peak Gust Speed	(km/h)	Maximum scalar wind speed from 5 second readings.
	2 min. Gust Speed	(km/h)	Maximum of 2 minute scalar wind speed means from readings every 5 seconds.
	10 min. Gust Speed	(km/h)	Maximum of 10 minute scalar wind speed means from readings every 5 seconds.
<b>Datalogger Type</b>		<b>Telemetry Type</b>	
Campbell Scientific CR1000		Raven X CDMA Cellular Modem	

**Table C.3-4 Summary of monthly climate data collected at the RAMP Horizon Climate Station (C2) during the 2013 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2012	-32.8	-12.3	8.1	28.45	31.7	88.01	22.51	96.64	6.2	191	54.5	34.8	30.4
Dec-2012	-34.8	-20.3	-3.0	99.18	39.9	88.23	-10.54	96.30	4.9	176	36.3	31.1	28.4
Jan-2013	-36.4	-18.2	1.9	22.33	56.3	86.76	6.81	96.51	5.9	191	68.2	48.0	40.6
Feb-2013	-28.5	-10.3	5.8	19.71	58.0	86.66	50.08	95.23	6.1	196	50.7	35.9	28.2
Mar-2013	-30.0	-10.2	8.4	20.52	59.8	73.75	127.61	96.88	7.2	175	45.5	30.2	26.0
Apr-2013	-17.6	-1.8	13.7	27.37	1.3	63.42	197.91	96.61	11.0	150	65.4	45.6	41.4
May-2013	-14.3	12.6	26.4	27.72	0.0	51.31	253.24	96.36	9.7	184	57.4	36.8	32.2
Jun-2013	7.3	16.1	28.7	145.52	0.0	72.09	218.50	96.23	7.5	171	50.1	34.4	25.6
Jul-2013	3.6	16.4	32.5	60.91	0.0	68.99	227.30	96.36	7.7	216	45.6	28.4	23.6
Aug-2013	4.9	16.6	28.5	47.58	0.0	73.91	206.49	96.38	7.2	195	48.1	32.6	28.7
Sep-2013	-2.6	12.5	29.6	52.74	0.0	73.63	149.03	95.70	7.7	230	44.1	30.4	24.5
Oct-2013	-14.0	3.5	16.4	23.83	0.0	81.64	63.26	96.16	7.6	204	55.0	36.8	33.0
2013 WY Annual	-36.4	0.4	32.5	575.85	-	75.70	126.02	96.28	7.38	190.05	68.2	48.0	41.4

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.3.1.7.

### C.3.1.3 Steepbank Climate Station (C3)

The Steepbank climate station (C3) was upgraded to a full climate station in November 2010. During the 2013 WY, air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation data were collected at this station as described in Table C.3-5. Monthly observations for 2013 WY are summarized in Table C.3-6, and daily observations are provided in the RAMP database.

**Table C.3-5 Data collected at the RAMP Steepbank Climate Station (C3), 2013 WY.**

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature -Rotronic HC2-S3 thermistor	Minimum	(°C)	Minimum of 1 minute means from readings every 5 sec.
	Mean	(°C)	Mean of readings every 5 sec.
	Maximum	(°C)	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation -OTT Pluvio2 weighing precipitation gauge	Total	(mm)	Sum of 0.01 mm readings.
Depth of Snow on Ground -Campbell Scientific SR50 sonic level sensor	Total	(cm)	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity -Rotronic HC2-S3 humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Global Solar Radiation -Kipp and Zonen SP Lite 2 pyranometer	Mean	(kW/m <sup>2</sup> )	Mean of readings every 5 sec.
Barometric pressure -RM Young 61302V barometric pressure sensor	Mean	kPa	Recorded for every minute and averaged per 1 hour
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Mean Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	(km/h)	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	(km/h)	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	(km/h)	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	(km/h)	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
<b>Datalogger Type</b>		<b>Telemetry Type</b>	
Campbell Scientific CR1000		Raven XT CDMA Cellular Modem	

**Table C.3-6 Summary of monthly climate data collected at the RAMP Steepbank Climate Station (C3) during the 2013 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2012	-35.3	-11.4	8.1	19.14	18.8	77.09	23.68	97.87	8.6	151	37.5	28.7	26.8
Dec-2012	-37.2	-20.0	-6.0	13.91	34.9	73.07	14.81	97.56	6.4	145	38.6	29.7	24.8
Jan-2013	-37.6	-18.2	1.8	11.42	58.6	73.70	19.71	97.77	7.1	144	39.7	32.3	28.6
Feb-2013	-28.4	-9.2	6.2	12.2	61.8	75.66	54.66	97.00	9.5	147	43.6	36.8	33.8
Mar-2013	-32.7	-9.4	8.4	6.06	44.6	64.99	117.72	98.08	9.2	123	62.4	48.4	37.9
Apr-2013	-18.4	-0.9	16.2	24.77	0.0	61.76	177.88	97.49	11.4	123	59.3	43.2	40.7
May-2013	-10.1	13.7	28.2	19.32	0.0	50.25	259.07	97.53	9.9	152	63.3	46.1	41.4
Jun-2013	6.3	16.7	29.8	138.82	0.0	71.16	208.06	97.25	9.1	137	57.4	42.0	36.2
Jul-2013	4.2	17.2	34.0	81.91	0.0	66.04	217.60	97.36	7.6	181	41.9	32.1	28.7
Aug-2013	6.5	17.6	29.4	112.25	0.0	69.84	188.08	97.26	7.0	164	45.6	30.7	22.9
Sep-2013	-1.2	13.7	30.8	53.02	0.0	68.85	123.22	96.81	8.1	176	43.3	35.8	29.4
Oct-2013	-11.6	3.9	15.3	19.44	0.0	76.36	51.93	97.39	8.1	182	47.3	36.5	32.6
2013 WY Annual	-37.6	1.1	34.0	512.3	-	69.1	121.4	97.4	8.5	152.0	63.3	48.4	41.4

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.3.1.7.

### C.3.1.4 Pierre Climate Station (C4)

The Pierre climate station (C4) was installed in July 25, 2011. This station monitored air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation from November 2012 to October 2013. Table C.3-7 provides a list of the data collected at the station. Monthly observations for 2013 WY are summarized in Table C.3-8, and daily observations are provided in the RAMP database.

**Table C.3-7 Data collected at the RAMP Pierre Climate Station (C4), 2013 WY.**

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature -HMP45C212 thermistor	Minimum	(°C)	Minimum of 1 minute means from readings every 5 sec.
	Mean	(°C)	Mean of readings every 5 sec.
	Maximum	(°C)	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation -OTT Pluvio2 weighing precipitation gauge	Total	(mm)	Sum of 0.01 mm readings
Depth of Snow on Ground -Campbell Scientific SR50 sonic level sensor	Total	(cm)	Average of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity -HMP45C212 humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Global Solar Radiation -Kipp and Zonen SP Lite 2 pyranometer	Mean	(kW/m <sup>2</sup> )	Mean of readings every 5 sec.
Barometric pressure -RM Young 61205V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Mean Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	(km/h)	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	(km/h)	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	(km/h)	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	(km/h)	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
<b>Datalogger Type</b>		<b>Telemetry Type</b>	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

**Table C.3-8 Summary of monthly climate data collected at the RAMP Pierre Climate Station (C4) during the 2013 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2012	-38.1	-12.3	8.8	29.98	33.2	81.28	13.56	98.26	3.8	176	48.7	33.2	28.6
Dec-2012	-37.2	-21.8	-8.3	26.47	40.4	78.27	5.33	97.96	2.7	151	27.9	15.9	13.1
Jan-2013	-38.8	-19.3	4.4	17.49	55.4	77.74	11.43	98.15	3.5	164	34.6	25.2	22.3
Feb-2013	-31.7	-10.4	7.5	17.86	55.2	78.99	43.90	97.67	4.1	173	40.4	25.5	18.8
Mar-2013	-34.3	-10.6	9.2	20.04	67.8	67.21	106.02	98.49	4.7	157	36.1	25.6	19.7
Apr-2013	-23.0	-1.6	16.1	25.44	16.1	60.10	182.43	98.19	7.2	130	45.2	30.6	22.2
May-2013	-14.7	12.7	28.0	13.92	0.0	52.79	239.64	97.97	6.3	175	50.2	34.8	25.1
Jun-2013	4.1	16.4	29.8	138.88	0.0	72.80	201.96	97.73	5.0	161	46.3	27.3	21.4
Jul-2013	2.4	16.4	34.7	59.58	0.0	69.17	208.40	97.80	5.1	209	50.5	31.0	28.7
Aug-2013	2.1	16.3	29.6	73.13	0.0	74.86	189.43	97.77	4.1	197	38.6	27.9	23.1
Sep-2013	-4.2	11.7	31.6	85.88	0.0	76.99	129.95	97.29	4.5	193	43.4	28.3	24.2
Oct-2013	-12.0	3.4	16.9	25.74	0.0	82.45	57.42	97.92	4.6	182	52.9	31.9	27.2
2013 WY Annual	-38.8	0.1	34.7	534.41	-	72.72	115.79	97.93	4.6	172	52.9	34.8	28.7

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.3.1.7.



### C.3.1.5 Surmont Climate Station (C5)

The Surmont climate station (C5) was installed on October 16, 2011. During the 2013 WY, air temperature, relative humidity, total precipitation, snow depth, wind speed and direction, and barometric pressure data were collected at this station as described in Table C.3-9. Monthly observations for the 2013 WY are summarized in Table C.3-10 and daily observations are provided in the RAMP database.

**Table C.3-9 Data collected at the RAMP Surmont Climate Station (C5), 2013.**

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature -HMP45C212 thermistor	Minimum	(°C)	Minimum of 1 minute means from readings every 5 sec.
	Mean	(°C)	Mean of readings every 5 sec.
	Maximum	(°C)	Maximum of 1 minute means from readings every 5 sec.
Total Precipitation -OTT Pluvio2 weighing precipitation gauge	Total	(mm)	Sum of 0.01 mm readings
Depth of Snow on Ground -Campbell Scientific SR50 sonic level sensor	Total	(cm)	Mean of 12 readings made in the last minute of each quarter hour.
Mean Relative Humidity -HMP45C212 humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Global Solar Radiation -Kipp and Zonen SP Lite 2 pyranometer	Mean	(kW/m <sup>2</sup> )	Mean of readings every 5 sec.
Barometric pressure -RM Young 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Mean Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Mean Speed	(km/h)	Daily mean wind speed from readings averaged every 5 sec.
	Peak Gust Speed	(km/h)	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	(km/h)	Maximum of 2 minute scalar wind speed means from readings every 5 sec.
	10 min. Gust Speed	(km/h)	Maximum of 10 minute scalar wind speed means from readings every 5 sec.
<b>Datalogger Type</b>		<b>Telemetry Type</b>	
Campbell Scientific CR1000		Raven X HSPA Cellular Modem	

**Table C.3-10 Summary of monthly climate data collected at the RAMP Surmont Climate Station (C5) during the 2013 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speeds	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov-2012	-27.4	-11.3	7.6	23.90	20.5	83.68	22.33	94.91	6.3	208	42.97	26.06	22.97
Dec-2012	-33.7	-18.4	-1.7	26.69	35.9	82.13	15.06	94.54	4.0	191	33.23	21.15	17.02
Jan-2013	-36.9	-16.3	4.0	25.21	52.9	80.23	22.52	94.76	5.6	227	49.25	34.84	29.11
Feb-2013	-24.3	-8.4	5.4	23.84	57.8	78.54	53.61	94.44	7.0	207	43.89	33.24	27.98
Mar-2013	-29.6	-9.2	12.4	26.40	59.9	67.53	112.78	95.13	7.1	217	48.62	35.93	30.14
Apr-2013	-19.5	-1.3	13.7	39.83	21.8	63.81	165.09	94.90	8.0	192	57.44	45.07	33.06
May-2013	-16.7	11.8	26.5	19.28	0.0	53.74	239.26	94.89	7.5	194	68.8	47.82	40.3
Jun-2013	3.6	15.0	27.8	200.94	0.0	73.40	193.06	94.66	6.6	199	50.17	34.68	30.26
Jul-2013	4.1	15.8	32.7	101.60	0.0	69.67	200.10	94.87	6.3	221	50.1	28.75	24.3
Aug-2013	3.3	16.6	28.4	20.18	0.0	68.22	183.82	94.85	5.2	197	44.88	25.68	23.64
Sep-2013	-1.8	12.6	29.3	38.27	0.0	69.32	142.64	94.33	6.3	218	45.44	27.77	23.84
Oct-2013	-16.7	3.5	14.8	23.29	0.0	75.11	60.43	94.81	6.8	225	47.13	33.29	25.09
2013 WY Annual	-36.9	0.9	32.7	569.43	-	72.11	117.56	94.76	6.4	208	68.8	47.82	40.30

### C.3.1.6 Climate Variables at Other RAMP Stations

Table C.3-11 summarizes the climate variables monitored at RAMP stations other than the Aurora, Horizon, Steepbank, Pierre, and Surmont climate stations.

Total precipitation was monitored at stations L1 (using a Pluvio 1000/Pluvio 2 weighing gauge) and L2 (using a Geonor weighing gauge), with rainfall also being measured from April to October of 2013 at stations S3, S19, S40, and S43 using tipping bucket rain gauges.

Barometric pressure was monitored at Station S5A throughout the 2013 WY.

Table C.3-12 and Table C.3-13 provide a monthly summary of the climate data collected at other RAMP stations. Daily monitoring data were included in the RAMP database. Daily cumulative precipitation and rainfall depths at the various stations were compared to precipitation recorded at other regional stations in Figure C.3-1 and Table C.3-12.

**Table C.3-11 Climate data collected at other RAMP stations, 2013.**

Station	Variable	Sensor
L1 McClelland Lake	Total Precipitation	Ott Pluvio 1000/ Ott Pluvio 2 weighing gauge
	Water Temperature	
	Air Temperature	Ott PLS built-in thermistor
	Relative Humidity	HMP45C212 thermistor HMP45C212 humidity sensor
L2 Kearn Lake	Precipitation	Geonor precipitation gauge
	Water Temperature	Ott PLS built-in thermistor
	Air Temperature	HMP45C212 thermistor
	Relative Humidity	HMP45C212 humidity sensor
S3 Iyininim Creek above Kearn Lake	Rainfall	Texas Electronics TE525 tipping bucket
S5A Muskeg River above Muskeg Creek	Barometric Pressure	RM Young 61302V barometric pressure sensor
S19 Tar River Lowland Tributary near the mouth	Rainfall	Texas Electronics TE525 tipping bucket
S40 MacKay River at Petro-Canada Bridge	Rainfall	Texas Electronics TE525 tipping bucket
S43 Firebag River upstream of Suncor Firebag	Rainfall	Texas Electronics TE525 tipping bucket

**Table C.3-12 Summary of climate data collected at McClelland Lake (L1) and Kearl Lake (L2) during the 2013 WY.**

Station	L1 McClelland Lake				L2 Kearl Lake			
Period of Operation	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013	Nov 1, 2012 to Oct 31, 2013
Month	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)
Nov-2012	27.20	1.4	-12.4	83.69	25.81	6.6	-12.0	82.82
Dec-2012	25.60	-0.1	-21.4	81.10	17.49	4.8	-20.1	80.71
Jan-2013	23.10	-1.4	-18.9	80.77	9.82	4.1	-18.2	80.14
Feb-2013	18.00	-1.4	-10.6	81.19	19.82	3.6	-9.9	79.61
Mar-2013	20.40	-1.9	-11.0	70.23	20.34	3.3	-10.0	67.86
Apr-2013	18.40	-0.5	-2.2	65.35	31.55	2.9	-1.8	63.00
May-2013	11.10	4.0	12.1	56.28	25.43	4.3	13.3	52.29
Jun-2013	145.20	15.9	17.1	71.66	147.63	10.6	17.0	69.76
Jul-2013	77.30	18.7	17.3	68.29	80.05	13.7	16.9	67.18
Aug-2013	42.89	19.6	17.3	73.81	59.26	14.4	17.5	70.87
Sep-2013	59.21	16.0	13.0	73.81	80.91	14.3	13.2	71.70
Oct-2013	28.60	6.7	3.7	81.34	34.74	10.5	3.7	78.25
Annual Sum	497.00	-	-	-	552.85	-	-	-
Annual Mean	-	6.4	0.3	73.96	-	7.8	0.8	72.02

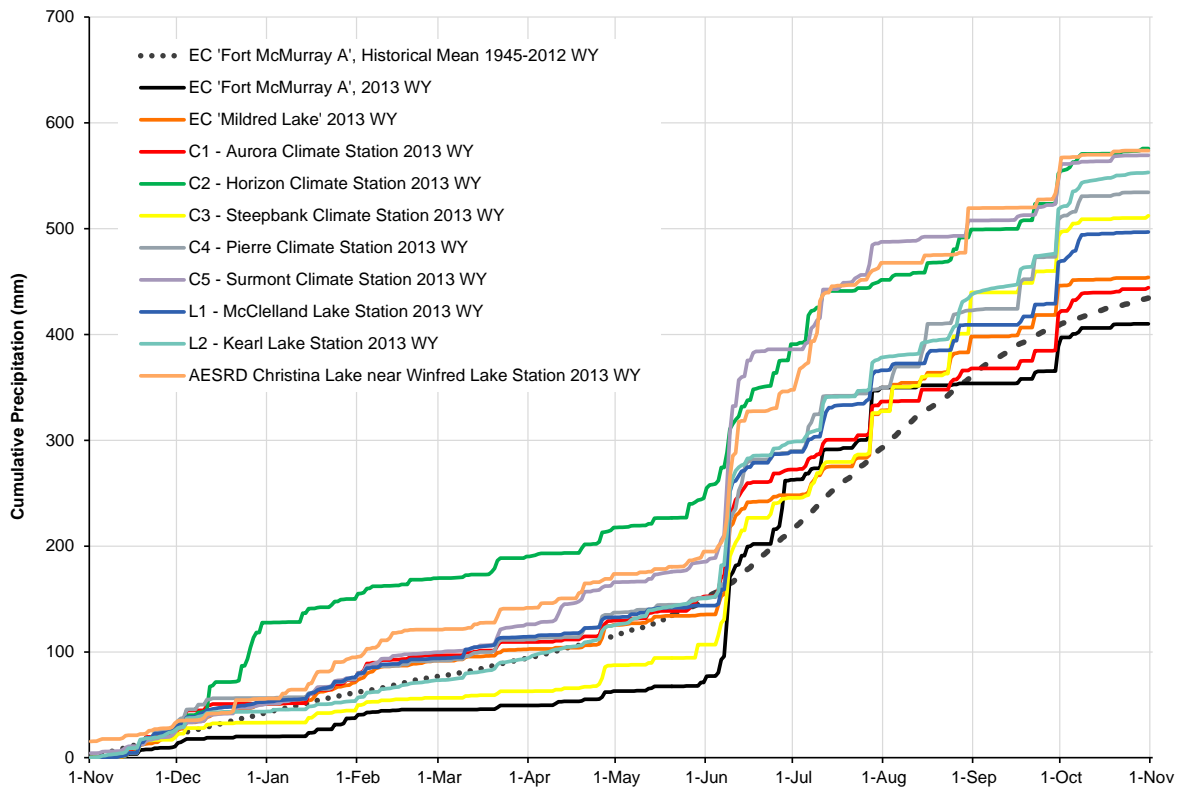
Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.3.1.7.

**Table C.3-13 Summary of atmospheric pressure (kPa) data collected at other RAMP stations during the 2013 WY.**

Month	S3 Iyininim Creek above Kearl Lake	S19 Tar River Lowland Tributary near the mouth	S40 MacKay River at Petro- Canada Bridge	S43 Firebag River above Suncor Firebag	S5A Muskeg River above Muskeg Creek
Nov-2012	-	-	12.45 P	0.90 P	98.33
Dec-2012	-	-	-	-	98.07 P
Jan-2013	-	-	-	-	98.25
Feb-2013	-	-	-	-	97.77
Mar-2013	-	-	-	-	98.56
Apr-2013	-	1.40 P	-	-	98.61 P
May-2013	31.50 P	19.10	5.08 P	8.10 P	97.91
Jun-2013	174.90	137.30	153.67	19.50	97.81
Jul-2013	83.40	65.90	83.31	36.40	97.77
Aug-2013	38.00	30.70	36.57	63.00	97.74
Sep-2013	60.90	65.80	25.40	92.96	97.23
Oct-2013	32.00	23.40 P	23.62	40.89	97.85
<b>Annual Sum</b>	420.70	343.60	340.10	261.75	-
<b>Annual Mean</b>	-	-	-	-	97.99

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.3.1.7.

**Figure C.3-1 Annual precipitation from climate stations in the oil sands region, 2013 WY.**



### C.3.1.7 RAMP Database

RAMP Climate and Hydrology data are available on-line through the RAMP database ([www.ramp-alberta.org](http://www.ramp-alberta.org)). The 2013 WY data are published to the RAMP website in May 2014 upon the completion of the QA/QC process for data management. The following notes apply to the monthly climate data (summarized above) and to the daily data, which are publically available and provided in the RAMP database:

- Precipitation measurements, including tipping bucket rain gauges, do not differentiate between rainfall and snowfall; therefore, the values recorded represent total precipitation for the associated period of record;
- Wind direction is reported in degrees clockwise from north;
- Reported monthly climate data include extreme minimum and maximum temperature data; mean temperature and relative humidity; and total precipitation and solar radiation; and
- Reported annual values include extreme minimum and maximum temperature; mean temperature, relative humidity and solar radiation; and total precipitation.

### C.3.1.8 2013 Snow Course Survey Results

Snow course surveys were completed at sites representing four general terrain types across the RAMP study area:

- Flat low lying areas (FL);
- Open land or lake areas (OP);
- Mixed deciduous (MD); and
- Jackpine (JP).

Locations of the snow course surveys are shown on Figure 3.1-1 of the main report.

Snow course surveys were completed from February 1 to 6, February 25 to 27, and March 25 to 29, 2013. The results organized by land cover type are shown in Table C.3-14 and organized by region in Table C.3-15. Snow survey data are also available through the RAMP database.

**Table C.3-14 Summary of the RAMP snow course surveys organized by land cover type, winter 2013.**

Terrain Type	Survey ID	February (Feb)		March (Mar)		April (Mar)	
		Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)
Flat Low Lying	CANR-FL-A	79	130	77	159	88	124
	CNRL-FL-A	69	97	67	139	75	159
	MCLL-FL-A	75	110	68	164	76	107
	NEX-FL-A	63	96	63	144	71	170
	Mean	72	108	69	<u>152</u>	78	140
Open Land/Lake Area	CANR-OP-A	31	50	34	86	28	69
	CNRL-OP-A	35	46	34	-	70	105
	MCLL-OP-A	37	51	16	-	30	70
	NEX-OP-A	42	68	16	51	26	63
	Mean	36	54	25	69	39	<u>77</u>
Mixed Deciduous	CANR-MD-A	65	110	61	126	70	153
	CNRL-MD-A	66	102	64	158	73	105
	MCLL-MD-A	62	112	59	162	52	129
	NEX-MD-A	61	102	60	155	70	155
	Mean	64	107	61	<u>150</u>	66	136
Jackpine	CANR-JP-A	60	96	61	156	63	145
	CNRL-JP-A	50	61	53	103	63	128
	MCLL-JP-A	52	96	46	116	52	129
	NEX-JP-A	50	104	55	135	60	146
	Mean	53	89	54	128	60	<u>137</u>

Note: Underlined mean values denote the maximum observed values for a given terrain type in 2013. These values are plotted in Figure 4.1-4 of the main report.

**Table C.3-15 Summary of the RAMP snow course surveys organized by region, winter 2013.**

Region	Survey ID	February (Feb)		March (Mar)		April (Mar)	
		Snow Depth [cm]	SWE [mm]	Snow Depth [cm]	SWE [mm]	Snow Depth [cm]	SWE [mm]
Kearl Lake Area	CANR-FL-A	79	130	77	159	88	124
	CANR-OP-A	31	50	34	86	28	69
	CANR-MD-A	65	110	61	126	70	153
	CANR-JP-A	60	96	61	156	63	145
	Mean	59	97	58	132	62	123
CNRL Lake Area	CNRL-FL-A	69	97	67	139	75	159
	CNRL-OP-A	35	46	34	-	70	105
	CNRL-MD-A	66	102	64	158	73	105
	CNRL-JP-A	50	61	53	103	63	128
	Mean	55	77	55	133	70	124
McClelland Lake Area	MCLL-FL-A	75	110	68	164	76	107
	MCLL-OP-A	37	51	16	-	30	70
	MCLL-MD-A	62	112	59	162	52	129
	MCLL-JP-A	52	96	46	116	52	129
	Mean	57	92	47	147	53	109
Sucker Lake Area	NEX-FL-A	63	96	63	144	71	170
	NEX-OP-A	42	68	16	51	26	63
	NEX-MD-A	61	102	60	155	70	155
	NEX-JP-A	50	104	55	135	60	146
	Mean	54	93	49	121	57	134



## C.4 HYDROMETRIC DATA COLLECTED IN THE 2013 WY

Hydrometric data for the region were collected throughout the 2013 WY. RAMP Climate and Hydrology data are available on-line through the RAMP website ([www.ramp-alberta.org](http://www.ramp-alberta.org)). The 2013 WY data are published to the RAMP website in May 2014 upon the completion of the QA/QC process for data management.

### C.4.1 RAMP Hydrometric Data

Hydrometric data, including water level and discharge, were collected for the region during the 2013 WY. These data were collected at hydrometric monitoring stations where near-continuous water level data were recorded using pressure transducers and data loggers. Discharge rating curves, developed and maintained for each station, were applied to develop flow values from the recorded water level data. Suspended sediment samples were also collected at RAMP hydrometric stations during the open-water period of the 2013 WY. Table C.4-1 provides a summary of the equipment at each RAMP hydrometric station during the 2013 WY, including types of data loggers, pressure transducers, and telemetry.

**Table C.4-1 Equipment deployed at RAMP hydrometric stations.**

RAMP Station	Data Logger Type	Pressure Transducer Type	Telemetry Type
L1	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
L2	Campbell Scientific CR-1000	Ott PLS	Raven X HSPA Cellular Modem
L3	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
L4	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S2	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S3	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S5	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S6	Campbell Scientific CR-800	Ott PLS	Raven X CDMA Cellular Modem
S7	Campbell Scientific CR-800	Ott PLS	Raven XT CDMA Cellular Modem
S9	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S10/S10A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S11	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S12	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S14A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S15A	Campbell Scientific CR-800	Ott PLS	Raven CDMA Cellular Modem
S16A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S19	Campbell Scientific CR-800	Ott PLS	Raven XT CDMA Cellular Modem
S20	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S20A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S22	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S24	Campbell Scientific CR-800	Ott PLS (x2)	Raven X HSPA Cellular Modem
S25	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S31	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S32	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S33	Campbell Scientific CR-800	Ott PLS	Raven X CDMA Cellular Modem
S34	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem

**Table C.4-1 (Cont'd.)**

<b>RAMP Station</b>	<b>Data Logger Type</b>	<b>Pressure Transducer Type</b>	<b>Telemetry Type</b>
S36	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S37	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S40	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S43	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S44	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S45	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S46	Campbell Scientific CR-1000	Ott PLS (x2)	Campbell Scientific TX320 GOES Transmitter
S47A	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S48	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S49	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S50A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S51	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S53	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S54	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S55	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater
S56	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S57	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S58	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S60	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S61	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S62	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S63	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S64	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S65	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem

### **C.4.1.1 Water Level and Discharge**

Table C.4-2 provides a summary of RAMP hydrometric monitoring in the 2013 WY. The quality assessment shown for each station record was based on an assessment matrix that considered the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the completeness of the data record.

Data quality for the 2013 WY was generally good (33 of 50 locations) with wildlife, high water levels, and equipment attrition affecting the 2013 WY hydrometric record at 17 stations as described below:

- High water level during spring flooded the enclosure at station S5 Muskeg River above Stanley Creek. The modem was damaged, but the data logger

remained functional and no loss of data occurred. Once water levels decreased, the data logger and modem were replaced and the enclosure was relocated to higher ground.

- A pressure transducer malfunction at station S25 Susan Lake Outlet, between May and July 2013, resulted in erratic data. The pressure transducer malfunction was corrected and good quality data were collected for the remainder of the open-water season.
- The pressure transducer at station S11 Poplar Creek at Hwy 63, was dry from August 19 to September 22, 2013, caused by channel scour during the spring high water that moved the channel. The monitoring station was relocated to the right bank, about 10 m downstream of the original monitoring location, and was reinstated on September 22, 2013.
- High water level during the spring flooded the enclosure at station S32 Surmont Creek at Hwy 881. The modem and data logger were damaged, and the system stopped recording data on May 20, 2013. The modem and datalogger were replaced, and the enclosure was relocated to a higher position. The station was reinstated on June 25, 2013.
- The pressure transducer at station S55 Gregoire River near the mouth was pulled from the data logger on June 11, 2013 during a high-water event. Channel scour was significant at this site, and approximately 10 m of the left bank was washed away, causing damage to three of four benchmarks. The station was reinstated on August 11 and two new benchmarks were installed on September 15, 2013.
- The pressure transducer at station S56 Jackfish River below Christina Lake was pulled from the logger by debris in the river during the spring high water period. The transducer was replaced on May 18, 2013 and the station was reinstated.
- An ice jam and subsequent break-up caused damage to station S24 Athabasca River below Eymundson Creek on May 2, 2013. The data logger and modem were replaced, two new benchmarks were installed, and the enclosure was mounted to a new mast to reinstate the station on May 13, 2013.
- An ice jam and subsequent break-up caused damage to station S46 Athabasca River near Embarras Airport on May 2, 2013. All benchmarks were damaged by ice, and the enclosure was flooded. The data logger and pressure transducer were replaced, three new benchmarks were installed, and the enclosure was mounted to a new mast to reinstate the station on May 23, 2013.
- Ice break-up caused the pressure transducer to be pulled from the data logger at station S47A Christina River near the mouth on May 2, 2013. The transducer was replaced and the station was reinstated on May 9, 2013.
- A power cable was severed by wildlife causing a disruption to monitoring at station S36 McClelland Lake outlet above the Firebag River on August 21, 2013. The power cables were repaired and the station was reinstated on September 15, 2013.
- A power cable was pulled from the monitoring equipment at station S43 Firebag River above Suncor Firebag, causing a disruption in monitoring on

July 17, 2013. The cable was repaired and the station was reinstated on August 12, 2013.

- A power connector was severed at station S50A Red Clay Creek, when wildlife pulled the enclosure from the tree that it was mounted to, causing a disruption to monitoring on August 5, 2013. The station was repaired and reinstated during the next field visit on August 10, 2013.
- Wildlife caused the transducer cable to be disconnected from station S61 Christina River above Statoil Leismer, causing a disruption to monitoring on September 12, 2013. The sensor was re-wired and the station was reinstated on September 16. Wildlife caused damage to power cables and the transducer cable again on September 28, causing a disruption to station monitoring. The station was repaired and reinstated during the next field visit on October 17, 2013.
- The tipping bucket and solar panel were vandalized at station S31 Hanginstone Creek at North Star Road. The data logger remained online, so station monitoring was not disrupted. The solar panel was replaced during the field visit on September 17 and a replacement tipping bucket will be installed in spring 2014.
- A faulty power connection at station S5A Muskeg River above Muskeg Creek, caused station monitoring to be intermittent from April 9, to May 8, 2013 when the connection was repaired.
- A faulty power connection caused a disruption to monitoring at station S31 Hanginstone Creek at North Star Road, on February 25, 2013. The connection was repaired during the next field visit, and the station was reinstated on April 3, 2013.
- A faulty power connection caused a disruption to monitoring at station S53 Dover River near the mouth, on June 8, 2013. The connection was repaired and the station was reinstated during the next field visit on June 15, 2013.
- A solar panel short at station S51 High Hills River near the mouth, caused the data logger to malfunction on August 11, 2013. The solar panel was repaired and station function was reinstated on September 14, 2013.

Data quality at the following eight stations was compromised due to backwater effects, caused by conditions such as beaver activity:

- S09, Kearn Lake outlet;
- S15A, Tar River near the mouth;
- S36, McClelland Lake outlet above Firebag River;
- S37, East Jackpine Creek near the 1,300 ft. contour;
- S57, Sunday Creek above Christina Lake;
- S58, Sawbones Creek above Christina Lake;
- S62, Birch Creek at Highway 881; and
- S64, Unnamed Creek, east of Christina Lake.

**Table C.4-2 Summary of RAMP hydrometric monitoring during the 2013 WY.**

Watershed and Station	Catchment Area (km <sup>2</sup> )	Monitored Period 2013 WY	Percent of Open-Water Period Record Available 2013 WY	Maximum Daily Discharge (Water Year: Nov 1 2012 - Oct 31 2013)		Minimum Daily Discharge (Open Water Season: May 1 - Oct 31 2013)		Runoff Volume (Open Water Season: May 1 - Oct 31 2013)	
				2013 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2013 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2013 WY (mm)	Historic mean (mm)
<b>Athabasca River</b>									
S46 - Athabasca River near Embarras Airport	156,000.0	Nov 1 - Oct 31	90	3690	2796	405	565	128.2	119.8
S24 - Athabasca River below Eymundson Creek	146,000.0	Nov 1 - Oct 31	93	2989	2363	435	368	125.5	96.9
Athabasca River at Fort McMurray (07DA001)	133,000.0	Nov 1 - Oct 31	100	3040	2536	347	425	143.5	117.4
<b>Athabasca River East Tributaries</b>									
S6 - Mills Creek at Highway 63	9.0	Nov 1 - Oct 31	100	0.2	0.1	0.01	0.02	112.5	75.7
S12 - Fort Creek at Highway 63	63.8	Apr 29 - Oct 31	100	0.7	-	0.03	0.02	45.0	22.5
S25 - Susan Lake Outlet	20.7	July 11 - Oct 31	61	0.3	-	0.00	0.01	17.7	40.1
<b>Muskeg River Basin</b>									
S2 - Jackpine Creek at Canterra Road	342.0	Nov 1 - Oct 31	100	26.5	7.6	0.14	0.27	204.4	88.7
S3 - Iyininim Creek above Kearl Lake	39.3	May 5 - Oct 31	98	4.7	-	0.02	0.02	230.7	105.5
S5 - Muskeg River above Stanley Creek	396.0	Nov 1 - Oct 31	95	12.8	8.4	0.29	0.17	121.9	66.2
S5A - Muskeg River above Muskeg Creek	521.0	Nov 1 - Oct 31	97	21.1	8.2	0.36	0.34	115.5	61.9
S7 - Muskeg River near Fort McKay (07DA008)	1457	Nov 1 - Oct 31	100	80.6	22.1	1.15	1.05	162.2	69.8
S9 - Kearl Lake Outlet	76.5	Nov 1 - Oct 31	100	5.1	0.5	0.028	0.02	198.1	29.1
S10 - Wapasu Creek at Canterra Road	90.7	Nov 1 - Oct 31	100	18.1	3.3	0.05	0.06	258.8	79.9
S20 - Muskeg River Upland	157.0	May 2 - Oct 31	99	20.9	-	0.04	0.05	196.2	63.5
S22 - Muskeg Creek near the Mouth	323.0	Nov 1 - Oct 31	100	18.4	-	0.14	0.15	177.8	60.2
S33 - Muskeg River at Aurora/Albian Boundary	897.0	Nov 1 - Oct 31	100	36.2	13.9	0.53	0.44	118.8	52.3
S37 - East Jackpine Creek near the 1300m Contour	47.4	May 5 - Oct 31	98	2.8	-	0.03	0.01	171.6	89.3
<b>Steepbank River Basin</b>									
S38 - Steepbank River near Fort McMurray (07DA006)	1,320	Nov 1 - Oct 31	100	70.5	33.8	1.39	1.67	208.0	102.4
<b>Firebag River Basin</b>									
S27 - Firebag River near the Mouth (07DC001)	5,987.6	Nov 1 - Oct 31	100	373	118.3	19.90	15.56	203.6	99.0
S36 - McClelland Lake Outlet above Firebag River	367.0	Nov 1 - Oct 31	87	3.1	-	0.34	0.35	34.7	19.4
S43 - Firebag River above Suncor Firebag	2,381.0	Nov 1 - Oct 31	86	106.9	42.8	7.02	5.41	156.5	92.8
<b>Athabasca River West Tributaries</b>									
S44 - Pierre River near Fort McKay (07DA013)	123.0	May 1 - Oct 31	100	3.3	1.4	0.02	0.05	73.3	37.3
S48 - Big Creek	304	May 1 - Oct 31	100	3.5	-	0.25	0.15	46.6	22.0
S49 - Eymundson Creek near the Mouth	320.0	May 1 - Oct 31	100	14.7	-	0.15	0.17	106.6	35.9
S50A - Red Clay Creek	180.0	May 1 - Oct 31	98	7.2	-	0.15	0.08	112.0	17.0
<b>Ells River Basin</b>									
S14A - Ells River at CNRL Bridge	2,420.0	Nov 1 - Oct 31	100	63.4	54.1	3.26	2.41	128.4	67.7
S45 - Ells River above Joslyn Creek Diversion	2,231.0	Nov 13 - Oct 23	100	50.4	22.8	3.61	3.39	121.5	48.5

\* See Section C.3.1.1 for details of missing data.

Means were calculated from years with greater than 85% of data for the required period.

**Table C.4-2 (Cont'd.)**

Watershed and Station	Catchment Area (km <sup>2</sup> )	Monitored Period 2013 WY	Percent of Open-Water Period Record Available 2013 WY	Maximum Daily Discharge (Water Year: Nov 1 2012 - Oct 31 2013)		Minimum Daily Discharge (Open Water Season: May 1 - Oct 31 2013)		Runoff Volume (Open Water Season: May 1 - Oct 31 2013)	
				2013 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2013 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2013 WY (mm)	Historic mean (mm)
				<b>Mackay River Basin</b>					
S26 - MacKay River near Fort McKay (07DB001)	5,569.3	Nov 1 - Oct 31	100	187	105.8	1.92	3.66	137.9	65.5
S40 - MacKay River at Petro-Canada Bridge	4,090.0	Nov 1 - Oct 31	100	152	34.0	2.18	2.80	158.1	53.6
S53 - Dover River near the Mouth	963	Nov 1 - Oct 31	96	31	14.1	0.37	0.18	87.0	18.4
S54 - Dunkirk River near Fort McKay	1,570.0	Nov 1 - Oct 31	100	75	25.5	0.80	0.52	145.3	60.9
<b>Tar River Basin</b>									
S15A - Tar River near the Mouth	332.0	April 29 - Oct 31	100	19.0	2.8	0.10	0.19	114.7	35.7
S19 - Tar River Lowland Tributary near the Mouth	21.0	April 29 - Oct 31	100	0.149	-	0.000	0.002	15.8	11.2
S34 - Tar River above CNRL Lake	146.0	Nov 1 - Oct 31	100	11.6	4.5	0.06	0.09	125.0	73.3
<b>Calumet River Basin</b>									
S16A / S16A / CR-1 - Calumet River	169.0	May 1 - Oct 31	100	7.3	2.2	0.01	0.02	62.6	17.5
<b>Poplar River Basin</b>									
S11 - Poplar Creek at Highway 63 (07DA007)	151	Nov 1 - Oct 31	82	21.9	9.8	0.04	0.06	386.7	140.5
S39 - Beaver River above Syncrude (07DA018)	164.8	Nov 1 - Oct 31	100	3.7	8.4	0.12	0.13	49.8	78.1
<b>Clearwater River Tributaries</b>									
S29 - Christina River near Chard (07CE002)	4,862.9	Nov 1 - Oct 31	90	172.0	90.6	0.87	6.68	140.8	76.7
S31 - Hangingstone Creek near the Mouth	119.0	Nov 1 - Oct 31	100	10.1	-	0.14	0.19	219.8	121.1
S32 - Surmount Creek at Highway 881	157.0	May 1 - Oct 31	81	11.2	-	0.08	0.12	141.6	113.5
S42 - Clearwater River above Christina River (07CD005)	17,016.6	Nov 1 - Oct 31	100	288.0	189.3	78.00	59.45	127.7	85.5
S47A - Christina River near the Mouth	13,284.0	Nov 1 - Oct 31	88	345.3	166.3	16.22	16.90	111.8	71.9
S51 - High Hills River near the Mouth	1,588.0	Nov 1 - Oct 31	82	75.9	-	2.98	-	112.0	-
S55 - Gregoire River above the Christina River	1,015.0	Nov 1 - Oct 31	67	52.7	-	0.69	0.87	102.2	83.1
S56 - Jackfish River below Christina Lake	1,290.0	Nov 1 - Oct 31	98	65.2	-	1.88	0.74	174.9	40.4
S57 - Sunday Creek above Christina Lake	374.0	Nov 1 - Oct 31	100	35.1	-	0.28	0.20	196.1	47.3
S58 - Sawbones Creek above Christina Lake	126.0	May 1 - Oct 31	100	13.3	-	0.10	0.10	185.1	25.8
S60 - Unnamed Creek south of Christina Lake	140.0	May 6 - Oct 31	97	6.5	-	0.06	-	158.3	-
S61 - Christina River above Statoil Leismer	1,028.0	May 10 - Oct 31	84	71.6	-	2.28	-	204.7	-
S62 - Birch Creek at Hwy 881	197.0	May 18 - Oct 31	91	16.2	-	0.26	-	117.9	-
S63 - Sunday Creek at Hwy 881	135.0	May 6 - Oct 31	83	11.2	-	0.02	-	141.6	-
S64 - Unnamed Creek East of Christina Lake	171.0	May 15 - Oct 31	92	7.4	-	0.28	-	130.2	-
				Maximum Water Level		Minimum Water Level			
<b>Water Level Stations</b>				2012 WY	Historic mean	2012 WY	Historic mean		
L1 - McClelland Lake (Firebag River Watershed)	204.0	Nov 1 - Oct 31	93	-	294.548	-	294.289		
L2 - Kearn Lake	71.6	Nov 1 - Oct 31	100	332.391	332.098	331.634	331.717		
L3 - Isadore's Lake	14.2	Nov 1 - Oct 31	100	234.233	234.014	233.617	233.683		
L4 - Namur Lake near the Outlet (Ells River Watershed)	164	Nov 1 - Oct 31	100	98.288	-	97.791	-		

\* See Section C.3.1.1 for details of missing data.

Means were calculated from years with greater than 85% of data for the required period.

### C.4.1.2 Suspended Sediment

Suspended sediment samples were collected at 45 RAMP streamflow stations for a total of 206 measurements in the 2013 WY. The total suspended sediment (TSS) data are provided in Table C.4-3. Discharge (Q) shown in the table is the manual discharge measurement at the time the sample was collected.

**Table C.4-3 Suspended sediment data collected at RAMP hydrometric stations during the 2013 WY.**

Station		May 1 to 23	June 2 to July 2	Aug 7 to 21	Sept 9 to 23	Oct 16 to Nov 2
S02	TSS (mg/L)	103	5.0	3.0	4.0	3.0
	Q (m <sup>3</sup> /s)	18.8**	7.21**	1.42	0.259	1.59
S03	TSS (mg/L)	155	236	<3.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	2.930**	2.460**	0.084	0.018	0.170
S5	TSS (mg/L)	4.0	*	8.0	*	6.0
	Q (m <sup>3</sup> /s)	10.950**	*	0.609	0.608	2.420
S5A	TSS (mg/L)	434	3.0	6.0	6.0	15.0
	Q (m <sup>3</sup> /s)	12.200**	13.400**	0.663	0.529	2.190
S6	TSS (mg/L)	*	*	7.0	8.0	<3.0
	Q (m <sup>3</sup> /s)	0.012	0.138	0.031	0.094	0.052
S7	TSS (mg/L)	11.0	6.0	<3.0	4.0	5.0
	Q (m <sup>3</sup> /s)	26.90	8.37**	5.94	2.88**	7.41**
S9	TSS (mg/L)	8.0	<3.0	<3.0	4.0	4.0
	Q (m <sup>3</sup> /s)	0.031	2.040	0.301	0.045	0.331
S10A	TSS (mg/L)	8.0	9.0	4.0	<3.0	3.0
	Q (m <sup>3</sup> /s)	5.070	8.250	0.229	0.056	0.800
S11	TSS (mg/L)	*	17.0	6.0	*	4.0
	Q (m <sup>3</sup> /s)	2.51	1.88	3.19	0.10	1.43
S12	TSS (mg/L)	*	<3.0	12.0	4.0	5.0
	Q (m <sup>3</sup> /s)	0.352	0.402	0.069	0.047	0.107
S14A	TSS (mg/L)	742.0	98.0	5.0	4.0	10.0
	Q (m <sup>3</sup> /s)	64.20	37.70**	8.05	5.12	7.54
S15A	TSS (mg/L)	*	37.0	38.0	135.0	31.0
	Q (m <sup>3</sup> /s)	0.761	2.120	0.242	0.336	0.306
S16A	TSS (mg/L)	11.0	16.0	<3.0	*	3.0
	Q (m <sup>3</sup> /s)	1.460	3.590	0.023	0.009	0.088
S19	TSS (mg/L)	*	<3.0	16.0	46.0	3.0
	Q (m <sup>3</sup> /s)	0.108	0.033	0.002	0.000	0.008
S20A	TSS (mg/L)	8.0	7.0	6.0	8.0	<3.0
	Q (m <sup>3</sup> /s)	0.883	20.7**	0.171	0.062	0.493
S22	TSS (mg/L)	27.0	9.0	<3.0	<3.0	4.0
	Q (m <sup>3</sup> /s)	2.17	18.6**	1.17	0.147	1.47
S24	TSS (mg/L)	1,090	766	50.0	21.0	17.0
	Q (m <sup>3</sup> /s)	2,520	2,770	987	668	504
S25	TSS (mg/L)	10.0	<3.0	4.0	4.0	<3.0
	Q (m <sup>3</sup> /s)	0.226	*	0.016	0.086	0.054
S31	TSS (mg/L)	24.0	13.0	11.0	8.0	4.0
	Q (m <sup>3</sup> /s)	3.05	2.66	0.502	0.133	0.245
S32	TSS (mg/L)	165	89.0	12.0	4.0	<3.0
	Q (m <sup>3</sup> /s)	4.92	3.460	0.621	0.130	0.319
S33	TSS (mg/L)	*	39.0	3.0	5.0	3.0
	Q (m <sup>3</sup> /s)	17.1**	8.54	1.95	0.665	3.90

\* Not measured.

\*\* No manual measurement available, continuous discharge value displayed.

**Table C.4-3 (Cont'd.)**

Station		May 1 to 23	June 2 to July 2	Aug 7 to 21	Sept 9 to 23	Oct 16 to Nov 2
S34	TSS (mg/L)	21.0	370	7.0	<3.0	5.0
	Q (m <sup>3</sup> /s)	5.800**	1.520	0.183	0.065	0.573
S36	TSS (mg/L)	4.0	11.0	3.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	1.060	3.320	0.455	0.599	0.687
S37	TSS (mg/L)	3.0	*	*	25.0	<3.0
	Q (m <sup>3</sup> /s)	3.250**	2.830	0.222	0.039	0.201
S40	TSS (mg/L)	213	64.0	4.0	5.0	7.0
	Q (m <sup>3</sup> /s)	114**	38.0**	21.8	3.5	12.6
S43	TSS (mg/L)	23.0	17.0	<3.0	<3.0	*
	Q (m <sup>3</sup> /s)	81.30**	90.10**	9.18	7.10	13.00
S44	TSS (mg/L)	122.0	192.0	13.0	*	6.0
	Q (m <sup>3</sup> /s)	1.050	3.020	0.045	0.019	0.152
S45	TSS (mg/L)	110	*	11.0	<3.0	9.0
	Q (m <sup>3</sup> /s)	49.5**	43.2	9.71	5.15	7.14
S46	TSS (mg/L)	421	*	*	34.0	25.0
	Q (m <sup>3</sup> /s)	2,220	3,693**	1,100	692	549
S47A	TSS (mg/L)	*	*	*	16.0	*
	Q (m <sup>3</sup> /s)	283	114	86.7	29.5	28.5
S48	TSS (mg/L)	34.0	*	<3.0	3.0	7.0
	Q (m <sup>3</sup> /s)	0.608	2.86**	0.445	0.249	0.535
S49	TSS (mg/L)	114	1,220	88.0	*	52.0
	Q (m <sup>3</sup> /s)	2.12	8.94	0.311	0.18	0.561
S50A	TSS (mg/L)	21.0	18.0	4.0	10.0	5.0
	Q (m <sup>3</sup> /s)	0.528	7.24	0.497	0.536	0.582
S51	TSS (mg/L)	832	371	18.0	34.0	*
	Q (m <sup>3</sup> /s)	60.5**	44.4**	4.49	2.89	6.21
S52	TSS (mg/L)	71.0	<3.0	11.0	9.0	<3.0
	Q (m <sup>3</sup> /s)	1.84	1.22	1.22	0.883	0.870
S53	TSS (mg/L)	157	86.0	3.0	4.3	9.0
	Q (m <sup>3</sup> /s)	26.2	27.9	1.51	0.471	1.65
S54	TSS (mg/L)	45.0	18.0	12.0	5.0	11.0
	Q (m <sup>3</sup> /s)	28.00	17.20	2.78	1.07	4.67
S55	TSS (mg/L)	5.0	164.0	12.0	<3.0	8.0
	Q (m <sup>3</sup> /s)	48.70**	11.00	5.80	1.02	1.65
S56	TSS (mg/L)	11.0	<3.0	5.9	<3.0	5.0
	Q (m <sup>3</sup> /s)	33.6	42.3**	4.36	3.45	2.75
S57	TSS (mg/L)	241	10.0	<3.0	4.0	3.0
	Q (m <sup>3</sup> /s)	28.9**	2.190	0.330	0.323	0.685
S58	TSS (mg/L)	11.0	15.0	6.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	3.010	1.220	0.251	0.153	0.178
S60	TSS (mg/L)	47.0	7.0	3.0	5.0	4.0
	Q (m <sup>3</sup> /s)	4.68	0.763	0.150	0.067	0.174
S61	TSS (mg/L)	27.0	36.0	14.0	16.0	9.0
	Q (m <sup>3</sup> /s)	73.7	56.6	9.80	2.63	2.71
S62	TSS (mg/L)	92.0	46.0	4.0	13.0	4.0
	Q (m <sup>3</sup> /s)	3.160	1.680	0.412	0.283	0.401
S63	TSS (mg/L)	68.0	<3.0	150	3.0	4.0
	Q (m <sup>3</sup> /s)	11.3	1.15	0.122	0.233	0.264
S64	TSS (mg/L)	9.0	4.0	17.0	6.0	27.0
	Q (m <sup>3</sup> /s)	2.890	1.430	0.476	0.354	0.302

\* Not measured.

\*\* No manual measurement available, continuous discharge value displayed.



### C.4.2 Hydrometric Data from Focal Projects

Several oil sands operators provided stream flow and operational water withdrawal and discharge data to RAMP, as summarized in Table C.4-4.

**Table C.4-4 Hydrometric information for 2013 WY received from oil sands operators and incorporated into the RAMP water balance analyses.**

Operator	Watershed	Activity	Annual Volume (dam <sup>3</sup> )	Location	Time- step
CNRL - Horizon	Athabasca	Withdrawals from Athabasca River	19,398	459004 E, 6353835 N	Daily
CNRL - Kirby	Christina	Water withdrawals	30.7	Various	Daily
ConocoPhillips	Christina	Water withdrawals	41.8	Various	Daily
Husky Energy	Muskeg	Water releases	67.5	496177 E, 6343145 N	Daily
Imperial Oil Resources	Athabasca	Water withdrawals	4,723	469833 E, 6380051 N	Daily
MEG Energy	Christina	Water withdrawals	122.3	Various	Daily
Nexen	Christina	Water withdrawals	130.0	Various	Daily
Shell – Jackpine Mine	Athabasca	Withdrawals from Athabasca River	14,945	461423 E, 6346082 N	Daily
Statoil Canada Ltd.	Christina	Water withdrawals	44.0	Various	Monthly
Suncor Energy Ltd.	Athabasca	Withdrawals from the Athabasca River	23,932	473402 E, 6315276 N	Daily
		Releases to the Athabasca River	0.0		Daily
	Firebag	Water Releases	773	Various	Daily
	MacKay	Water withdrawals	8.7	Various	Daily
Syncrude	Muskeg	Aurora Clean Water Diversion to Stanley Creek	5,029	472955 E, 6355575 N	Daily
		Treated Sewage Releases to Athabasca River	265	469241 E, 6321495 N	Daily
	Athabasca	Withdrawals from Athabasca River	43,839	469584 E, 6320596 N	Daily
		Poplar Creek	Diversion from Beaver Creek into Poplar Creek	51,265	
Genovus	Christina	Water withdrawals	97.0	Various	Daily
JACOS	Horse	Water withdrawals	22.0	Various	Daily

Note: The above data were used in the water balance calculations described in Section 5. Further information was received from industry but not included in the water balance calculations, including: (i) data classified as muskeg dewatering, groundwater extraction, or other processes not affecting natural surface watercourses and waterbodies; (ii) operator withdrawal and discharge data located downstream of the corresponding observed *test* monitoring station; and (iii) focal project withdrawal and discharges occurring on days when observed *test* monitoring did not occur (e.g., during winter months for open-water monitoring stations, or when data collection was prevented due to forest fires or other reasons).

### C.4.3 Hydrometric Data from Government Agencies

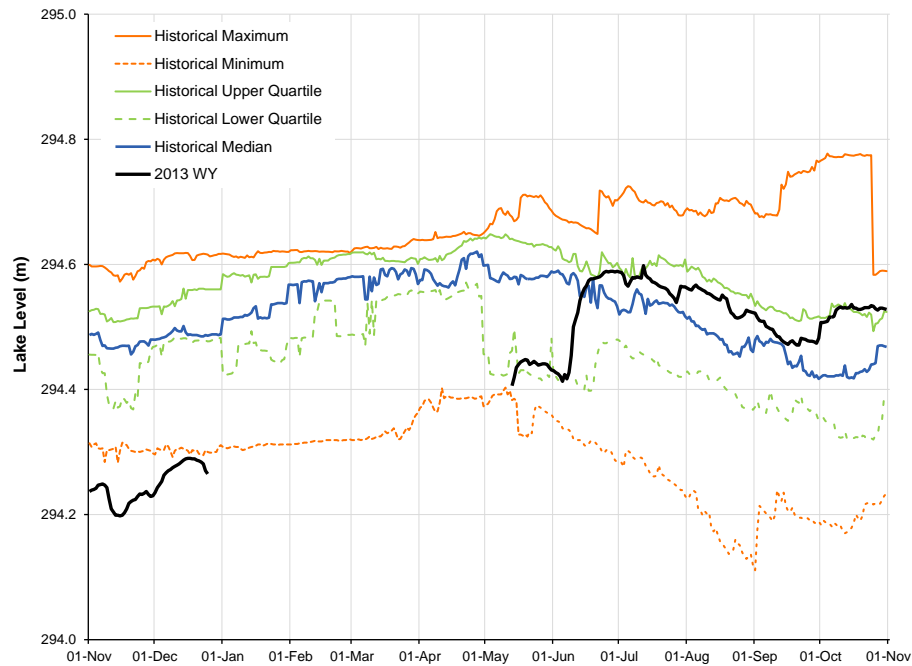
Daily discharge data are published by Environment Canada, including data for WSC hydrometric stations that are within the RAMP study area. In some cases, RAMP provided winter monitoring at seasonal WSC stations to extend the record to cover the full year. For stations where RAMP monitored to supplement the Environment Canada

data record, the full period of record, including both RAMP and WSC data, has been incorporated into the RAMP database. Beginning on January 1, 2013, WSC took over full operation of these stations; however, for the 2013 WY, RAMP conducted the winter monitoring at these stations from November 1 to December 31, 2012. Data flagging protocols are used in the database to identify data sources. An inventory of the data obtained for the stations is provided in Section C.5.

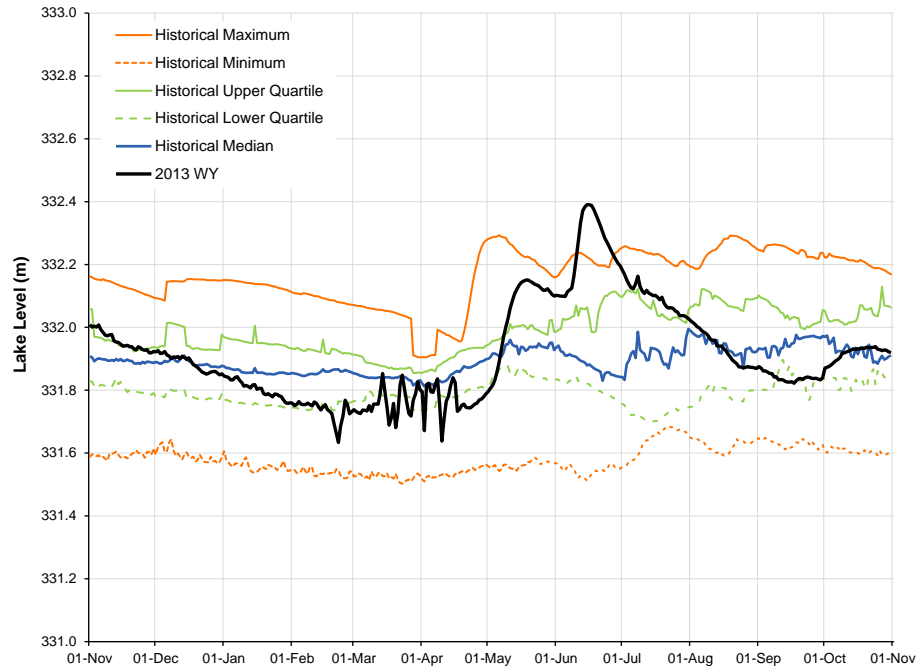
#### C.4.4 2013 WY Hydrographs with Historical Context

Hydrographs of discharge and water level for the 2013 WY measured at lotic and lentic RAMP stations, respectively are presented in Figure C.4-1 to Figure C.4-49. Historical maximum, minimum, and median daily values are also provided to assist with interpretation. Stations L4, S48, S49, S50A, S51, S55, S57, S58, S60, S61, S62, S63, and S64 do not contain more than three years of historical data, and are shown as individual years for these stations. In all cases, the current year was excluded from the calculation of the historical context, so that the current year was compared to the previous years.

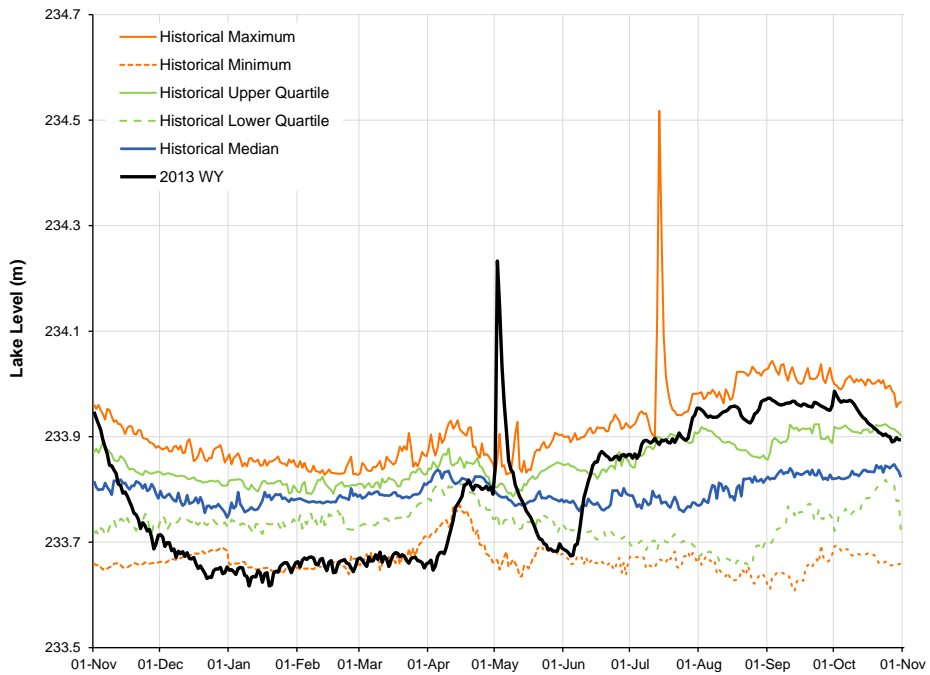
**Figure C.4-1 Water level of McClelland Lake (Station L1) during the 2013 WY, compared to historical values.**



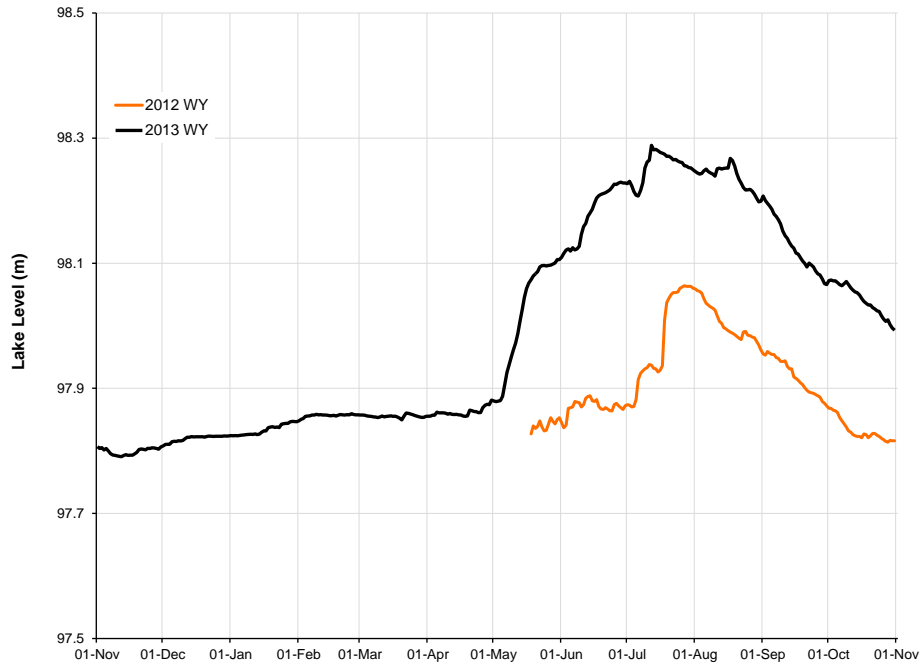
**Figure C.4-2 Water level of Kearl Lake (Station L2) during the 2013 WY compared, to historical values.**



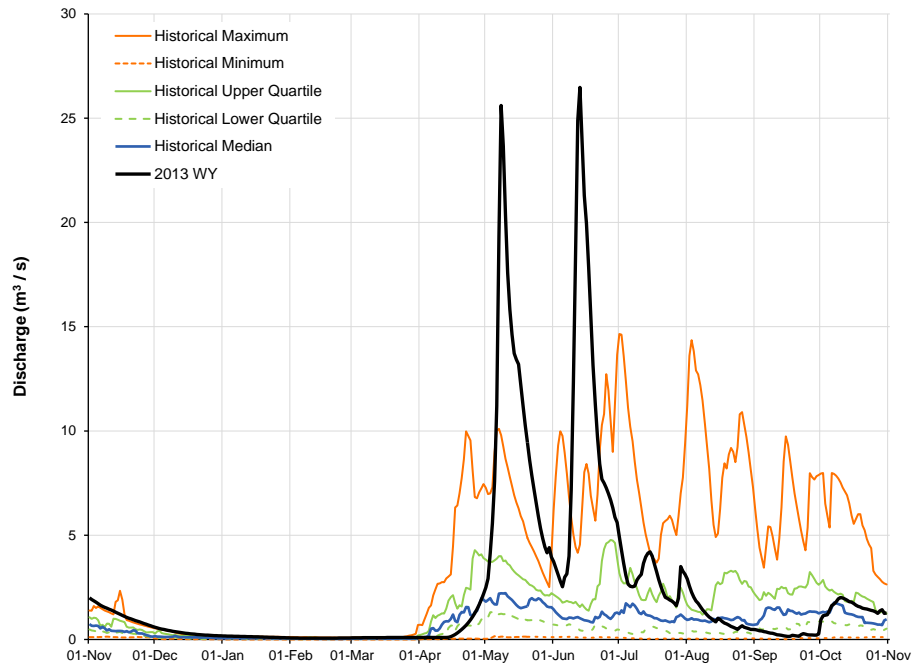
**Figure C.4-3 Water level of Isadore's lake (Station L3) during the 2013 WY, compared to historical values.**



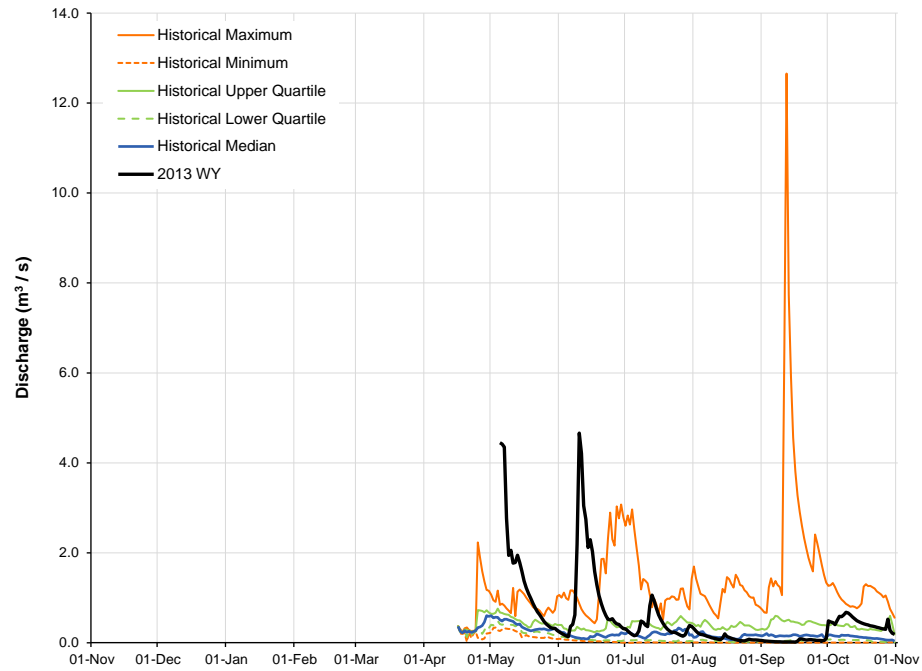
**Figure C.4-4 Water level of Namur Lake near the outlet (Station L4) during the 2013 WY.**



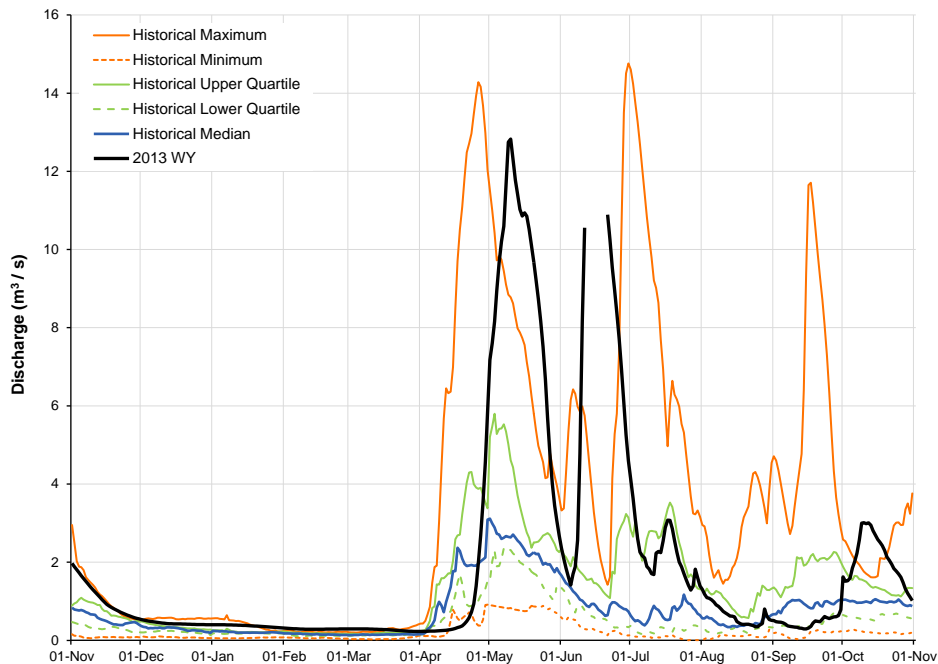
**Figure C.4-5 Discharge of Jackpine Creek at the Canterra Road (Station S2) during the 2013 WY, compared to historical values.**



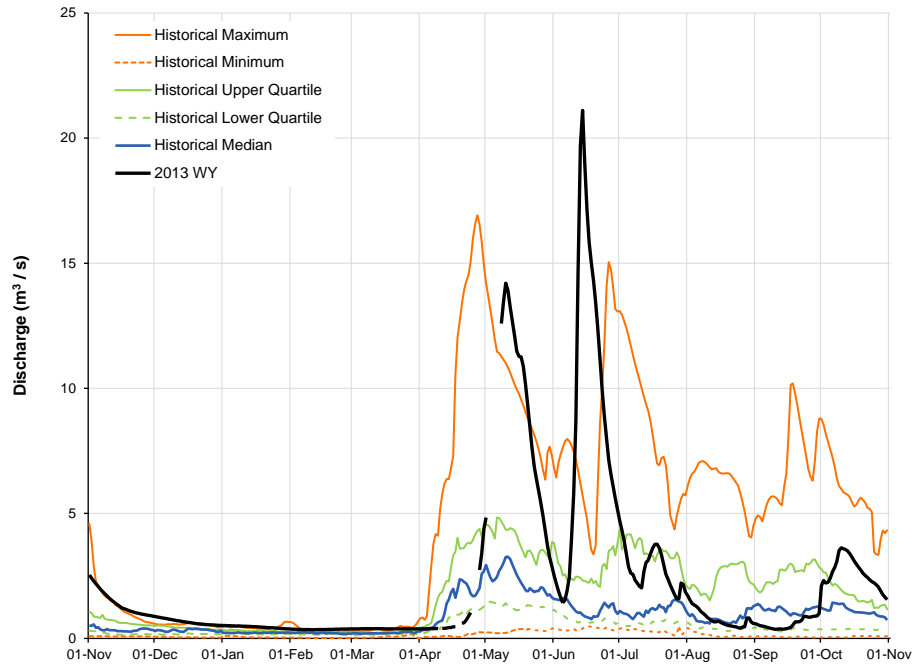
**Figure C.4-6 Discharge of Iyininim Creek, located above Kears Lake (Station S3) during the 2013 WY, compared to historical values.**



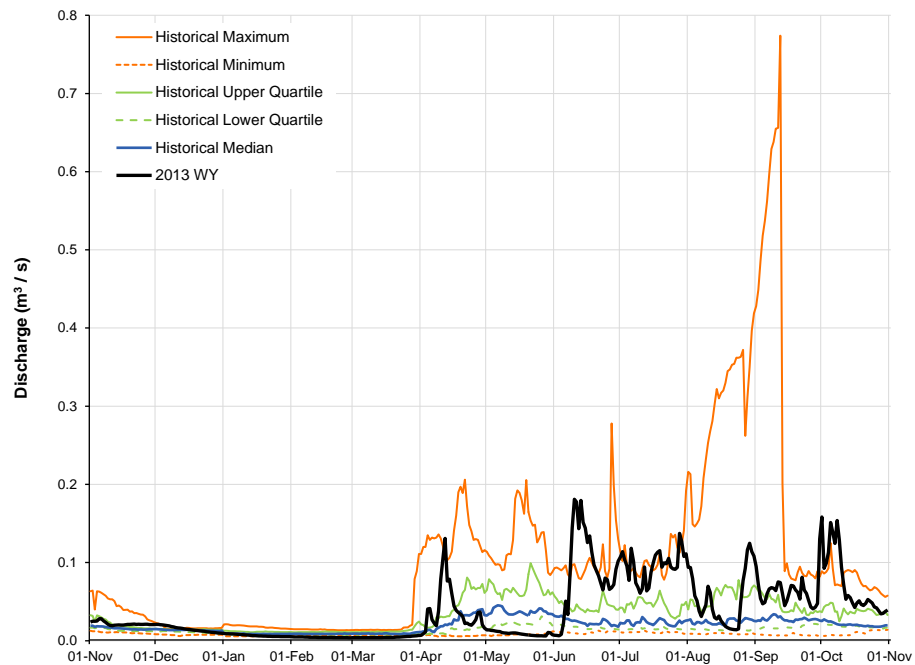
**Figure C.4-7 Discharge of Muskeg River, located above Stanley Creek (Station S5) for the 2013 WY, compared to historical values.**



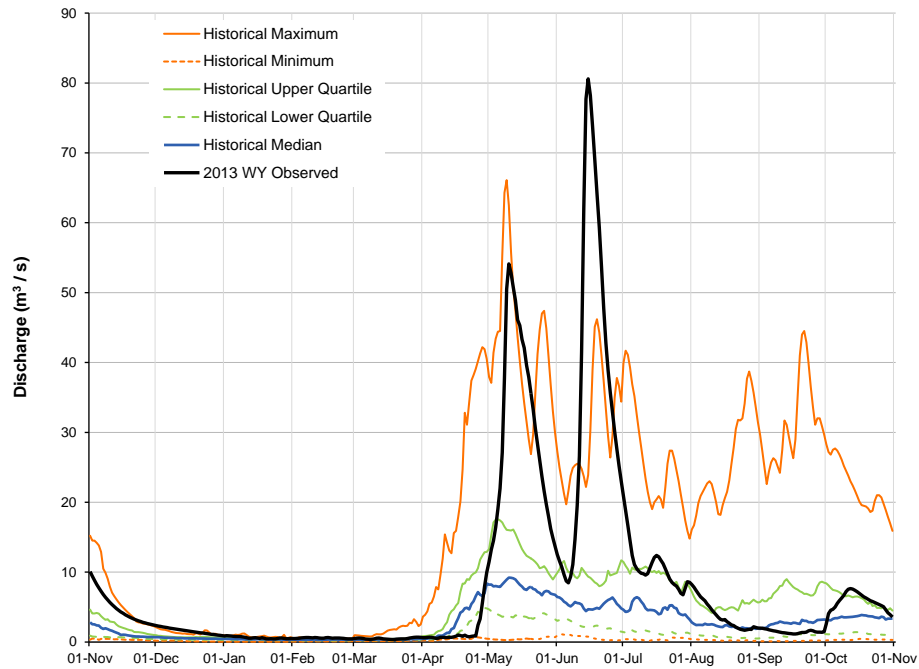
**Figure C.4-8 Discharge of Muskeg River, located above Muskeg Creek (Station S5A) for the 2013 WY, compared to historical values.**



**Figure C.4-9 Discharge of Mills Creek at Highway 63 (Station S6) for the 2013 WY, compared to historical values.**

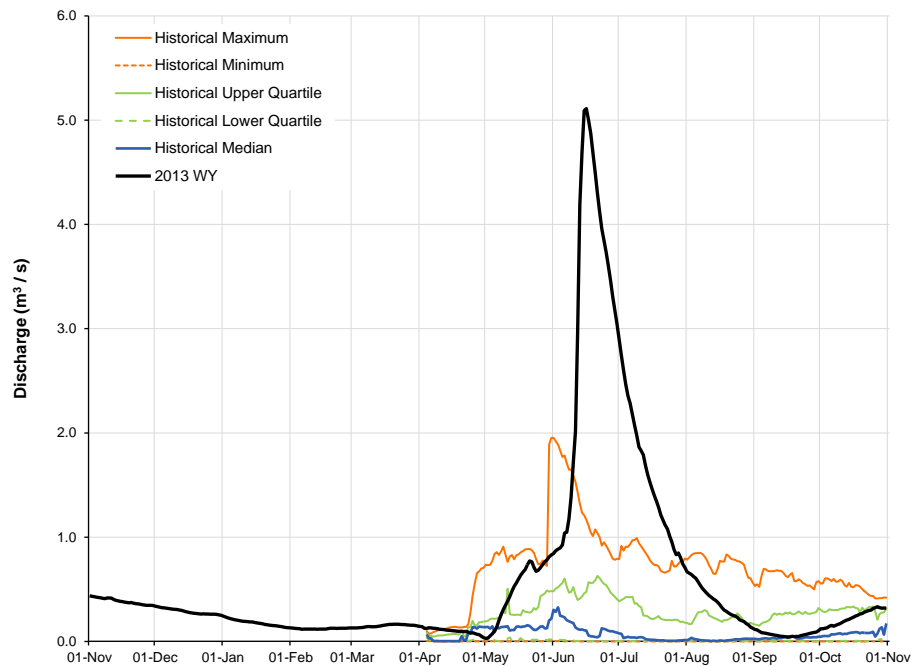


**Figure C.4-10 Discharge of Muskeg River near Fort McKay (Station S7) for the 2013 WY, compared to historical values.**



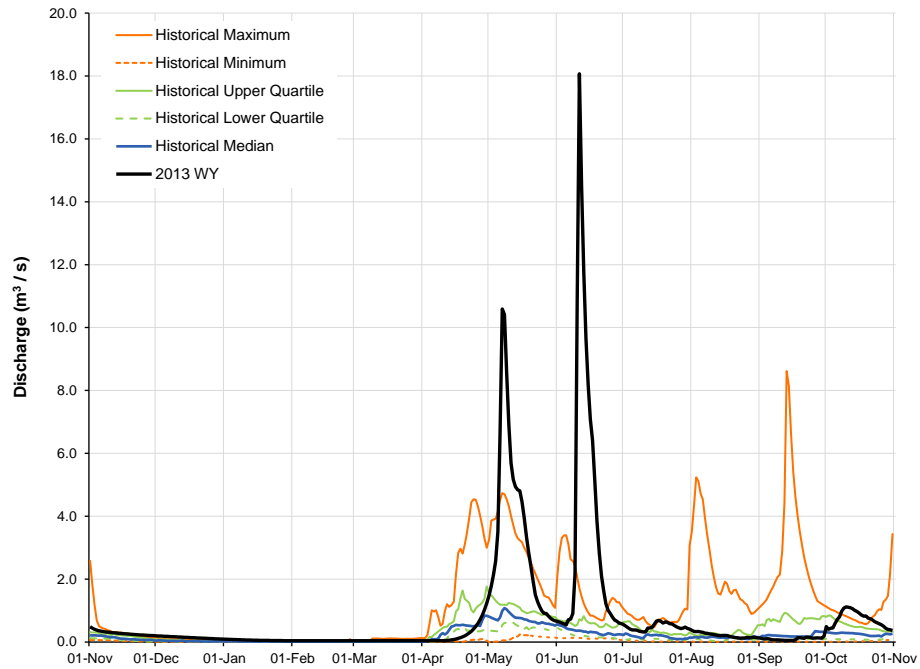
Note: Hydrograph is composed of provisional WSC data from station 07DA008 from January 1 to October 31, 2013, and RAMP Station S7 data from November 1, 2012 to December 31, 2012.

**Figure C.4-11 Discharge of the Kearl Lake Outlet (Station S9) for the 2013 WY, compared to historical values.**

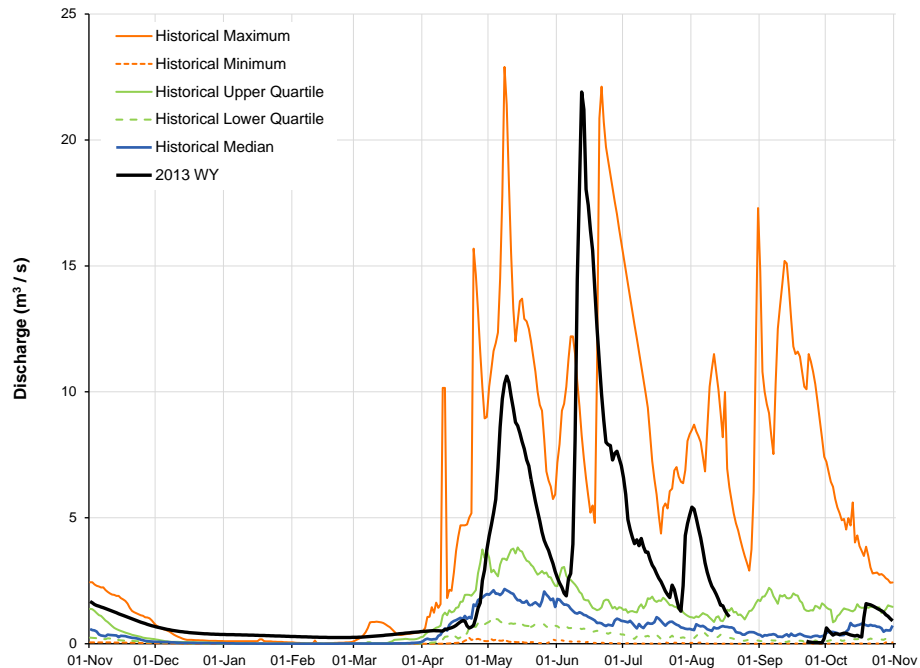


Note: Data at this station were impacted by beaver activity and data should be considered of poor quality.

**Figure C.4-12 Discharge of Wapasu Creek near the mouth at Canterra Road (Station S10A) for the 2013 WY, compared to historical values.**

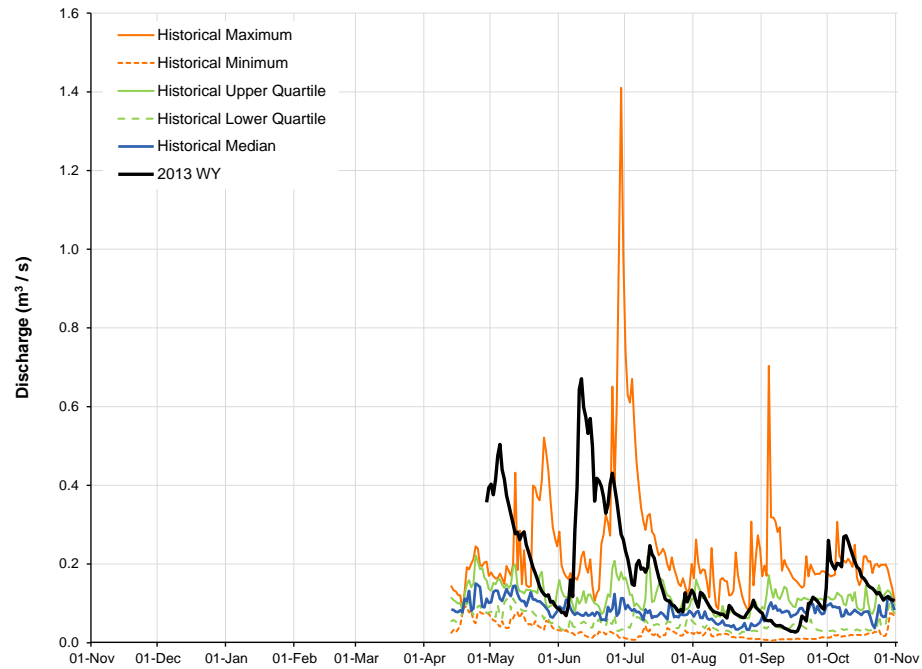


**Figure C.4-13 Discharge of Poplar Creek at Highway 63 (Station S11) for the 2013 WY, compared to historical values.**

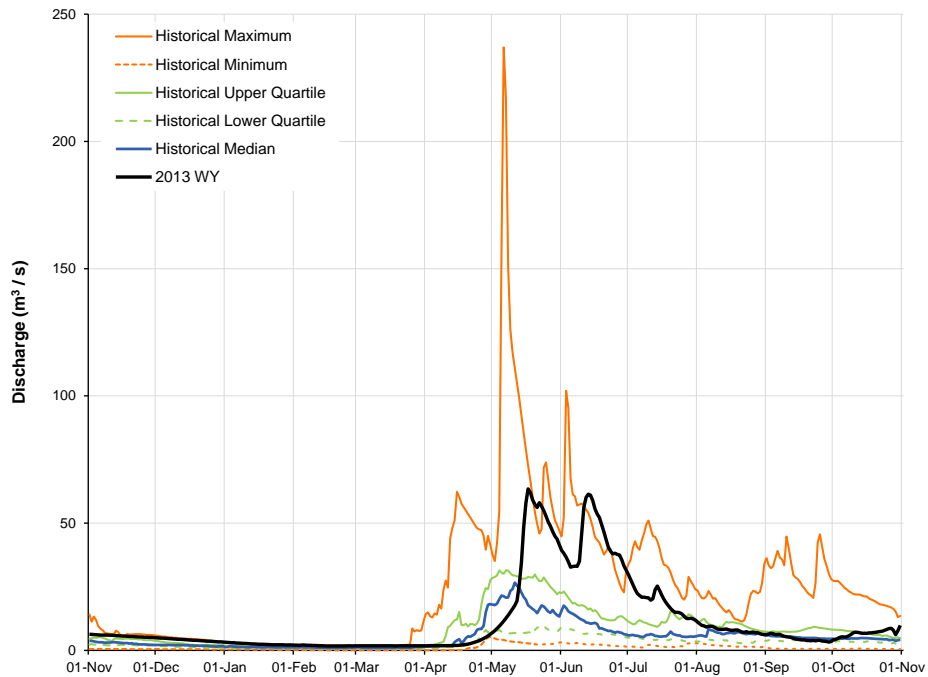




**Figure C.4-14 Discharge of Fort Creek at Highway 63 (Station S12) for the 2013 WY, compared to historical values.**

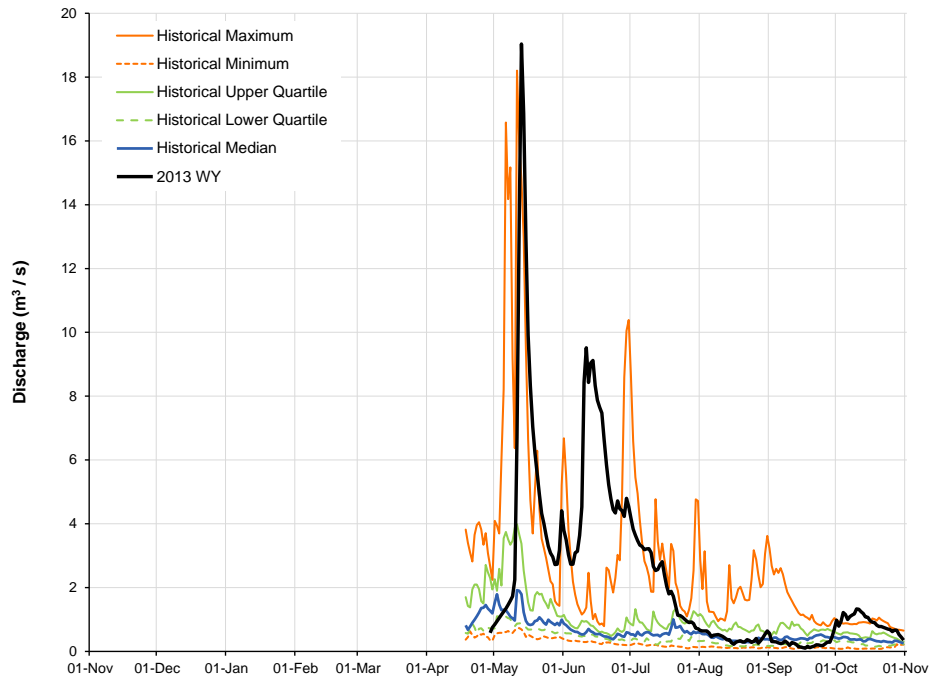


**Figure C.4-15 Discharge of Ells River at the CNRL Bridge (Station S14A) for the 2013 WY, compared to historical values.**



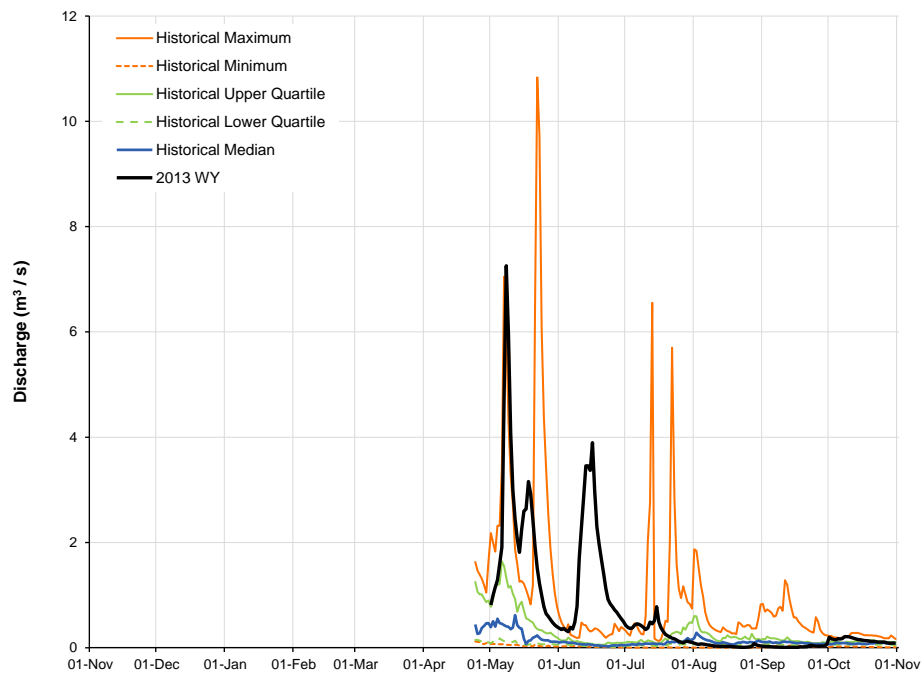
Note: Historical statistics were based on data from WSC Station 07DA017 (1975 to 1986) and RAMP Station S14A (2004 to 2012).

**Figure C.4-16 Discharge of Tar River near the mouth (Station S15A) for the 2013 WY, compared to historical values.**



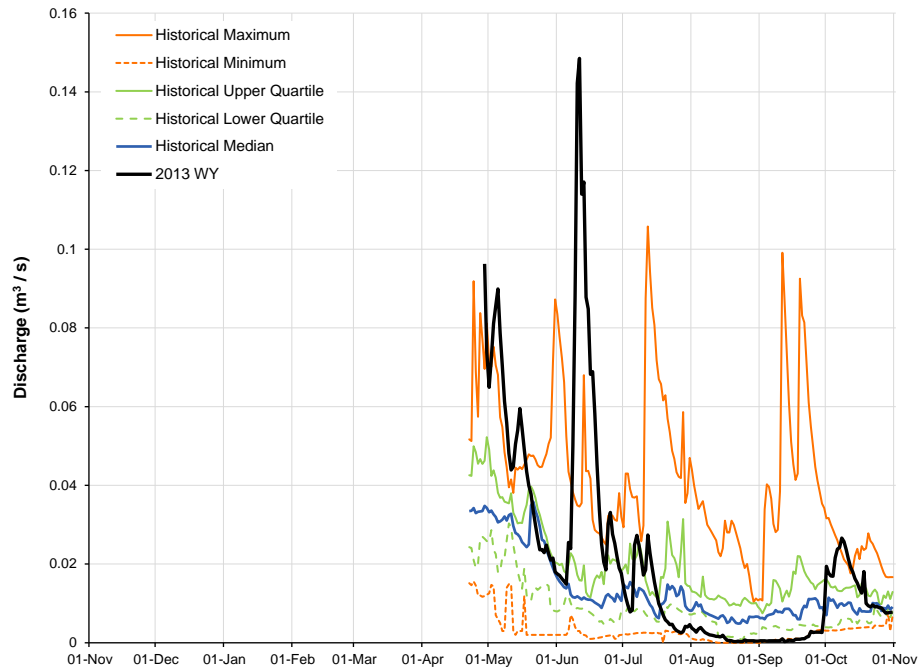
Note: Historical statistics were based on data from WSC Station 07DA015 (1975 to 1977), RAMP Station S15 (2001 to 2006), and RAMP Station S15A (2007 to 2012).

**Figure C.4-17 Discharge of Calumet River near the mouth (Station S16A) for the 2013 WY, compared to historical values.**

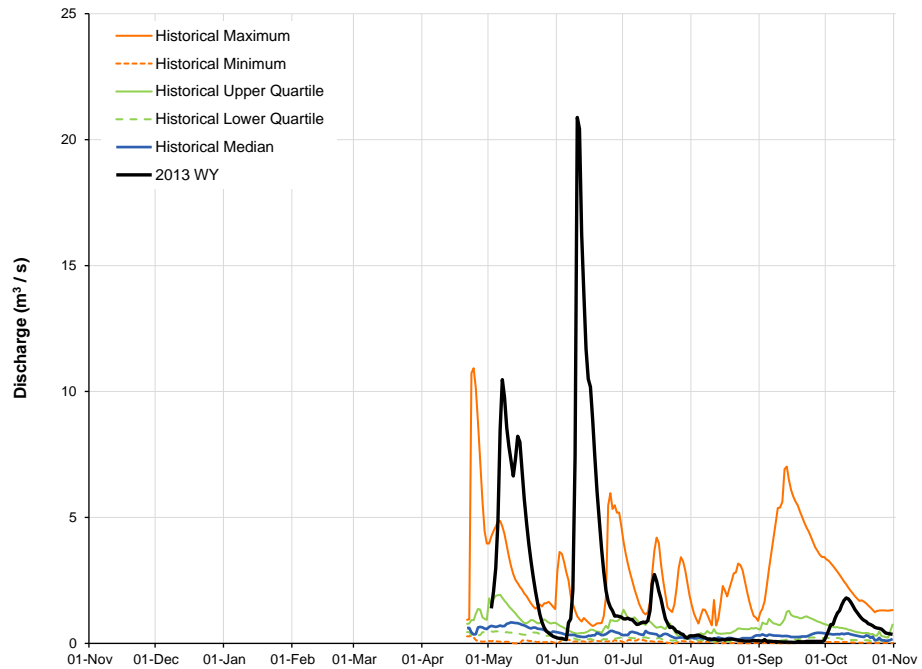


Note: Historical statistics were based on data from WSC Station 07DA014 (1975 to 1977), RAMP Station S16 (2001 to 2005), CNRL Station CR1 (2006 to 2009), and RAMP Station S16A (2010 to 2012).

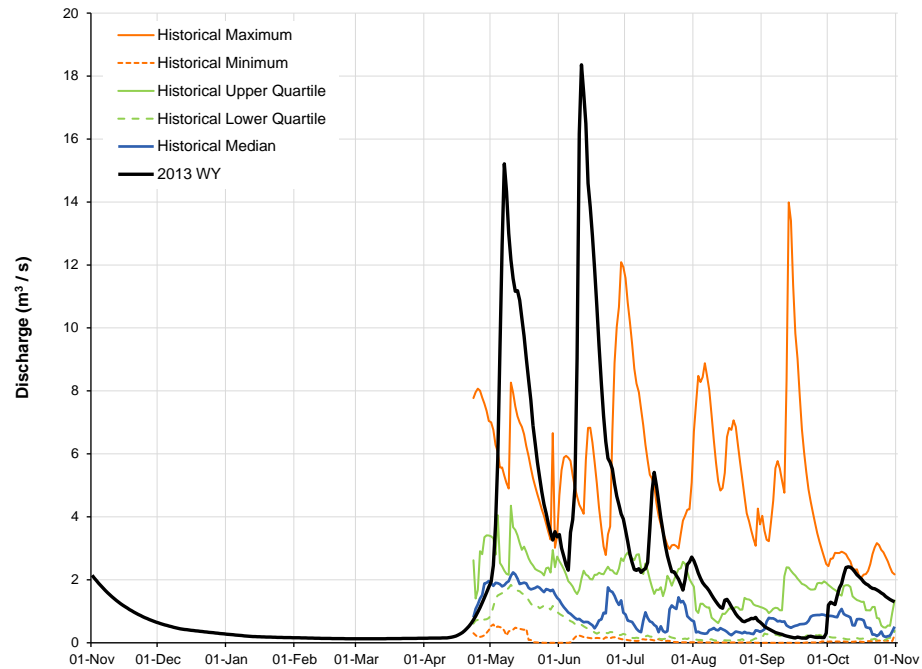
**Figure C.4-18 Discharge of Tar River Lowland Tributary near the mouth (Station S19) for the 2013 WY, compared to historical values.**



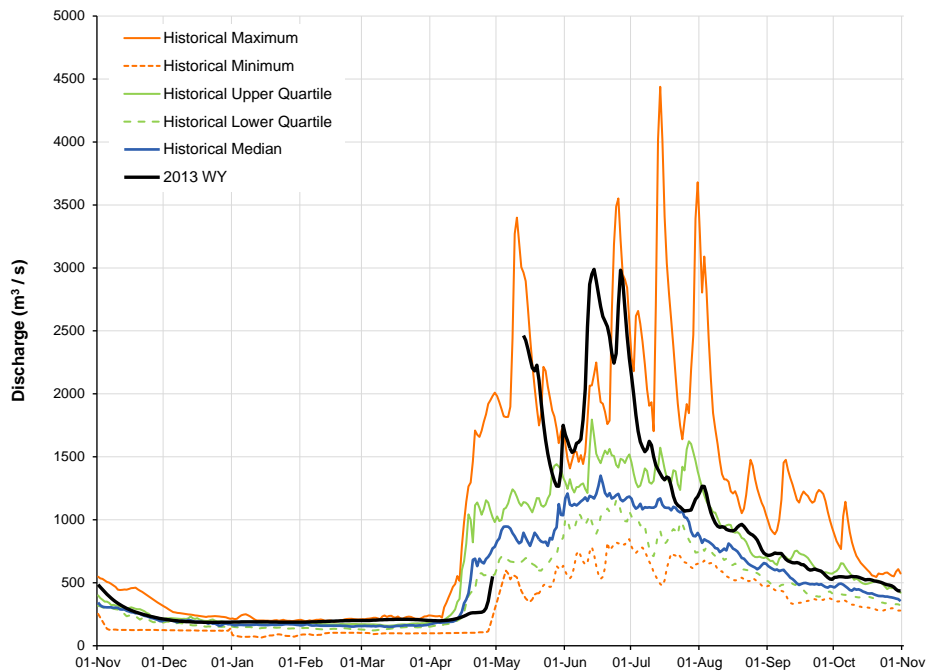
**Figure C.4-19 Discharge of Muskeg River Upland (Station S20A) for the 2013 WY, compared to historical values.**



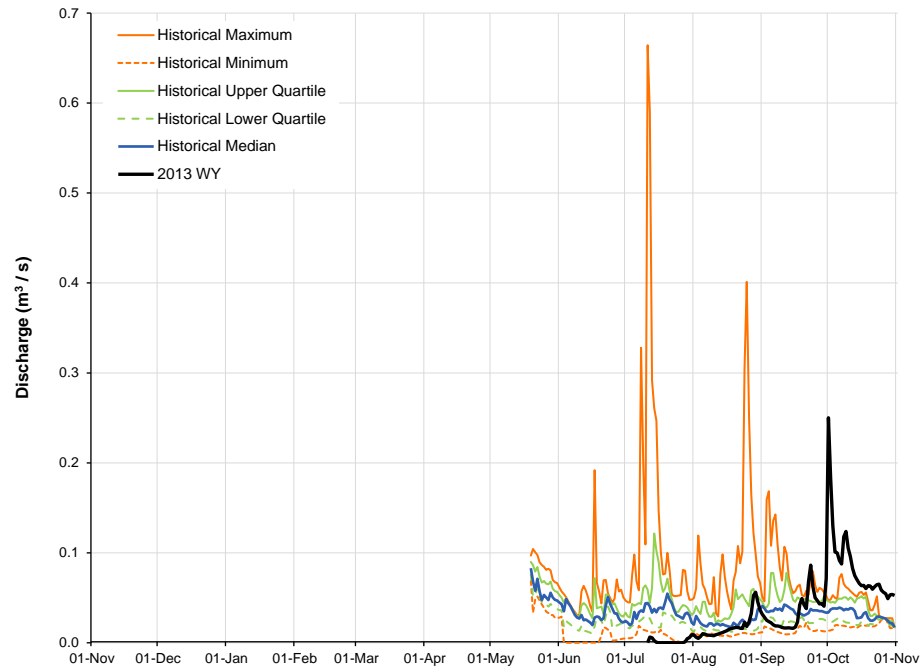
**Figure C.4-20 Discharge of Muskeg Creek near the mouth (Station S22) for the 2013 WY, compared to historical values.**



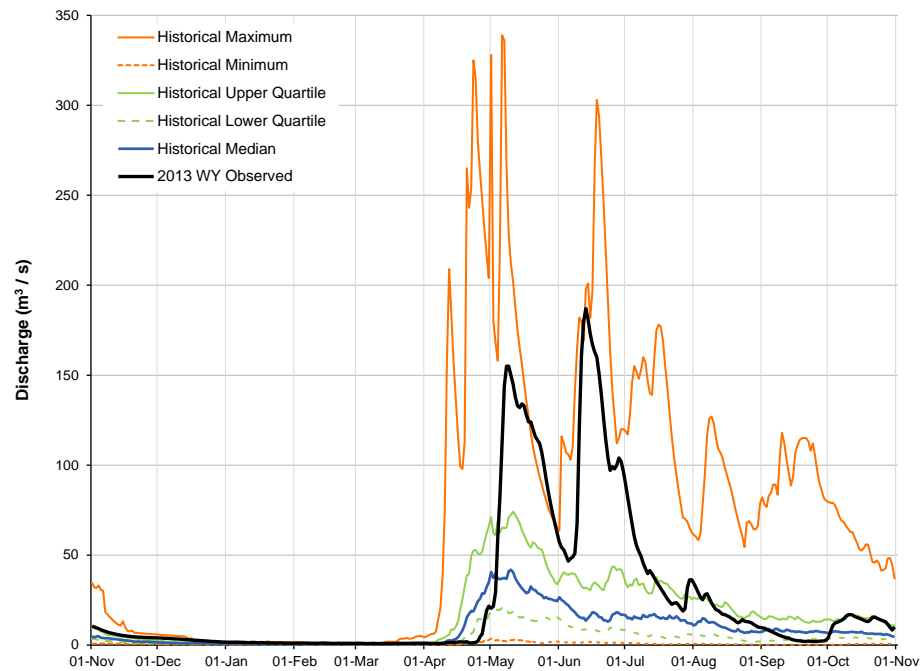
**Figure C.4-21 Discharge of Athabasca River below Eymundson Creek (Station S24) for the 2013 WY, compared to historical values.**



**Figure C.4-22 Discharge for the Susan Lake Outlet (Station S25) for the 2013 WY, compared to historical values.**

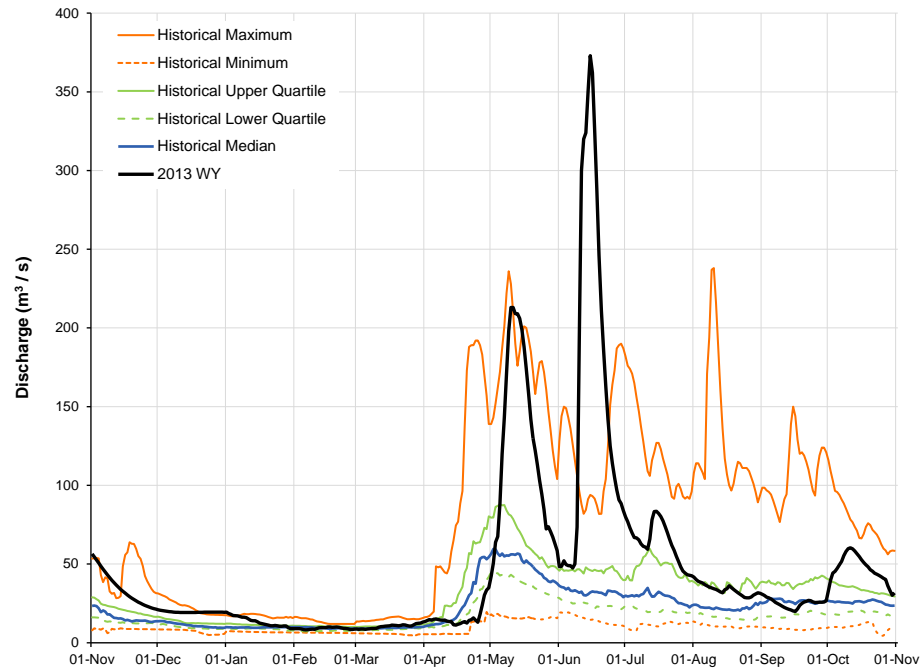


**Figure C.4-23 Discharge of MacKay River near Fort McKay (Station S26) for the 2013 WY, compared to historical values.**



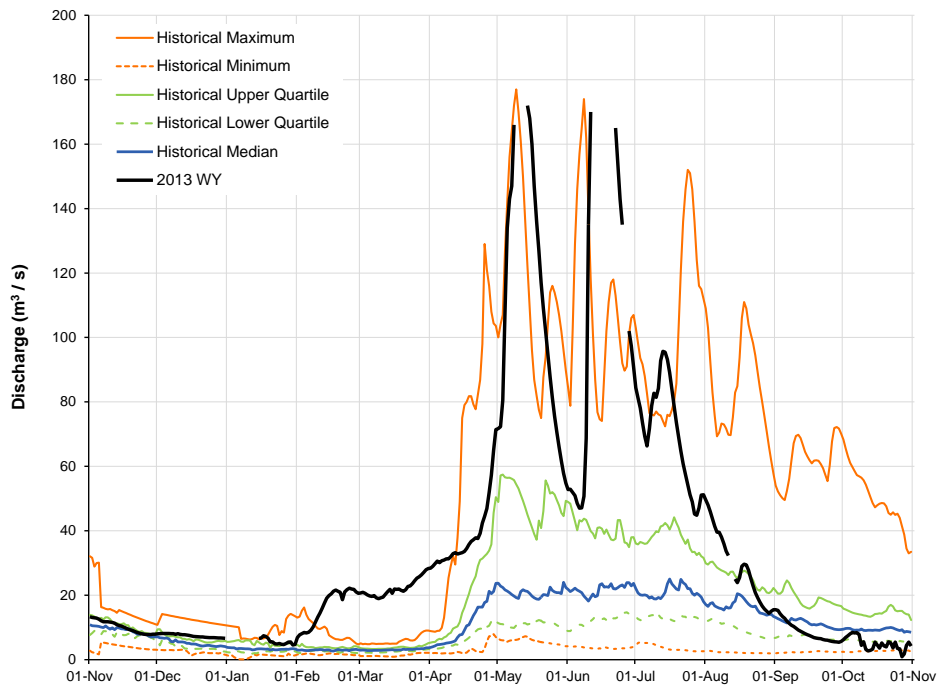
Note: Hydrograph is composed of provisional WSC data from station 07DB001 from January 1 to October 31, 2013, and RAMP Station S26 data from November 1, 2012 to December 31, 2012.

**Figure C.4-24 Discharge of Firebag River near the mouth (Station S27) for the 2013 WY, compared to historical values.**



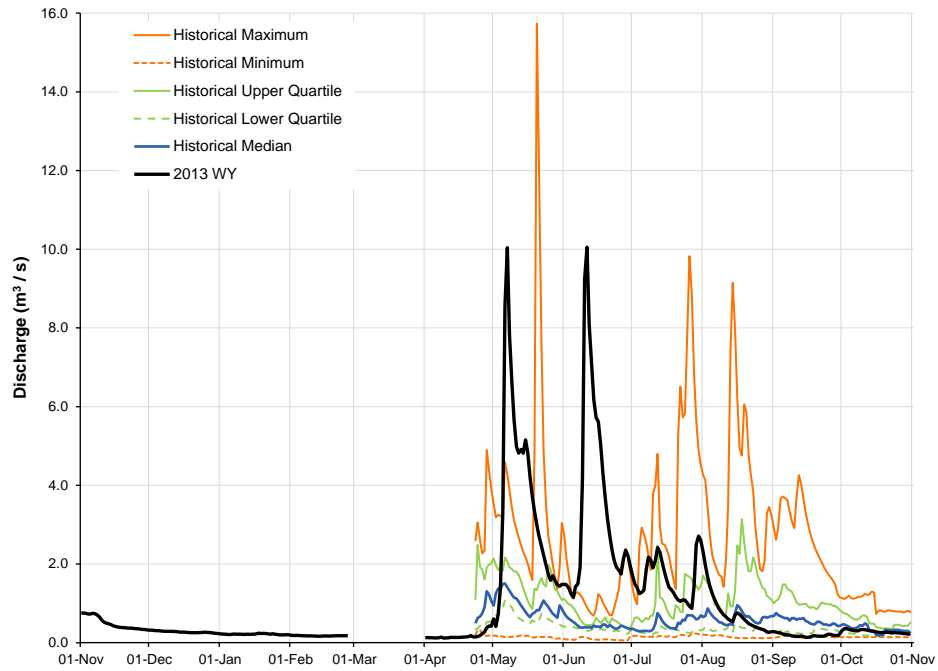
Note: Hydrograph is composed of provisional WSC data from station 07DB001 from January 1 to October 31, 2013, and RAMP Station S27 data from November 1, 2012 to December 31, 2012.

**Figure C.4-25 Discharge of Christina River near Chard (Station S29) for the 2013 WY, compared to historical values.**

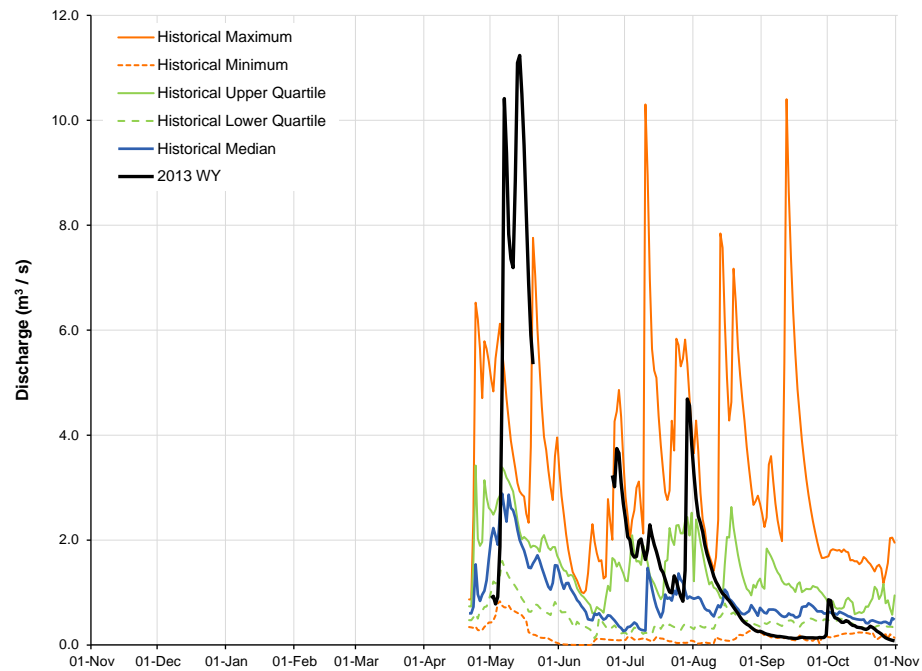


Note: Hydrograph is composed of provisional WSC data from Station 07CE002 from January 1 to October 31, 2013, and RAMP Station S29 data from November 1, 2012 to December 31, 2012.

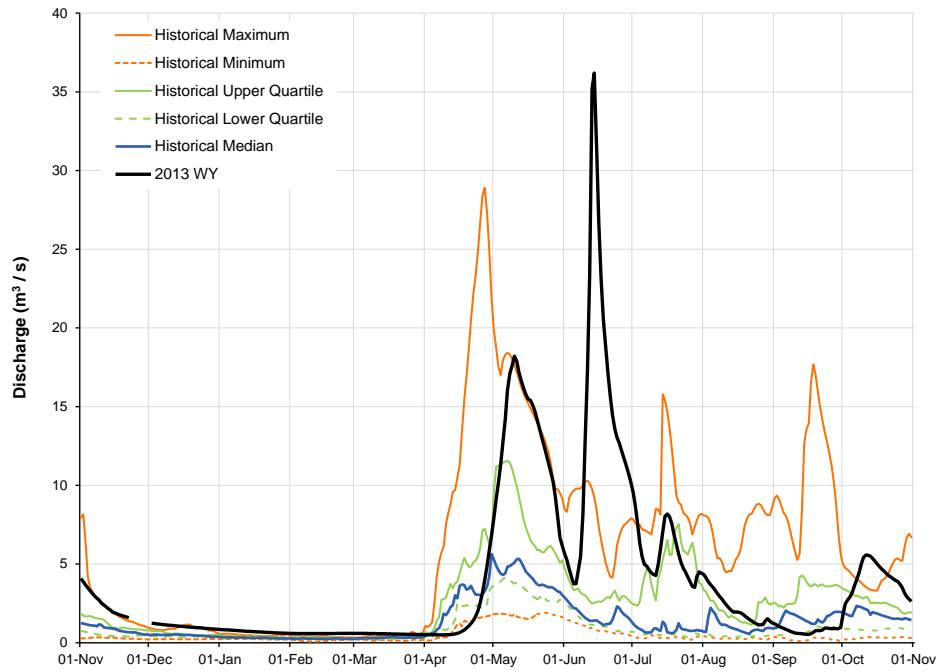
**Figure C.4-26 Discharge of Hangingstone Creek at North Star Road (Station S31) for the 2013 WY, compared to historical values.**



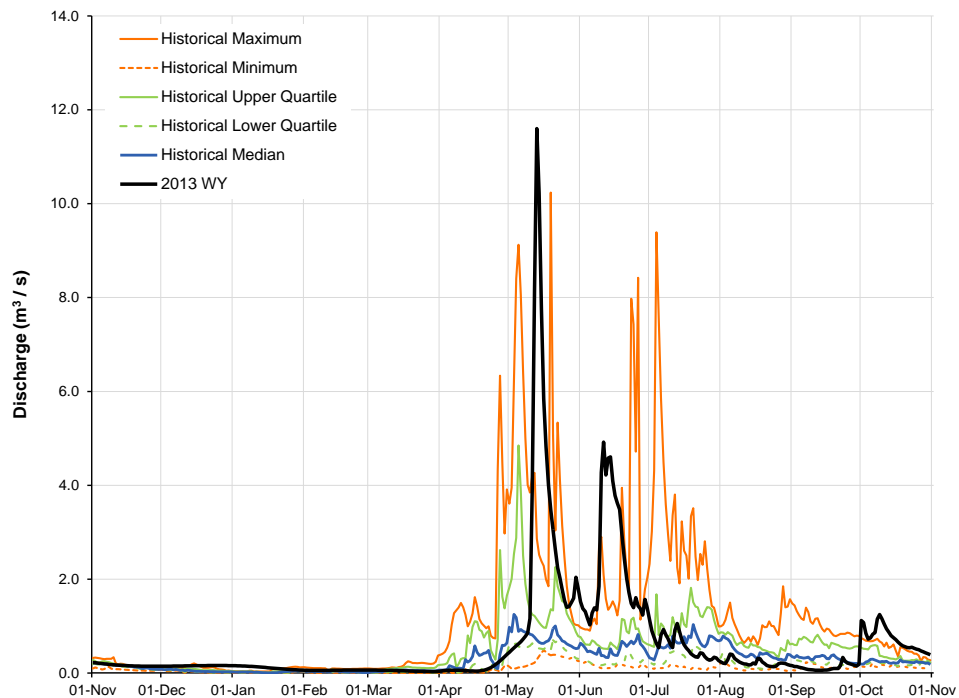
**Figure C.4-27 Discharge of Surmont Creek at Highway 881 (Station S32) for the 2013 WY, compared to historical values.**



**Figure C.4-28 Discharge of Muskeg River at the Aurora North/MRM Boundary (Station S33) for the 2013 WY, compared to historical values.**

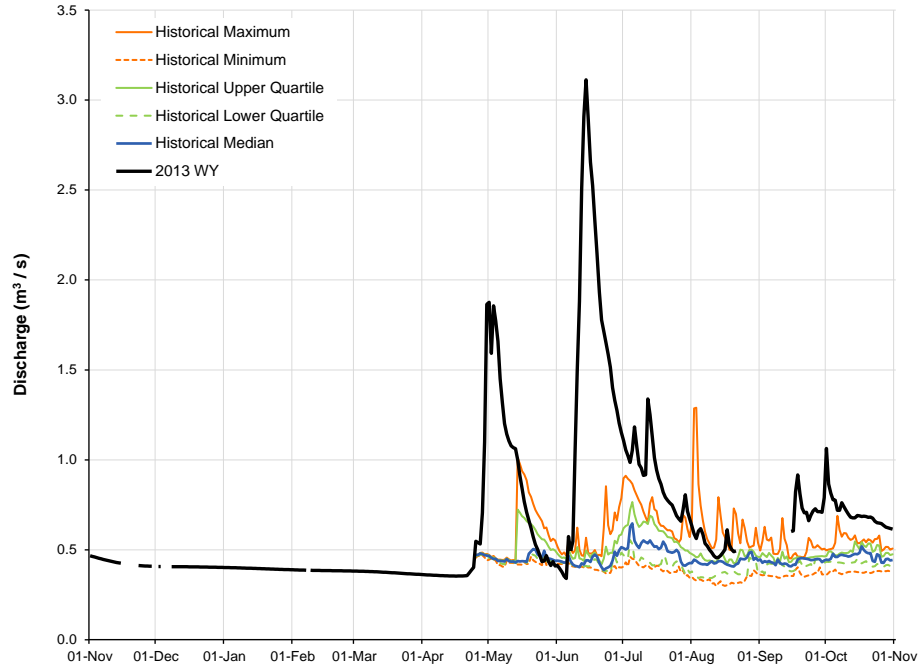


**Figure C.4-29 Discharge of Tar River above the CNRL Lake (Station S34) for the 2013 WY, compared to historical values.**

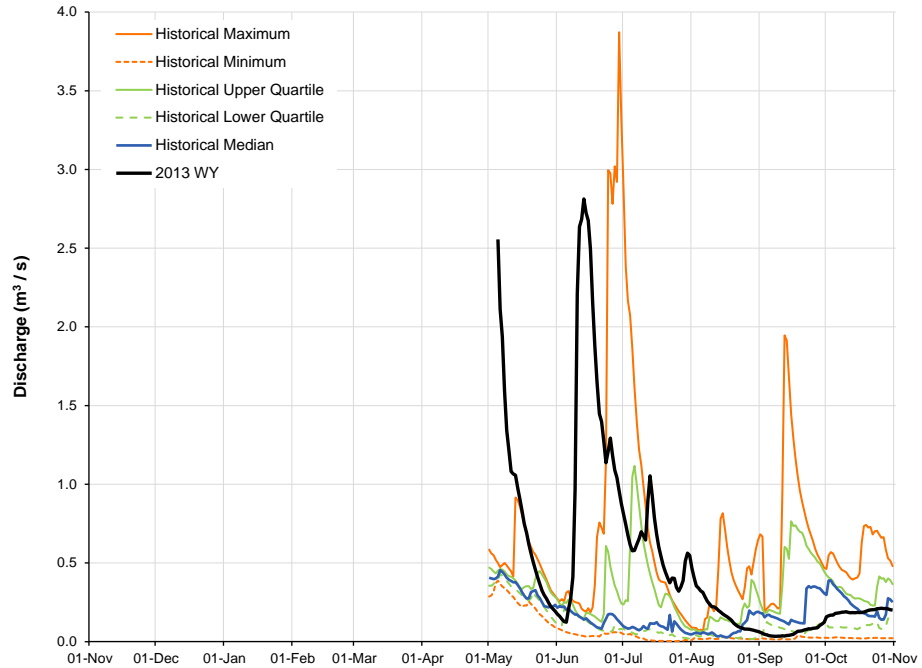




**Figure C.4-30 Discharge of the McClelland Lake Outlet above Firebag River (Station S36) for the 2013 WY, compared to historical values.**

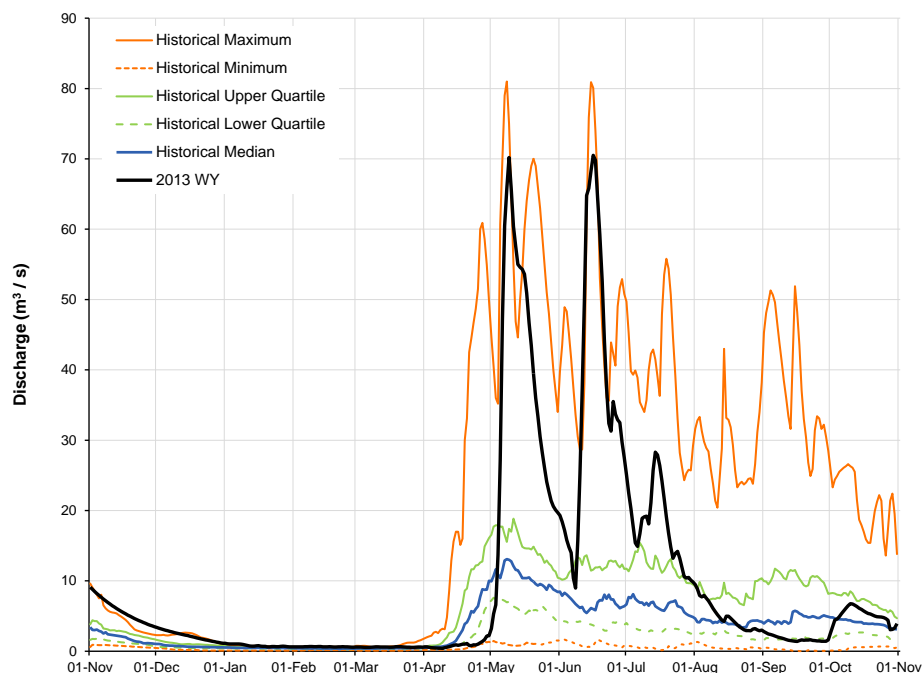


**Figure C.4-31 Discharge of East Jackpine Creek near the 1,300 ft. Contour (Station S37) for the 2013 WY, compared to historical values.**



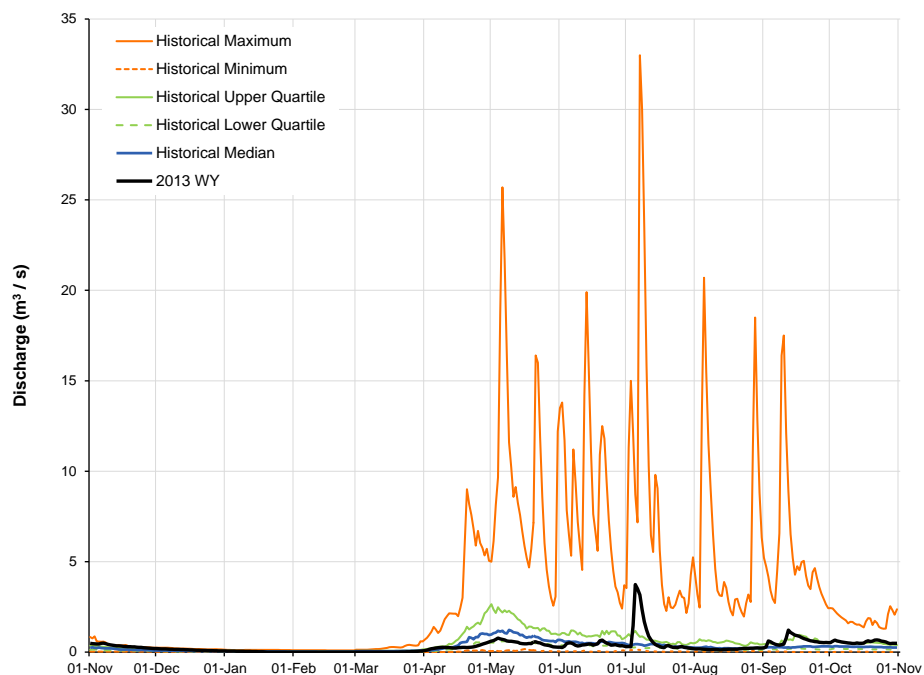
Note: Station monitoring was affected by beaver activity, and data should be considered of poor quality.

**Figure C.4-32 Discharge of Steepbank River near Fort McMurray (Station S38) for the 2013 WY, compared to historical values.**



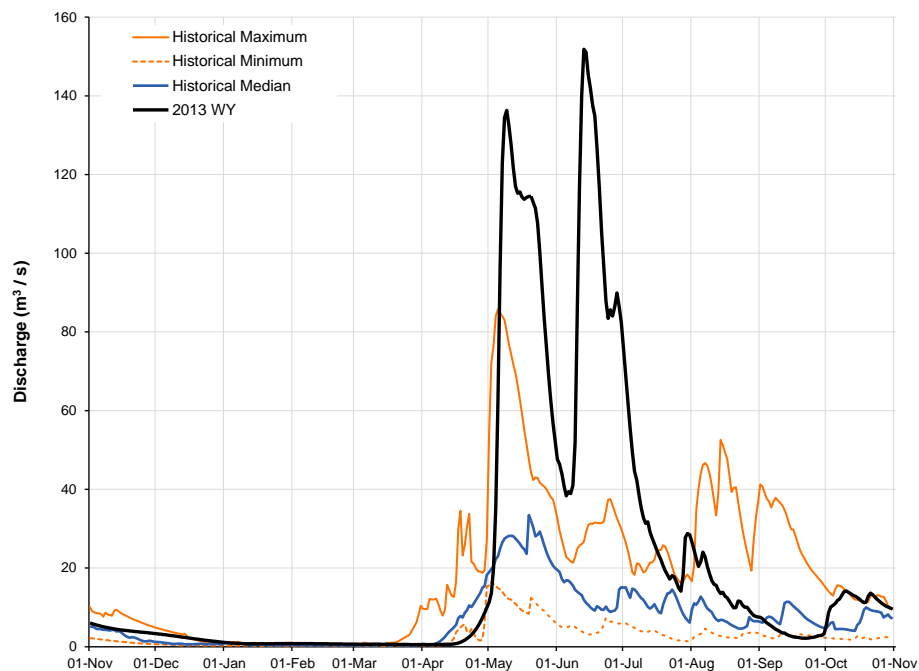
Note: Hydrograph is composed of provisional WSC data from station 07DA006 from January 1 to October 31, 2013, and RAMP Station 38 data from November 1, 2012 to December 31, 2012.

**Figure C.4-33 Discharge of Beaver River above Syncrude (Station S39) for the 2013 WY, compared to historical values.**

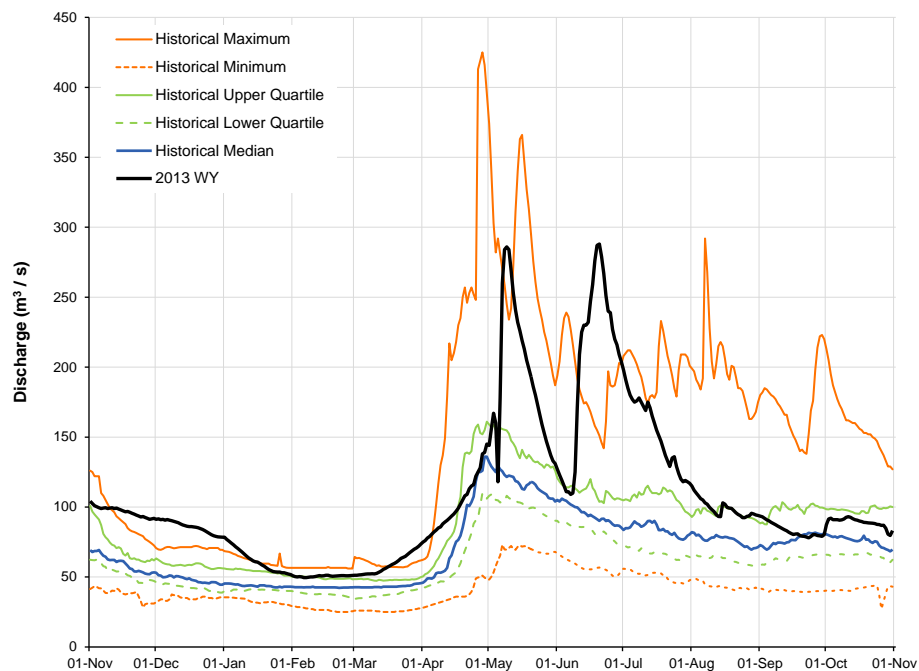


Note: Hydrograph is composed of provisional WSC data from station 07DA018 from March 1 to October 31, 2013, and RAMP Station S39 data from November 1, 2012 to February 28, 2013.

**Figure C.4-34 Discharge of Mackay River at Petro-Canada Bridge (Station S40) for the 2013 WY, compared to historical values.**

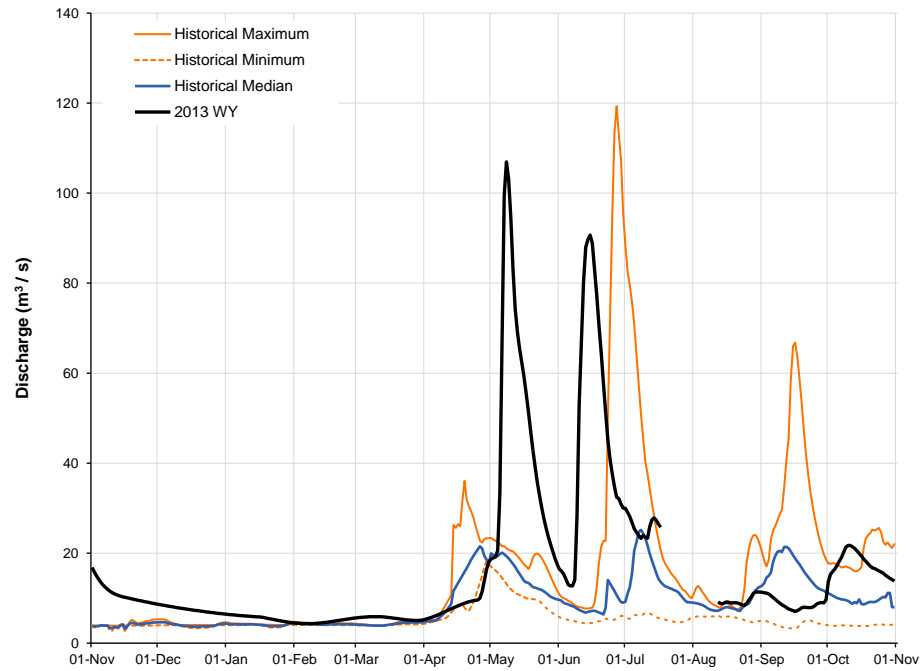


**Figure C.4-35 Discharge of Clearwater River located above Christina River (Station S42) for the 2013 WY, compared to historical values.**

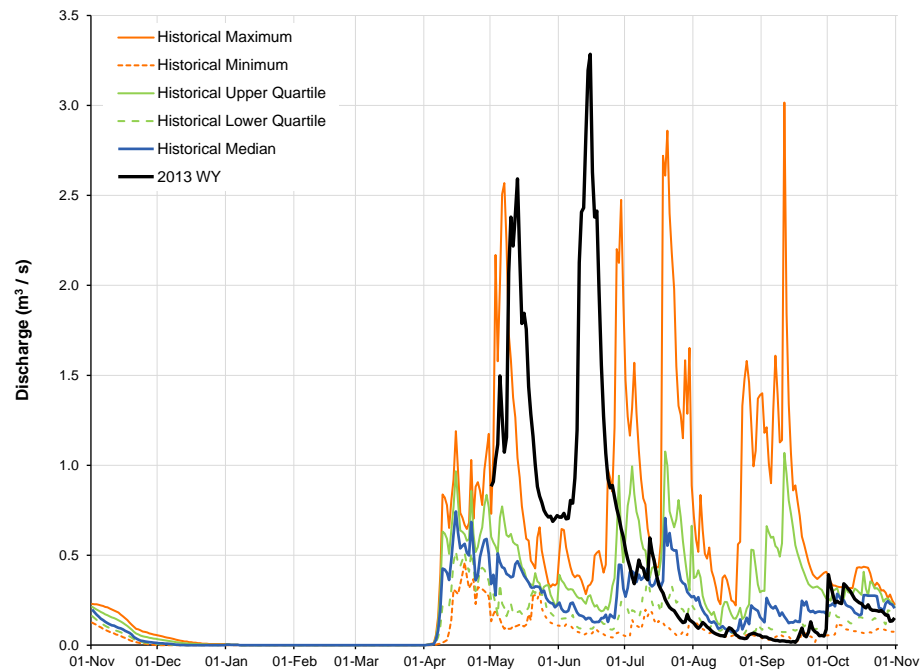


Note: Hydrograph is composed of provisional WSC data from station 07CD005 from January 1 to October 31, 2013, and RAMP Station S42 data from November 1, 2012 to December 31, 2012.

**Figure C.4-36 Discharge of Firebag River above Suncor Firebag (Station S43) for the 2013 WY, compared to historical values.**

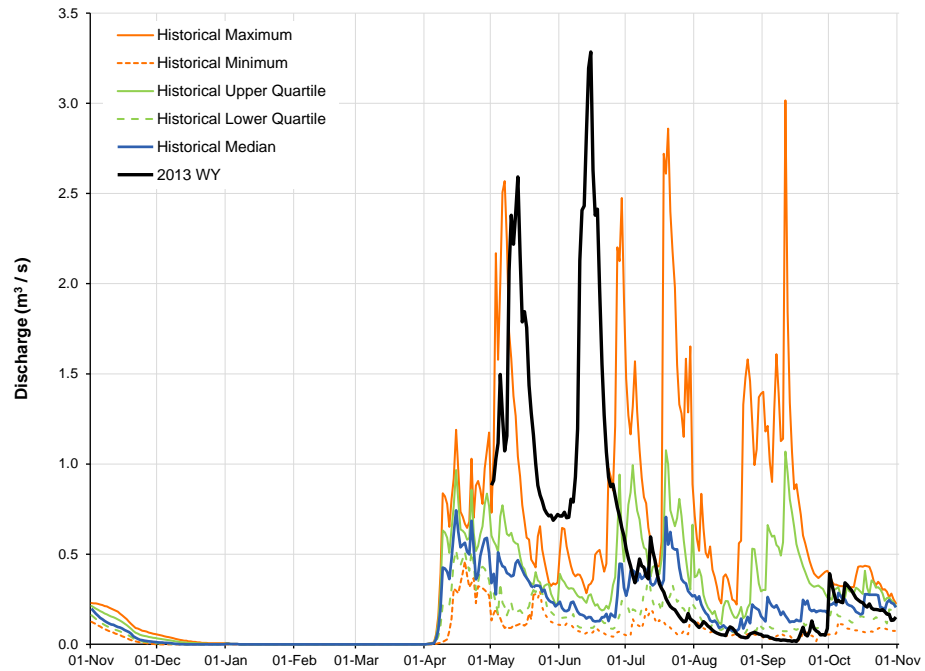


**Figure C.4-37 Discharge of Pierre River near Fort McKay (Station S44) for the 2013 WY, compared to historical values.**

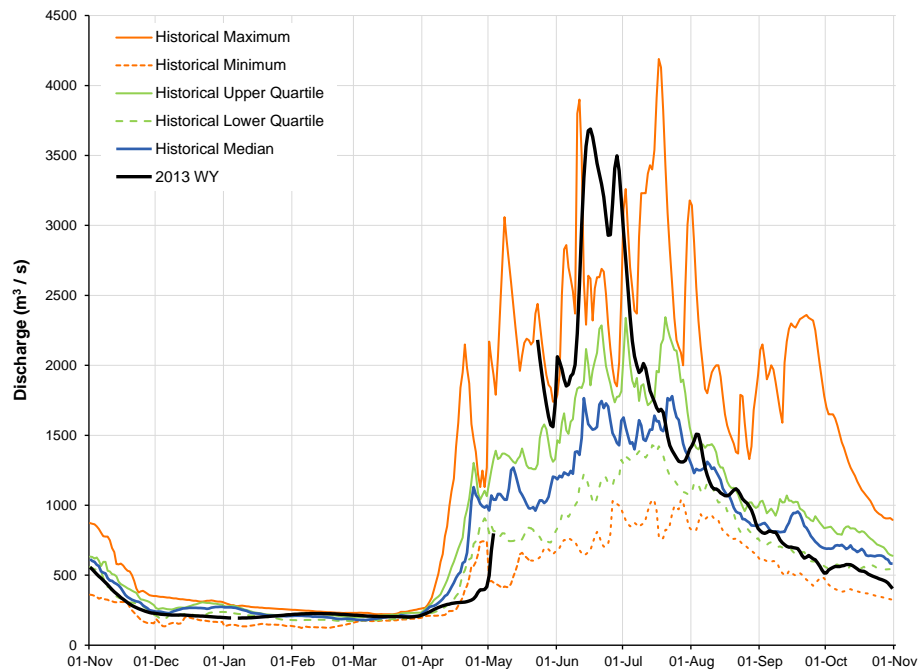


Note: Historical statistics were based on data from WSC Station 07DA013 (1975 to 1977) and RAMP Station S44 (2009 to 2012).

**Figure C.4-38 Discharge of Ells River above the Joslyn Creek Diversion (Station S45) for the 2013 WY, compared to historical values.**

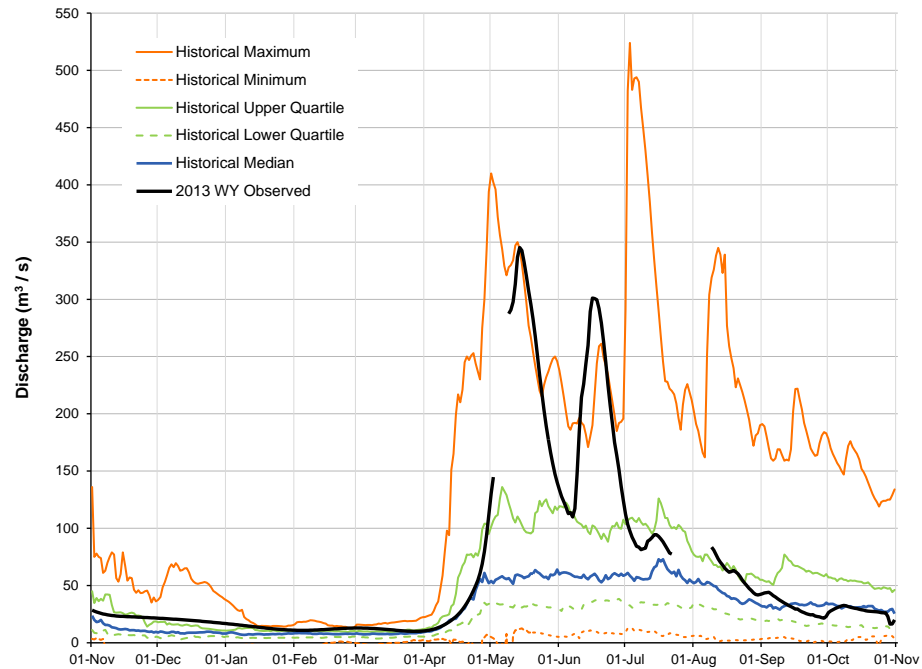


**Figure C.4-39 Discharge of Athabasca River near Embarras Airport (Station S46) for the 2013 WY, compared to historical values.**



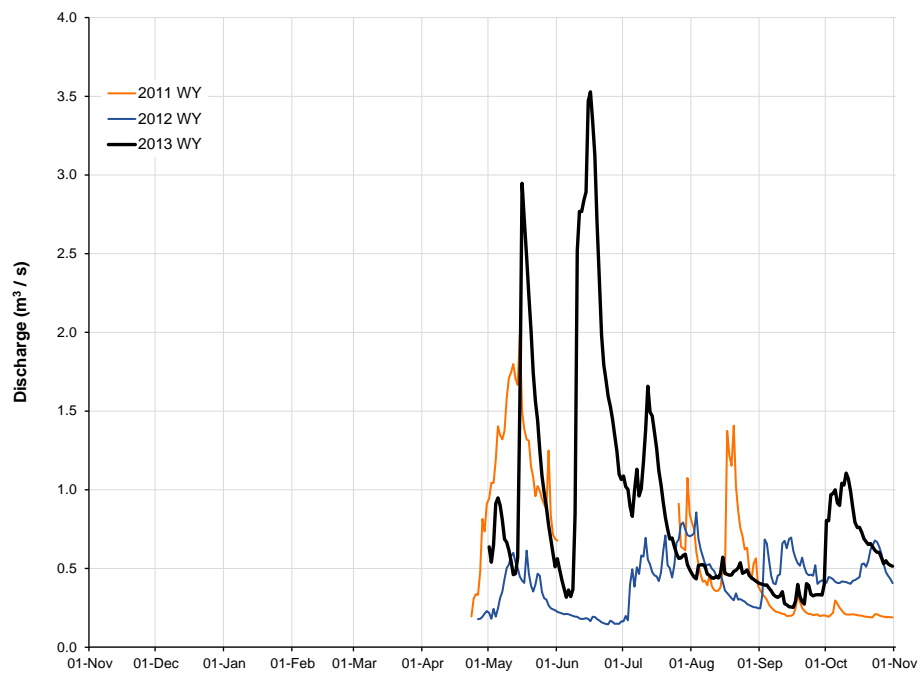
Note: Historical statistics were based on data from WSC Station 07DD001 (1971 to 1984).

**Figure C.4-40 Discharge of Christina River near the mouth (Station S47A) for the 2013 WY, compared to historical values.**

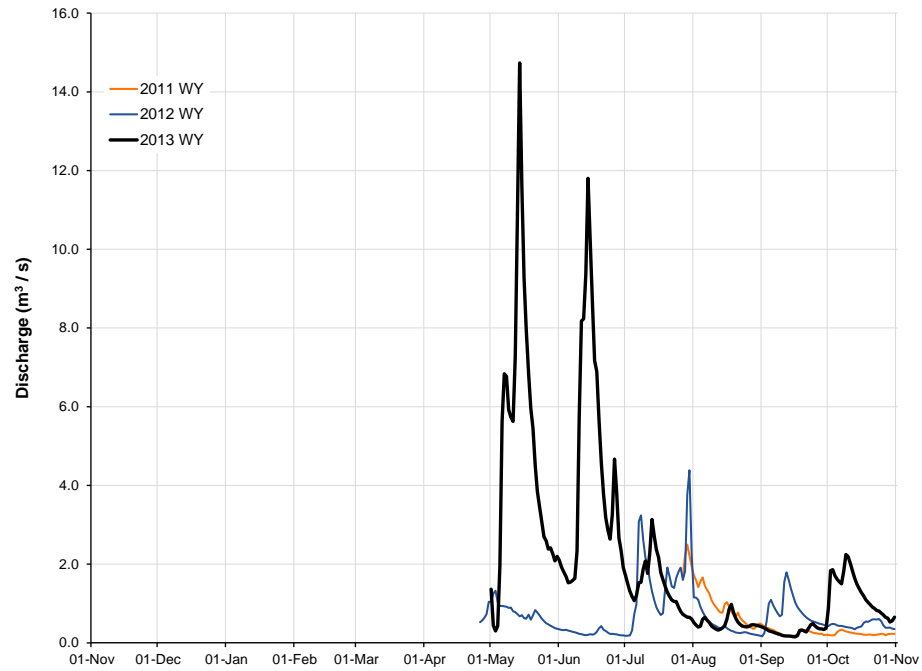


Note: Historical statistics from 1967 to 2012 were estimated by calculating the difference between the measured flow at Clearwater River above Christina River, WSC Station 07CD005 and Clearwater River above Draper, WSC Station 07CD001.

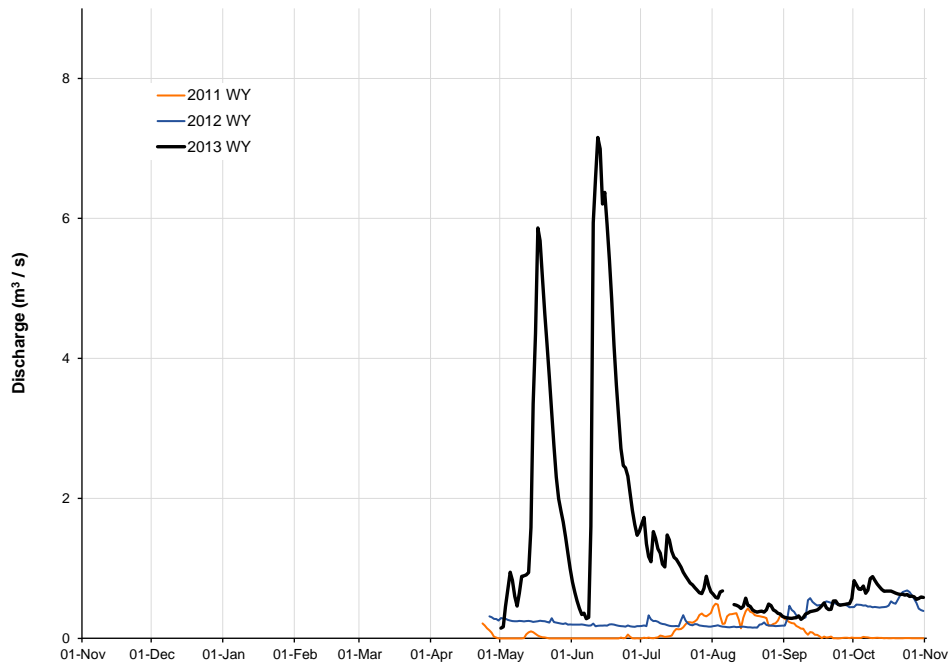
**Figure C.4-41 Discharge of Big Creek (Station S48) for the 2011 to 2013 WY.**



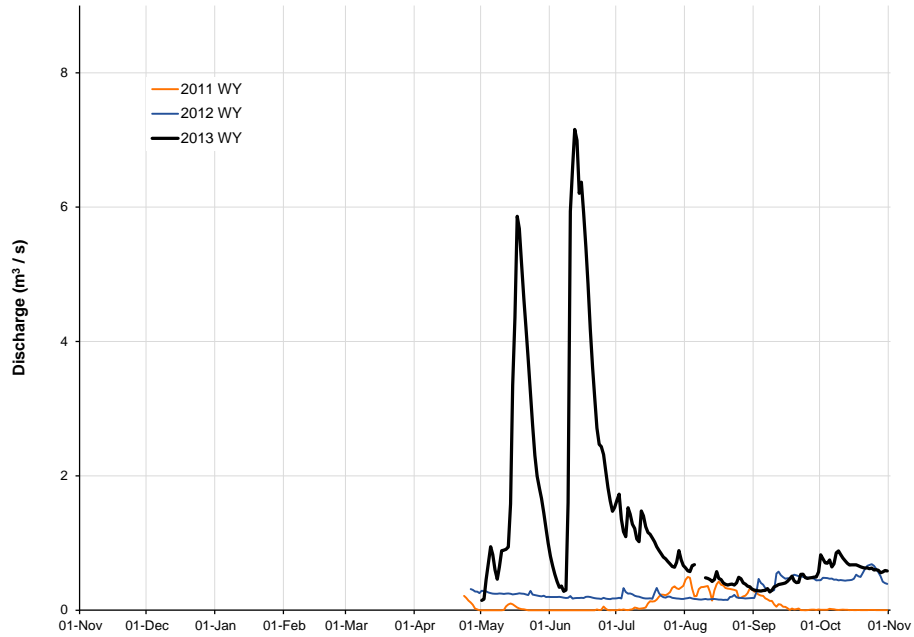
**Figure C.4-42 Discharge of Eymundson Creek near the mouth (Station S49) for the 2011 to 2013 WY.**



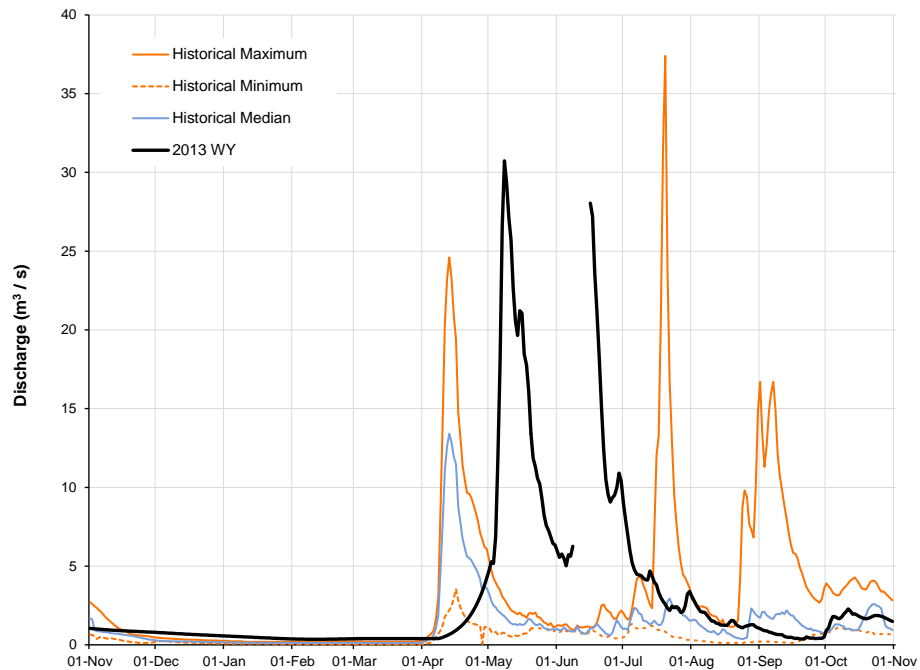
**Figure C.4-43 Discharge hydrograph of Red Clay Creek (Station S50A) for the 2011 to 2013 WY.**



**Figure C.4-44 Discharge of High Hills River above Clearwater River (Station S51) for the 2011 to 2013 WY.**



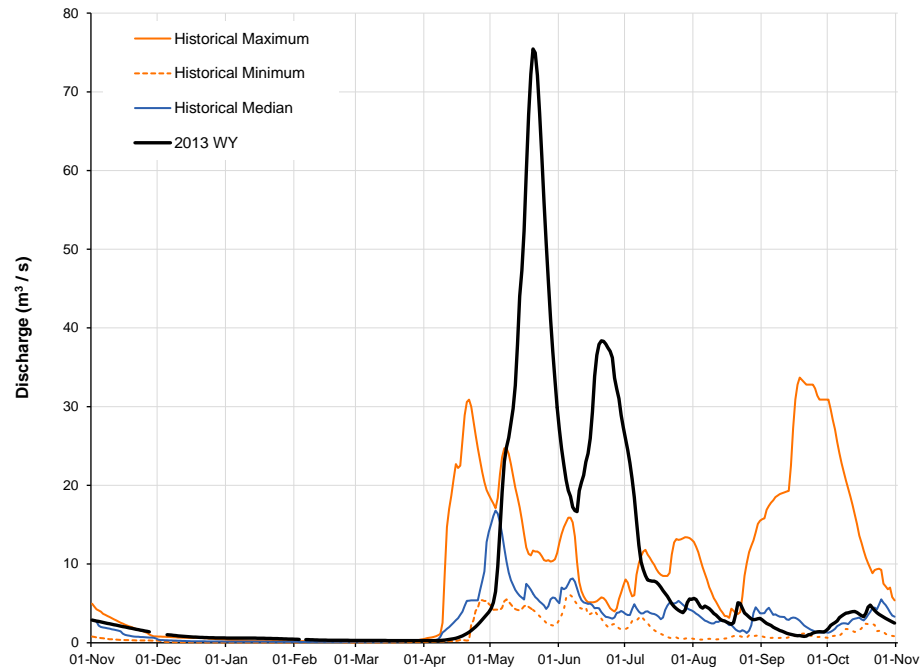
**Figure C.4-45 Discharge of Dover River near the mouth (Station S53) for the 2013 WY, compared to historical values.**



Note: Historical statistics were based on data from WSC Station 07DB002 (1975 to 1977).

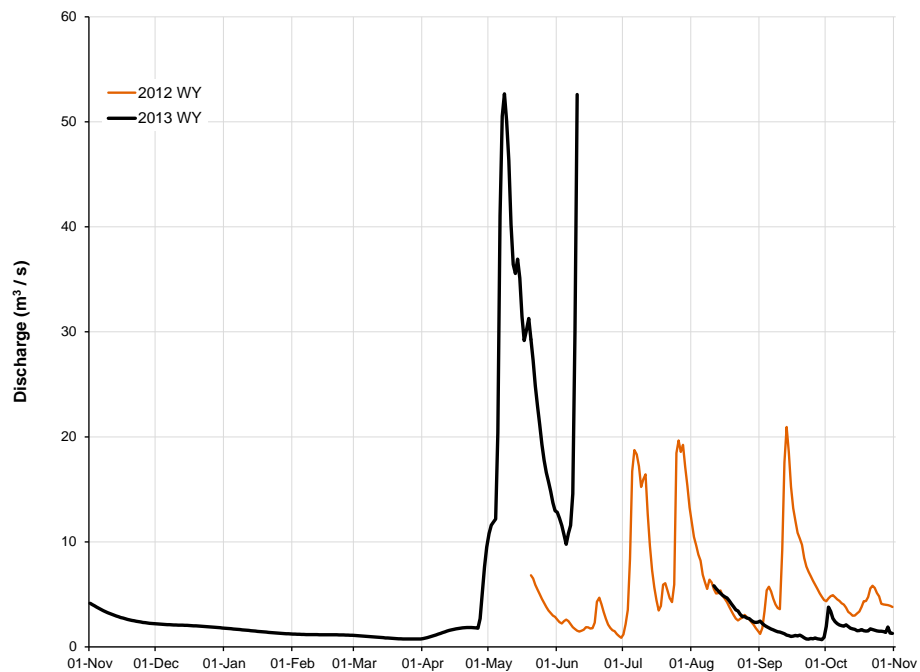


**Figure C.4-46 Discharge of Dunkirk River near Fort MacKay (Station S54) for the 2013 WY, compared to historical values.**

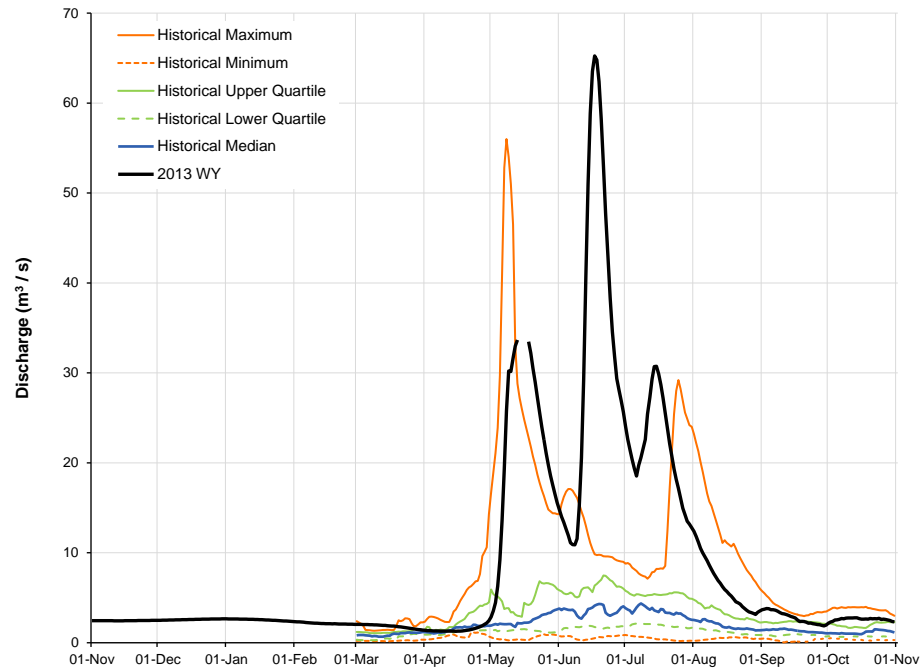


Note: Historical statistics were based on data from WSC Station 07DB003 (1975 to 1979).

**Figure C.4-47 Discharge of Gregoire River above Christina River (Station S55) for the 2012-2013 WY.**

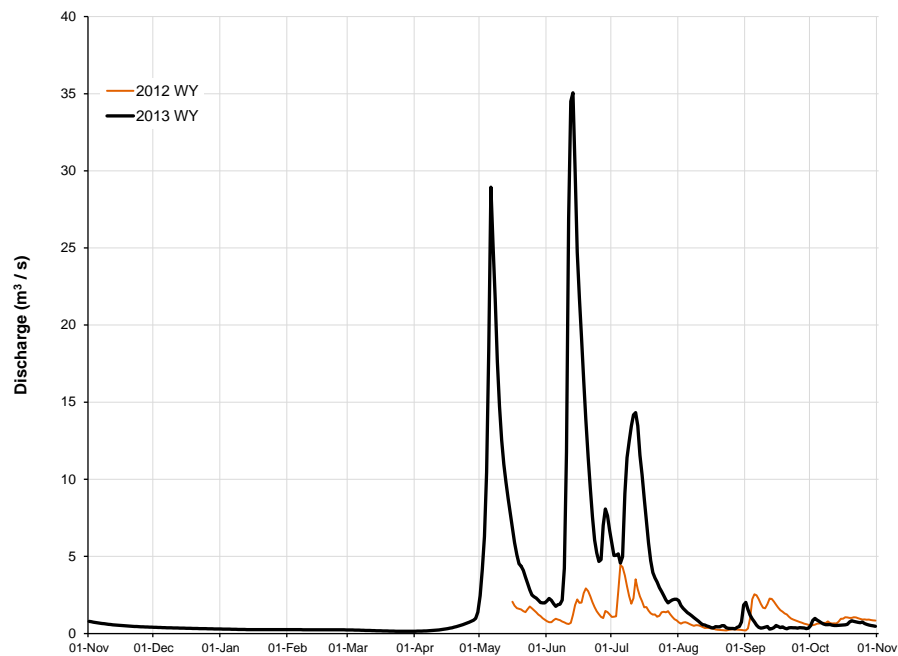


**Figure C.4-48 Discharge of Jackfish River below Christina (Station S56) for the 2013 WY, compared to historical values.**

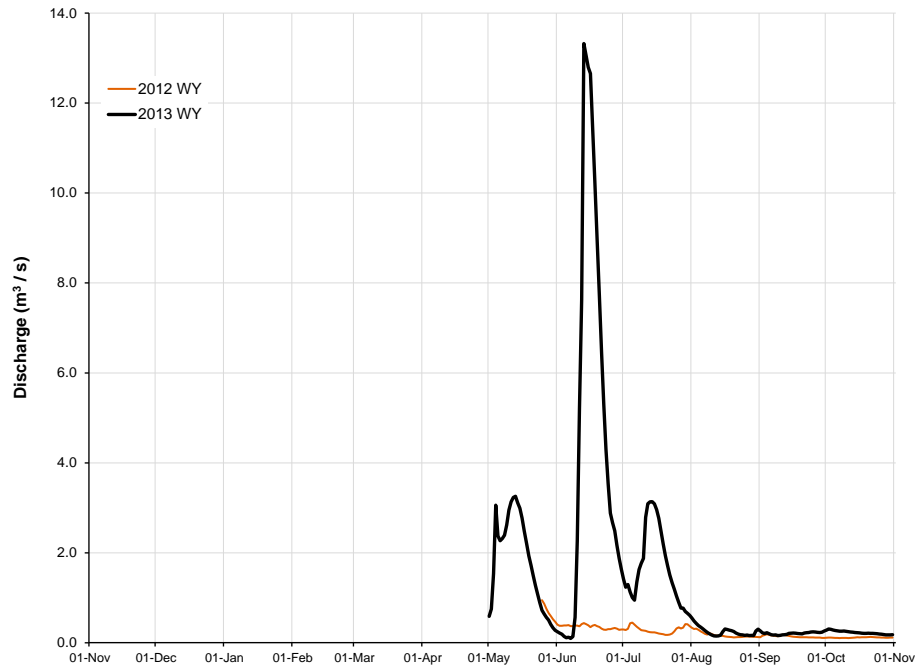


Note: Historical statistics were based on data from WSC Station 07CE005 (1982 to 1995).

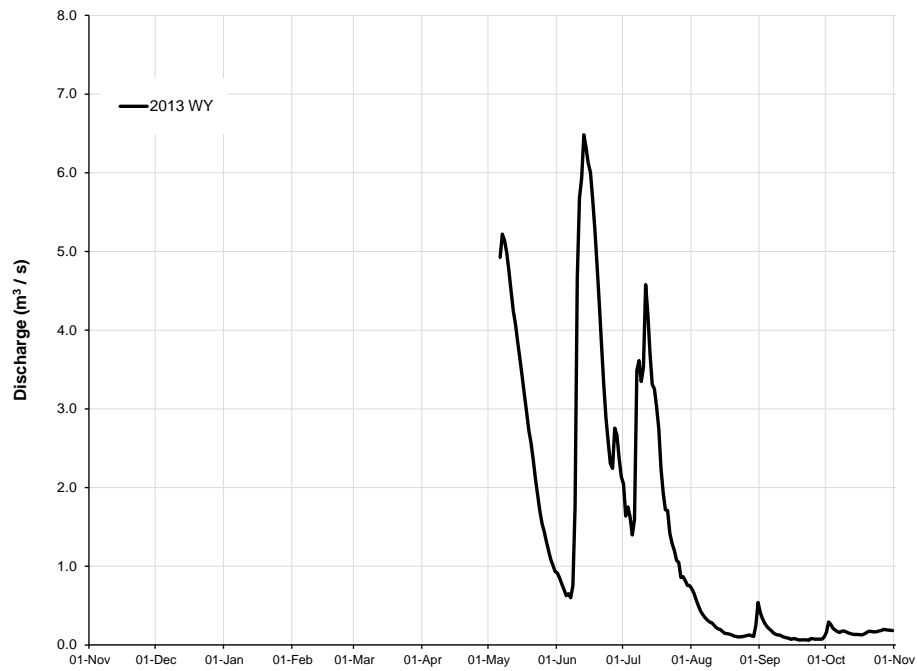
**Figure C.4-49 Discharge of Sunday Creek above Christina Lake (Station S57) for the 2012 to 2013 WY.**



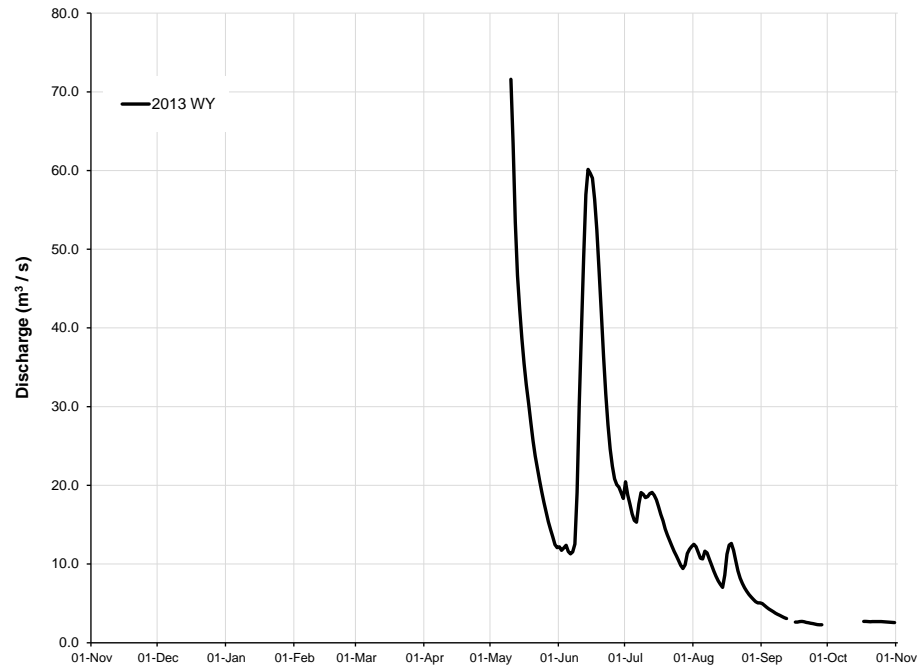
**Figure C.4-50 Discharge of Sawbones Creek above Christina Lake (Station S58) for the 2012 to 2013 WY.**



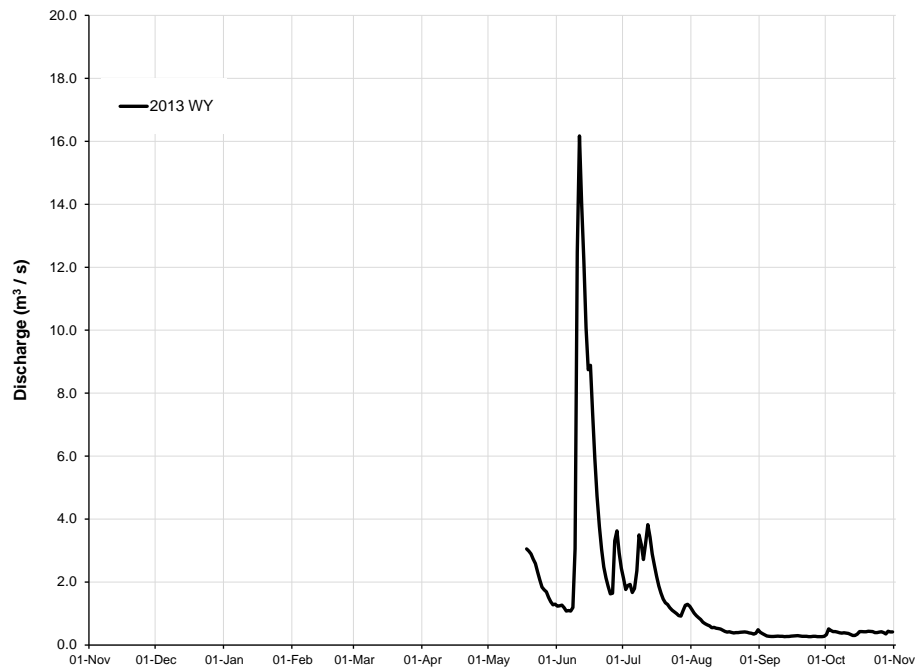
**Figure C.4-51 Discharge of Unnamed Creek south of Christina Lake (Station S60) for the 2013 WY.**



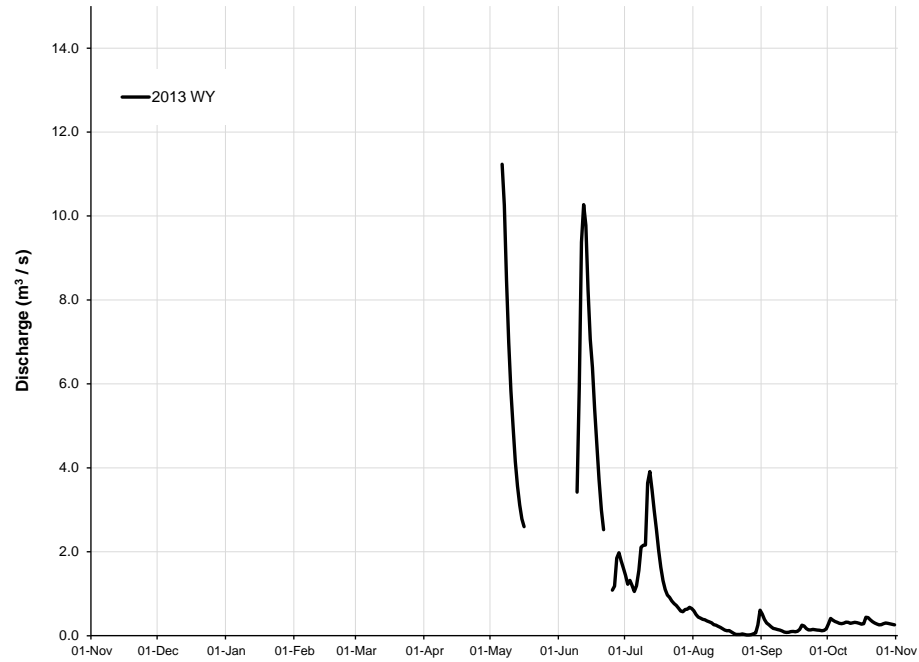
**Figure C.4-52 Discharge of Christina River above Statoi Leismer (Station S61) for the 2013 WY.**



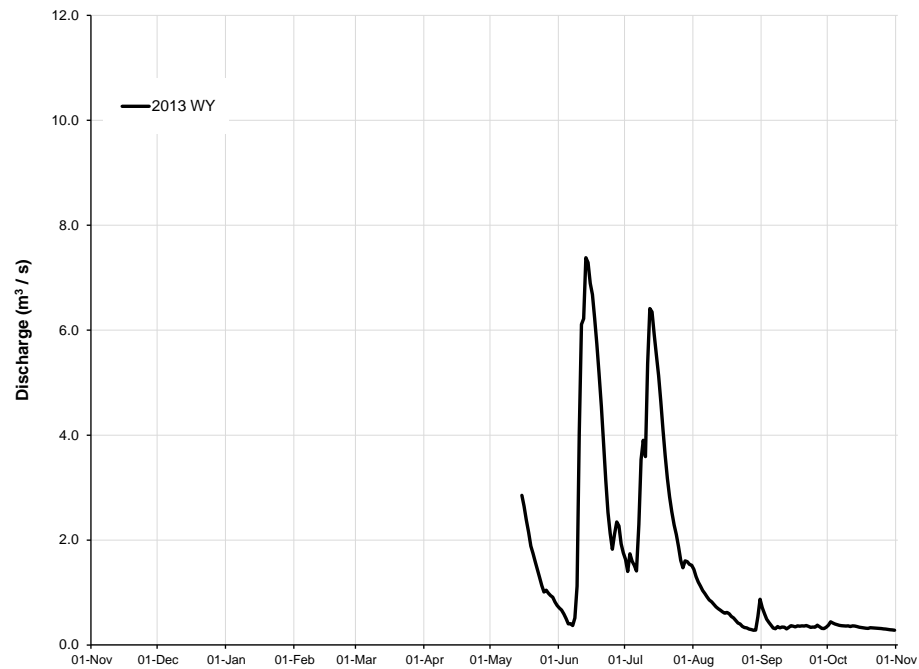
**Figure C.4-53 Discharge of Birch Creek at Highway 881 (Station S62) for the 2013 WY.**



**Figure C.4-54 Discharge of Sunday Creek at Highway 881 (Station S63) for the 2013 WY.**



**Figure C.4-55 Discharge of Unnamed Creek east of Christina Lake (Station S64) for the 2013 WY.**



## C.5 NATURALIZED FLOW CALCULATION

### C.5.1 Introduction

A water balance approach was used to assess hydrologic impacts on the flow regime experienced at the mouth of major tributaries to the Athabasca River within the oil sands region. This analytical approach is considered useful in that the difference between observed and naturalized flows can be calculated using recorded and calculated flow inputs and outputs.

The water balance approach involved the calculation of a naturalized hydrograph by accounting for flow inputs and outputs that have affected the observed hydrograph at a particular location. By adding back into the observed hydrograph, flows that would have occurred under natural conditions, and subtracting flows that would not have occurred naturally, but have been added to the system through human intervention (i.e., flows added as a result of industrial activity such as industrial flow releases and land-use changes), a naturalized hydrograph for a location was calculated. The observed hydrograph and the naturalized hydrograph were compared to assess the impacts to the flow regime at the specified location. Details of the procedure are provided below.

### C.5.2 Rationale

#### C.5.2.1 Water Balance

In general, the water balance for a partially-developed watershed (that is, a watershed that has been affected by land clearing, hydrologic isolation, and water withdrawals and discharges from watercourses) may be considered as follows:

$$Q_{nat} = Q_{Obs} + Q_w - Q_r + Q_{HI} - Q_c \quad (1)$$

Where,

- $Q_{nat}$  is the calculated *baseline* or naturalized hydrograph;
- $Q_{Obs}$  is the *test* hydrograph, which was observed;
- $Q_w$  are the focal project water withdrawals from the watercourse;
- $Q_r$  are the focal project water discharges to the watercourse;
- $Q_{HI}$  is the natural runoff that would have occurred in the watershed, but was intercepted or closed-circuited by focal projects; and
- $Q_c$  is the incremental increase in runoff caused by cleared land within the watershed.

For watersheds monitored as part of the RAMP program, the observed discharge was the discharge measured at streamflow stations near the watershed outlet.

Water withdrawals and discharges were obtained from industry reports. In most cases, daily discharges were reported. In other cases the withdrawal or discharge was reported as a monthly or annual volume, and the corresponding daily discharges were estimated by RAMP.

The natural flow,  $Q_{nat}$  was initially unknown and estimated by solving Equation 1 using information on the other components of the water balance. Because some of the other components were not known precisely, and because the water balance equation omits

factors such as changes in surface water discharge in response to groundwater extraction,  $Q_{nat}$  was referred to as “naturalized”, rather than “natural”.

The effects of clearing and hydrologic isolation were estimated as discussed in the following sections.

### C.5.2.2 Effect of Clearing

The effect of clearing was estimated by assuming a 20% increase in mean runoff depth in cleared areas. This assumption provided an approximate estimate of increased runoff. A more precise assessment would require consideration of the following factors:

- The effect of clearing on runoff is not well defined and may vary significantly depending on the soil type, initial vegetation, and other factors; and
- When land is cleared, the runoff is frequently treated in settling ponds, which may have sufficient capacity to attenuate the runoff and appreciably affect the discharge hydrograph.

Using an assumption of a constant increase in mean runoff depth was considered to be appropriate for reviewing changes in flow characteristics when evaluated at the mouth of the tributaries, because the cleared area is usually small compared to the total watershed area.

### C.5.2.3 Closed-Circuited Areas

Closed-circuited (or hydrologically isolated) areas were delineated based on satellite imagery and reviewed by oil sands operators (Table C.5-1). It was assumed that zero runoff was released to the environment from closed-circuited areas.

The definition of “effective area” used in the water balance analyses was the area of the watershed remaining after removal of the closed-circuited areas. The effective area included both cleared and natural areas that were not closed-circuited by development activities. All areas of the watershed that were not closed-circuited were included in the effective area for the purpose of the water balance analyses. The effective area as defined for this analysis may include areas that were ineffective in the classic hydrological sense of areas that do not contribute runoff to the stream during normal (up to 1:2 year) runoff events.

**Table C.5-1 Area of each watershed that was cleared or hydrologically closed-circuited, 2013.**

Watershed	Total Area <sup>1</sup> (km <sup>2</sup> )	Closed-Circuit Area (km <sup>2</sup> )	Cleared Area (km <sup>2</sup> )
Athabasca River <sup>2</sup>	156,000	362	87
Muskeg River	1,457	128	100
Steepbank River	1,320	5.4	48.8
Tar River	332	98.0	13.1
Mackay River	5,569	7.1	38.8
Calumet River	169	0.7	1.3
Firebag River	5,988	13.6	53.7
Ells River	2,420	3.6	30.2
Christina River <sup>2</sup>	13,038	13.4	109
Hangingstone River	962	0.3	4.0
Poplar Creek	151	3.1	1.9
Fort Creek	64	17.9	36.7

<sup>1</sup> Area is reported for the stream monitoring station.

<sup>2</sup> Values reported for all oil sands projects in these watersheds.

### C.5.3 Water Balance Procedure

In order to calculate the naturalized hydrograph, the observed discharge was first adjusted to remove the effects of industrial water withdrawals and discharges. The resulting discharge represented the observed runoff (R) from the contributing portion of the watershed. The observed runoff was then converted to a naturalized runoff depth (d), accounting for the effects of clearing. The naturalized runoff depth was used to calculate the naturalized discharge for the watershed (HydB). The natural flow that would have occurred from industrially closed-circuited areas (Rn), and the incremental flow from cleared areas (Ri) were also calculated. This process is as follows:

$$R = Q_{Obs} + Q_w - Q_r \quad (2)$$

$$d = \frac{R}{[A_E + (A_C \times F)]} \times C \quad (3)$$

$$Q_{nat} = \frac{A \times d}{C} \quad (4)$$

$$Q_{HI} = \frac{A_{HI} \times d}{C} \quad (5)$$

$$Q_c = \frac{A_C \times d \times F}{C} \quad (6)$$

Where,

- A is the total watershed area (km<sup>2</sup>);
- A<sub>C</sub> is the cleared area in the watershed (km<sup>2</sup>);
- A<sub>E</sub> is the effective area (i.e., A - A<sub>HI</sub>) (km<sup>2</sup>);
- A<sub>HI</sub> is the closed-circuited area (km<sup>2</sup>);
- C is the conversion factor from m<sup>3</sup>/s/km<sup>2</sup> to mm/yr;
- d is the naturalized runoff depth (mm);
- F is the adjustment factor to account for clearing (0.20); and
- R is the observed runoff from the effective area adjusted for reported industrial withdrawals and discharges (m<sup>3</sup>/s).

The water balance calculation was done at a daily time step.

### C.5.4 Previously Published Estimates

Naturalized flows provided in the RAMP reports in 2005 to 2007 (RAMP 2006; 2007, 2007) were estimated using methods similar to, but slightly different than the procedure described above. Estimates for 2005 to 2007 were revised to be consistent with the method used for 2008 to 2013, which reflected more accurately a naturalized water balance, and these revisions were presented in the RAMP 2008 report (RAMP 2009a). The assumption of differences in runoff response between upland and lowland terrain, previously applied to closed-circuited areas, was not applied due to the lack of a reliable and consistent approach for all watersheds.



## C.5.5 Results of 2013 Water Year Naturalized Flow Calculation

The results from these calculations for the 2013 WY are presented in Table C.5-2 to Table C.5-16 .

**Table C.5-2 Summary of the naturalized flow calculation for RAMP Station S46, Athabasca River near Embarras Airport.**

*RAMP funders (i.e., focal projects only)*

NOTES	

	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	15,600,000	8,620	36,174	15,563,826
RAMP site (km <sup>2</sup> )	156,000.0	86.2	361.7	155,638.3
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
23,878.143	Annual Sum (million cumecs)	24,055.66	-0.74%
1402.978	Mean open-water season (1-May : 31-Oct)	1410.962	-0.566%
240.016	Mean winter discharge (1-Nov : 31-Mar)	244.176	-1.704%
3689.609	Annual maximum daily discharge	3710.380	-0.560%
404.542	Open-water season minimum daily discharge	408.923	-1.071%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	23,878.14
Closed-circuit loss	million m <sup>3</sup>	-55.781
Incremental runoff from land clearing	million m <sup>3</sup>	2.658
Withdrawals from the stream	million m <sup>3</sup>	-102.455
Releases into the stream	million m <sup>3</sup>	1.821
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	-23.76
Incremental volume	million m <sup>3</sup>	-177.520
Naturalized Hydrograph	million m <sup>3</sup>	24,055.663
Incremental volume	% of natural	-0.738%
Naturalized Runoff Depth	mm	154.20

**Table C.5-3 Summary of the naturalized flow calculation for RAMP Station S46 (WSC Station 07DD001), Athabasca River near Embarras Airport.**

**All development**

NOTES	

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>15,600,000</b>	<b>8,686</b>	<b>36,174</b>	<b>15,563,826</b>
RAMP site (km <sup>2</sup> )	156,000.0	86.9	361.7	155,638.3
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
23,878.143	Annual Sum (million cumecs)		24,055.468	-0.74%
1402.978	Mean open-water season (1-May : 31-Oct)		1410.950	-0.565%
240.016	Mean winter discharge (1-Nov : 31-Mar)		244.175	-1.703%
3689.609	Annual maximum daily discharge		3710.334	-0.559%
404.542	Open-water season minimum daily discharge		408.920	-1.071%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	23,878.143
Closed-circuit loss	million m <sup>3</sup>	-55.781
Incremental runoff from land clearing	million m <sup>3</sup>	2.679
Withdrawals from the stream	million m <sup>3</sup>	-102.455
Releases into the stream	million m <sup>3</sup>	1.821
Diversion into/out of watershed	million m <sup>3</sup>	0.00
Tributary changes	million m <sup>3</sup>	-23.590
Incremental volume	million m <sup>3</sup>	-177.326
Naturalized Hydrograph	million m <sup>3</sup>	24,055.468
Incremental volume	% of natural	-0.737%
Naturalized Runoff Depth	mm	154.20

**Table C.5-4 Summary of the naturalized flow calculation for WSC Station 07DA008 (RAMP Station S7), Muskeg River near Fort McKay.**

NOTES	

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>145,700</b>	<b>9,995</b>	<b>12,835</b>	<b>132,865</b>
RAMP site (km <sup>2</sup> )	1,457.0	99.9	128	1,328.7
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
261.775	Annual Sum (million cumecs)	276.960	-5.48%
14.868	Mean open-water season (1-May : 31-Oct)	15.837	-6.12%
1.633	Mean winter discharge (1-Nov : 31-Mar)	1.637	-0.25%
80.600	Annual maximum daily discharge	87.041	-7.40%
1.150	Open-water season minimum daily discharge	0.997	15.32%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	261.775
Closed-circuit loss	million m <sup>3</sup>	-24.397
Incremental runoff from land clearing	million m <sup>3</sup>	3.800
Withdrawals from the stream	million m <sup>3</sup>	-0.046
Releases into the stream	million m <sup>3</sup>	0.068
Diversion into/out of watershed	million m <sup>3</sup>	5.391
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	-15.1848
Naturalized Hydrograph	million m <sup>3</sup>	276.960
Incremental volume	% of natural	-5.48%
Naturalized Runoff Depth	mm	190.09

**Table C.5-5 Summary of the naturalized flow calculation for WSC Station 07DA006 (RAMP Station S38), Steepbank River near Fort McMurray.**

NOTES	

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	132,000	4,882	538	131,462
RAMP site (km <sup>2</sup> )	1,320.0	48.8	5.4	1,314.6
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
302.975	Annual Sum (million cumecs)		301.971	0.33%
17.271	Mean open-water season (1-May : 31-Oct)		17.214	0.33%
2.001	Mean winter discharge (1-Nov : 31-Mar)		1.995	0.33%
70.500	Annual maximum daily discharge		70.267	0.33%
1.390	Open-water season minimum daily discharge		1.385	0.33%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	302.975
Closed-circuit loss	million m <sup>3</sup>	-1.230
Incremental runoff from land clearing	million m <sup>3</sup>	2.234
Withdrawals from the stream	million m <sup>3</sup>	0.000
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	1.003
Naturalized Hydrograph	million m <sup>3</sup>	301.97
Incremental volume	% of natural	0.332%
Naturalized Runoff Depth	mm	228.77

**Table C.5-6 Summary of the naturalized flow calculation for RAMP Station S15A, Tar River near the mouth.**

NOTES	

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	33,200	1,306	9,836	23,364
RAMP site (km <sup>2</sup> )	332.0	13.1	98.4	233.6
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
38.200	Annual Sum (million cumecs)		53.681	-28.8%
2.396	Mean open-water season (1-May : 31-Oct)		3.367	-28.8%
-	Mean winter discharge (1-Nov : 31-Mar)		-	-
19.038	Annual maximum daily discharge		26.754	-28.8%
0.099	Open-water season minimum daily discharge		0.139	-28.8%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	38.200
Closed-circuit loss	million m <sup>3</sup>	-15.904
Incremental runoff from land clearing	million m <sup>3</sup>	0.422
Withdrawals from the stream	million m <sup>3</sup>	0.000
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	-15.482
Naturalized Hydrograph	million m <sup>3</sup>	53.681
Incremental volume	% of natural	-28.84%
Naturalized Runoff Depth	mm	161.69

**Table C.5-7 Summary of the naturalized flow calculation for WSC Station 07DB001 (RAMP Station S26), MacKay River near Fort McKay.**

<b>NOTES</b>	
Using WSC area of 5569.3 km <sup>2</sup> , not total area (5568.7 km <sup>2</sup> ): WSC area ~ same.	

<b>LAND AREAS</b>				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>556,930</b>	<b>3,876</b>	<b>711</b>	<b>556,219</b>
RAMP site (km <sup>2</sup> )	5,569.3	38.8	7.11	5,562.2
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

<b>RESULTS SUMMARY</b>		<b>Baseline</b>	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
807.771	Annual Sum (million cumecs)	807.687	0.010%
48.319	Mean open-water season (1-May : 31-Oct)	48.314	0.010%
2.397	Mean winter discharge (1-Nov : 31-Mar)	2.396	0.012%
187.000	Annual maximum daily discharge	186.978	0.012%
1.920	Open-water season minimum daily discharge	1.920	0.012%

<b>ANNUAL WATER BALANCE COMPONENTS</b>		
Observed Hydrograph	million m <sup>3</sup>	807.771
Closed-circuit loss	million m <sup>3</sup>	-1.031
Incremental runoff from land clearing	million m <sup>3</sup>	1.124
Withdrawals from the stream	million m <sup>3</sup>	-0.009
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	0.084
Naturalized Hydrograph	million m <sup>3</sup>	807.69
Incremental volume	% of natural	0.010%
Naturalized Runoff Depth	mm	145.025

**Table C.5-8 Summary of the naturalized flow calculation for RAMP Station S16A, Calumet River near the mouth.**

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	16,900	129	70	16,830
RAMP site (km <sup>2</sup> )	169.0	1.29	0.70	168.3
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
10.58	Annual Sum (million cumecs)		10.61	-0.3%
0.67	Mean open-water season (1-May : 31-Oct)		0.67	-0.3%
-	Mean winter discharge (1-Nov : 31-Mar)		-	-
7.26	Annual maximum daily discharge		7.28	-0.3%
0.01	Open-water season minimum daily discharge		0.01	-0.3%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	10.581
Closed-circuit loss	million m <sup>3</sup>	-0.044
Incremental runoff from land clearing	million m <sup>3</sup>	0.016
Withdrawals from the stream	million m <sup>3</sup>	0.000
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	-0.028
Naturalized Hydrograph	million m <sup>3</sup>	10.608
Incremental volume	% of natural	-0.26%
Naturalized Runoff Depth	mm	62.77

**Table C.5-9 Summary of the naturalized flow calculation for WSC Station 07DC001 (RAMP Station S27), Firebag River near the mouth.**

NOTES	
Using WSC catchment area of 5987.6 km <sup>2</sup> , not total area (5681.90 km <sup>2</sup> ): WSC area 5% higher.	

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>598,760</b>	<b>5,366</b>	<b>1,358</b>	<b>597,402</b>
RAMP site (km <sup>2</sup> )	5,987.6	53.7	13.6	5,974.0
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
1,488.66	Annual Sum (million cumecs)		1,489.37	-0.05%
76.68	Mean open-water season (1-May : 31-Oct)		76.72	-0.05%
17.47	Mean winter discharge (1-Nov : 31-Mar)		17.48	-0.05%
373.00	Annual maximum daily discharge		373.18	-0.05%
19.90	Open-water season minimum daily discharge		19.91	-0.05%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1,488.66
Closed-circuit loss	million m <sup>3</sup>	-3.38
Incremental runoff from land clearing	million m <sup>3</sup>	2.67
Withdrawals from the stream	million m <sup>3</sup>	0.00
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.00
Tributary changes	million m <sup>3</sup>	0.00
Incremental volume	million m <sup>3</sup>	-0.71
Naturalized Hydrograph	million m <sup>3</sup>	1,489.37
Incremental volume	% of natural	-0.05%
Naturalized Runoff Depth	mm	248.74



**Table C.5-10 Summary of the naturalized flow calculation for RAMP Station S14A, Ells River at the CNRL Bridge.**

NOTES	

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>242,000</b>	<b>3,022</b>	<b>355</b>	<b>241,645</b>
RAMP site (km <sup>2</sup> )	2,420.0	30.2	3.55	2,416.5
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
359.329	Annual Sum (million cumecs)		358.959	0.10%
19.552	Mean open-water season (1-May : 31-Oct)		19.532	0.10%
3.181	Mean winter discharge (1-Nov : 31-Mar)		3.178	0.10%
63.431	Annual maximum daily discharge		63.366	0.10%
3.263	Open-water season minimum daily discharge		3.260	0.10%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	359.329
Closed-circuit loss	million m <sup>3</sup>	-0.526
Incremental runoff from land clearing	million m <sup>3</sup>	0.897
Withdrawals from the stream	million m <sup>3</sup>	0.000
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	0.370
Naturalized Hydrograph	million m <sup>3</sup>	358.959
Incremental volume	% of natural	0.10%
Naturalized Runoff Depth	mm	148.33

**Table C.5-11 Summary of the naturalized flow calculation for RAMP Station S47, Christina River near the mouth.**

**RAMP funders (i.e., focal projects only)**

NOTES	

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>1,303,805</b>	<b>10,568</b>	<b>1,343</b>	<b>1,302,462</b>
RAMP site (km <sup>2</sup> )	13,038.0	105.7	13.4	13,024.6
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
1,781.208	Annual Sum (million cumecs)		1,780.592	0.03%
106.775	Mean open-water season (1-May : 31-Oct)		106.725	0.05%
15.955	Mean winter discharge (1-Nov : 31-Mar)		15.965	-0.06%
345.259	Annual maximum daily discharge		345.075	0.05%
16.223	Open-water season minimum daily discharge		16.213	0.06%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1,781.208
Closed-circuit loss	million m <sup>3</sup>	-1.834
Incremental runoff from land clearing	million m <sup>3</sup>	2.887
Withdrawals from the stream	million m <sup>3</sup>	-0.436
Releases into the stream	million m <sup>3</sup>	0.00
Diversion into/out of watershed	million m <sup>3</sup>	0.00
Tributary changes	million m <sup>3</sup>	0.00
Incremental volume	million m <sup>3</sup>	0.616
Naturalized Hydrograph	million m <sup>3</sup>	1,780.592
Incremental volume	% of natural	0.03%
Naturalized Runoff Depth	mm	136.57

**Table C.5-12 Summary of the naturalized flow calculation for RAMP Station S47, Christina River near the mouth.**

**All development**

NOTES			

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	1,303,805	10,926	1,343	1,302,462
RAMP site (km <sup>2</sup> )	13,038.0	109.3	13.4	13,024.6
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
1,781.208	Annual Sum (million cumecs)		1,780.494	0.04%
106.775	Mean open-water season (1-May : 31-Oct)		106.719	0.05%
15.955	Mean winter discharge (1-Nov : 31-Mar)		15.964	-0.06%
345.259	Annual maximum daily discharge		345.056	0.06%
16.223	Open-water season minimum daily discharge		16.213	0.06%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1,781.208
Closed-circuit loss	million m <sup>3</sup>	-1.834
Incremental runoff from land clearing	million m <sup>3</sup>	2.984
Withdrawals from the stream	million m <sup>3</sup>	-0.436
Releases into the stream	million m <sup>3</sup>	0.00
Diversion into/out of watershed	million m <sup>3</sup>	0.00
Tributary changes	million m <sup>3</sup>	0.00
Incremental volume	million m <sup>3</sup>	0.714
Naturalized Hydrograph	million m <sup>3</sup>	1,780.494
Incremental volume	% of natural	0.04%
Naturalized Runoff Depth	mm	136.56

**Table C.5-13 Summary of the naturalized flow calculation for WSC Station 07CD004, Hangingstone River at Fort McMurray.**

NOTES	
Using WSC area of 962 km <sup>2</sup> , not total watershed area (1065.7 km <sup>2</sup> ): WSC area 9.7% lower.	

LAND AREAS	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	96,200	402	32	96,168
RAMP site (km <sup>2</sup> )	962.0	4.0	0.32	961.7
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
217.36	Annual Sum (million cumecs)		217.26	0.04%
13.164	Mean open-water season (1-May : 31-Oct)		13.157	0.05%
-	Mean winter discharge (1-Nov : 31-Mar)		-	-
182.000	Annual maximum daily discharge		181.908	0.05%
0.565	Open-water season minimum daily discharge		0.565	0.05%

ANNUAL WATER BALANCE COMPONENTS			
Observed Hydrograph		million m <sup>3</sup>	217.360
Closed-circuit loss		million m <sup>3</sup>	-0.072
Incremental runoff from land clearing		million m <sup>3</sup>	0.182
Withdrawals from the stream		million m <sup>3</sup>	-0.014
Releases into the stream		million m <sup>3</sup>	0.000
Diversion into/out of watershed		million m <sup>3</sup>	0.000
Tributary changes		million m <sup>3</sup>	0.000
Incremental volume		million m <sup>3</sup>	0.096
Naturalized Hydrograph		million m <sup>3</sup>	217.264
Incremental volume		% of natural	0.04%
Naturalized Runoff Depth		mm	225.85

**Table C.5-14 Summary of the naturalized flow calculation for RAMP Station S11 (WSC Station 07DA007), Poplar Creek at Highway 63.**

NOTES	

LAND AREAS				
	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	15,100	193	314	14,786
RAMP site (km <sup>2</sup> )	151.0	1.9	3.1	147.9
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
			67.506	Annual Sum (million cumecs)
3.673	Mean open-water season (1-May : 31-Oct)		1.056	247.8%
0.511	Mean winter discharge (1-Nov : 31-Mar)		0.289	77.0%
21.904	Annual maximum daily discharge		18.474	18.6%
0.039	Open-water season minimum daily discharge		0.031	27.6%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	67.506
Closed-circuit loss	million m <sup>3</sup>	-0.473
Incremental runoff from land clearing	million m <sup>3</sup>	0.058
Withdrawals from the stream	million m <sup>3</sup>	-0.003
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	50.678
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	50.260
Naturalized Hydrograph	million m <sup>3</sup>	22.747
Incremental volume	% of natural	196.77%
Naturalized Runoff Depth	mm	150.64

**Table C.5-15 Summary of the naturalized flow calculation for RAMP Station S12, Fort Creek at Highway 63.**

NOTES	

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	6,380	3,671	1,792	4,588
RAMP site (km <sup>2</sup> )	63.8	36.7	17.9	45.9
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
2.937	Annual Sum (million cumecs)		3.521	-16.6%
0.181	Mean open-water season (1-May : 31-Oct)		0.217	-16.6%
-	Mean winter discharge (1-Nov : 31-Mar)		-	-
0.671	Annual maximum daily discharge		0.804	-16.6%
0.027	Open-water season minimum daily discharge		0.032	-16.6%

ANNUAL WATER BALANCE COMPONENTS			
Observed Hydrograph		million m <sup>3</sup>	2.937
Closed-circuit loss		million m <sup>3</sup>	-0.989
Incremental runoff from land clearing		million m <sup>3</sup>	0.405
Withdrawals from the stream		million m <sup>3</sup>	0.00
Releases into the stream		million m <sup>3</sup>	0.000
Diversion into/out of watershed		million m <sup>3</sup>	0.00
Tributary changes		million m <sup>3</sup>	0.00
Incremental volume		million m <sup>3</sup>	-0.584
Naturalized Hydrograph		million m <sup>3</sup>	3.521
Incremental volume		% of natural	-16.58%
Naturalized Runoff Depth		mm	55.19

**Table C.5-16 Summary of the naturalized flow calculation for RAMP Station S6, Mills Creek at Highway 63.**

NOTES	

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	900	244	558	342
RAMP site (km <sup>2</sup> )	9.0	2.44	5.58	3.4
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
1.252	Annual Sum (million cumecs)		2.879	-56.5%
0.064	Mean open-water season (1-May : 31-Oct)		0.147	-56.5%
0.011	Mean winter discharge (1-Nov : 31-Mar)		0.024	-56.5%
0.181	Annual maximum daily discharge		0.416	-56.5%
0.006	Open-water season minimum daily discharge		0.014	-56.5%

ANNUAL WATER BALANCE COMPONENTS			
Observed Hydrograph		million m <sup>3</sup>	1.252
Closed-circuit loss		million m <sup>3</sup>	-1.784
Incremental runoff from land clearing		million m <sup>3</sup>	0.156
Withdrawals from the stream		million m <sup>3</sup>	0.000
Releases into the stream		million m <sup>3</sup>	0.000
Diversion into/out of watershed		million m <sup>3</sup>	0.00
Tributary changes		million m <sup>3</sup>	0.00
Incremental volume		million m <sup>3</sup>	-1.628
Naturalized Hydrograph		million m <sup>3</sup>	2.879
Incremental volume		% of natural	-56.5%
Naturalized Runoff Depth		mm	319.94

## **C.6 INVENTORY OF CLIMATE AND HYDROLOGIC DATA IN THE RAMP DATABASE**

An inventory of the climate and hydrologic data collected by RAMP, and contained in the RAMP database, is provided on the following pages (Table C.6-1 and Table C.6-2). These data will be made available on the RAMP website, subsequent to this report being published. In addition to the data collected by RAMP, data from the following sources contributed to the analyses in the 2013 WY RAMP Technical Report:

- Water Survey of Canada (WSC) (<http://www.wsc.ec.gc.ca/>):
  - Provisional WSC hydrologic data have been used when final data were not yet available. In the RAMP database, data for a joint WSC/RAMP station are provided starting with the year in which RAMP monitoring began. To provide regional context RAMP stations are identified where historical WSC data are available to extend the record length.
- Environment Canada (EC) ([http://climate.weatheroffice.gc.ca/climateData/canada\\_e.html](http://climate.weatheroffice.gc.ca/climateData/canada_e.html)):
  - Provisional EC climate data have been used when final data were not yet available.
- Industry Data:
  - Volumes of water released and withdrawn, as part of RAMP focal activities, were supplied by each focal project company.



**Table C.6-1 Inventory of hydrologic data collected by RAMP.**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S01 - Alsands Drain	Discharge	1995-08-10	2002-12-31
	Water Level	1997-04-16	2002-12-30
S02 - Jackpine Creek at Canterra Road	Discharge	1995-05-06	2013-10-31
	Water Level	1997-04-17	2013-10-31
	Water Temperature	2007-10-20	2013-10-31
S03 - Iyininim Creek above Kearl Lake	Total Rainfall	1999-04-30	2013-10-31
	Discharge	1989-01-18	2013-10-31
	Water Level	1989-04-20	2013-10-31
	Water Temperature	2011-08-15	2013-10-31
S04 - Blackfly Creek near the mouth	Discharge	1989-02-15	1998-10-27
S04A - Blackfly Creek near the mouth	Discharge	2007-04-25	2007-10-25
	Water Level	2007-04-25	2007-10-25
S05 - Muskeg River above Stanley Creek	Discharge	2003-05-04	2013-10-31
	Water Level	2003-02-12	2013-10-31
	Water Temperature	2010-06-26	2013-10-31
S05A - Muskeg River above Muskeg Creek	Station Pressure	2002-03-16	2013-10-31
	Discharge	1995-08-11	2013-10-31
	Water Level	1997-04-17	2013-10-31
	Water Temperature	2004-09-01	2013-10-31
S06 - Mills Creek at Highway 63	Discharge	1997-04-16	2013-10-31
	Water Level	1997-04-16	2013-10-31
	Water Temperature	2010-09-19	2013-10-31
S07 - Muskeg River near Fort McKay (07DA008)	Discharge <sup>1</sup>	1998-03-01	2013-10-31
	Water Level	2000-01-01	2013-10-31
	Water Temperature	2010-06-22	2013-10-31
S08 - Stanley Creek near the mouth	Water Level	1999-09-14	2003-10-14
S09 - Kearl Lake Outlet	Discharge	1989-01-18	2013-10-31
	Water Level	1989-01-18	2013-10-31
	Station Pressure	1999-04-07	2001-04-20
	Water Temperature	2011-04-26	2013-10-31
S10 - Wapasu Creek at Canterra Road	Discharge	1997-05-08	2012-08-12
	Water Level	1997-05-08	2012-08-12
	Water Temperature	2008-01-01	2012-08-12
S10A - Wapasu Creek near the Mouth	Discharge	2012-08-13	2013-10-31
	Water Level	2012-08-13	2013-10-31
	Water Temperature	2012-08-13	2013-10-31
S11 - Poplar Creek at Highway 63 (07DA007)	Discharge <sup>2</sup>	1996-04-20	2013-10-31
	Water Level	1995-05-05	2013-10-31
	Water Temperature	2008-05-14	2013-10-31
S12 - Fort Creek at Highway 63	Discharge	2000-04-02	2013-10-31
	Water Level	2000-04-02	2013-10-31
	Water Temperature	2011-08-08	2013-10-31
S13 - Shell Pond 3 Outlet	Discharge	2000-03-02	2002-12-07
	Water Level	2000-03-02	2002-12-07
S14 - Eills River above Joslyn Creek	Discharge <sup>3</sup>	2001-03-15	2007-10-24
	Water Level	2001-05-13	2007-10-24

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S14A - Elys River at CNRL Bridge	Discharge <sup>3</sup>	2004-10-30	2013-10-31
	Water Level	2004-10-30	2013-10-31
	Water Temperature	2005-07-14	2013-10-31
S15 - Tar River near the mouth (07DA015)	Discharge <sup>4</sup>	2001-05-09	2006-10-28
	Water Level	2001-05-09	2006-10-28
S15A - Tar River near the mouth	Discharge <sup>4</sup>	2007-05-01	2013-10-31
	Water Level	2007-05-01	2013-10-31
	Water Temperature	2007-09-21	2013-10-31
S16 - Calumet River near the mouth	Daily Maximum Temperature	2001-06-11	2005-10-11
	Daily Minimum Temperature	2001-06-11	2005-10-11
	Daily Mean Temperature	2001-06-11	2005-10-11
	Total Rainfall	2001-06-11	2005-05-02
	Total Snowfall	2001-06-11	2005-03-23
	Total Precipitation	2001-06-11	2005-05-02
	Discharge <sup>5</sup>	2001-05-12	2004-10-31
	Water Level	2001-05-12	2004-10-31
	Water Temperature	2003-05-27	2004-10-31
S16A - Calumet River near the mouth	Discharge <sup>5</sup>	2010-04-12	2013-10-31
	Water Level	2010-05-12	2013-10-31
	Water Temperature	2011-07-27	2013-10-31
S17 - Tar River Upland Tributary	Discharge	2001-05-12	2003-06-24
	Water Level	2001-05-12	2004-10-31
S18A - Calumet River Upland Tributary	Discharge	2002-06-10	2009-10-25
	Water Level	2002-06-10	2009-10-25
S19 - Tar River Lowland Tributary near the mouth	Total Rainfall	2002-06-13	2005-12-31
	Total Precipitation	2006-01-01	2009-10-22
	Total Rainfall	2010-04-22	2013-10-31
	Discharge	2001-05-09	2013-10-31
	Water Level	2001-05-09	2013-10-31
S20/S20A - Muskeg River Upland	Water Temperature	2012-04-23	2013-10-31
	Discharge	2001-05-08	2013-10-31
	Water Level	2001-05-08	2013-10-31
S21 - Shelley Creek near the mouth	Water Temperature	2012-04-24	2013-10-31
	Water Level	2001-05-14	2003-10-14
	Discharge	1989-01-17	2013-10-31
S22 - Muskeg Creek near the mouth	Water Level	1989-01-17	2013-10-31
	Water Temperature	2012-04-24	2013-10-31
	Discharge	2001-01-01	2002-12-31
S23 - Aurora Boundary Weir	Water Level	2001-01-01	2002-12-31
	Discharge	2001-06-20	2013-10-31
S24 - Athabasca River below Eymundson Creek	Water Level	2001-06-20	2013-10-31
	Water Temperature	2010-08-11	2013-10-31
	Discharge	2002-06-11	2013-10-31
S25 - Susan Lake Outlet	Water Level	2002-06-11	2013-10-31
	Water Temperature	2012-05-19	2013-10-31

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S26 - MacKay River near Fort McKay (07DB001)	Discharge <sup>6</sup>	2001-03-01	2013-10-31
S27 - Firebag River near the mouth (07DC001)	Discharge <sup>7</sup>	2002-01-01	2013-10-31
	Water Level	2002-01-01	2010-02-28
S28 - Khahago Creek below Blackfly Creek	Discharge	1989-01-19	2007-10-25
	Water Level	1989-01-19	2007-10-25
S29 - Christina River near Chard (07CE002)	Discharge <sup>8</sup>	2002-01-13	2010-10-31
	Total Rainfall	2002-07-08	2003-10-10
S31 - Hangingstone Creek at North Star Road	Discharge	2002-04-10	2013-10-31
	Water Level	2002-04-10	2013-10-31
	Total Rainfall	2010-04-23	2013-10-31
S32 - Surmount Creek at Highway 881	Discharge	2002-05-18	2013-10-31
	Water Level	2002-01-14	2013-10-31
	Water Temperature	2008-06-24	2013-10-31
S33 - Muskeg River at Aurora/Shell Boundary	Discharge	2003-01-29	2013-10-31
	Water Level	2003-04-30	2013-10-31
	Water Temperature	2009-11-01	2013-10-31
S34 - Tar River above CNRL Lake	Discharge	2005-04-26	2013-10-31
	Water Level	2005-04-26	2013-10-31
	Water Temperature	2008-04-08	2013-10-31
S35 - McClelland Lake Outlet	Water Level	2008-06-29	2008-10-08
S36 - McClelland Lake Outlet above Firebag River	Discharge	2008-05-14	2013-10-31
	Water Level	2008-05-14	2013-10-31
	Water Temperature	2011-07-27	2013-10-31
S37 - East Jackpine Creek near the 1300 m Contour	Discharge	2007-09-22	2013-10-31
	Water Level	2007-09-22	2013-10-31
	Water Temperature	2012-04-25	2013-10-31
S38 - Steepbank River near Fort McMurray (07DA006)	Discharge <sup>9</sup>	2009-01-01	2013-10-31
S39 - Beaver River above Syncrude (07DA018)	Discharge <sup>10</sup>	2009-01-01	2013-10-31
S40 - MacKay River at Petro-Canada Bridge	Discharge	2008-01-01	2013-10-31
	Water Level	2008-01-01	2013-10-31
	Total Rainfall	2010-04-23	2013-10-31
	Water Temperature	2008-09-19	2013-10-31
S42 - Clearwater River above Christina River (07CD005)	Discharge <sup>11</sup>	2009-01-01	2013-10-31
S43 - Firebag River above Suncor Firebag	Discharge	2009-05-01	2013-10-31
	Water Level	2009-05-01	2013-10-31
	Total Rainfall	2010-04-12	2013-10-31
	Water Temperature	2009-09-18	2013-10-31
S44 - Pierre River near Fort McKay (07DA013)	Discharge <sup>12</sup>	2009-05-01	2013-10-31
	Water Level	2009-05-01	2013-10-31
	Water Temperature	2011-07-27	2013-10-31
S45 - Ells River above Joslyn Creek Diversion	Discharge	2009-06-13	2013-10-31
	Water Level	2009-06-13	2013-10-31
	Water Temperature	2009-06-13	2013-10-31

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S46 - Athabasca River near Embarras Airport	Discharge <sup>13</sup>	2011-08-16	2013-10-31
	Water Level	2011-08-16	2013-10-31
	Water Temperature	2011-08-16	2013-10-31
S47/S47A - Christina River near the mouth	Discharge	2011-07-28	2013-10-31
	Water Level	2011-07-28	2013-10-31
	Water Temperature	2011-07-28	2013-10-31
S48 - Big Creek near the mouth	Discharge	2011-04-23	2013-10-31
	Water Level	2011-04-23	2013-10-31
	Water Temperature	2011-04-23	2013-10-31
S49 - Eymundson Creek near the mouth	Discharge	2011-07-27	2013-10-31
	Water Level	2011-07-27	2013-10-31
	Water Temperature	2011-07-27	2013-10-31
S50 - Red Clay Creek	Discharge	2011-04-23	2011-10-29
	Water Level	2011-04-23	2011-10-29
	Water Temperature	2011-04-23	2011-10-29
S50A - Red Clay Creek	Discharge	2012-04-26	2013-10-31
	Water Level	2012-04-26	2013-10-31
	Water Temperature	2012-04-26	2013-10-31
S51 - High Hills River near the Mouth	Discharge	2012-05-20	2013-10-31
	Water Level	2012-05-20	2013-10-31
	Water Temperature	2012-05-20	2013-10-31
S53 - Dover River near the Mouth	Discharge <sup>14</sup>	2012-05-18	2013-10-31
	Water Level	2012-05-18	2013-10-31
	Water Temperature	2012-05-18	2013-10-31
S54 - Dunkirk River near Fort MacKay	Discharge <sup>15</sup>	2012-05-17	2013-10-31
	Water Level	2012-05-17	2013-10-31
	Water Temperature	2012-05-17	2013-10-31
S55 - Gregoire River near the Mouth	Discharge	2012-05-20	2013-10-31
	Water Level	2012-05-20	2013-10-31
	Water Temperature	2012-05-20	2013-10-31
S56 - Jackfish River below Christina Lake	Discharge <sup>16</sup>	2012-05-16	2013-10-31
	Water Level	2012-05-16	2013-10-31
	Water Temperature	2012-05-16	2013-10-31
S57 - Sunday Creek above Christina Lake	Discharge	2012-05-16	2013-10-31
	Water Level	2012-05-16	2013-10-31
	Water Temperature	2012-05-16	2013-10-31
S58 - Sawbones Creek above Christina Lake	Discharge	2012-05-25	2013-10-31
	Water Level	2012-05-25	2013-10-31
	Water Temperature	2012-05-25	2013-10-31
S60 - Unnamed Creek South of Christina Lake	Discharge	2013-05-06	2013-10-31
	Water Level	2013-05-06	2013-10-31
	Water Temperature	2013-05-06	2013-10-31
S61 - Christina River above Statoil Leismer	Discharge	2013-05-10	2013-10-31
	Water Level	2013-05-10	2013-10-31
	Water Temperature	2013-05-10	2013-10-31

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S62 - Birch Creek at Highway 881	Discharge	2013-05-18	2013-10-31
	Water Level	2013-05-18	2013-10-31
	Water Temperature	2013-05-18	2013-10-31
S63 - Sunday Creek above Christina Lake	Discharge	2013-05-06	2013-10-31
	Water Level	2013-05-06	2013-10-31
	Water Temperature	2013-05-06	2013-10-31
S64 - Unnamed Creek East of Christina Lake	Discharge	2013-05-15	2013-10-26
	Water Level	2013-05-15	2013-10-26
	Water Temperature	2013-05-15	2013-10-26
CR1 - Calumet River	Discharge <sup>5</sup>	2005-05-04	2009-10-18
L1 - McClelland Lake	Daily Maximum Temperature	2007-03-29	2013-10-31
	Daily Minimum Temperature	2007-03-29	2013-10-31
	Daily Mean Temperature	2007-02-09	2013-10-31
	Total Rainfall	2002-08-09	2013-10-31
	Total Precipitation	2006-04-15	2013-10-31
	Relative Humidity	2006-09-06	2013-10-31
	Discharge	1997-06-22	2006-09-02
	Water Level	1997-06-22	2013-10-31
	Water Temperature	2008-03-14	2013-10-31
L2 - Kearl Lake	Daily Maximum Temperature	2008-01-01	2013-10-31
	Daily Minimum Temperature	2008-01-01	2013-10-31
	Daily Mean Temperature	2007-09-25	2013-10-31
	Total Precipitation	2008-01-01	2013-10-31
	Relative Humidity	2007-09-25	2013-10-31
	Discharge	2007-04-26	2007-10-17
	Water Level	1989-01-19	2013-10-31
	Water Temperature	2007-09-25	2013-10-31
L3 - Isadore's Lake	Water Level	2000-02-22	2013-10-31
	Water Temperature	2011-10-31	2013-10-31
L4 - Namur Lake	Water Level	2012-05-18	2013-10-31
	Water Temperature	2012-05-18	2013-10-31

Historical discharge data available from Water Survey of Canada for RAMP stations in similar locations.

- <sup>1</sup> S07 – Muskeg River near Fort McKay (07DA008) 1974 to present.
- <sup>2</sup> S11 – Poplar Creek at Highway 63 (Poplar Creek near Fort McMurray 07DA007) 1972 to 1986.
- <sup>3</sup> S14/S14A – Ells River above Joslyn Creek/Ells River at CNRL Bridge (Ells River near the mouth 07DA017) 1975 to 1986.
- <sup>4</sup> S15/S15A – Tar River near the mouth (Tar River near Fort McKay 07DA015) 1975 to 1977.
- <sup>5</sup> S16/CR1/S16A – Calumet River near the mouth (Calumet River near Fort McKay 07DA014) 1975 to 1977.
- <sup>6</sup> S26 – MacKay River near Fort McKay (07DB001) 1972 to present.
- <sup>7</sup> S27 – Firebag River near the mouth (07DC001) 1971 to present.
- <sup>8</sup> S29 – Christina River near Chard (07CE002) 1982 to present.
- <sup>9</sup> S38 – Steepbank River near Fort McMurray (07DA006) 1972 to present.
- <sup>10</sup> S39 – Beaver River above Syncrude (07DA018) 1975 to present.
- <sup>11</sup> S42 – Clearwater River above Christina River (07CD005) 1966 to present.
- <sup>12</sup> S44 – Pierre River near Fort McKay (07DA013) 1975 to 1977.
- <sup>13</sup> S46 – Athabasca River near Embarras Airport (Athabasca River at Embarras Airport 07DD011) 1971 to 1984.
- <sup>14</sup> S53 – Dover River near the mouth (Dover River near the Mouth 07DB002) 1975 to 1977.
- <sup>15</sup> S54 – Dunkirk River near Fort McKay (Dunkirk River near Fort McKay 07DB003) 1975 to 1979.
- <sup>16</sup> S56 – Jackfish River below Christina Lake (Jackfish River below Christina Lake 07CE005) 1982 to 1995.

**Table C.6-2 Inventory of climate data collected by RAMP.**

<b>Climate Station</b>	<b>Data Type</b>	<b>From Date</b>	<b>To Date</b>
C1 - Aurora Climate Station	Daily Maximum Temperature	1995-05-10	2013-10-31
	Daily Minimum Temperature	1995-05-10	2013-10-31
	Daily Mean Temperature	1988-03-11	2013-10-31
	Total Rainfall	1995-05-10	2008-12-31
	Total Snowfall	1996-01-01	2008-12-31
	Total Precipitation	1988-03-10	2013-10-31
	Snow on the Ground	1995-10-26	2013-10-31
	Speed of Extreme Gust	1995-05-10	2013-10-31
	Global Solar Radiation (RF1)	1988-03-11	2013-10-31
	Relative Humidity	1995-05-10	2013-10-31
	Maximum 2-Minute Wind Speed	1995-05-10	2013-10-31
	Maximum 10-Minute Wind Speed	1995-05-10	2013-10-31
	C2 - Horizon Climate Station	Daily Maximum Temperature	2008-10-16
Daily Minimum Temperature		2008-10-16	2013-10-31
Daily Mean Temperature		2008-10-16	2013-10-31
Snow on the Ground		2009-01-01	2013-10-31
Speed of Extreme Gust		2008-10-16	2013-10-31
Global Solar Radiation (RF1)		2008-10-16	2013-10-31
Station pressure		2008-10-16	2013-10-31
Relative Humidity		2008-10-16	2013-10-31
Maximum 2-Minute Wind Speed		2008-10-16	2013-10-31
Maximum 10-Minute Wind Speed		2008-10-16	2013-10-31
Total Precipitation		2009-06-11	2013-10-31
C3 - Steepbank Climate Station	Daily Maximum Temperature	2010-11-03	2013-10-31
	Daily Minimum Temperature	2010-11-03	2013-10-31
	Daily Mean Temperature	2010-11-03	2013-10-31
	Snow on the Ground	2010-11-03	2013-10-31
	Speed of Extreme Gust	2010-11-03	2013-10-31
	Global Solar Radiation (RF1)	2010-11-03	2013-10-31
	Station pressure	2010-11-03	2013-10-31
	Relative Humidity	2010-11-03	2013-10-31
	Maximum 2-Minute Wind Speed	2010-11-03	2013-10-31
	Maximum 10-Minute Wind Speed	2010-11-03	2013-10-31
	Total Precipitation	2009-08-13	2013-10-31
C4 - Pierre Climate Station	Daily Maximum Temperature	2011-07-25	2013-10-31
	Daily Minimum Temperature	2011-07-25	2013-10-31
	Daily Mean Temperature	2011-07-25	2013-10-31
	Snow on the Ground	2011-07-25	2013-10-31
	Speed of Extreme Gust	2011-07-25	2013-10-31
	Global Solar Radiation (RF1)	2011-07-25	2013-10-31
	Station pressure	2011-07-25	2013-10-31
	Relative Humidity	2011-07-25	2013-10-31
	Maximum 2-Minute Wind Speed	2011-07-25	2013-10-31
	Maximum 10-Minute Wind Speed	2011-07-25	2013-10-31
	Total Precipitation	2011-07-25	2013-10-31

**Table C.6-12 (Cont'd.)**

<b>Climate Station</b>	<b>Data Type</b>	<b>From Date</b>	<b>To Date</b>
C5 - Surrmont Climate Station	Daily Maximum Temperature	2011-10-16	2013-10-31
	Daily Minimum Temperature	2011-10-16	2013-10-31
	Daily Mean Temperature	2011-10-16	2013-10-31
	Snow on the Ground	2011-10-16	2013-10-31
	Speed of Extreme Gust	2011-10-16	2013-10-31
	Global Solar Radiation (RF1)	2011-10-16	2013-10-31
	Station pressure	2011-10-16	2013-10-31
	Relative Humidity	2011-10-16	2013-10-31
	Maximum 2-Minute Wind Speed	2011-10-16	2013-10-31
	Maximum 10-Minute Wind Speed	2011-10-16	2013-10-31
	Total Precipitation	2011-10-16	2013-10-31

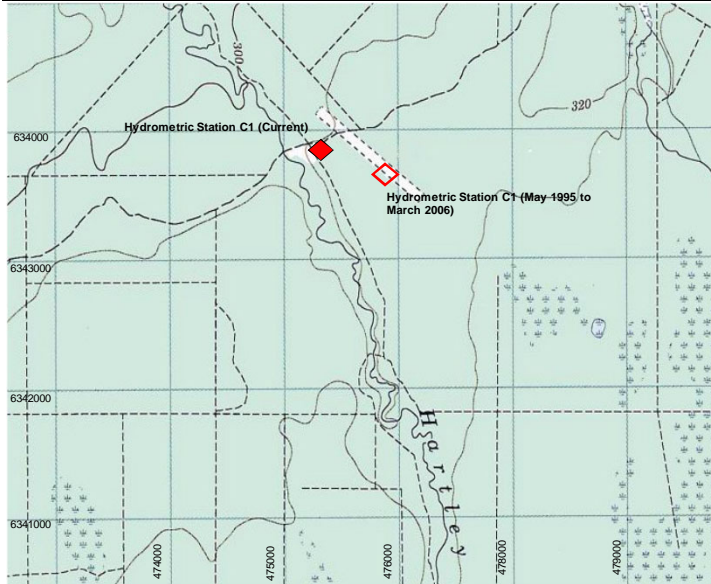
## **C.7 UPDATED STATION DESCRIPTION SHEETS**

Updated station description sheets are provided below for all stations that were active in the 2013 WY.

Revised 24 March, 2014

**Location and Purpose:**

Established in May 1995 to monitor climate conditions in the Muskeg River basin. Formerly Station 271 for the OSLO project-1988 data available.



Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	March 1996 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Truck via Canterra Road/ Jackpine Mine
<b>UTM Coordinates:</b>	475230 E, 6344049 N (NAD83)
<b>Lat/Long:</b>	57°14'20" N, 111°24'37" W (NAD83)
<b>Station Elevation:</b>	308 m
<b>NTS Map:</b>	73M/10

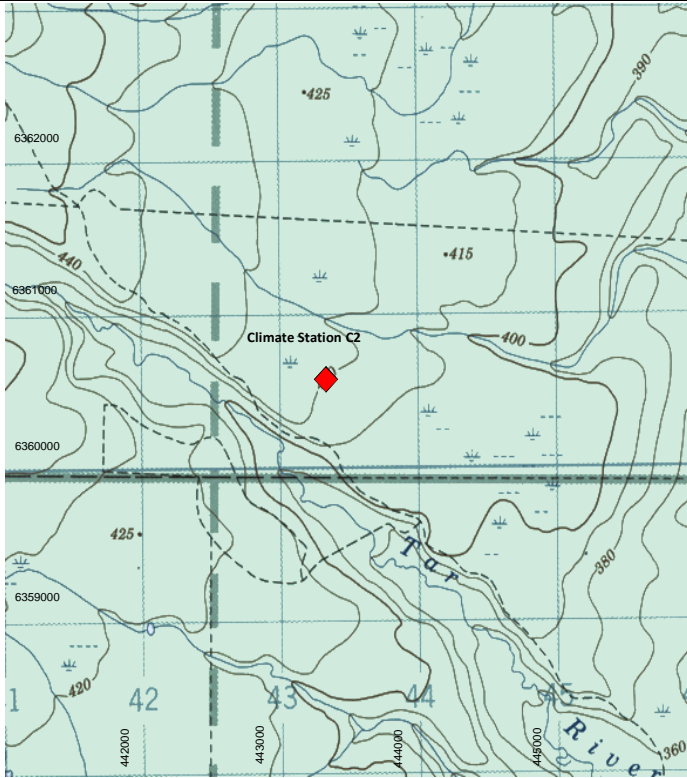




Revised 24 March, 2014

**Location and Purpose:**

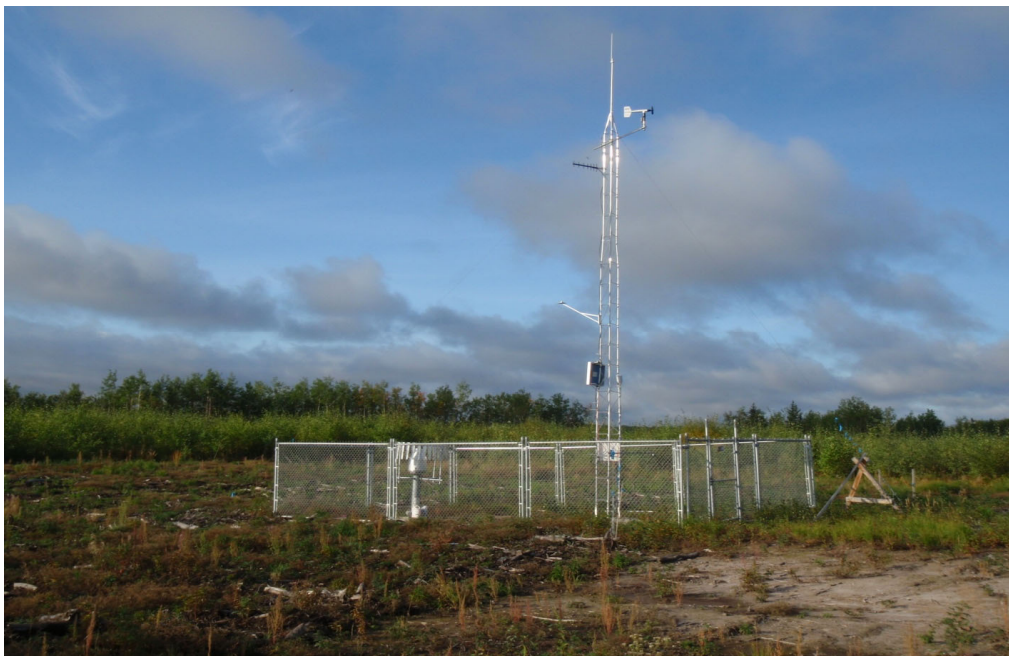
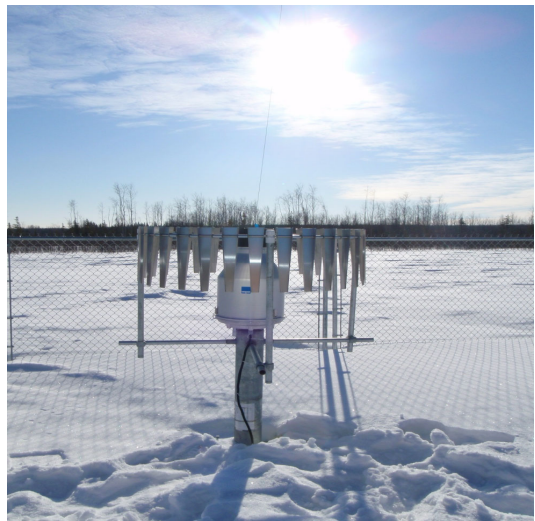
Established in October 2008 to monitor climate conditions in the Tar River basin.



Map Grid Based on UTM NAD 27

**Station Details**

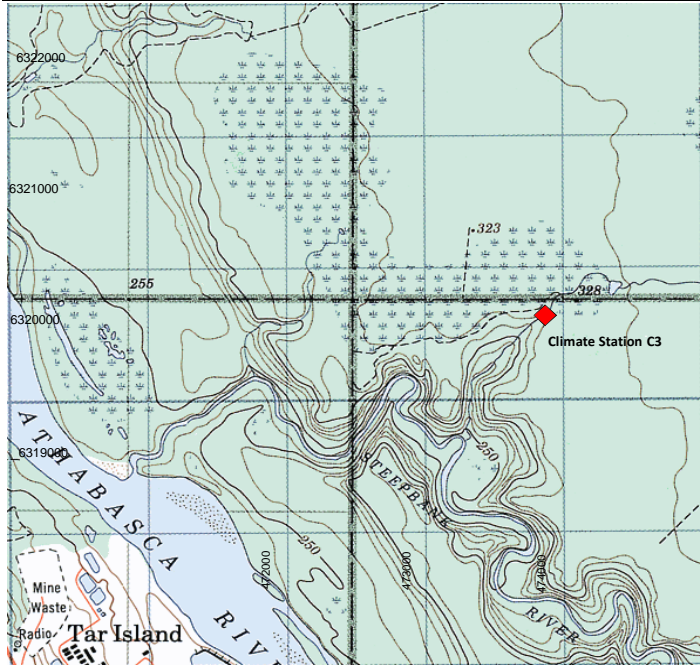
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 1998 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via CNRL Horizon
<b>UTM Coordinates:</b>	443364 E, 6360515 N (NAD83)
<b>Lat/Long:</b>	57°23'02" N, 111°56'31" W (NAD83)
<b>Station Elevation:</b>	412 m
<b>NTS Map:</b>	74E/05



Revised 24 March, 2014

**Location and Purpose:**

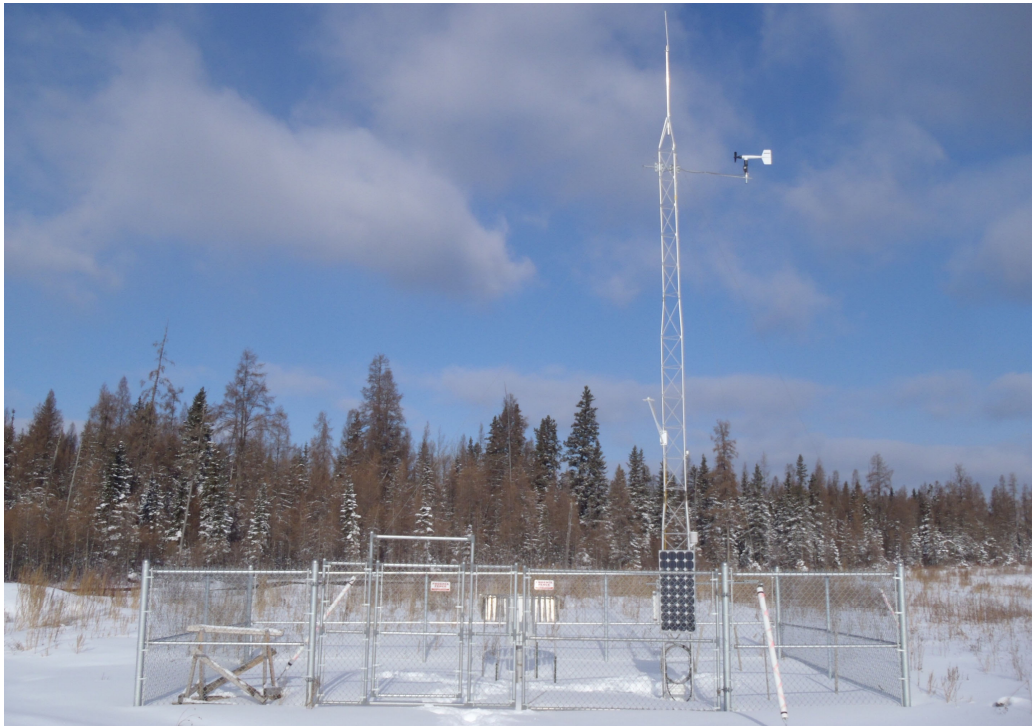
Established in August 2009 to monitor precipitation in the northwest Steepbank River area, and upgraded to a full climate station in November 2010.



Map Grid Based on UTM NAD 27

**Station Details**

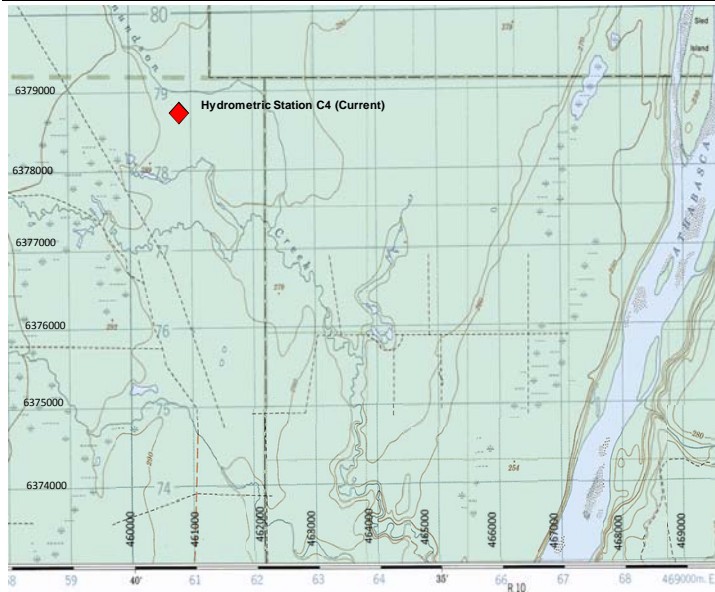
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	August 2009 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via Suncor
<b>UTM Coordinates:</b>	473950 E, 6320500 N (NAD83)
<b>Lat/Long:</b>	57°01'38" N, 111°25'45" W (NAD83)
<b>Station Elevation:</b>	328 m
<b>NTS Map:</b>	74E/03



Revised 24 March, 2014

**Location and Purpose:**

Established in July 2011 to monitor climate conditions on the west side of the Athabasca River, north of all current development.



Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	July 2011 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>UTM Coordinates:</b>	460853 E, 6378740 N (NAD83)
<b>Lat/Long:</b>	57°32'58" N, 111°39'14" W (NAD83)
<b>Station Elevation:</b>	291 m
<b>NTS Map:</b>	74E/12



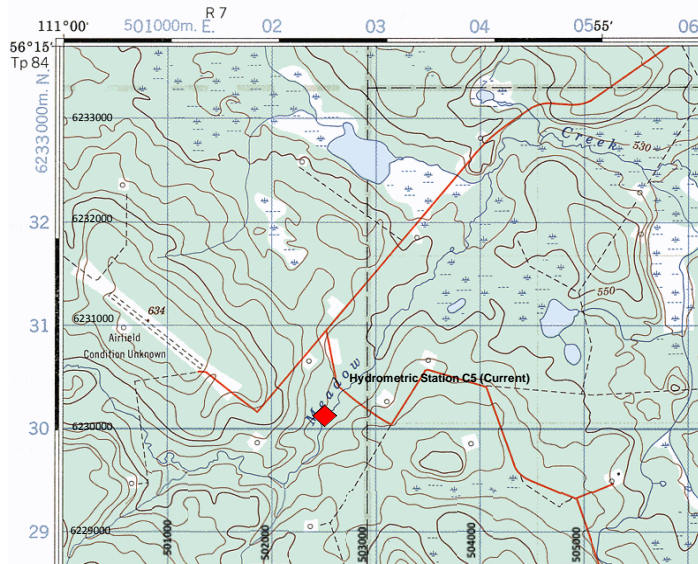
Revised 24 March, 2014

**Location and Purpose:**

Established in October 2011 to monitor climate conditions between Fort McMurray and Christina Lake.

**Station Details**

<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 2011 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Truck via Hwy 881 and Surmont Project
<b>UTM Coordinates:</b>	502542 E, 6230964 N (NAD83)
<b>Lat/Long:</b>	56°13'24" N, 110°57'32" W (NAD83)
<b>Station Elevation:</b>	555 m
<b>NTS Map:</b>	74D/02



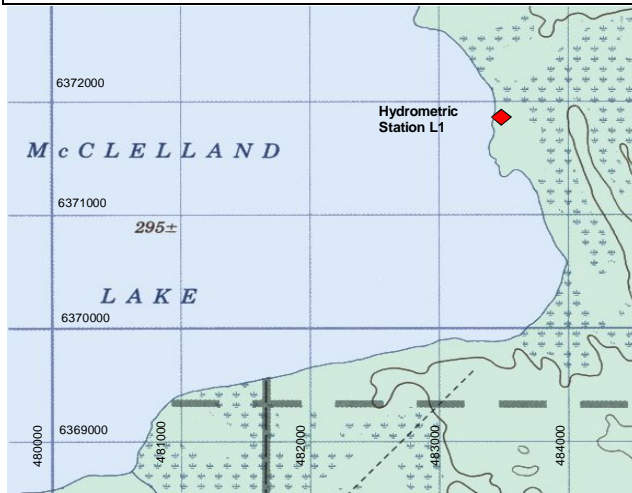
Map Grid Based on UTM NAD 27



Revised March 26, 2014

**Location and Purpose:**

Established on the East side of McClelland Lake, 12 km North West of the Kearsal project to monitor for Suncor Fort Hills EIA predictions.



Map Grid Based on UTM NAD 27



Looking North West  
across the lake from

**Station Details**

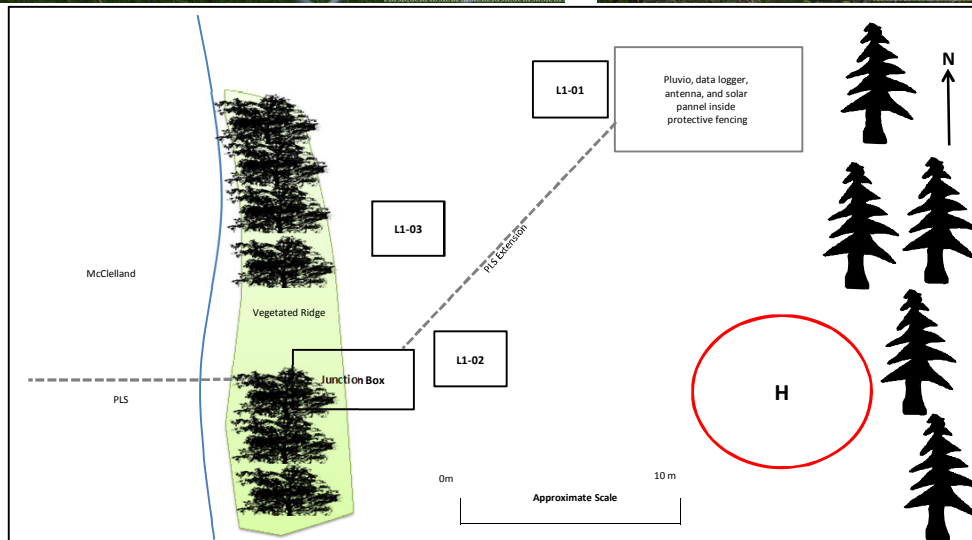
**Variables Measured:** Water level, Water Temperature, Precipitation, Air Temperature, Relative Humidity, Cellular  
**Telemetry:**  
**Period of Record:** July 1997 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 191km<sup>2</sup>  
**UTM Coordinates:** 483430 E, 6371950 N (NAD83)  
**Lat/Long:** 57°29'30" N, 111°16'37" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM1:** RAMP L1-01  
**Elevation:** 294.865m  
**Basis:** Level survey RAMP L1-1  
**Location:** Next to Fence Enclosure  
**Description:** Iron Rod  
**BM2:** RAMP L1-02  
**Elevation:** 295.036m  
**Basis:** Level survey  
**Location:** 20m West of station  
**Description:** 3/4" Pipe  
**BM3:** RAMP L1-03  
**Elevation:** 294.664  
**Basis:** Level survey RAMP L1-1  
**Location:** 10m West of station  
**Description:** 3/4" Pipe



Looking North toward the  
Station near the junction



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor water levels in Kearl Lake, in order to assess potential effects of nearby oilsands activities and to aid in water balance calculations for the lake. Several climate variables are also measured to compliment data gathered at RAMP climate stations in the region.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Water Level, Water Temperature, Air Temperature, Precipitation, Relative Humidity  
**Telemetry:** Cellular  
**Period of Record:** May 1999 to Present  
**Station Operation:** Year Round  
**Access:** 2WD access via Canterra Road  
**Relative Location:** Approx. 24km SW (straight line) of Hwy 63 - East Athabasca Hwy intersection  
**Drainage Area:** 71.6 km<sup>2</sup>  
**UTM Coordinates:** 484839 E, 6351065 N (NAD83)  
**Lat/Long:** 57°18'8.3" N, 111°15'5.8" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP L2-03  
**Elevation:** 332.394 m  
**Basis:** Level Survey from L2-01  
**Location:** South of lake access trail  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP L2-04  
**Elevation:** 333.226 m  
**Basis:** Level survey from L2-01  
**Location:** South of lake access trail by previous Rebar BM  
**Description:** 3/4" Pipe with coupling

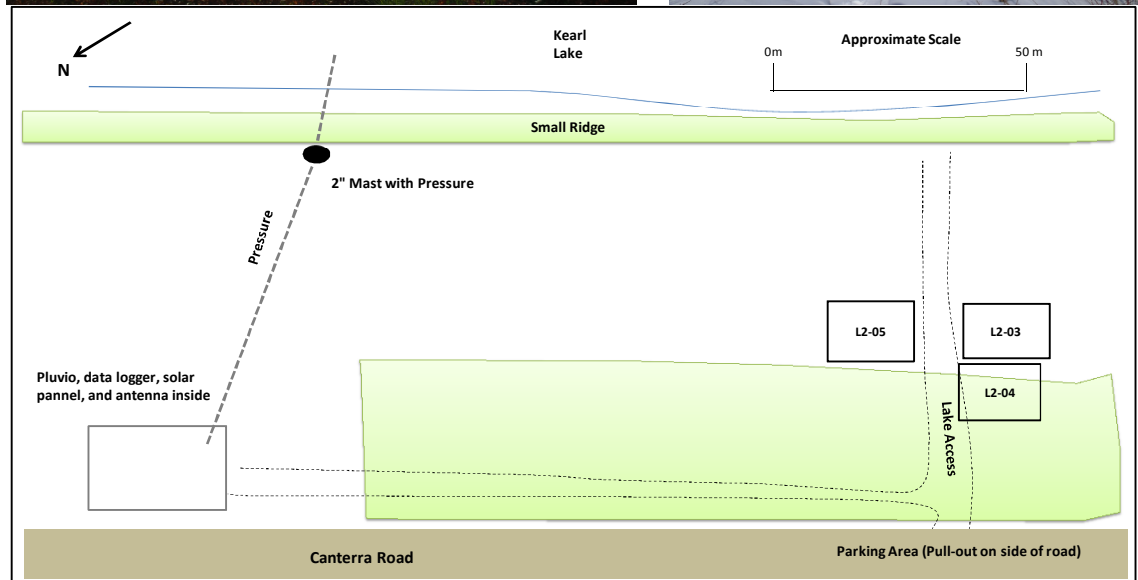
**BM:** RAMP L2-05  
**Elevation:** 332.798 m  
**Basis:** Level Survey from L2-01  
**Location:** North of lake access trail  
**Description:** 3/4" Pipe with flagging



View across Kearl Lake at Station L2



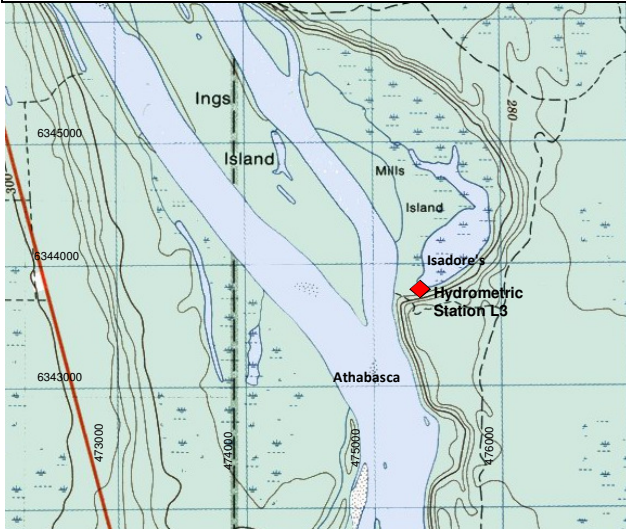
Equipment inside fencing at RAMP



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor water levels on Isadore's Lake, in order to assess the effects of nearby oilsands operations.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Water level, Water Temperature  
**Telemetry:** Cellular  
**Period of Record:** February 2000 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Summer: Jet Boat via Athabasca River, footpath; Winter: Helicopter  
**Relative Location:** Approx. 2km South of Hwy 63 - Sycrude Aurora Access intersection  
**Drainage Area:** 14.2 km<sup>2</sup>  
**UTM Coordinates:** 463305 E, 6342967 N (NAD83)  
**Lat/Long:** 57°13'42" N, 111°36'28" W (NAD83)  
**NTS Map:** 74E/04

**Benchmark Information**

**BM:** RAMP L3-05  
**Elevation:** 235.537 m  
**Basis:** Level Survey from L3-02  
**Location:** 35m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP L3-06  
**Elevation:** 234.619 m  
**Basis:** Level Survey from L3-02  
**Location:** 30m South of data logger  
**Description:** 3/4" Pipe with pink flagging

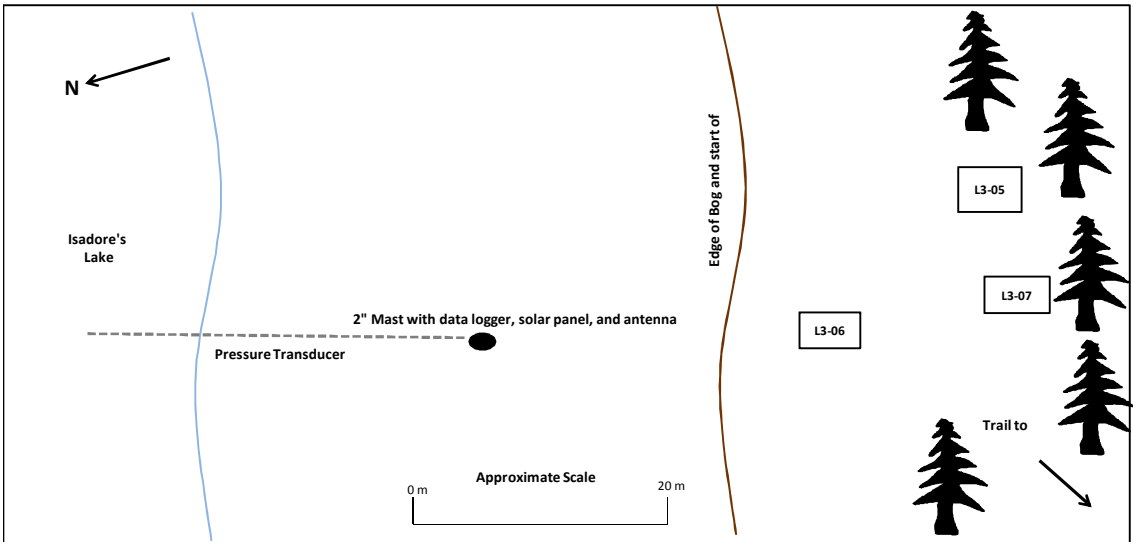
**BM:** RAMP L3-07  
**Elevation:** 235.380 m  
**Basis:** Level Survey from L3-02  
**Location:** 35m South of data logger  
**Description:** 3/4" Pipe with pink flagging



View of the right shoreline of Isadore's Lake (RAMP L3)



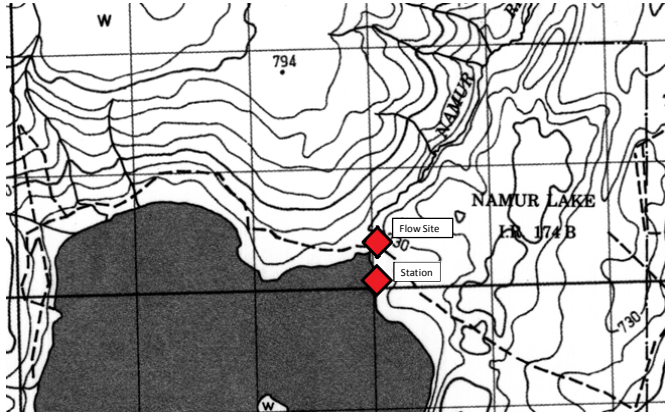
RAMP Lake Station L3, Isadore's Lake; Foreground: BM L3-6 and 2" Pipe Equipment Mast



Revised March 26, 2014

**Location and Purpose:**

Established on the North-Eastern shore of Namur Lake. Located 300m South East of the outlet this station was established to monitor water levels and discharge from the Lake as part of the Joint Oilsands Monitoring Program.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 164 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 402886 E, 6370260 N (NAD83)  
**Lat/Long:** 57°27'53"N, 112°37'8"W (NAD83)  
**NTS Map:** 84H/07

**Measurement Details**

**Channel:** The channel is approximately 7m wide and it has trapezoidal edges. The substrate is made up of predominately sand. This river can be waded throughout most of the year. The lake is substrate is predominately cobble near the station.

**Control:** Outlet of the lake acts as the control for this station.

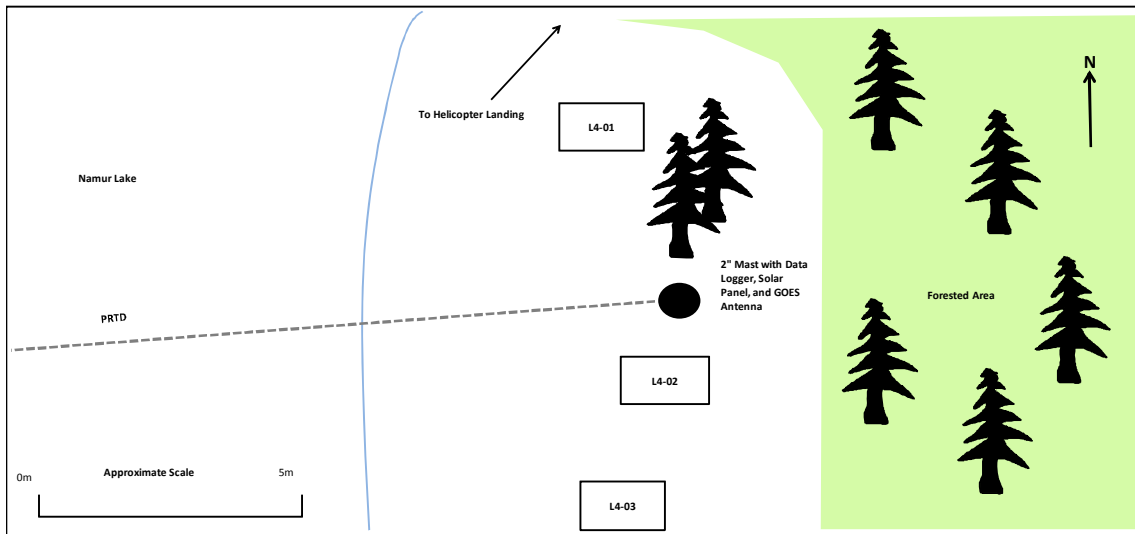
**Metering Section:** The metering section is located 20m downstream from the outlet on the North end of the lake.

**Benchmark Information**

**BM:** RAMP L4-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 4m North West of station  
**Description:** 3/4" Pipe

**BM:** RAMP L4-02  
**Elevation:** 100.055 m  
**Basis:** Level Survey from RAMP L4-01  
**Location:** 5m South East of station  
**Description:** 3/4" Pipe

**BM:** RAMP L4-03  
**Elevation:** 100.127 m  
**Basis:** Level Survey from RAMP L4-01  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe

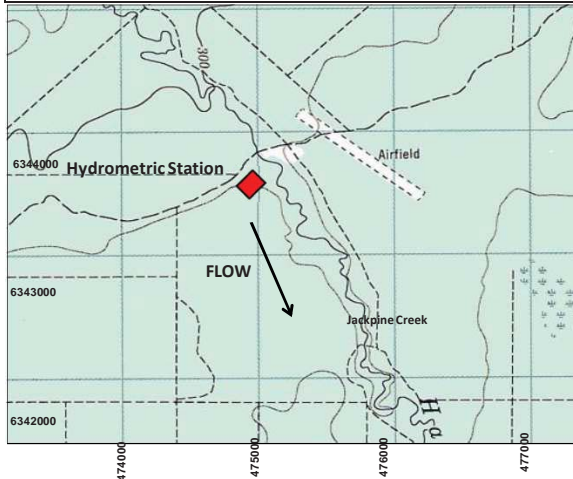




Revised 3 September, 2013

**Location and Purpose:**

Established to monitor discharge on Jackpine Creek upstream of the Muskeg River. Replaced an Environment Canada hydrometric station (07DA009) that previously operated at the original site from 1975 to 1993. Station was moved to present location in 2000 to allow road access and avoid beaver dam activity.



Map Grid Based on UTM NAD 27



Upstream view of Jackpine Creek at RAMP hydrometric station S2

**Station Details**

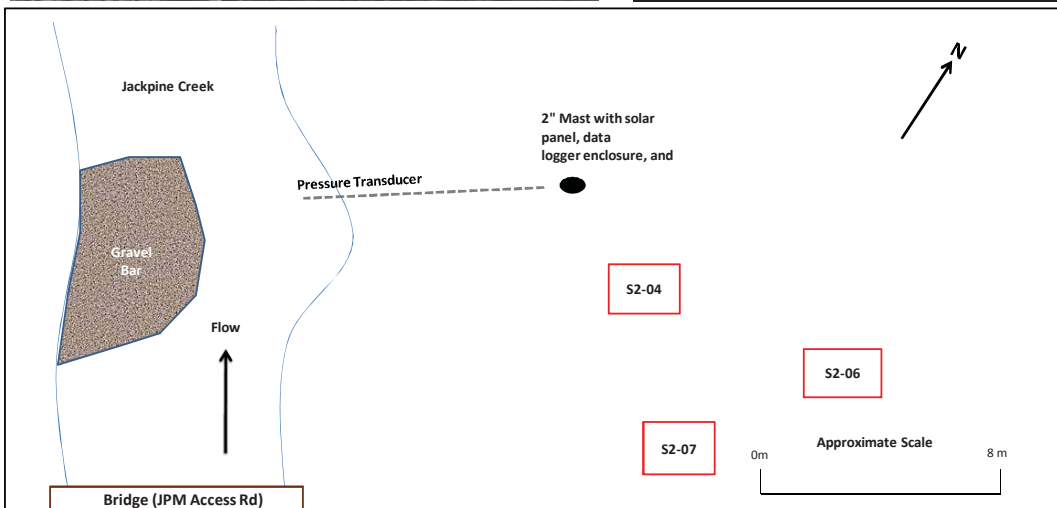
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 1995 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Shell Jackpine Mine  
**Relative Location:** Approx. 12km SW of Hwy 63 - Shell MRM Access intersection  
**Drainage Area:** 342 km<sup>2</sup>  
**UTM Coordinates:** 474961 E, 6344087 N (NAD83)  
**Lat/Long:** 57°14'21" N, 111°24'53" W (NAD83)  
**NTS Map:** 74E/3

**Measurement Details:**

**Channel:** Trapezoidal channel edges, and approximately 10 m in width. Channel bed primarily made up of cobble, with subdominant sand.  
**Control:** A riffle approx. 20 m downstream of the station acts as the control  
**Metering Section:** The metering section is located approx. 10 m upstream of the station. Under most flow conditions, the channel can be waded, however during high water, due to fast flow and deep water, it may be necessary to use a kick boat or boat in order to perform a discharge measurement.

**Benchmark Information**

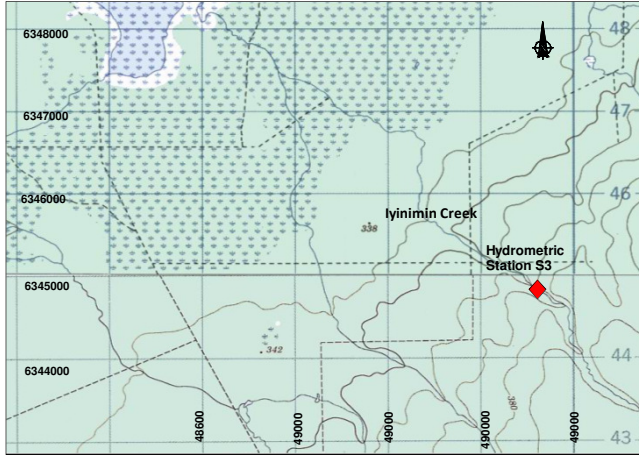
**BM:** RAMP S2-04  
**Elevation:** 297.256 m  
**Basis:** Level survey from S02-02  
**Location:** 3m SE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S2-06  
**Elevation:** 298.399 m  
**Basis:** Level Survey from RAMP S2-04  
**Location:** 20m ESE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S2-07  
**Elevation:** 298.432 m  
**Basis:** Level Survey from RAMP S2-06  
**Location:** 15m SSE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on Iyininim Creek upstream of Kearl Lake. This station was intended to characterize runoff from the North/West slopes of Muskeg Mountain and provide input to Kearl Lake water balance calculations. The station is located approx. 10 km (straight line) WNW of the intersection of the East Athabasca Hwy and Canterra Rd.



Map Grid Based on UTM NAD 27



RAMP Station S3, Iyininim Creek, cross-stream view

**Station Details**

**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** May 1995-Oct. 1999; May 2001-Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 39.3 km<sup>2</sup>  
**UTM Coordinates:** 489491 E, 6345029 N (NAD83)  
**Lat/Long:** 57° 15' 00" N, 111° 10' 27" W  
**NTS Map:** 74E/06

**Measurement Details:**

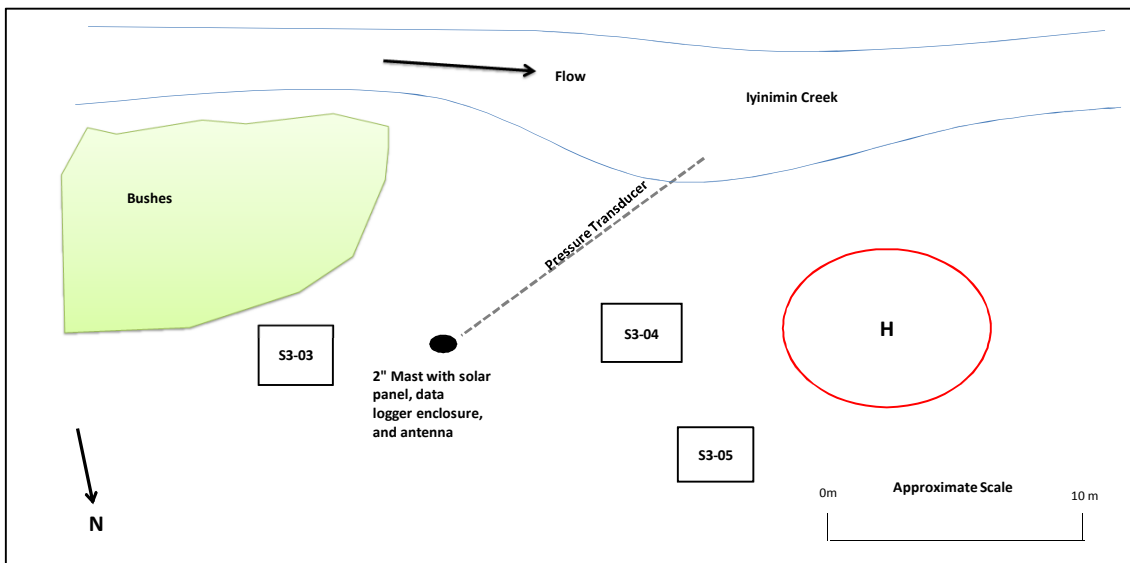
**Channel:** The channel is approx. 3m wide with trapezoidal edges. The channel bed is composed mainly of silt, with some cobble-boulder sized rocks  
**Control:** A riffle, along with debris, located approx. 40m downstream comprises the channel control  
**Metering Section:** Flow measured across from the station. During normal flow conditions the channel can be waded

**Benchmark Information**

**BM:** RAMP S3-03  
**Elevation:** 361.382 m  
**Basis:** Level Survey from S3-02  
**Location:** 3m East of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S3-04  
**Elevation:** 361.565 m  
**Basis:** Level Survey from RAMP S3-3  
**Location:** 5m West of data logger  
**Description:** 3/4" Pipe with pink flagging

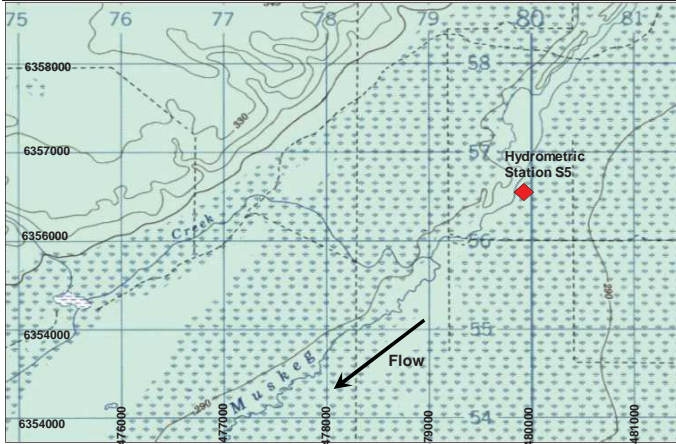
**BM:** RAMP S3-05  
**Elevation:** 361.588 m  
**Basis:** Level Survey from RAMP S3-3  
**Location:** 10m NW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on the Muskeg River above disturbed watersheds. Decommissioned in 1996, station was reactivated in 2003 in accordance with regulatory monitoring of nearby oilsands operations. Station is located approx. 20km NE of the Hwy 63 - Syncrude Aurora Access intersection.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Aug 1995-Dec 1996, Feb 2003-Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 396 km<sup>2</sup>  
**UTM Coordinates:** 479760 E, 6356755 N (NAD83)  
**Lat/Long:** 57°21'11" N, 111°20'10" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details:**

**Channel:** Channel is approx. 10m wide, with relatively straight edges. Channel bed composed mainly of silt/organics.

**Control:** The channel acts as the primary control.

**Metering Section:** Flow measurements are conducted about 5m downstream of the station, near the helicopter landing area. A kick-boat is needed during all water levels to measure flow, due to deep water.

**Benchmark Information**

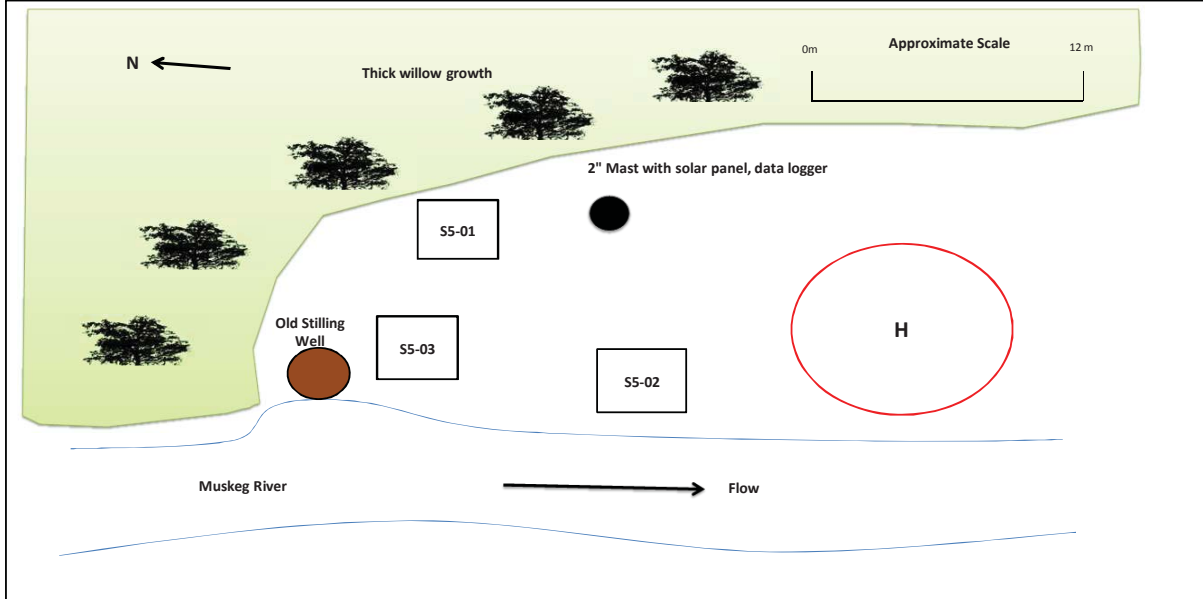
**BM:** RAMP S5-01  
**Elevation:** 98.369 m  
**Basis:** Level survey from S5-03  
**Location:** 4 m North of data logger  
**Description:** Old 3/4" Pipe

**BM:** RAMP S5-02  
**Elevation:** 98.516 m  
**Basis:** Level Survey from RAMP S5-01  
**Location:** 8 m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S5-3  
**Elevation:** 98.400 m  
**Basis:** Unknown  
**Location:** Close to old stilling well  
**Description:** T-Post



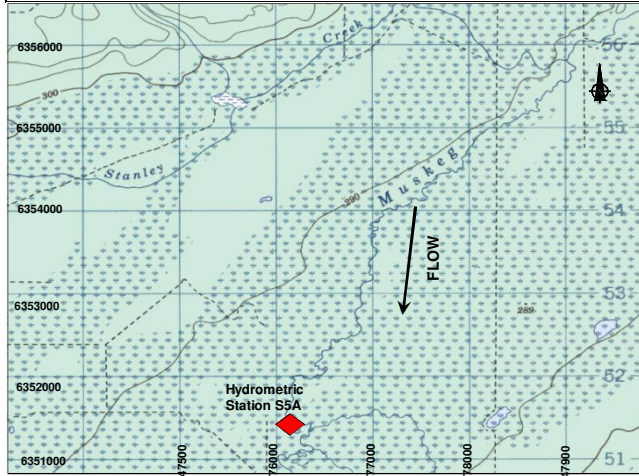
RAMP Station S5, Muskeg River Above Stanley Creek, view upstream of the station and the old stilling well



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on the Muskeg River upstream of disturbed watersheds. The station was relocated in 1998 to allow road access, and is approximately 14km ENE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Looking downstream from Station S5A

**Station Details**

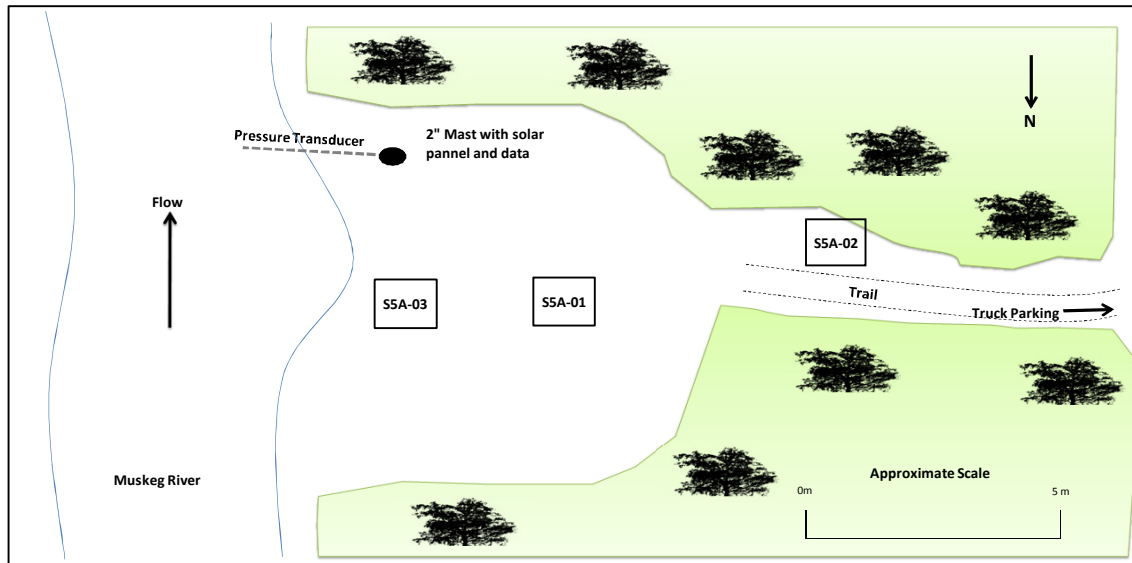
**Variables Measured:** Discharge, water level, water temperature, barometric pressure  
**Telemetry:** Cellular  
**Period of Record:** August 1995 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via the Syncrude Aurora Mine  
**Drainage Area:** 521 km<sup>2</sup>  
**UTM Coordinates:** 476100 E, 6351600 N (NAD83)  
**Lat/Long:** 57°18'30" N, 111°23'43" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details:**

**Channel:** The channel is approx. 14m wide and has relatively straight edges. The dominant bed material is silt, with layers of organics and woody debris present.  
**Control:** The channel morphology serves as the hydrologic control  
**Metering Section:** The metering section is located adjacent to the station, and a kick-boat is required to perform discharge measurements, due to deep water.

**Benchmark Information**

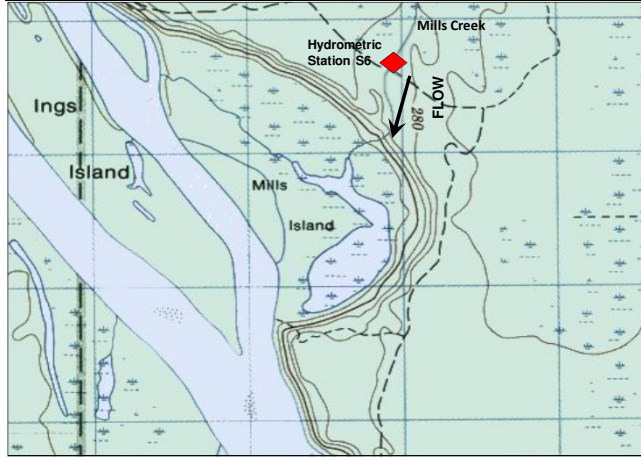
**BM:** RAMP S5A-01  
**Elevation:** 282.697 m  
**Basis:** Geodetic survey  
**Location:** 4 m NW of data logger  
**Description:** T-Post  
**BM:** RAMP S5A-02  
**Elevation:** 282.159 m  
**Basis:** Level Survey from S5A-01  
**Location:** 10 m West of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S5A-03  
**Elevation:** 282.352 m  
**Basis:** Level Survey from RAMP S5A-01  
**Location:** 3m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on Mills Creek, downstream of the Mills Creek fen, to provide insight into water quality affects on Isadore's Lake. The original plywood and timber pile V-notch weir was replaced with steel piles and a sheet steel weir in October 2005. The station is located 500m SE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 1997 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road access along Hwy 63 (paved)  
**Drainage Area:** 9 km<sup>2</sup>  
**UTM Coordinates:** 463829 E, 6344743 N (NAD83)  
**Lat/Long:** 57°14'44" N, 111°35'57" W (NAD83)  
**NTS Map:** 74E/04

**Measurement Details:**

**Channel:** The channel is approx. 1m wide and very shallow, with trapezoidal edges. The bed substrate is comprised of cobbles.

**Control:** The v-notch weir (weir equation does not apply) provides majority of control.

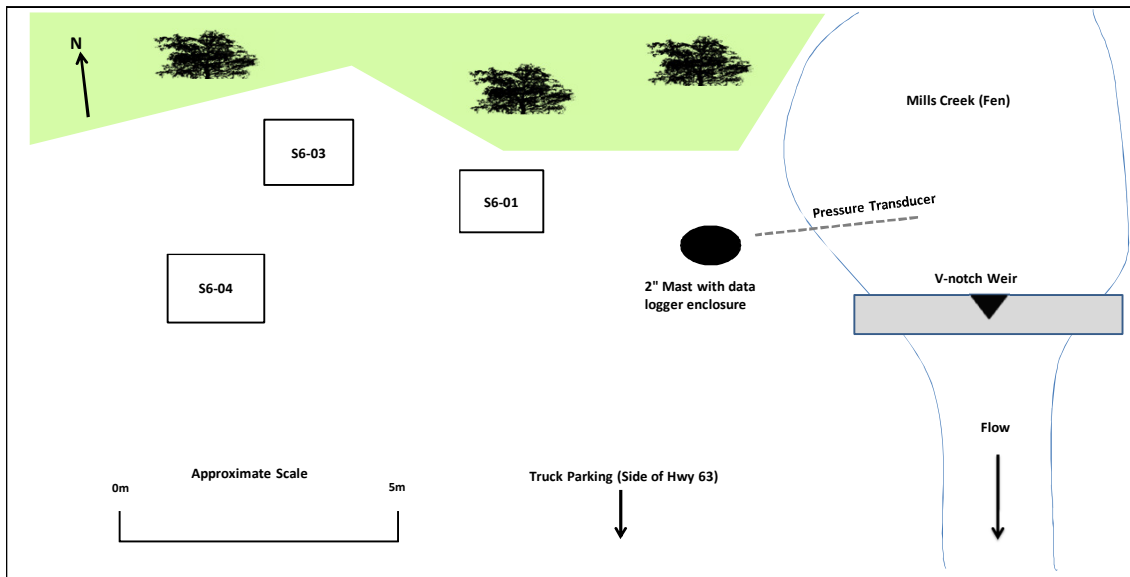
**Metering Section:** The metering section is located 3m downstream of the weir, and the channel can be waded at all water levels.

**Benchmark Information**

**BM:** RAMP S6-01  
**Elevation:** 273.600m  
**Basis:** Survey date unknown  
**Location:** 4m NW of data logger  
**Description:** Rebar in white PVC

**BM:** RAMP S6-03  
**Elevation:** 274.118m  
**Basis:** Level Survey from RAMP S6-01  
**Location:** 6m NW of data logger  
**Description:** 3/4" Pipe with pink flagging

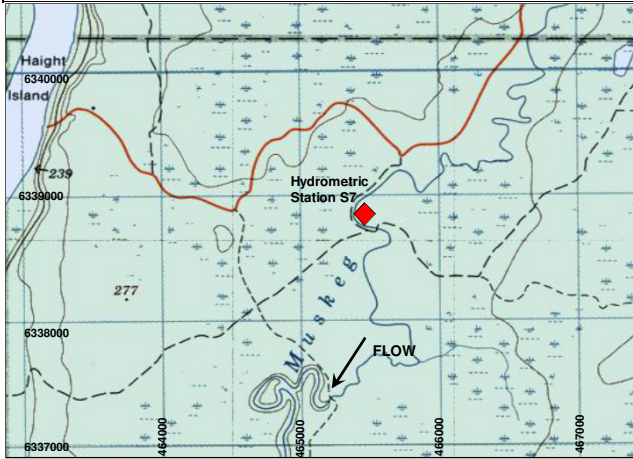
**BM:** RAMP S6-04  
**Elevation:** 274.113m  
**Basis:** Level Survey from RAMP S6-01  
**Location:** 7m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor winter discharge on the Muskeg River near Water Survey of Canada hydrometric station 07DA008. The WSC hydrometric station has operated since 1975 but discharges are only published for the March-October period. The station is located 1.4km ESE of the Hwy 63 - MRM Access intersection.



Map Grid Based on UTM NAD 27



Looking downstream on the Muskeg River at Station S7

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** October 1999 to Present  
**Station Operation:** Year Round  
**Access:** 2WD access via Canterra Road (gravel)  
**Drainage Area:** 1457 km<sup>2</sup>  
**UTM Coordinates:** 465408 E, 6338944 N (NAD83)  
**Lat/Long:** 57°11'32" N, 111°34'21" W (NAD83)  
**NTS Map:** 74E/04

**Measurement Details**

**Channel:** The channel is approximately 20m wide with trapezoidal edges. The channel bed is comprised of dominantly silt.

**Control:** A riffle located approx. 20m downstream of the station provides hydrologic control.

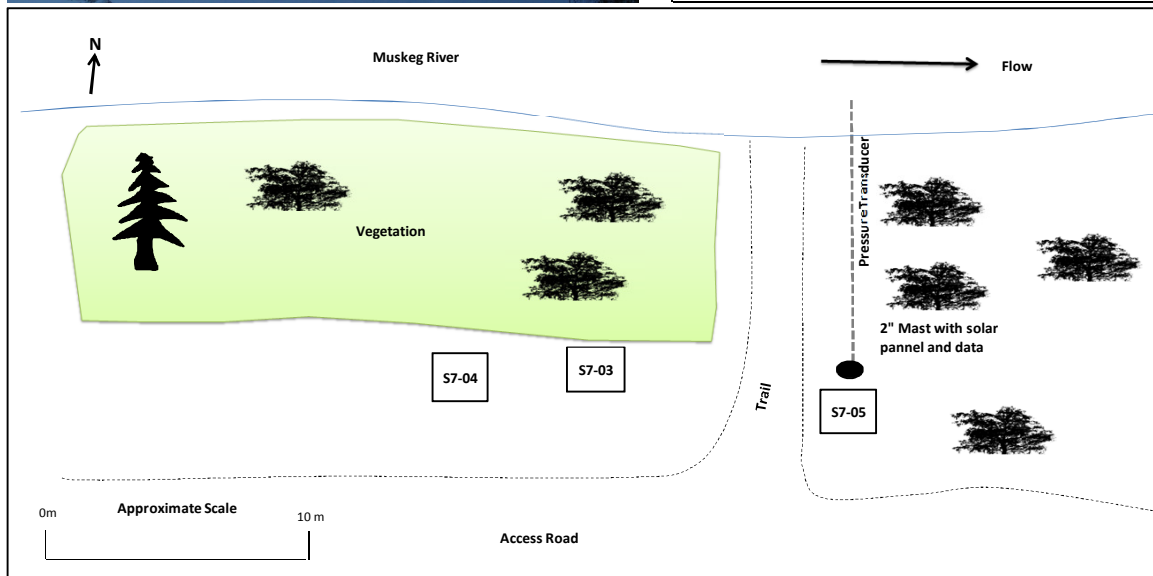
**Metering Section:** The metering section is located adjacent to the station. The channel can be waded under normal flow conditions, or with the aid of a kick-boat at higher water levels.

**Benchmark Information**

**BM:** RAMP S7-03  
**Elevation:** 275.499 m  
**Basis:** Level Survey from S7-01  
**Location:** 8m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S7-04  
**Elevation:** 274.826 m  
**Basis:** Level Survey from RAMP S7-03  
**Location:** 10m West of data logger  
**Description:** 3/4" Pipe with pink flagging

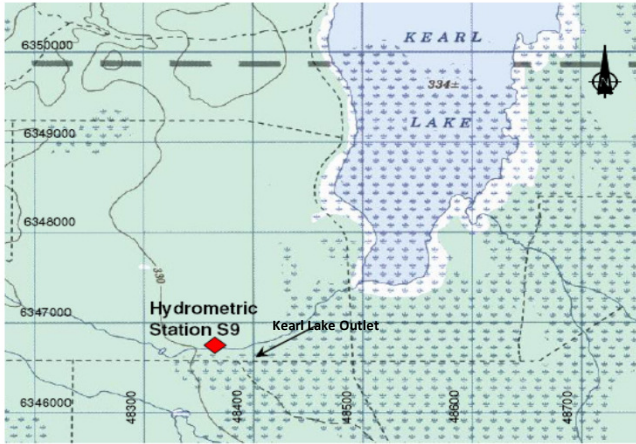
**BM:** RAMP S7-05  
**Elevation:** 275.208 m  
**Basis:** Level Survey from RAMP S7-03  
**Location:** 2m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on the Kearl Lake Outlet channel to provide data for the Kearl Lake water balance and to assess the effects of development on the lake. The station was relocated approximately 50m downstream in November 2005 to avoid the influence of beaver dams. The station is located approximately 15km (straight line) NW of the Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view of RAMP Hydrometric

**Station Details**

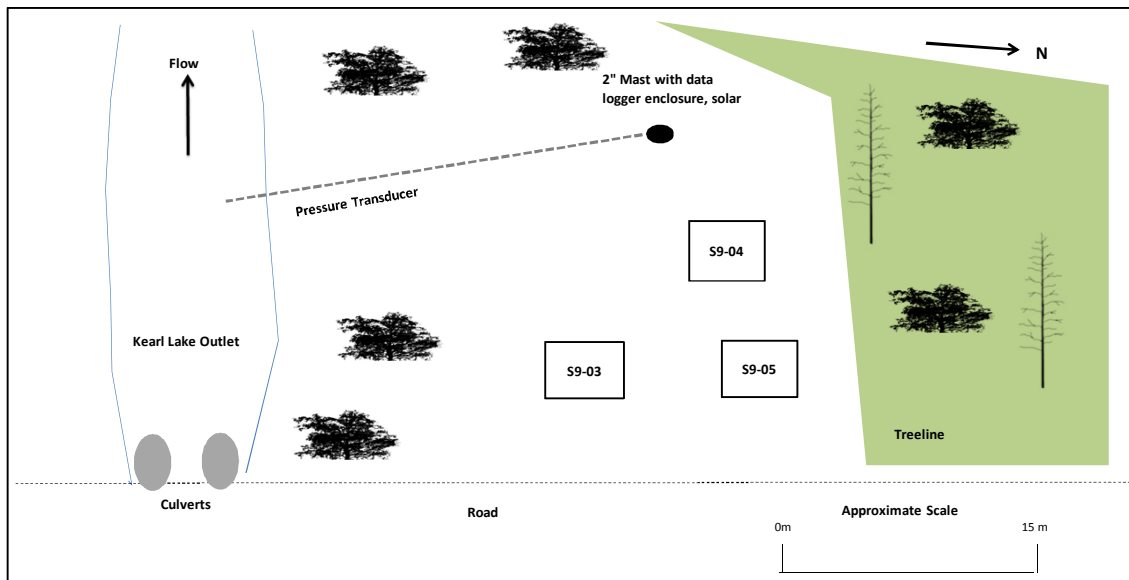
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2000-Oct. 2002, Apr. 2006-Present  
**Station Operation:** Year Round  
**Access:** 4WD road access  
**Drainage Area:** 76.5 km<sup>2</sup>  
**UTM Coordinates:** 483962 E, 6346990 N (NAD83)  
**Lat/Long:** 57°15'56.38" N, 111°15'57.27" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 7m wide with trapezoidal edges. The bed material is dominantly silt and organics.  
**Control:** Downstream beaver activity provides the hydrologic control on this channel reach.  
**Metering Section:** Flow is measured adjacent to the station. The channel can be waded under normal flow conditions.

**Benchmark Information**

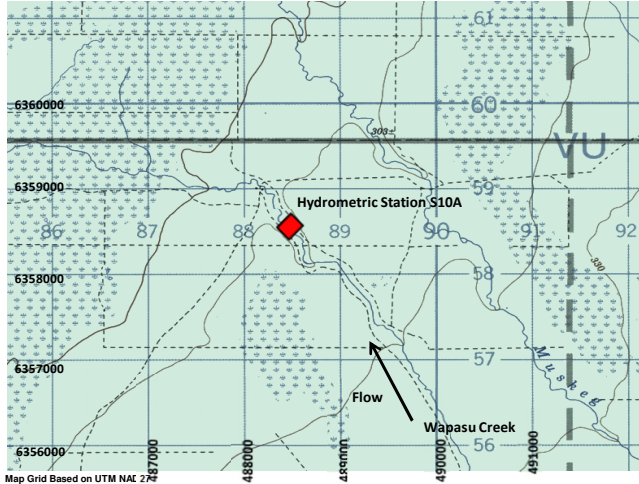
**BM:** RAMP S9-03  
**Elevation:** 330.231 m  
**Basis:** Level Survey from RAMP S9-04  
**Location:** 10 m East of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S9-04  
**Elevation:** 330.293 m  
**Basis:** Level Survey from previous BM: RAMP S9-01  
**Location:** 6 m NE of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S9-05  
**Elevation:** 330.635 m  
**Basis:** Level Survey from previous BM: RAMP S9-01  
**Location:** 10 m NE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established to measure discharge on Wapasu Creek upstream of the Muskeg River to monitor effects of nearby oilsands activity. Extensive beaver activity since 2009 has flooded most of the area around hydrometric station S10. As a result, in August 2012 the station was relocated (from 490350m E 6355500m N) approximately 3km downstream. Located approx. 20km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Upstream view of Wapasu Creek at Station S10A

**Station Details**

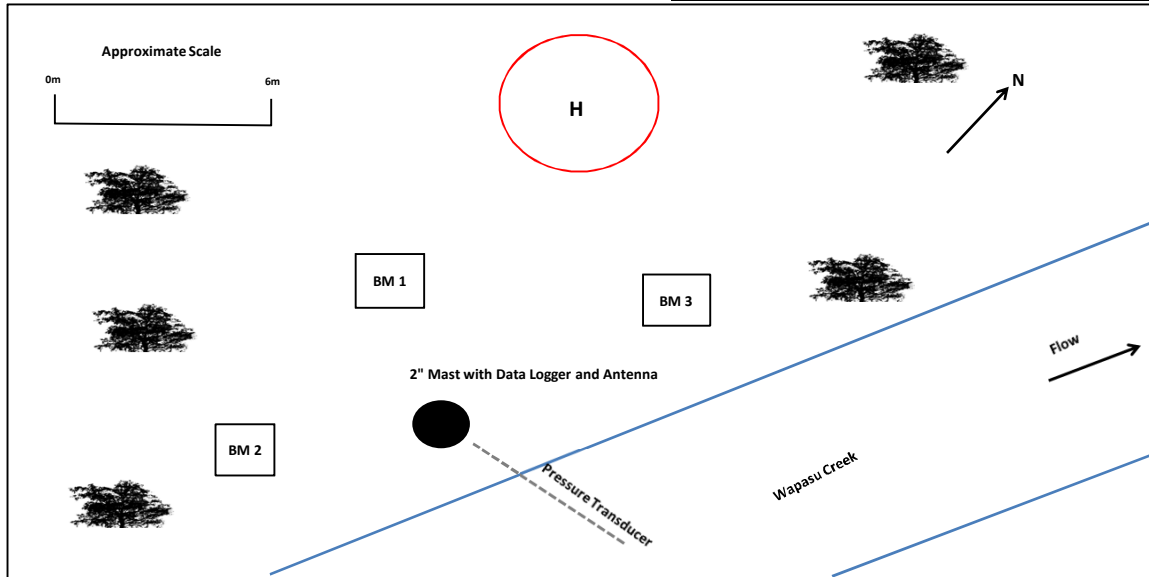
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Mar 1998-Oct 1999; May 2001-Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 101 km<sup>2</sup>  
**UTM Coordinates:** 488573 mE, 6358554 mN (NAD83)  
**Lat/Long:** 57°22'11"N, 111°11'24"W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 6m wide, with trapezoidal edges. The bed material is composed of a mixture of cobble and sand.  
**Control:** A riffle located approx. 30m downstream serves as the hydrologic control for this reach.  
**Metering Section:** The metering section is located adjacent to the station. The channel can be waded under normal flow conditions.

**Benchmark Information**

**BM:** RAMP S10A-01  
**Elevation:** 100.236 m  
**Basis:** Level Survey from RAMP S10A-02  
**Location:** 5m NW of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S10A-02  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S10A-03  
**Elevation:** 100.136 m  
**Basis:** Level Survey from RAMP S10A-02  
**Location:** 6 m North of data logger  
**Description:** 3/4" Pipe with pink flagging

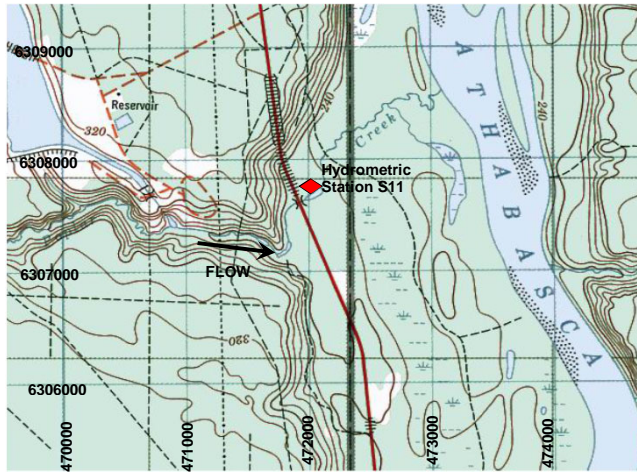




Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on Poplar Creek upstream of the Athabasca River. The station is located 50m downstream of the bridge at Hwy 63. Water Survey of Canada station (07DA007) operated in this general location from 1973 to 1986. The rationale for this station is to extend the measurement record of WSC station 07DA007.



Map Grid Based on UTM NAD 27



RAMP Hydrometric Station S11,  
Poplar Creek at Hwy 63

**Station Details**

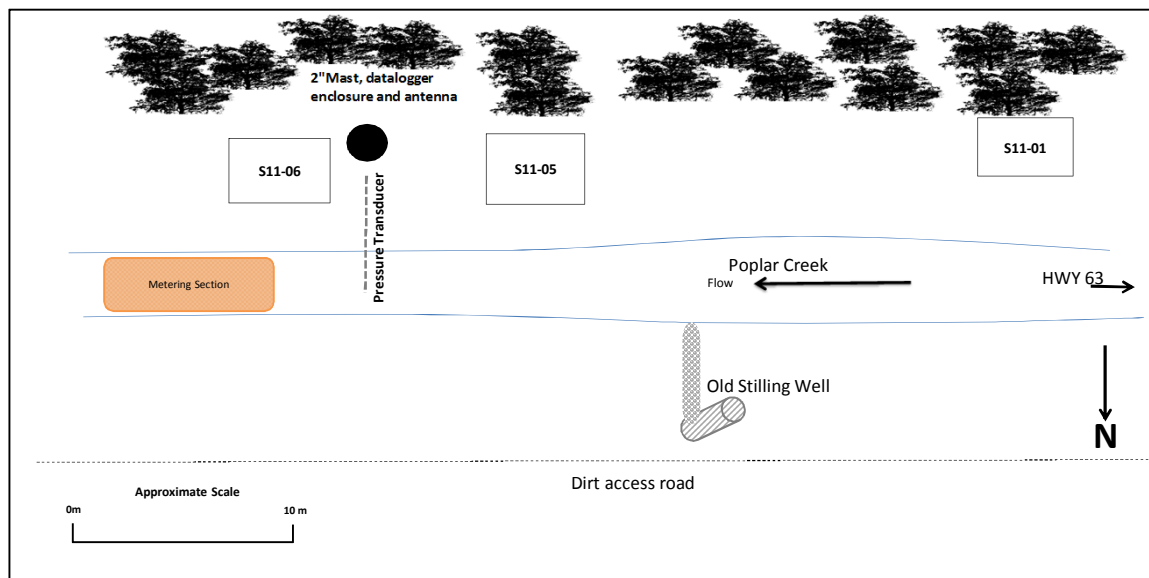
**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 1997 to Present  
**Station Operation:** Year Round  
**Access:** Seasonal dirt road off Hwy 63  
**Drainage Area:** 151km<sup>2</sup> (WSC)  
**UTM Coordinates:** 472000 E, 6307650 N (NAD83)  
**Lat/Long:** 56°54'46" N, 111°27'44" W (NAD83)  
**NTS Map:** 74D/14

**Measurement Details**

**Channel:** The channel is a straight reach 7m wide, the substrate is made up almost entirely of cobbles.  
**Control:** The site is located 5m downstream of a riffle with an additional riffle acting as a control 40m downstream.  
**Metering Section:** Measurements are conducted by wading across the river 5m downstream of the station.

**Benchmark Information**

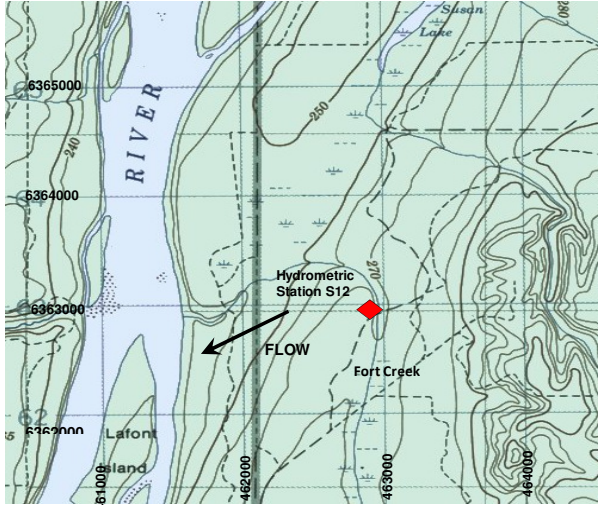
**BM:** RAMP S11-01  
**Elevation:** 242.081m  
**Basis:** Level survey from decommissioned BM  
**Location:** On Right Bank, 30m Upstream from logger  
**Description:** ASCM marker, square pin next to orange stake  
  
**BM:** RAMP S11-05  
**Elevation:** 242.212m  
**Basis:** Level Survey from RAMP S11-01  
**Location:** 7m W of datalogger  
**Description:** 3/4" Pipe  
  
**BM:** RAMP S11-06  
**Elevation:** 242.579m  
**Basis:** Level Survey from RAMP S11-01  
**Location:** 3m E of datalogger  
**Description:** 3/4" Pipe



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on Fort Creek upstream of the Athabasca River and was discontinued in 2002. The station was reactivated in 2006 to monitor streamflow downstream of the Fort Hills development. In August 2009 the station was moved 50m downstream due to road construction. The station is located approx. 18km North of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Downstream view of Fort Creek and

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2000-Oct. 2002; Apr 2006-Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access via Hwy 63 extension  
**Drainage Area:** 63.8 km<sup>2</sup>  
**UTM Coordinates:** 462600 E, 6363400 N (NAD83)  
**Lat/Long:** 57°24'48" N, 111°37'18" W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

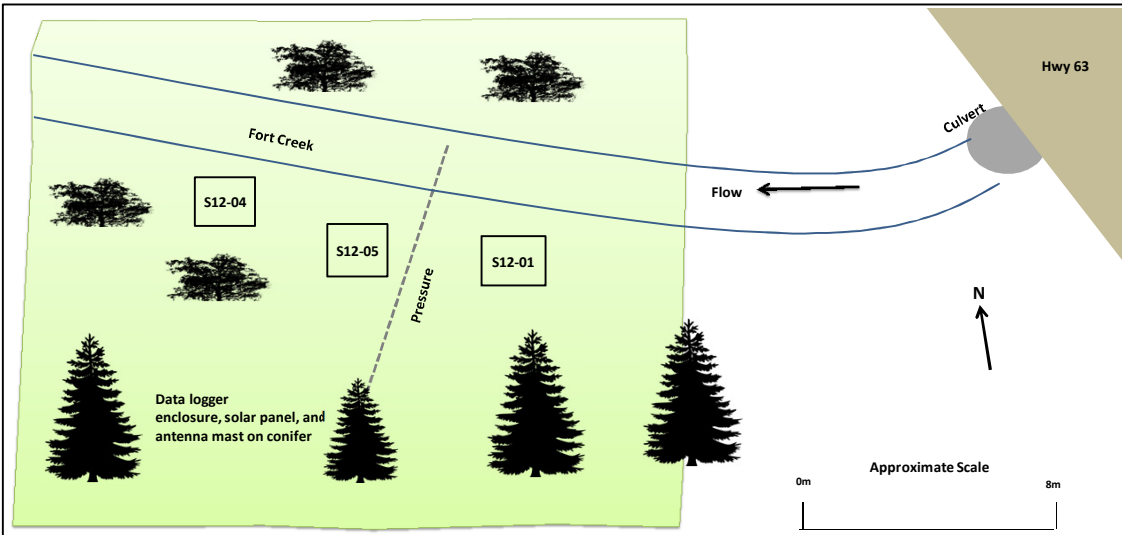
**Channel:** The channel is approx. 2m wide with trapezoidal edges. The dominant bed substrate is cobble, with subdominant sand.  
**Control:** A riffle located approx. 5m downstream provides the hydrologic control for this stream reach.  
**Metering Section:** The metering section is located 5m downstream of the station and can be waded at all water levels.

**Benchmark Information**

**BM:** RAMP S12-01  
**Elevation:** 98.699m  
**Basis:** Assumed  
**Location:** 5m Upstream of logger on Left Bank  
**Description:** T-Post

**BM:** RAMP S12-04  
**Elevation:** 99.093m  
**Basis:** Level Survey from RAMP S12-01  
**Location:** 10m NW of data logger  
**Description:** 3/4" Pipe with flagging

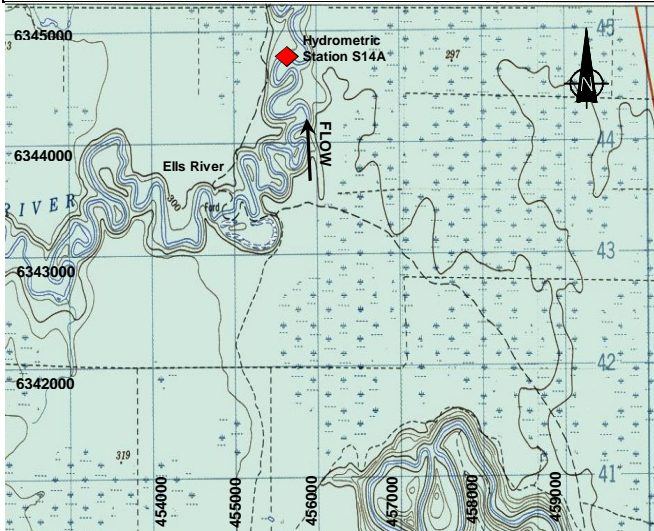
**BM:** RAMP S12-05  
**Elevation:** 99.058 m  
**Basis:** Level Survey from RAMP S12-01  
**Location:** 8m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised March 26, 2014

**Location and Purpose:**

Established in 2001 to monitor discharge in the vicinity of the inactive WSC station 07DA017. Replaced by station S14A in 2004, due to poor hydraulic conditions. Located 50m upstream from the bridge that crosses the Ells river on the CNRL highway.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** October 2004 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road access  
**Drainage Area:** 2450km<sup>2</sup>  
**UTM Coordinates:** 455748 E, 6344947 N (NAD83)  
**Lat/Long:** 57°14'44" N, 111°43'56" W (NAD83)  
**NTS Map:** 74E/04

**Measurement Details**

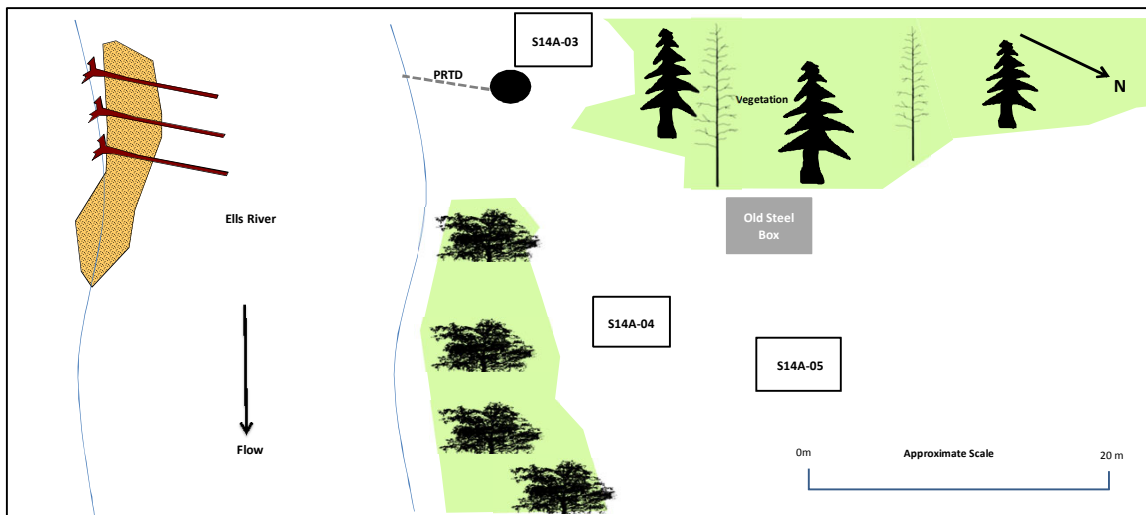
**Channel:** The Channel is approximately 27m wide and made up of cobble and sand substrate. It can be waded at low water levels, otherwise a half boat is required.  
**Control:** A riffle downstream acts as the control for this station.  
**Metering Section:** The metering section is located 15m downstream from the station on a straight reach of the river. The banks are well defined on both sides

**Benchmark Information**

**BM:** RAMP S14A-03  
**Elevation:** 99.989  
**Basis:** Level survey based on S14A-01  
**Location:** 3m South West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S14A-04  
**Elevation:** 100.407  
**Basis:** Level survey based on RAMP S14A-03  
**Location:** 5m South East of station  
**Description:** 3/4" Pipe

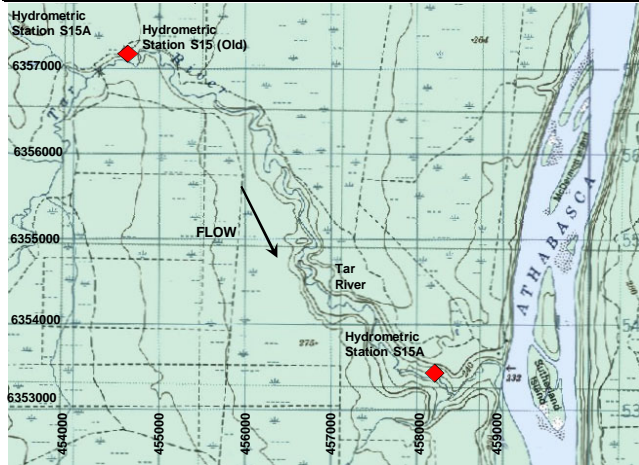
**BM:** RAMP S14A-05  
**Elevation:** 100.678  
**Basis:** Level survey based on RAMP S14A-03  
**Location:** 5m North East of station  
**Description:** 3/4" Pipe



Revised March 26, 2014

**Location and Purpose:**

Established on May 1, 2007 to replace station S15 which had poor hydraulic conditions. The purpose of the station is to monitor for CNRL EIA predictions by monitoring discharge and water level on the Tar River below development where flow is diverted out of the channel by CNRL. Located 1km East of Sutherland Island on the Athabasca River.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2007 to Present  
**Station Operation:** Year Round  
**Access:** 4WD road via CNRL Horizon  
**Drainage Area:** 333km<sup>2</sup>  
**UTM Coordinates:** 458395 E, 6353391 N (NAD83)  
**Lat/Long:** 57°19'17.57" N, 111°41'27.08" W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** The channel is approximately 7m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. This station can be waded throughout most of the open water season.

**Control:** This river is controlled by the channel morphology at this station. During periods of high water in the Athabasca River this station can be effected by backwater.

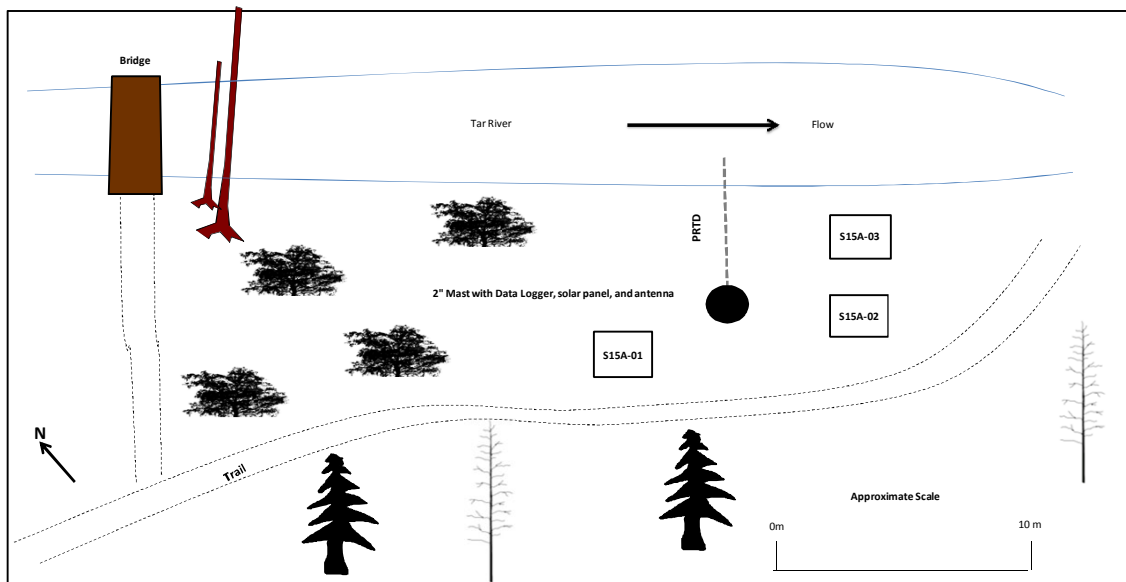
**Metering Section:** The metering section is located across from the station on a straight reach of the river. Both banks are well defined.

**Benchmark Information**

**BM:** RAMP S15A-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3m South of station  
**Description:** 3/4" Pipe

**BM:** RAMP S15A-02  
**Elevation:** 99.815 m  
**Basis:** Level Survey from RAMP S15A-01  
**Location:** 2m East of station  
**Description:** 3/4" Pipe

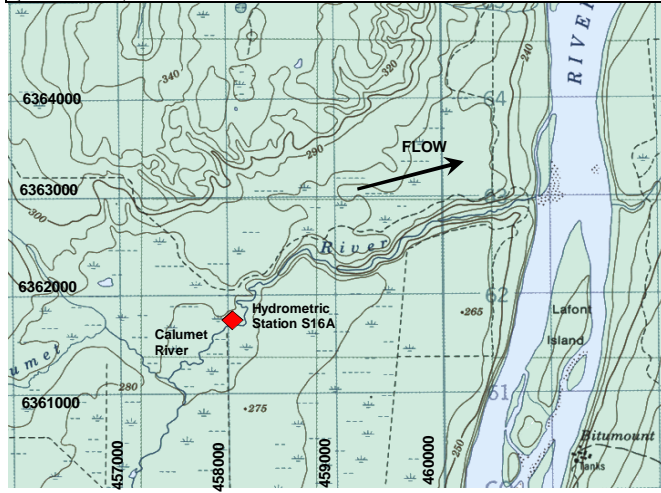
**BM:** RAMP S15A-03  
**Elevation:** 99.929 m  
**Basis:** Level Survey from RAMP S15A-01  
**Location:** 3m North East of station  
**Description:** 3/4" Pipe



Revised March 26, 2014

**Location and Purpose:**

Established to monitor discharge on the Calumet River near the Mouth. Located approximately 3km East of Lafont Island on the Athabasca river and 2km upstream from abandoned Environment Canada hydrometric station (07DA014) which operated from 1975-1977. Station was operated as S16 from 2001-2004, CR-1 from 2005-2009 by CNRL Horizon, and as S16A from 2010-Present.



Map Grid Based on UTM NAD 27



Looking upstream from near the station. August, 2013

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 174km<sup>2</sup>  
**UTM Coordinates:** 458147 E, 6361695 N (NAD83)  
**Lat/Long:** 57°23'46" N, 111°41'47" W(NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** The channel is approximately 4m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. There is weeds growing in the channel. This station can be waded throughout the open water season.

**Control:** A small riffle acts as the hydrologic control for this station.

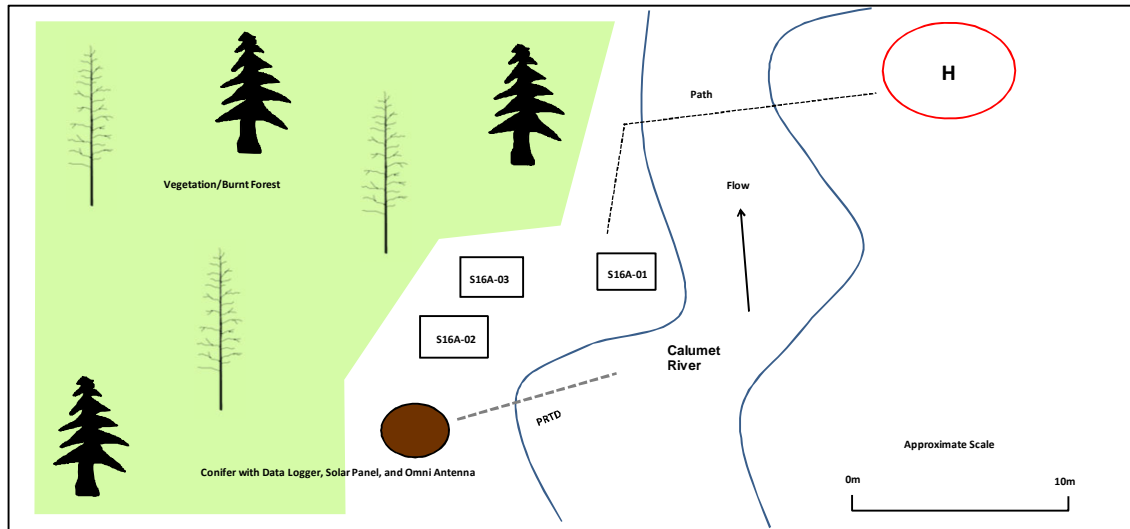
**Metering Section:** The metering section is located downstream from the station near the river crossing from the heli pad.

**Benchmark Information**

**BM:** RAMP S16A-01  
**Elevation:** 99.525m  
**Basis:** Assumed  
**Location:** 12m North East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S16A-02  
**Elevation:** 99.937m  
**Basis:** Level Survey from RAMP S16A-01  
**Location:** 10m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S16A-03  
**Elevation:** 100.356m  
**Basis:** Level Survey from RAMP S16A-01  
**Location:** 8m North of station  
**Description:** 3/4" Pipe



Revised March 26, 2014

**Location and Purpose:**

Established to monitor discharge and rainfall on the Tar River Tributary for CNRL Horizon EIA predictions. The station was relocated (from 457315 E, 6352863 N) in April 2012 approximately 200 meters downstream to avoid beaver dam activity. It is located 2km South East of Sutherland Island.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** June 2002 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via CNRL Horizon Mine  
**Drainage Area:** 11.5km<sup>2</sup>  
**UTM Coordinates:** 457372 E, 6352880 N (NAD83)  
**Lat/Long:** 57°19'70"N, 111°42'28"W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

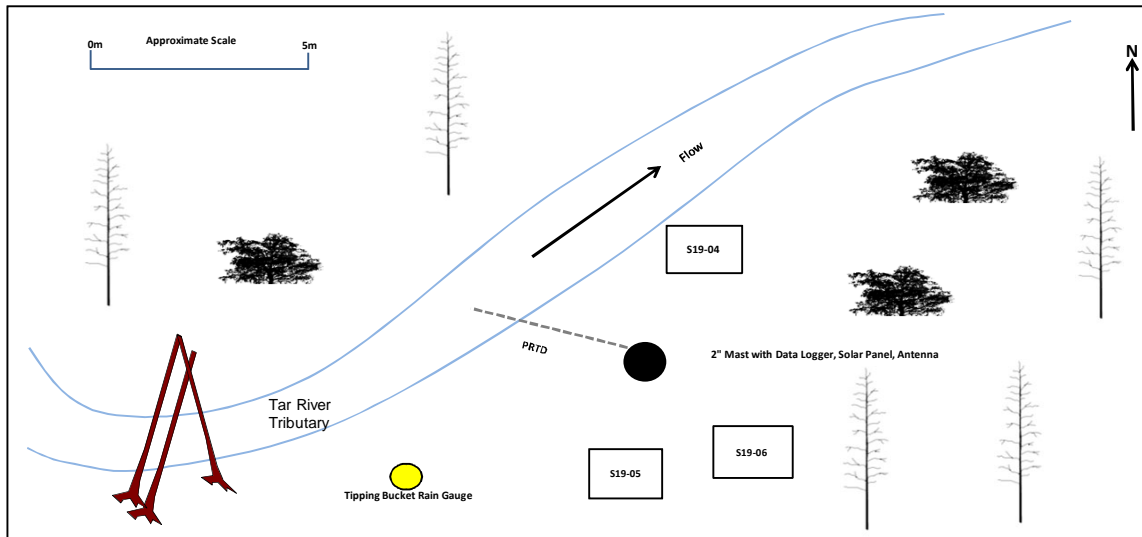
**Channel:** The channel is roughly 1.3m wide and the dominant bed type is sand and cobble.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across the river near the station.

**Benchmark Information**

**BM:** RAMP S19A-04  
**Elevation:** 103.334 m  
**Basis:** Old station BM elevations  
**Location:** 5m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S19A-05  
**Elevation:** 103.599 m  
**Basis:** Level Survey from RAMP S19A-04  
**Location:** 3m South of station  
**Description:** 3/4" Pipe

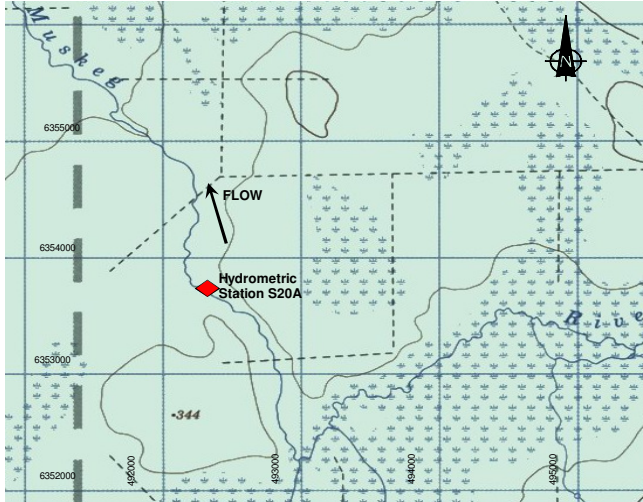
**BM:** RAMP S19A-06  
**Elevation:** 103.530 m  
**Basis:** Level Survey from RAMP S19A-04  
**Location:** 3m South East of station  
**Description:** 3/4" Pipe



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on the upper reach of the Muskeg River, upstream of oilsands operations. Station S20 (49178 E, 6354787 N) was relocated approximately 1 km upstream in May 2013, due to backwater effects caused by beaver activity. The station is located approx. 15km NNW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view from RAMP Hydrometric

**Station Details**

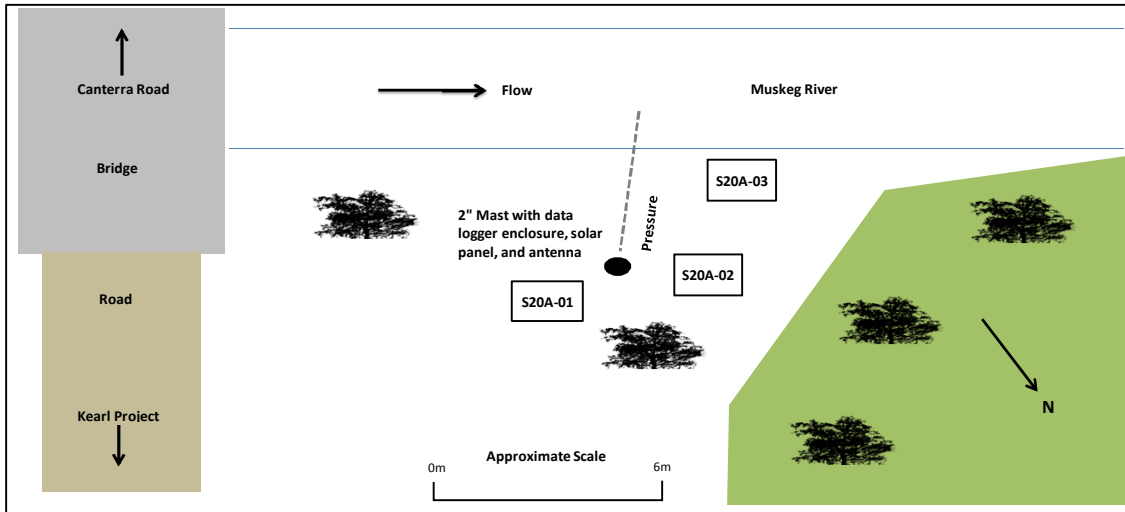
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD access on Canterra Rd. via Kearn Project Access Road  
**Drainage Area:** 154 km<sup>2</sup>  
**UTM Coordinates:** 492230 E, 6354940 N (NAD83)  
**Lat/Long:** 57°20'14" N, 111°07'45" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 8m wide with trapezoidal, but steep edges. The dominant substrate on the channel bed is silt, with subdominant cobble present.  
**Control:** A riffle about 30m downstream of the station provides the hydrologic control.  
**Metering Section:** The metering section is located approx. 10m downstream of the station, and can be waded safely during normal flow conditions.

**Benchmark Information**

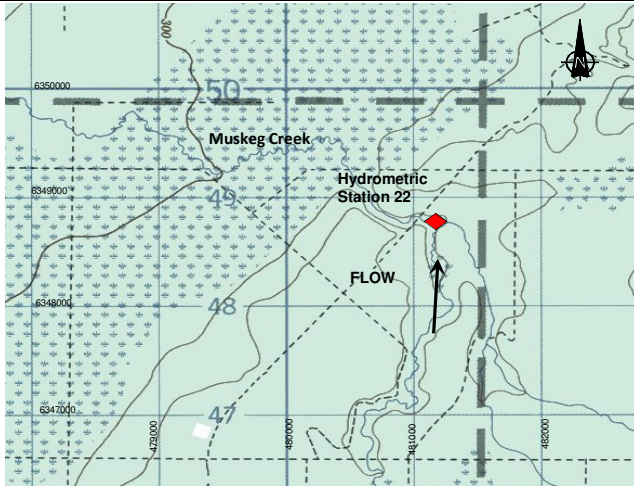
**BM:** RAMP S20A-01  
**Elevation:** 100.003 m  
**Basis:** Level survey from RAMP S20A-02  
**Location:** 2 m NE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S20A-02  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 2 m NW of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S20A-03  
**Elevation:** 99.918 m  
**Basis:** Level survey from RAMP S20A-02  
**Location:** 4 m West of data logger  
**Description:** 3/4" Pipe



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on Muskeg Creek upstream of the Muskeg River, to provide predictions for effects of nearby oilsands operations. The station is located approx. 19km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access on Canterra Road  
**Drainage Area:** 323 km<sup>2</sup>  
**UTM Coordinates:** 481036 E, 6348856 N (NAD83)  
**Lat/Long:** 57°17'3.5" N, 111°18'56.5" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 6m wide, with trapezoidal edges. The dominant bed substrate is cobble, with sand.

**Control:** A riffle approx. 50m downstream of the station acts as the control for this reach.

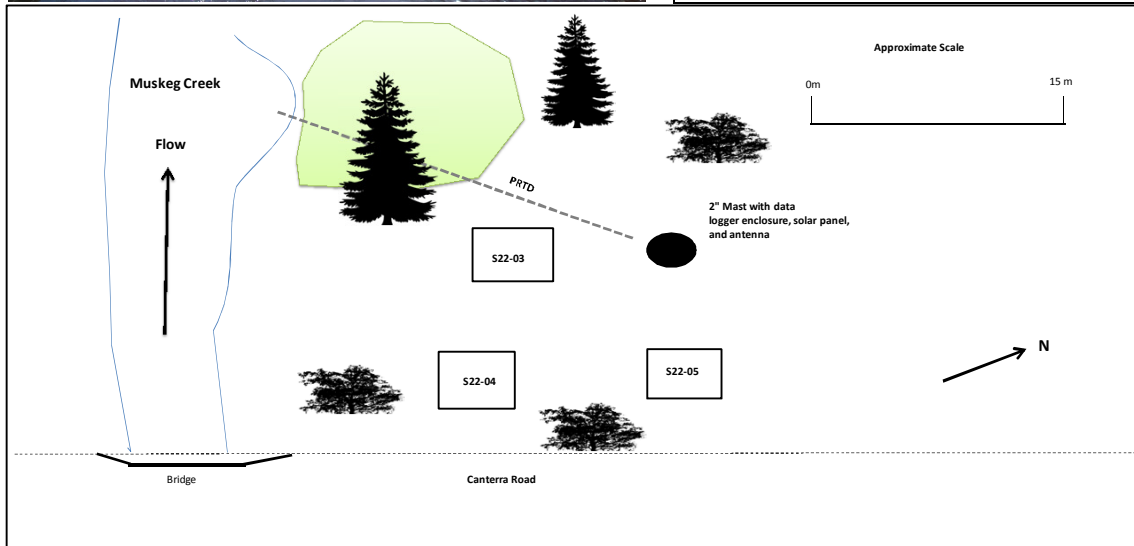
**Metering Section:** The open-water metering section is located 4m upstream of the station and the winter metering section is approx. 40m downstream. The channel can be waded during normal flow conditions.

**Benchmark Information**

**BM:** RAMP S22-03  
**Elevation:** 305.596 m  
**Basis:** Level Survey from S22-02  
**Location:** 3m West of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S22-4  
**Elevation:** 305.689 m  
**Basis:** Level Survey from RAMP S22-01  
**Location:** 5m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S22-05  
**Elevation:** 306.078 m  
**Basis:** Level Survey from RAMP S22-01  
**Location:** 1m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

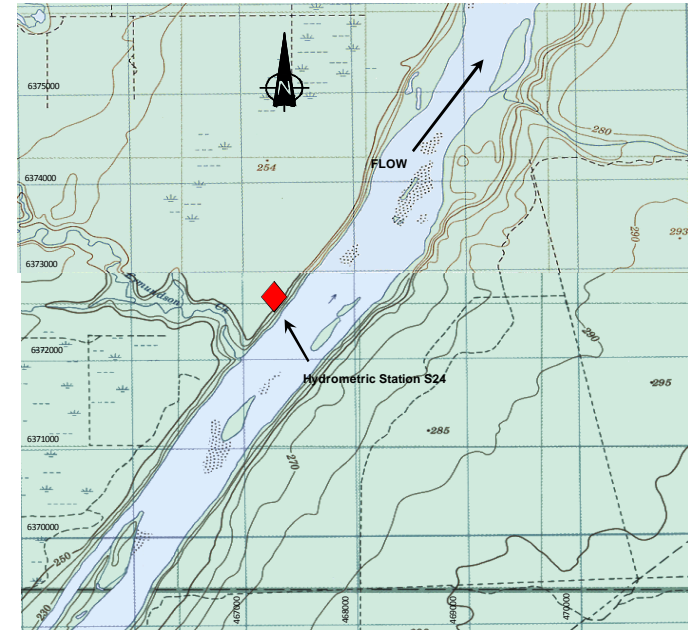




Revised 18 March, 2014

**Location and Purpose:**

Station is located 35 km downstream from Fort MacKay. This station was established as a downstream monitoring point of oil sands development in 2001.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 2001 to Present  
**Station Operation:** Year Round  
**Access:** Boat (summer) or helicopter (winter)  
**Drainage Area:** 146,000km<sup>2</sup>  
**Station Coordinates:** 466313 E, 6372760 N (NAD83)  
**Flow Coordinates:** 467570 E, 6375010 N (NAD 83)  
**Station Lat/Long:** 57°29'46"  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** Channel width is about 600 m at the monitoring station, and 450 m at the flow measurement reach. The deepest part of the channel is near the left bank, and sand bars typically appear near the right bank across from the monitoring station during low flows. Banks are steep on both sides and reasonably stable.  
**Control:** Channel narrows 2.6 km downstream from continuous monitoring station.  
**Metering Section:** Located 2.6 km downstream from monitoring station where channel narrows to 450 m. Measurements are conducted from a boat using OTT Acoustic Digital Current Meter.

**Benchmark Information**

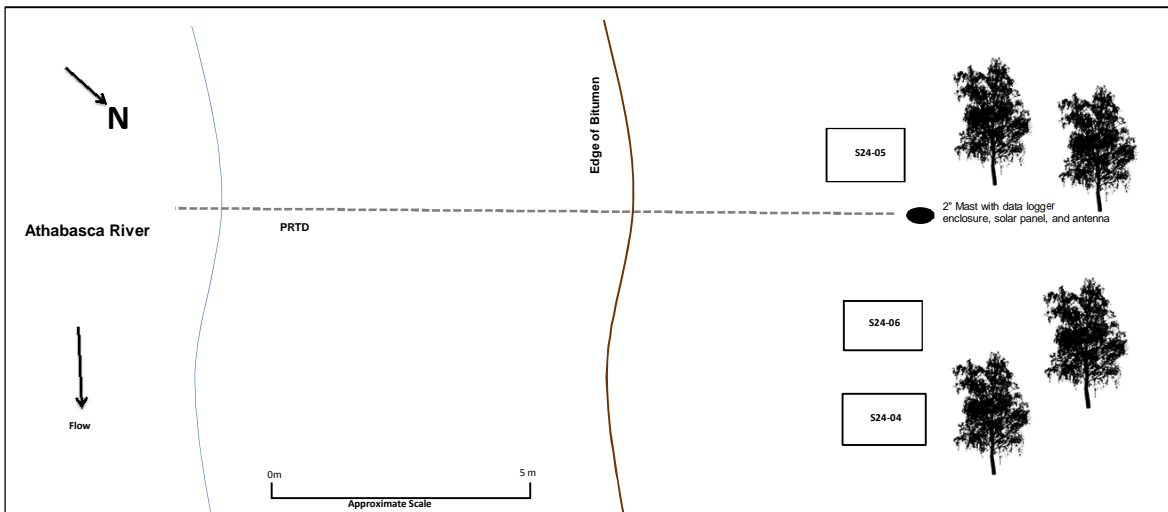
**BM:** RAMP S24-02  
**Elevation:** 231.347  
**Basis:** Geodetic  
**Location:** 2m North of data logger  
**Description:** T-Post - Destroyed by ice, 05-2013

**BM:** RAMP S24-03  
**Elevation:** 230.366m  
**Basis:** Level Survey from RAMP S24-02  
**Location:** 8m South of data logger  
**Description:** 3/4" Pipe - Destroyed by ice, 05-2013

**BM:** RAMP S24-04  
**Elevation:** 230.823m  
**Basis:** Level Survey from RAMP S24-02  
**Location:** 5 m North of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S24-05  
**Elevation:** 231.065  
**Basis:** Level Survey from RAMP S24-04  
**Location:** 1.5m South of data logger  
**Description:** 3/4" Pipe with pink flagging

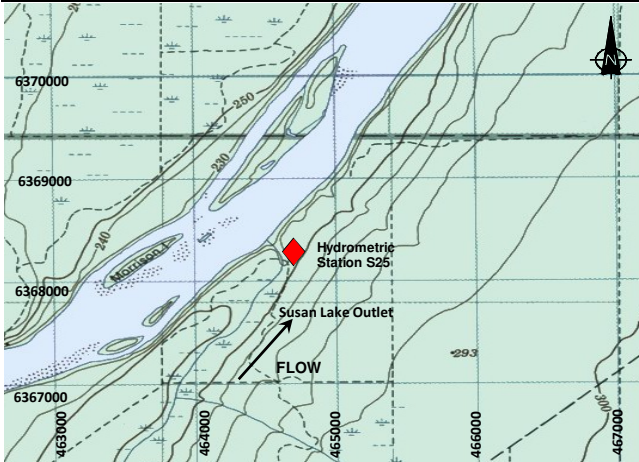
**BM:** RAMP S24-06  
**Elevation:** 230.366m  
**Basis:** Level Survey from RAMP S24-04  
**Location:** 8m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established in May 2002 to monitor discharge on Susan Lake Outlet upstream of the Athabasca River. The station was discontinued after the 2002 season, and was reactivated in May 2006 to monitor flows downstream of the Fort Hills development. The station is located approx. 23km North of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27

Upstream view at RAMP Hydrometric



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** Aug-Oct. 2002; May 2006-Present  
**Station Operation:** Open water (April-October)  
**Access:** Boat via the Athabasca River (Helicopter also)  
**Drainage Area:** 20.7 km<sup>2</sup> (including Susan Lake)  
**UTM Coordinates:** 464491 E, 6368503 N (NAD83)  
**Lat/Long:** 57°27'28" N, 111°35'30" W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** The channel is approx. 1m wide, with trapezoidal edges. The dominant bed substrate is cobble, with sand as subdominant.

**Control:** A riffle located approx. 10m downstream of the station serves as the control.

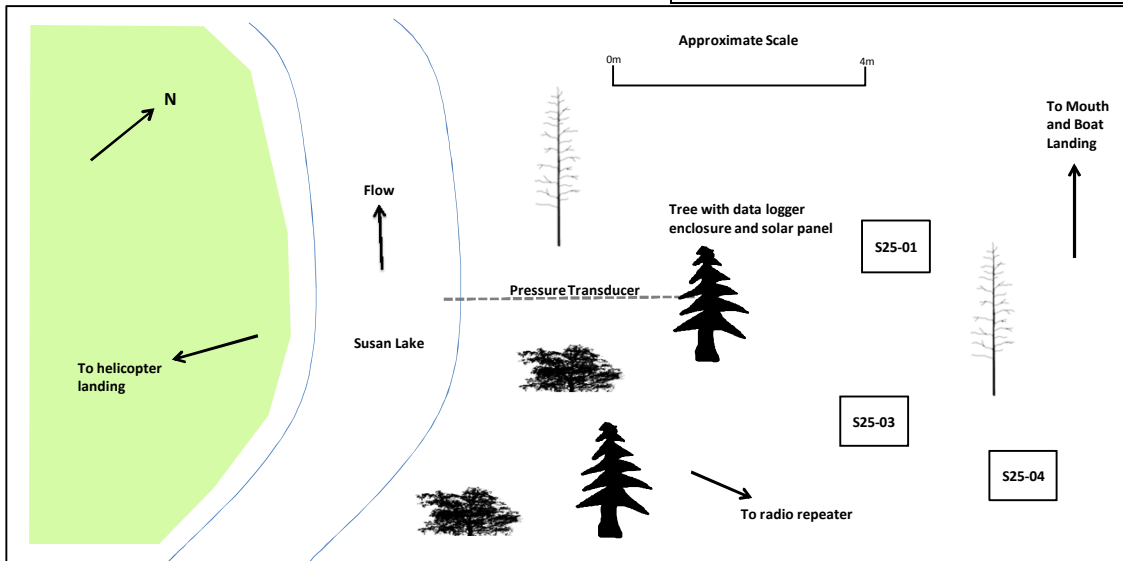
**Metering Section:** The metering section is located adjacent to the station, and the channel can be waded during normal flow conditions.

**Benchmark Information**

**BM:** RAMP S25-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2m North of data logger  
**Description:** T-Post in PVC

**BM:** RAMP S25-03  
**Elevation:** 100.121m  
**Basis:** Level Survey from RAMP S25-01  
**Location:** 2m East of data logger  
**Description:** 3/4" Pipe with pink flagging

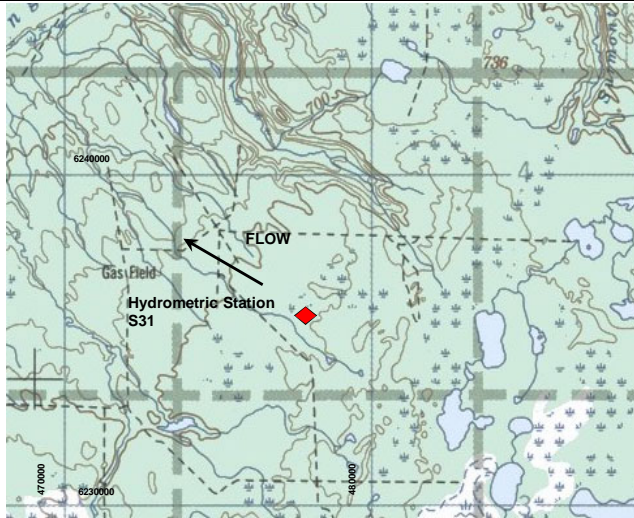
**BM:** RAMP S25-04  
**Elevation:** 100.261 m  
**Basis:** Level Survey from RAMP S25-01  
**Location:** 4m East of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on Hangingsone Creek. The site is accessed via North Star Road off Hwy 63, located 1.7km North of the Algar Tower East rest stop. The rationale for this site is to monitor the Suncor Meadow Creek EIA predictions.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Period of Record:** April 2004 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via North Star Road  
**Drainage Area:** 119 km<sup>2</sup>  
**UTM Coordinates:** 476969 E, 6236095 N (NAD83)  
**Lat/Long:** 56°16'9"N, 111°22'19"W (NAD83)  
**NTS Map:** 74D/06

**Measurement Details**

**Channel:** The channel is roughly 7.5m wide and the bed mostly consists of silts.  
**Control:** The channel pools at the top of a short riffle 15m downstream of monitoring station.  
**Metering Section:** Measurements are conducted at a straight reach of the channel 7m upstream of the monitoring station. This section can be easily waded across in order to conduct measurements.

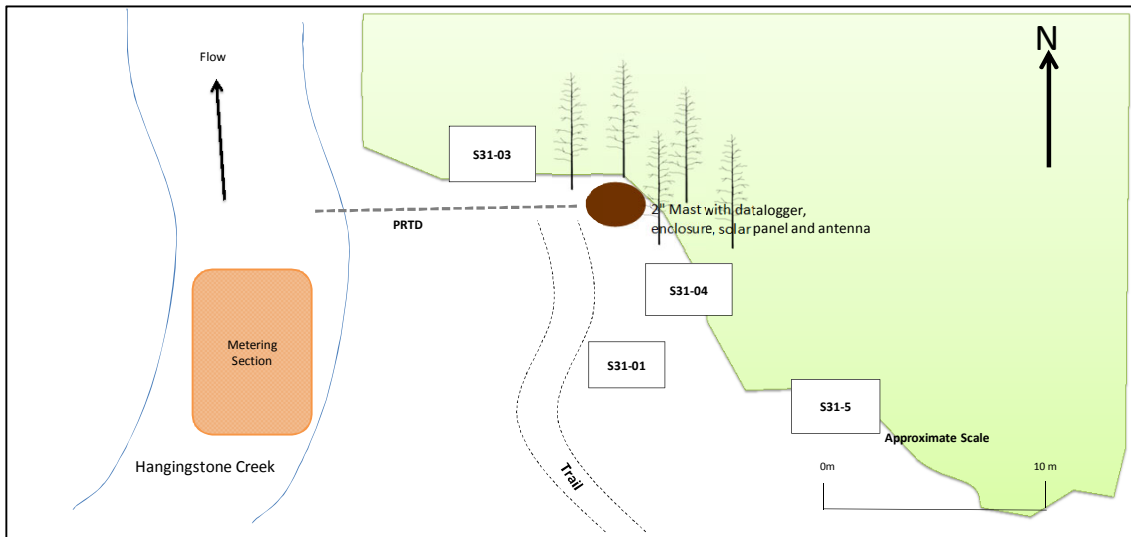
**Benchmark Information**

**BM:** RAMP S31-01  
**Elevation:** 100.128m  
**Basis:** Assumed  
**Location:** 8m S of data logger  
**Description:** T-post

**BM:** RAMP S31-03  
**Elevation:** 99.726m  
**Basis:** Level Survey from RAMP S31-01  
**Location:** 5m NW of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S31-04  
**Elevation:** 99.982m  
**Basis:** Level Survey from RAMP S31-01  
**Location:** 3m SW of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S31-05  
**Elevation:** 99.993m  
**Basis:** Level Survey from RAMP S31-01  
**Location:** 15m SW of data logger  
**Description:** 3/4" Pipe



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on Surmont Creek. The site is located 1.6km East of the Stony Mountain Rd and Hwy 881 intersection. The rationale for this site is to monitor Suncor Meadow Creek EIA predictions.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** April 2004 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 157 km<sup>2</sup>  
**UTM Coordinates:** 490252 E, 6254511 N (NAD83)  
**Lat/Long:** 56°26'N, 111°9'29"W (NAD83)  
**NTS Map:** 74D/06

**Measurement Details**

**Channel:** The channel is roughly 7m wide and the dominant bed type is sand and silt.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across at the straight reach downstream of the Hwy 881 bridge, 5m upstream of the monitoring station.

**Benchmark Information**

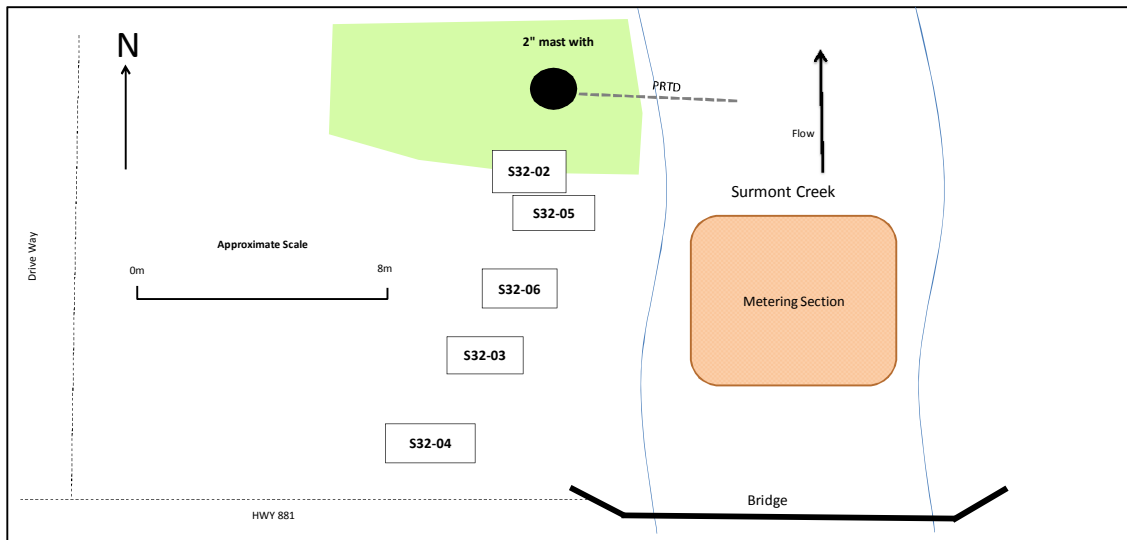
**BM:** RAMP S32-02  
**Elevation:** 98.981 m  
**Basis:** Assumed  
**Location:** 3m South of data logger  
**Description:** Rebar

**BM:** RAMP S32-03  
**Elevation:** 99.118m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 10m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S32-04  
**Elevation:** 99.412 m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 15m South of data logger  
**Description:** 3/4" Pipe, decommissioned

**BM:** RAMP S32-05  
**Elevation:** 98.807m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 4m South of data logger  
**Description:** 3/4" Pipe with pink flagging

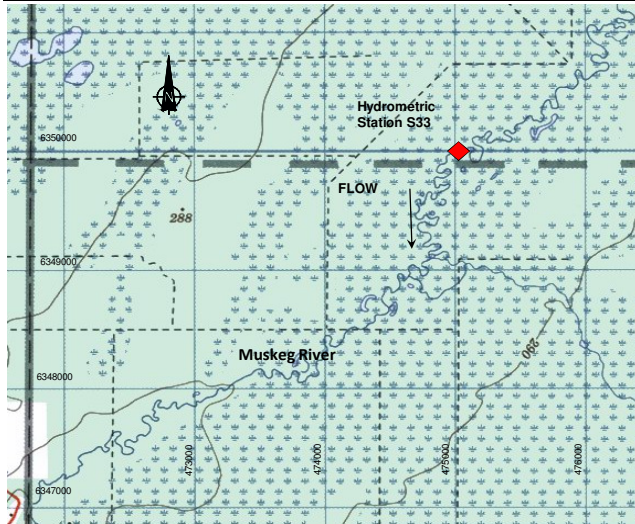
**BM:** RAMP S32-06  
**Elevation:** 98.664m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 7m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 31 March, 2014

**Location and Purpose:**

Established in April 2003 to monitor discharge on the Muskeg River at the Aurora-Shell lease boundary, in compliance with monitoring requirements LOC # 040365. The station is located approx. 13km NE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Upstream view at RAMP Hydrometric Station S33, Muskeg River at the

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** April 2003 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via the Aurora North mine  
**Drainage Area:** 897 km<sup>2</sup>  
**UTM Coordinates:** 474876 E, 6350204 N (NAD83)  
**Lat/Long:** 57°17'39" N, 111°25'11" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 8m wide, with relatively straight edges. The dominant bed material is silt, with layers of organics and some woody debris

**Control:** The channel morphology serves as the hydrologic control for this stream reach.

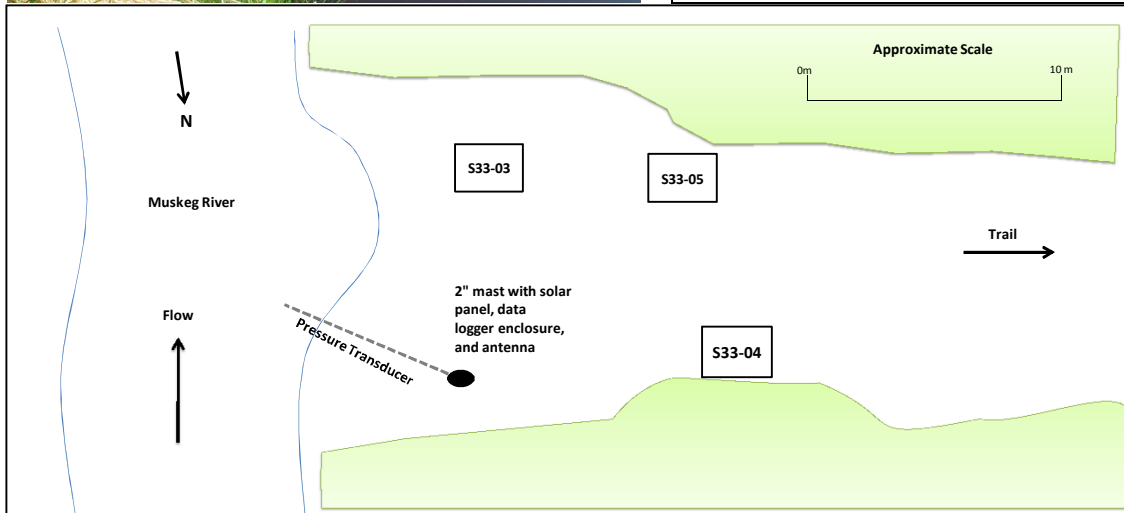
**Metering Section:** The metering section is located adjacent to the station, and the channel requires the use of a kick-boat to conduct a flow measurement, due to deep water.

**Benchmark Information**

**BM:** RAMP S33-03  
**Elevation:** 281.308 m  
**Basis:** Level survey from RAMP S33-02  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S33-04  
**Elevation:** 281.480 m  
**Basis:** Level survey from previous BM: RAMP S33-03  
**Location:** 8m South of data logger  
**Description:** 3/4" Pipe with pink flagging

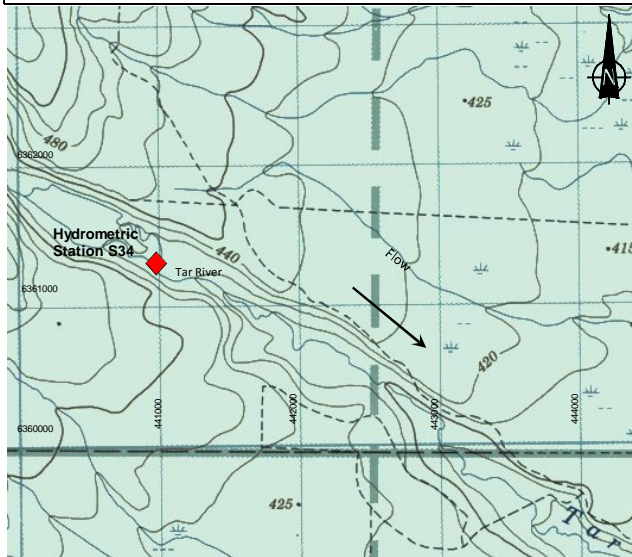
**BM:** RAMP S33-05  
**Elevation:** 281.461 m  
**Basis:** Level Survey from RAMP S33-03  
**Location:** 9m SW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised March 26, 2014

**Location and Purpose:**

Established in April 2005 to monitor discharge on the Tar River above the CNRL Compensation Lake for management purposes. Located 1km North East of the CNRL compensation lake.



Map Grid Based on UTM NAD 27



Looking North toward the station. June, 2013

Looking upstream from near the station.

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** April 2005 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 134km<sup>2</sup>  
**UTM Coordinates:** 440712 E, 6361615 N (NAD83)  
**Lat/Long:** 57°23'38.84" N, 111°59'10.17" W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

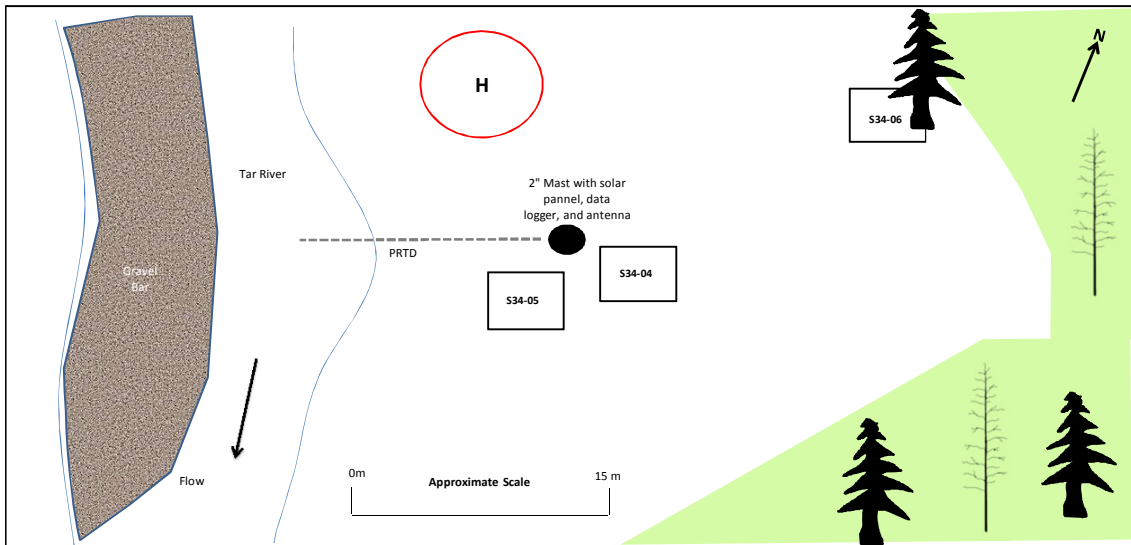
**Channel:** The channel is roughly 4m wide and the dominant bed type is sand and gravel. This river can be waded throughout the open water season.  
**Control:** A downstream riffle is the control for this site.  
**Metering Section:** Measurements are conducted by wading across near the station.

**Benchmark Information**

**BM:** RAMP S34-04  
**Elevation:** 98.498  
**Basis:** Level Survey from RAMP S34-01  
**Location:** 2m East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S34-05  
**Elevation:** 98.068  
**Basis:** Level Survey from RAMP S34-04  
**Location:** 2m South of station  
**Description:** 3/4" Pipe

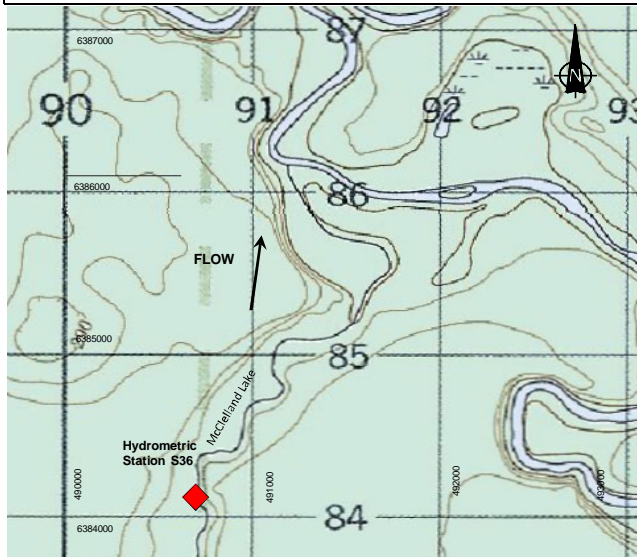
**BM:** RAMP S34-06  
**Elevation:** 98.258  
**Basis:** Level Survey from RAMP S34-04  
**Location:** 30m North of station  
**Description:** Lag Bolt in tree



Revised March 26, 2014

**Location and Purpose:**

Established in May 2008 to assist in monitoring runoff values for the entire catchment surrounding McClelland Lake.



Map Grid Based on UTM NAD 27



Looking downstream  
from 10m South West  
of the station. August.

Looking North West

**Station Details**

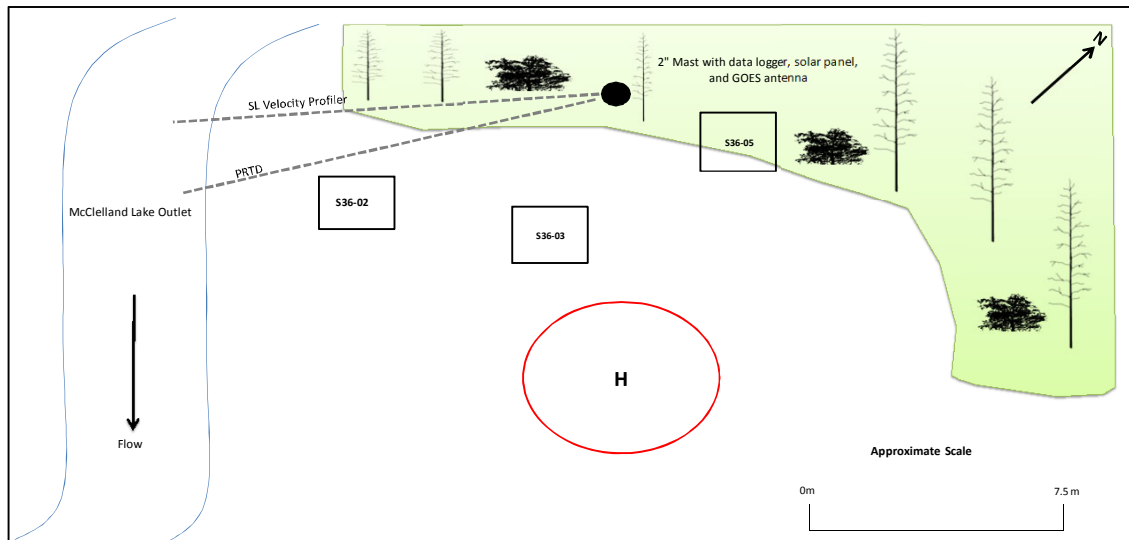
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2008 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 368 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 490626 E, 6384064 N (NAD83)  
**Lat/Long:** 57°35'56"N, 111°9'25"W (NAD83)  
**NTS Map:** 74E/11

**Measurement Details**

**Channel:** The channel is roughly 7m wide and the dominant bed type is sand and silt. There is some weeds growing along the banks. The river at this site can be waded throughout most of the open water season.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across the straight reach of the river 5m downstream from the station

**Benchmark Information**

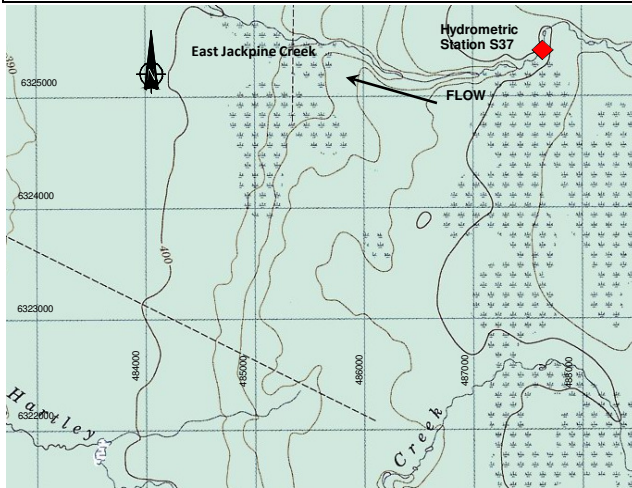
**BM:** RAMP S36-02  
**Elevation:** 99.923m  
**Basis:** Assumed  
**Location:** 8m North East of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S36-03  
**Elevation:** 100.313m  
**Basis:** Level Survey from RAMP S36-01  
**Location:** 6m North of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S36-05  
**Elevation:** 100.206m  
**Basis:** Level Survey from RAMP S36-01  
**Location:** 3/4" Pipe 6m SW of Mast  
**Description:** 3/4" Pipe



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on an upland reference location in the Muskeg River catchment. The station is located approx. 28km SE of the Hwy 63 - MRM Access Rd. intersection.



Map Grid Based on UTM NAD 27



Upstream view of East Jackpine

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** September 2007 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 47.4 km<sup>2</sup>  
**UTM Coordinates:** 487840 E, 6325424 N (NAD83)  
**Lat/Long:** 57°4'19.4" N, 111°12'2.0" W (NAD83)  
**NTS Map:** 74E/03

**Measurement Details**

**Channel:** The channel is approx. 5m wide at the measurement section, with trapezoidal edges. Dominant substrate includes cobble and gravel.

**Control:** A riffle approx. 6m downstream of the measurement section serves as the hydrologic control for the reach.

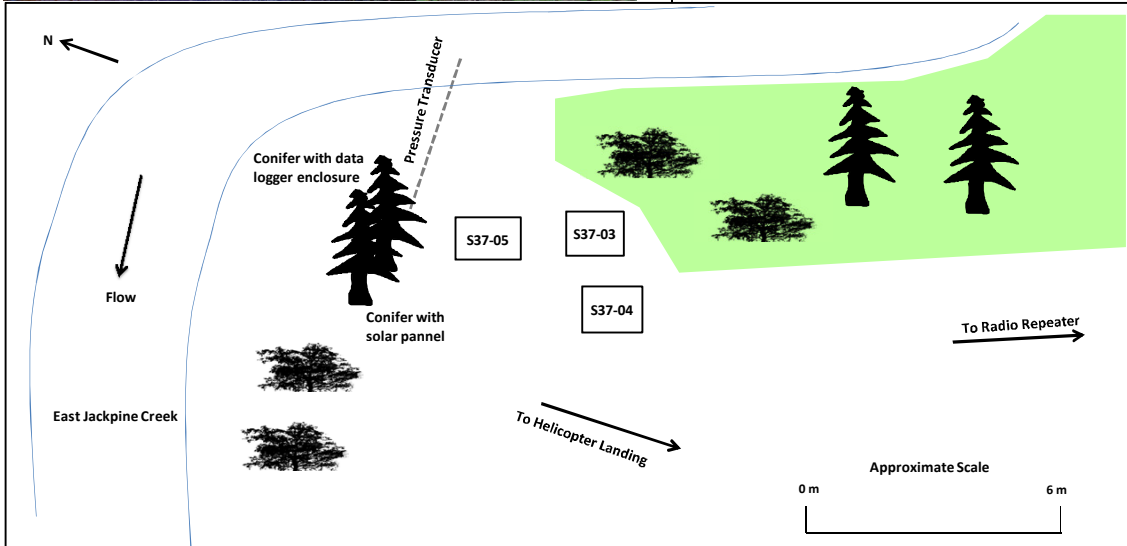
**Metering Section:** The measurement section is located approx. 30m downstream of the station, and can be waded under normal flow conditions.

**Benchmark Information**

**BM:** RAMP S37-03  
**Elevation:** 100.838m  
**Basis:** Assumed  
**Location:** 3m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S37-04  
**Elevation:** 101.078 m  
**Basis:** Level Survey from RAMP S37-03  
**Location:** 4m SW of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S37-05  
**Elevation:** 101.178 m  
**Basis:** Level Survey from RAMP S37-03  
**Location:** 1.5m from data logger  
**Description:** 3/4" Pipe with pink flagging

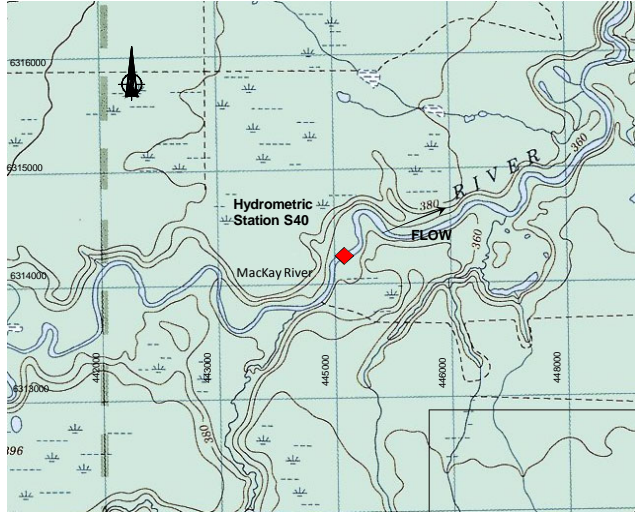




Revised March 26, 2014

**Location and Purpose:**

Established to monitor discharge on the Mackay River 30m downstream of the Petro-Canada Bridge as an upstream reference for the Suncor Dover and Mackay River developments.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** January 2008 to Present  
**Station Operation:** Year Round  
**Access:** Truck  
**Drainage Area:** 5290km<sup>2</sup>  
**UTM Coordinates:** 445023 E, 6314256 N (NAD83)  
**Lat/Long:** 56°58'7"N, 111°54'15"W (NAD83)  
**NTS Map:** 74D/13

**Measurement Details**

**Channel:** The channel is 30m wide. The substrate is made up of mostly cobble. During the open water season a belly boat needs to be used except during periods of very low waterlevels.  
**Control:** The control is a downstream riffle.  
**Metering Section:** Measurements are conducted on the straight reach downstream of the bridge near the station

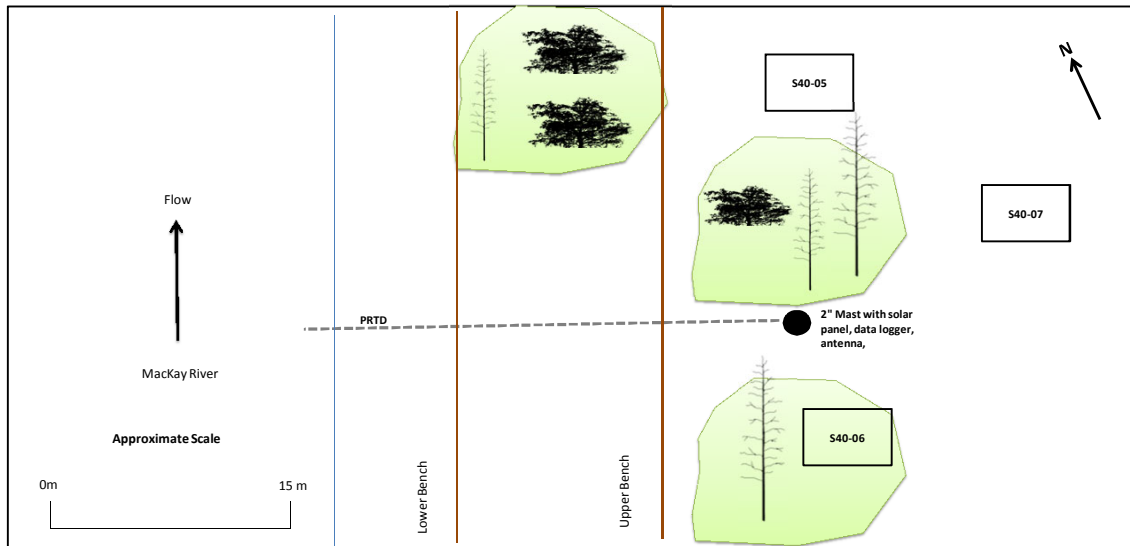
**Benchmark Information**

**BM:** RAMP S40-05  
**Elevation:** 100  
**Basis:** Assumed  
**Location:** Level Survey from RAMP S40-01  
**Description:** 3/4" Pipe  
**BM:** RAMP S40-06  
**Elevation:** 97.982m  
**Basis:** Level Survey from RAMP S40-01  
**Location:** 3m South of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S40-07  
**Elevation:** 99.932m  
**Basis:** Level Survey from RAMP S40-01  
**Location:** 4m South of station  
**Description:** 3/4" Pipe



Looking North West towards the station. June, 2013

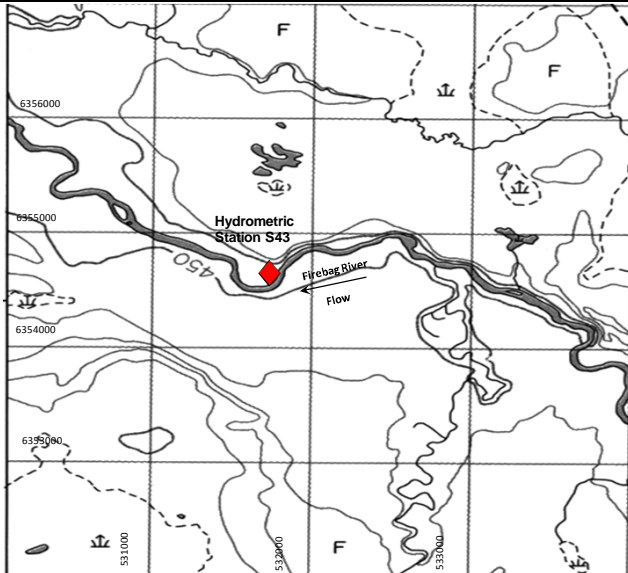
Looking upstream from near the station.



Revised March 26, 2014

**Location and Purpose:**

Established in May 2009 to monitor river discharge on the Firebag River upstream of oilsands operations. Located 33km North East of the Fort MacKay/Firebag Aerodrom.



Map Grid Based on UTM NAD 27



Looking downstream from near the station.

Looking South West towards the

**Station Details**

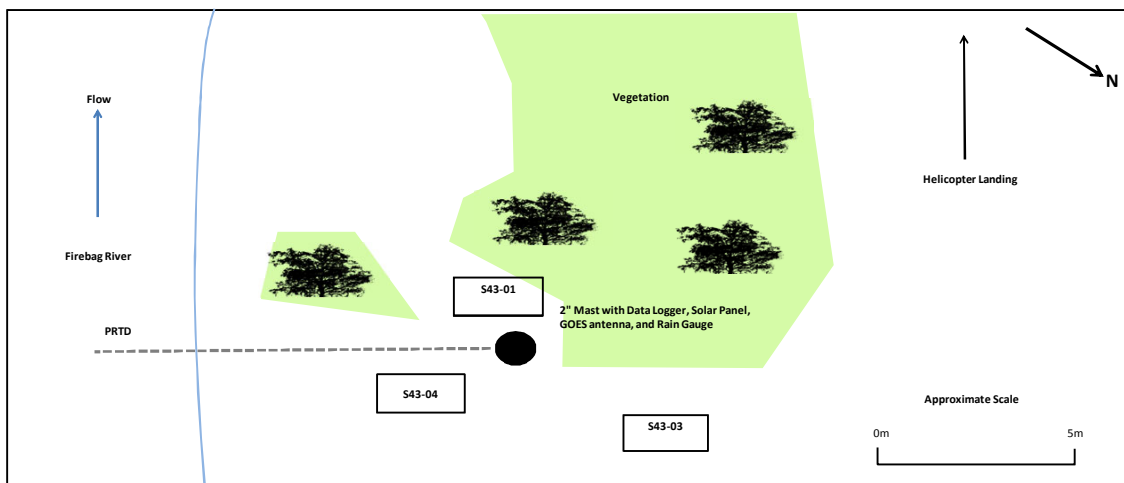
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** GOES  
**Period of Record:** May 2009 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 2,382 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 531528 E, 6354782 N (NAD83)  
**Lat/Long:** 57°20'05" N, 110°28'35" W (NAD83)  
**NTS Map:** 74E/08

**Measurement Details**

**Channel:** The channel is a straight reach 36m wide, the substrate is made up of mostly cobble and sand. Near the station it can only be waded during periods of low water levels in the open water season.  
**Control:** The channel morphology acts as the control at this station.  
**Metering Section:** Measurements are conducted by the use of a belly boat or by wading across the river near the station during low water levels.

**Benchmark Information**

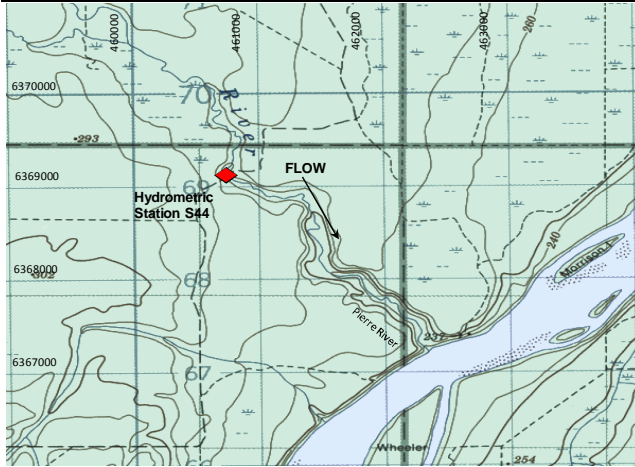
**BM:** RAMP S43-01  
**Elevation:** 100.270m  
**Basis:** Assumed  
**Location:** 1m South of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S43-03  
**Elevation:** 100.113m  
**Basis:** Level Survey from RAMP S43-01  
**Location:** 5m North of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S43-04  
**Elevation:** 100.338 m  
**Basis:** Level Survey from RAMP S43-01  
**Location:** 1m East of station  
**Description:** 3/4" Pipe



Revised March 27, 2014

**Location and Purpose:**

Established to monitor baseline discharge on the Pierre River prior to the Shell Pierre River Mine development. Installed near the abandoned Environment Canada hydrometric station 07DA013 that operated from 1975 to 1977.



Map Grid Based on UTM NAD 27



Looking upstream from near the station.

Looking North towards the station September,

**Station Details**

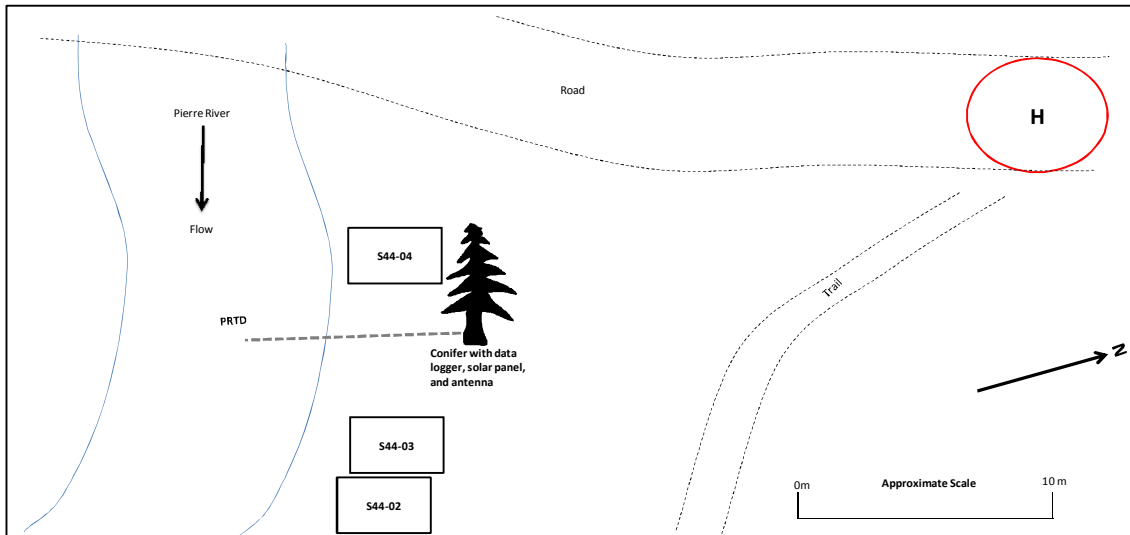
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** 1975-77; May 2009-Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 123km<sup>2</sup>  
**UTM Coordinates:** 460775 E, 6369400 N (NAD83)  
**Lat/Long:** 57°27'52.5" N, 111°39'14.9" W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** The channel is approximately 3.5m wide. The substrate is mostly made up of cobble. Water levels are generally very low and can be easily waded throughout the open water season.  
**Control:** The control at this station is a downstream riffle.  
**Metering Section:** Measurements are conducted by wading across the river near the station.

**Benchmark Information**

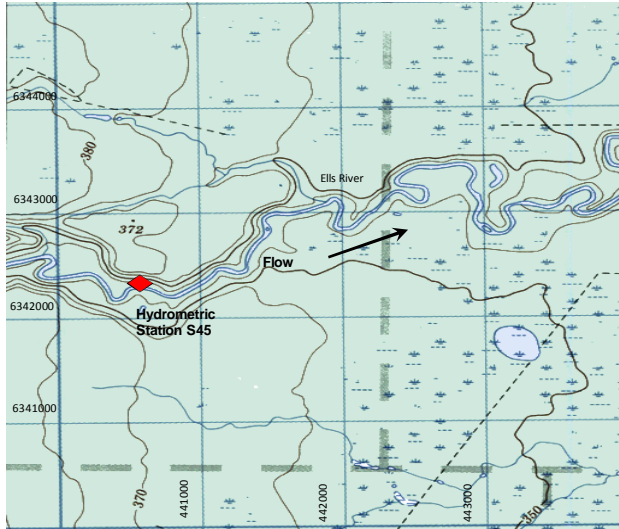
**BM:** RAMP S44-02  
**Elevation:** 99.878m  
**Basis:** Assumed  
**Location:** 8m East of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S44-03  
**Elevation:** 100.086m  
**Basis:** Level Survey from RAMP S44-01  
**Location:** 6m East of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S44-04  
**Elevation:** 99.784m  
**Basis:** Level Survey from RAMP S44-01  
**Location:** 2m West of station  
**Description:** 3/4" Pipe



Revised March 27, 2014

**Location and Purpose:**

Established to monitor discharge on the Ells River upstream of the proposed Joslyn Creek Diversion and the Fort MacKay water intake. Located 19km South West of the CNRL mine.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** June 2009 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 2450km<sup>2</sup>  
**UTM Coordinates:** 440605 E, 6342459 N (NAD83)  
**Lat/Long:** 57°13'17" N, 111°59'01" W (NAD83)  
**NTS Map:** 74E/04

**Measurement Details**

**Channel:** The channel is approximately 30m wide. The substrate is mostly made up of cobbles. During the open water season the river can only be waded during periods of lower waterlevels at this location

**Control:** This station has a downstream riffle that acts as the control.

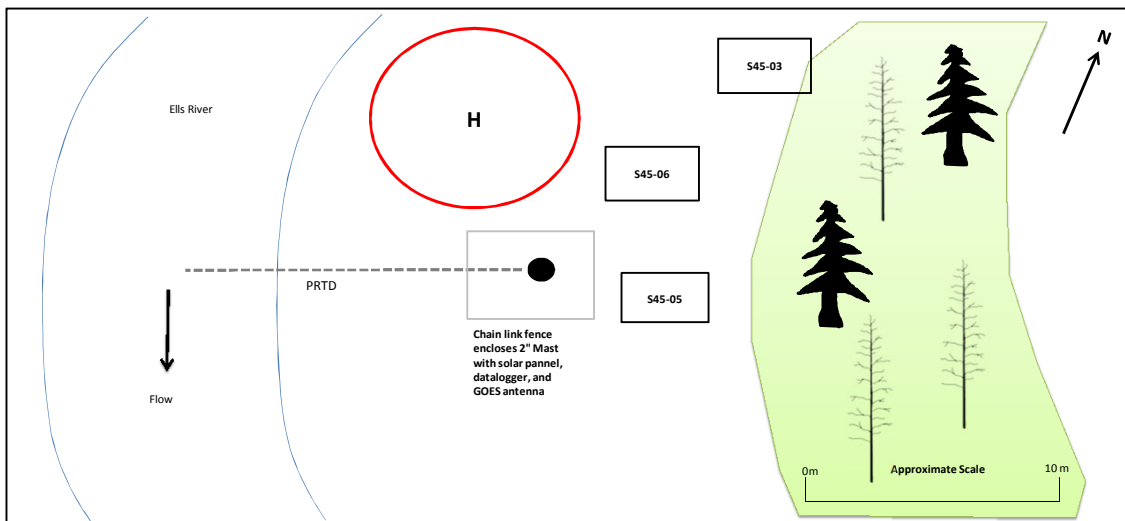
**Metering Section:** The metering section is located near the station, upstream of the bend to the east.

**Benchmark Information**

**BM:** RAMP S45-03  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 12m West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S45-05  
**Elevation:** 99.784m  
**Basis:** Level Survey from RAMP S45-03  
**Location:** 6m West of station  
**Description:** 3/4" Pipe

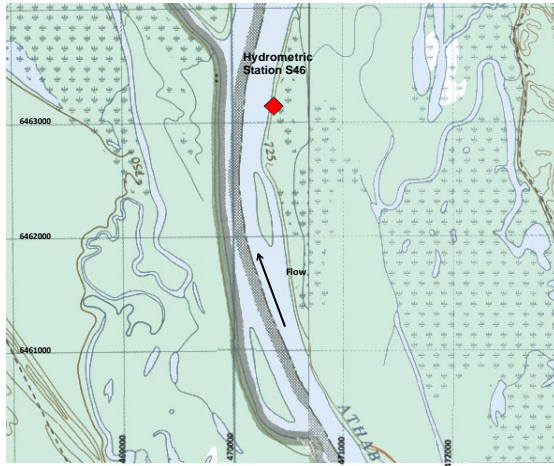
**BM:** RAMP S45-06  
**Elevation:** 99.880m  
**Basis:** Level Survey from RAMP S45-03  
**Location:** 3m North of station  
**Description:** 3/4" Pipe



Revised 18 March, 2014

**Location and Purpose:**

Station is located 14 km downstream from the Embarras airport. The station was established to monitor the Athabasca River downstream of all oil sands development.



Map Grid Based on UTM NAD 83

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** August 2011 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 156,000km<sup>2</sup>  
**UTM Coordinates:** 470241 E, 6463206 N (NAD83)  
**Lat/Long:** 58°18'32" N, 111°30'28" W (NAD83)  
**NTS Map:** 74L/05/06

**Measurement Details**

**Channel:** Channel width is about 400m. The deepest part of the channel is near the right bank, and sandbars typically appear downstream of the station near the left bank during low flows.  
**Control:** An island located 1.5 km downstream of monitoring station is likely control.  
**Metering Section:** Located at the monitoring station. Measurements are conducted from a boat using an OTT Acoustic Digital Current Meter.

**Benchmark Information**

**BM:** RAMP S46-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2m South of data logger  
**Description:** 3/4" Pipe with pink flagging

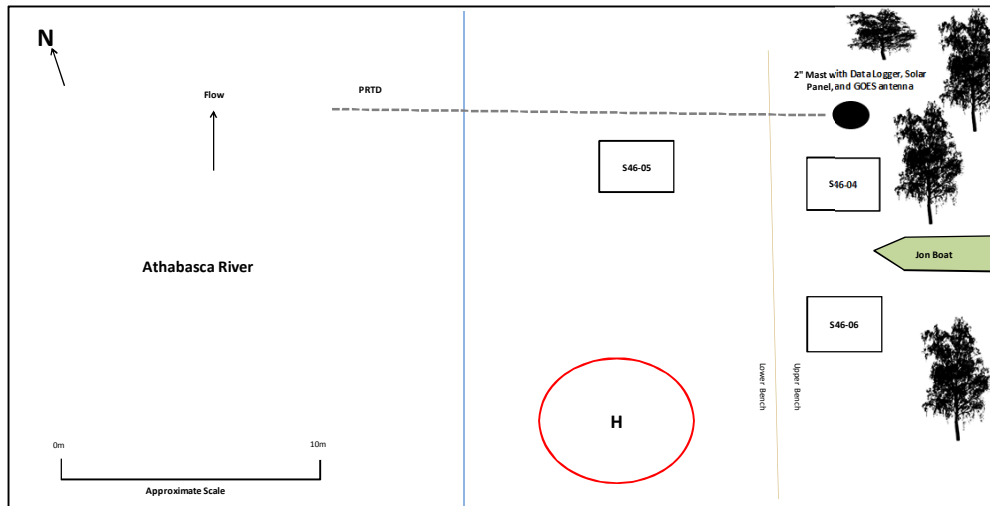
**BM:** RAMP S46-02  
**Elevation:** 99.771 m  
**Basis:** Level Survey from RAMP S46-01  
**Location:** 6m West of data logger (Lower Bench)  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S46-03  
**Elevation:** 98.508m  
**Basis:** Level Survey from RAMP S46-01  
**Location:** 6m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S46-04  
**Elevation:** 99.748  
**Basis:** Assumed  
**Location:** 2m South of data logger  
**Description:** 3/4" Pipe with orange flagging

**BM:** RAMP S46-05  
**Elevation:** 99.665  
**Basis:** Level Survey from RAMP S46-04  
**Location:** 6m West of data logger (Lower Bench)  
**Description:** 3/4" Pipe with orange flagging

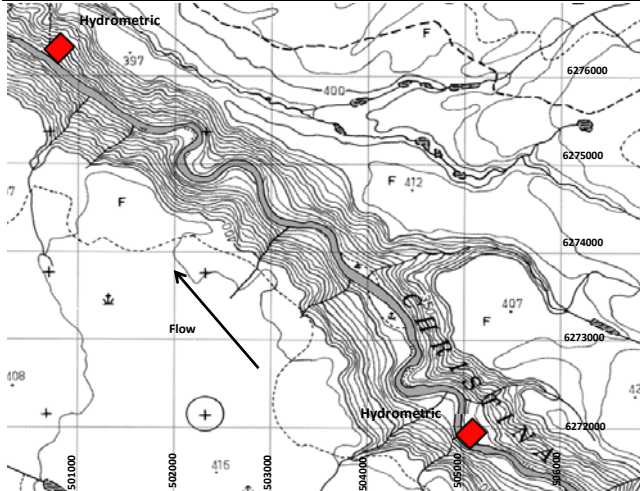
**BM:** RAMP S46-06  
**Elevation:** 98.606  
**Basis:** Level Survey from RAMP S46-04  
**Location:** 6m South of data logger  
**Description:** 3/4" Pipe with orange flagging



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on the Christina River near the mouth and downstream of all development in the Christina watershed. The station is located 12.3km southwest of the Clearwater River confluence.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2011 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 13,284 km<sup>2</sup>  
**UTM Coordinates:** 505048 E, 6272065 N (NAD83)  
**Lat/Long:** 56°35'34"N, 110°55'4"W (NAD83)  
**NTS Map:** 74D/10

**Measurement Details**

**Channel** The monitoring station is located on the inside of a large bend, out of the main flow. The channel is roughly 50m across with a bed of cobbles and boulders.

**Control** A number of short riffle and runs beginning 200m downstream of the station appear during low flow, for the remainder of the year the channel morphology serves as a control.

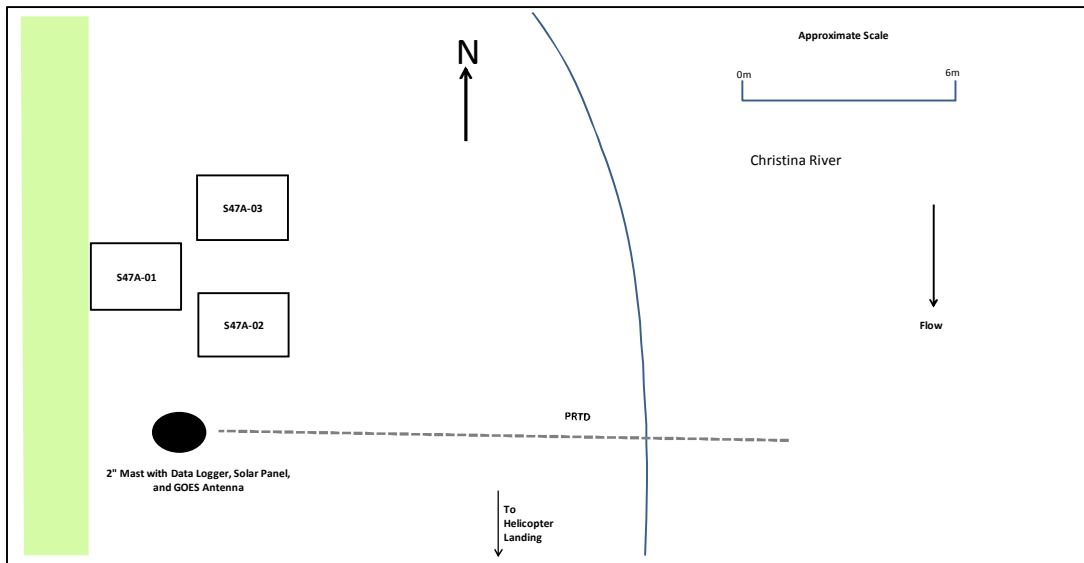
**Metering Section** The metering sections is located 9.9km downstream from the monitoring station. The channel at the metering section is very straight and roughly 70m across, the bed consists of mostly cobbles. Measurements are conducted using a boat and wading, depending on water levels.

**Benchmark Information**

**BM:** RAMP S47A-01  
**Elevation:** 100.096m  
**Basis:** Assumed  
**Location:** 6m SE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S47A-02  
**Elevation:** 99.884m  
**Basis:** Level Survey from RAMP S47A-01  
**Location:** 5m South of data logger  
**Description:** 3/4" Pipe

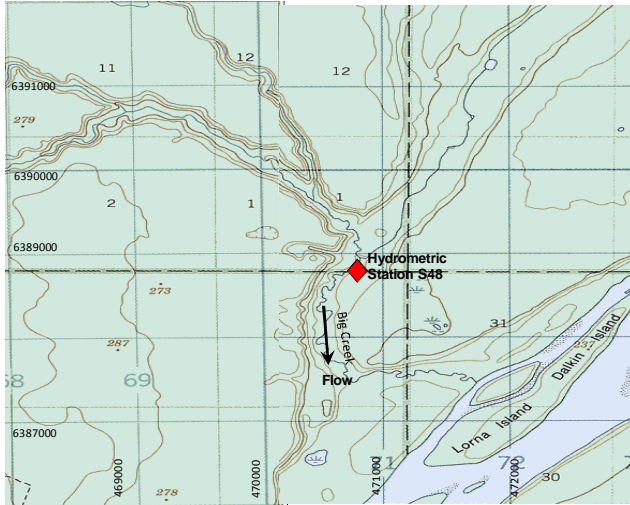
**BM:** RAMP S47A-03  
**Elevation:** 99.579m  
**Basis:** Level Survey from RAMP S47A-01  
**Location:** 7m South of data logger  
**Description:** 3/4" Pipe



Revised March 27, 2014

**Location and Purpose:**

Established to monitor water level and discharge on Big Creek near the mouth to establish baseline conditions prior to construction of the Pierre River and Teck Frontier mines. Located 2km North West of Lorna Island on the Athabasca River.



Map Grid Based on UTM NAD 27



Looking South towards the station from the left bank of

Looking downstream from near the station. August, 2013

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 304km<sup>2</sup>  
**UTM Coordinates:** 470894 E, 6389207 N (NAD83)  
**Lat/Long:** 57°38'39" N, 111°29'15" W (NAD83)  
**NTS Map:** 74E/11

**Measurement Details**

**Channel:** The channel is approximately 5m wide. The substrate is mostly made up of silt and sand. At this location the river can be waded throughout the open water season due to fairly low flows.

**Control:** This site is controlled by the channel morphology.

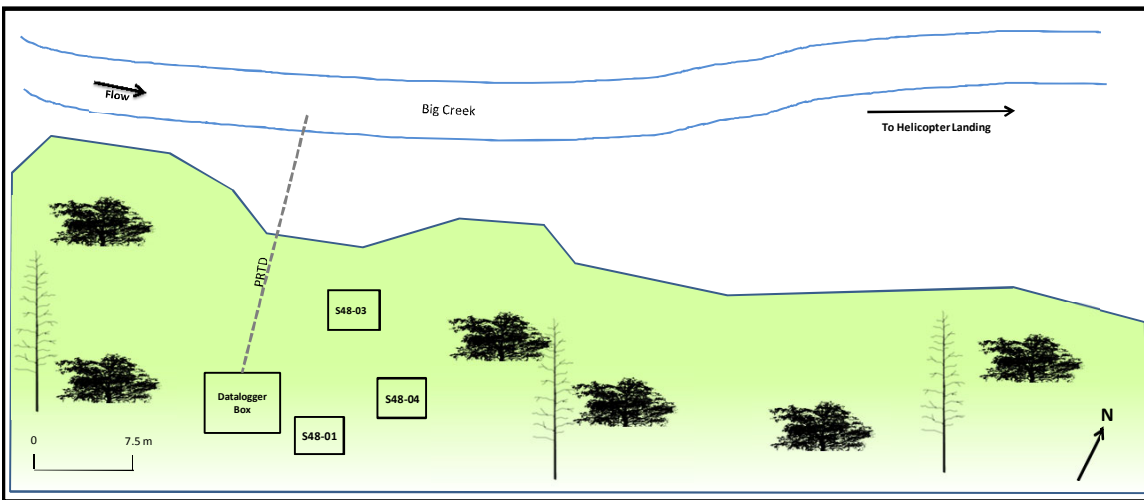
**Metering Section:** The metering section is located near the station.

**Benchmark Information**

**BM:** RAMP S48-01  
**Elevation:** 100.000  
**Basis:** Assumed  
**Location:** 2m SE of station  
**Description:** 3/4" Pipe

**BM:** RAMP S48-03  
**Elevation:** 99.798m  
**Basis:** Level Survey from RAMP S48-01  
**Location:** 6m North East of station  
**Description:** 3/4" Pipe

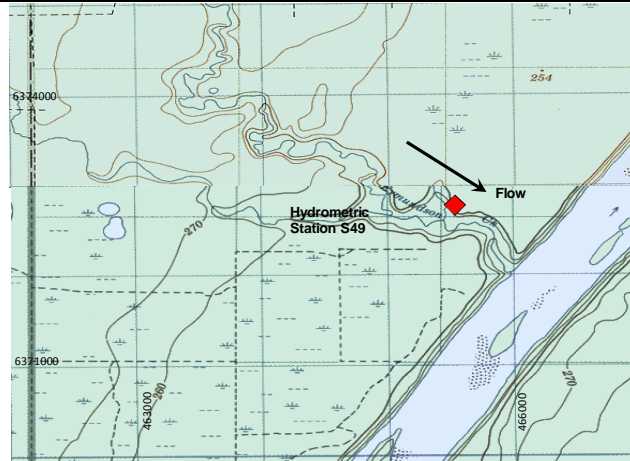
**BM:** RAMP S48-04  
**Elevation:** 99.662m  
**Basis:** Level Survey from RAMP S48-01  
**Location:** 6m East of station  
**Description:** 3/4" Pipe



Revised March 27, 2014

**Location and Purpose:**

Established to monitor water level and discharge on Eymundson Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. Located 20km North West of the Syncrude Arora Mine.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 243km<sup>2</sup>  
**UTM Coordinates:** 465524 E, 6372768 N (NAD83)  
**Lat/Long:** 57°29'46"N, 111°34'30"W (NAD83)  
**NTS Map:** 74E/12

**Measurement Details**

**Channel:** The channel has trapezoidal banks approximately 7m wide. The substrate is mostly made silt and sand. During the open water season the river can be waded except during periods of high water levels.

**Control:** The channel morphology is the control at this station.

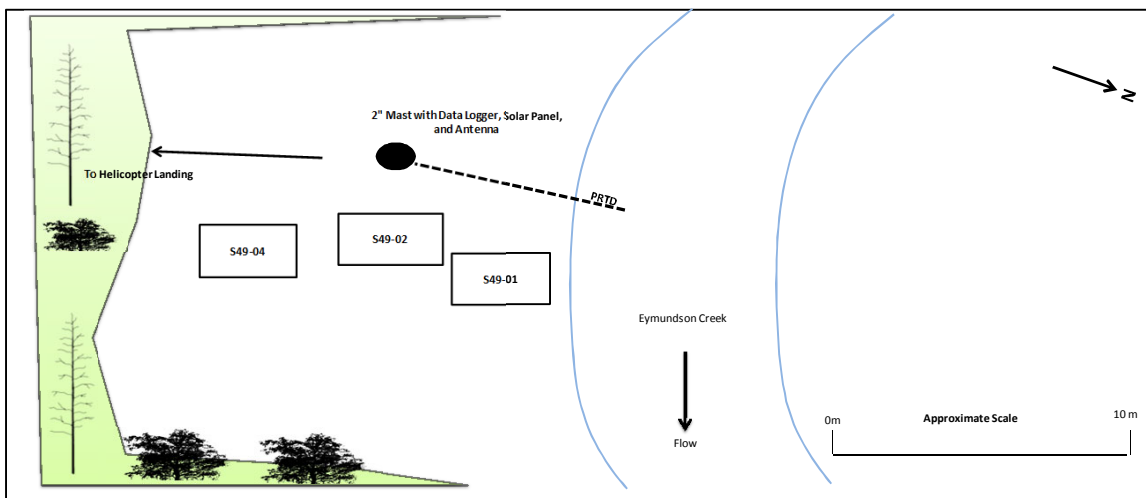
**Metering Section:** The metering section is located near the station.



**BM:** RAMP S49-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 6m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S49-02  
**Elevation:** 99.918  
**Basis:** Level Survey from RAMP S49-01  
**Location:** 5m North East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S49-04  
**Elevation:** 100.304  
**Basis:** Level Survey from RAMP S49-01  
**Location:** 7m North of station  
**Description:** 3/4" Pipe

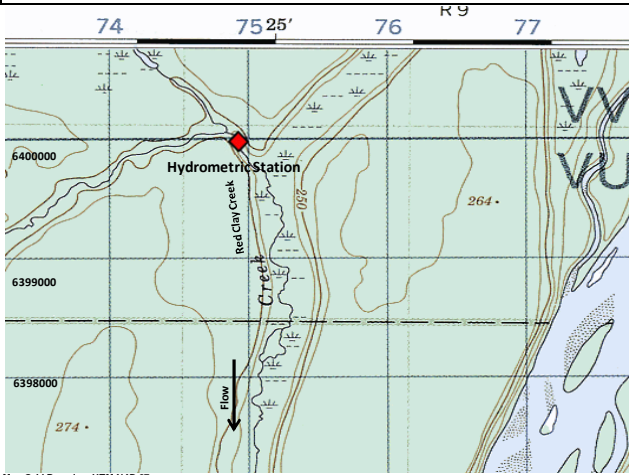




Revised March 27, 2014

**Location and Purpose:**

Established to monitor water level and discharge on Red Clay Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. The station was relocated (from 475701 E, 6395073 N) in April 2012 to avoid influence from beaver dams. Located 47km North of the Syncrude Arora mine development.



Map Grid Based on UTM NAD 27



Looking North West towards the station.

Looking upstream from near the station.

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 187km<sup>2</sup>  
**UTM Coordinates:** 474881 E, 6400224 N (NAD83)  
**Lat/Long:** 57°44'36"N, 111°25'16"W (NAD83)  
**NTS Map:** 74E/11

**Measurement Details**

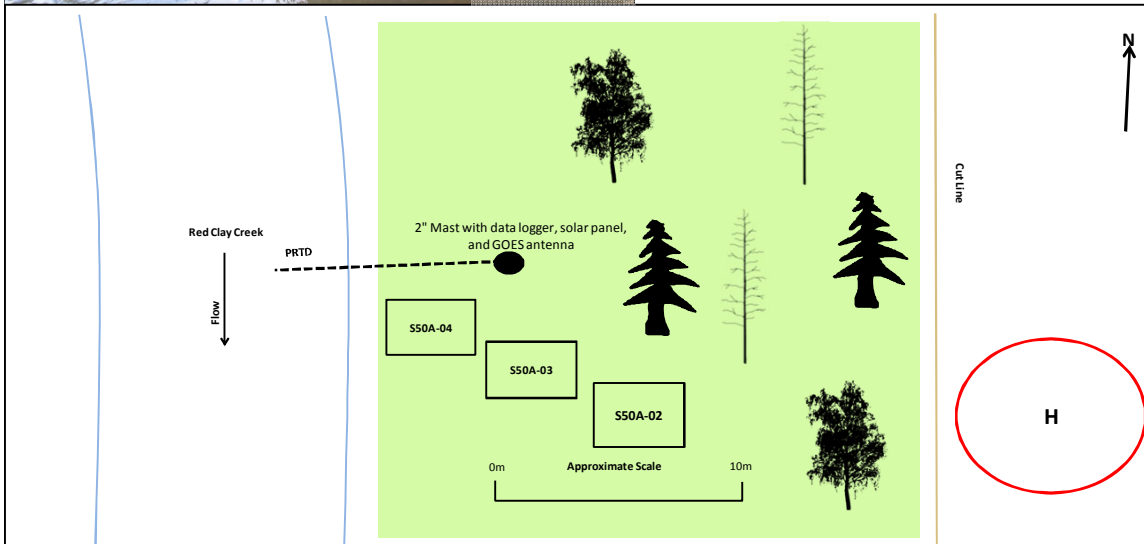
**Channel:** The channel is roughly 8m wide and the dominant bed type is sand. The river at this site can be waded throughout the open water season.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across the straight reach of the river 10m upstream of the PT.

**Benchmark Information**

**BM:** RAMP S50A-02  
**Elevation:** 100.995m  
**Basis:** Level Survey from RAMP S50A-01  
**Location:** 8m South of station  
**Description:** 3/4" Pipe

**BM:** RAMP S50A-03  
**Elevation:** 100.160m  
**Basis:** Level Survey from RAMP S50A-02  
**Location:** 7m South West of Logger  
**Description:** 3/4" Pipe

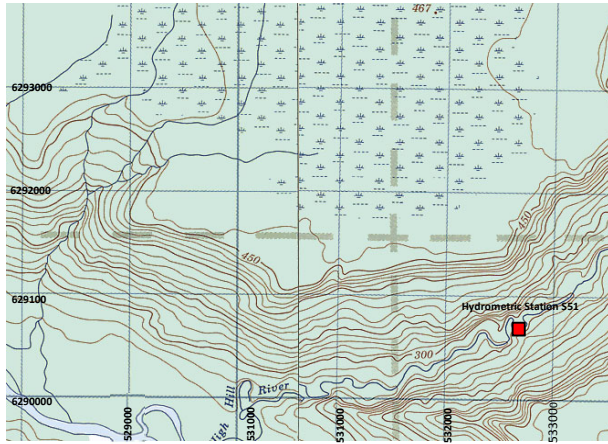
**BM:** RAMP S50A-04  
**Elevation:** 99.968  
**Basis:** Level Survey from RAMP S50A-02  
**Location:** 10m South East of Logger  
**Description:** 3/4" Pipe



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on High Hills River upstream of the confluence with the Clearwater River. The station was installed to act as an unaffected reference stream for the Alberta Oilsands Region. The monitoring station is located 5km northeast of the Clearwater River confluence.



Map Grid Based on UTM NAD 27



**Station Details**

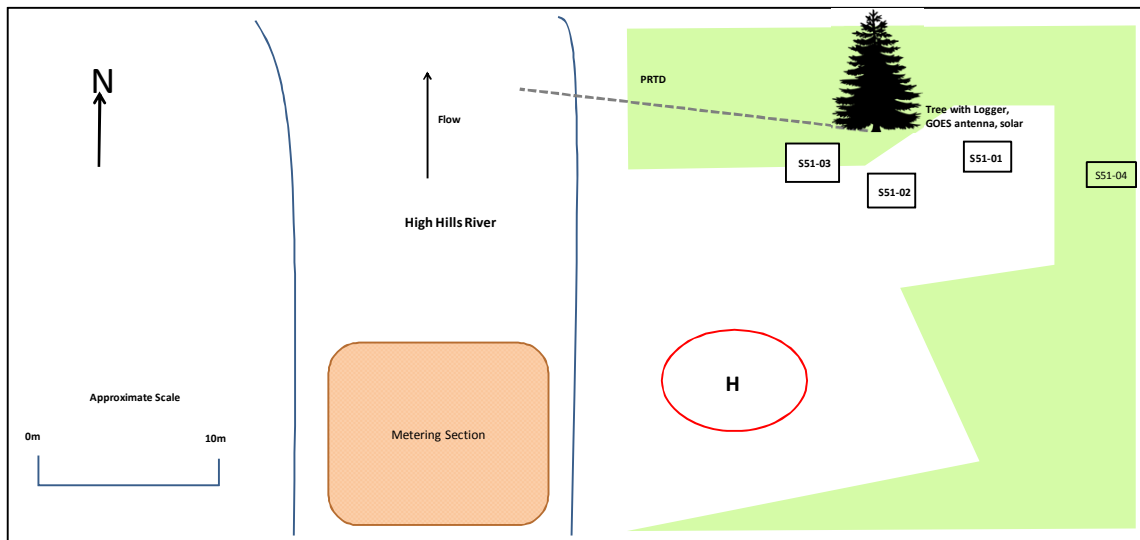
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,588 km<sup>2</sup>  
**UTM Coordinates:** 533925 mE, 6291921 mN (NAD83)  
**Lat/Long:** 56°45'42"N, 110°28'2"W (NAD83)  
**NTS Map:** 74D/16

**Measurement Details**

**Channel:** The channel is roughly 19m wide and the bed consists of gobbles and gravel.  
**Control:** A small riffle exists 25m downstream of the station before the channel drastically turns along a steep cutbank.  
**Metering Section:** The metering section is located across from the heli pad 20m upstream of the station. The channel is shallow enough to be waded, although...

**Benchmark Information**

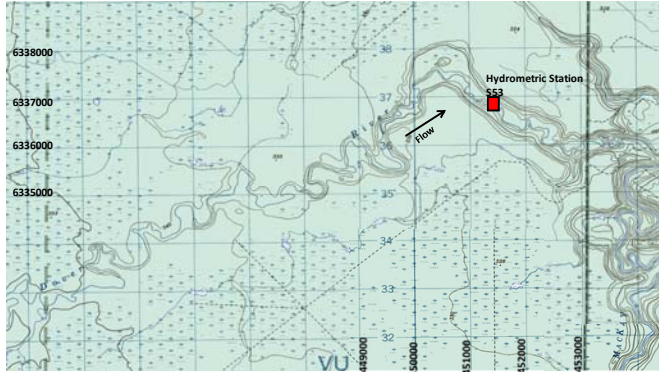
**BM:** RAMP S51-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3m SE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S51-02  
**Elevation:** 100.058 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 3m S of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S51-03  
**Elevation:** 100.474 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 2m W of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S51-04  
**Elevation:** 100.025 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 7m W of data logger  
**Description:** Lag bolt in tree



Revised March 27, 2014

**Location and Purpose:**

Established to monitor discharge on the Dover River upstream of the MacKay River. Water Survey of Canada operated nearby hydrometric site 07DB002 on the Dover River between 1975-77 at 57°10'12"N, 111°47'38"W.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:**  
**UTM Coordinates:** 451453 mE, 6337015 mN (NAD83)  
**Lat/Long:** 57°10'25"N, 111°48'10"W (NAD83)  
**NTS Map:** 74E/04

**Measurement Details**

**Channel:** The channel is roughly 15m wide and the dominant bed type is cobble and small boulder. The river at this site can be waded throughout most of the open water season.

**Control:** There is a downstream riffle that acts as the control at this station.

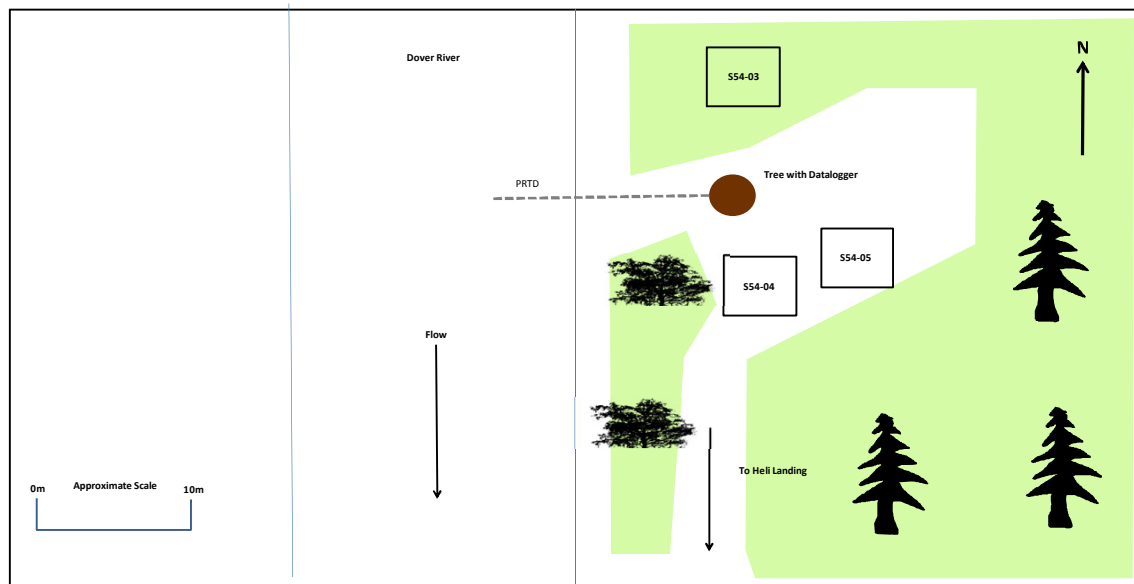
**Metering Section:** Measurements are conducted by wading across the straight reach of the river 5m downstream from the station.

**Benchmark Information**

**BM:** RAMP S53-03  
**Elevation:** 100.361m  
**Basis:** Assumed  
**Location:** Level Survey from RAMP S53-02  
**Description:** 3/4" Pipe

**BM:** RAMP S53-04  
**Elevation:** 100.165m  
**Basis:** Level Survey from RAMP S53-03  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe

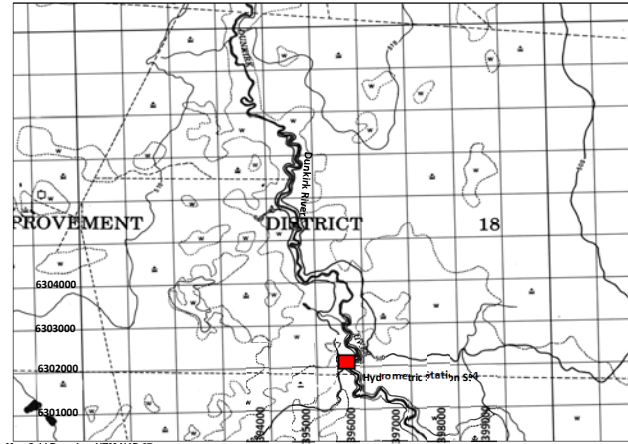
**BM:** RAMP S53-05  
**Elevation:** 100.388m  
**Basis:** Level Survey from RAMP S53-03  
**Location:** 5m East of station  
**Description:** 3/4" Pipe



Revised March 28, 2014

**Location and Purpose:**

Established to monitor discharge on the Dunkirk River upstream of the confluence with the MacKay River. Water Survey of Canada operated a nearby hydrometric station 07DB003 (at 56°51'20" N, 112°42'40" W) between 1975 and 1979.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,570 km<sup>2</sup> (WSC)  
**UTM Coordinates:** 395815 mE, 6302066 mN (NAD83)  
**Lat/Long:** 56°51'2"N, 112°42'29"W (NAD83)  
**NTS Map:** 84A/15

**Measurement Details**

**Channel** The channel is roughly 25m wide and the dominant bed type is sand and silt. The river at this site can be waded during periods of lower water levels of the open water season.

**Control** The channel morphology acts as the control at this site.

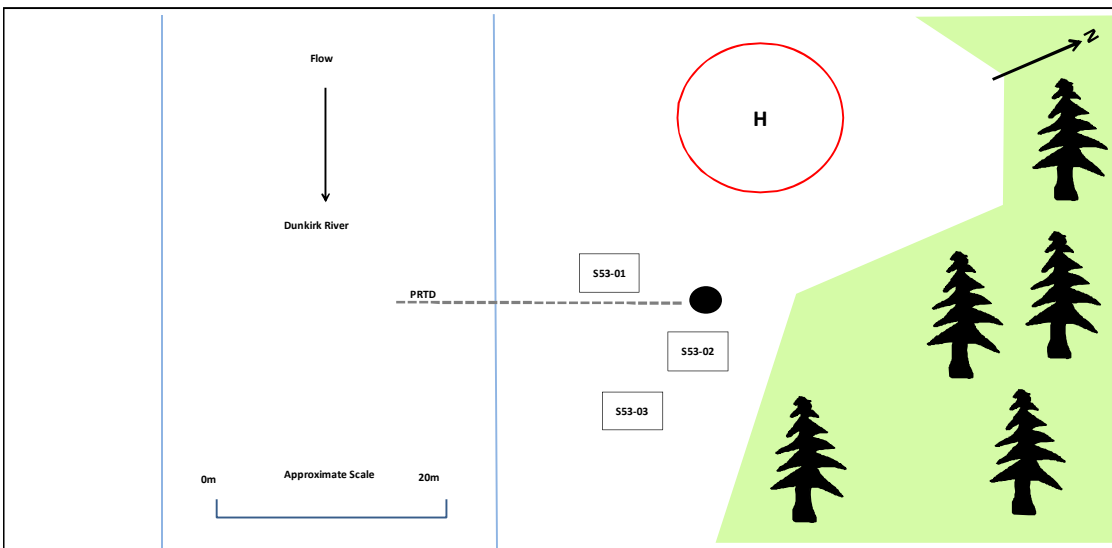
**Metering Section** Measurements are conducted by wading across the straight reach of the river near the station.

**Benchmark Information**

**BM:** RAMP S54-01  
**Elevation:** 99.674 m  
**Basis:** Assumed  
**Location:** 3m South West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S54-02  
**Elevation:** 99.699 m  
**Basis:** Level Survey from RAMP S54-01  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe

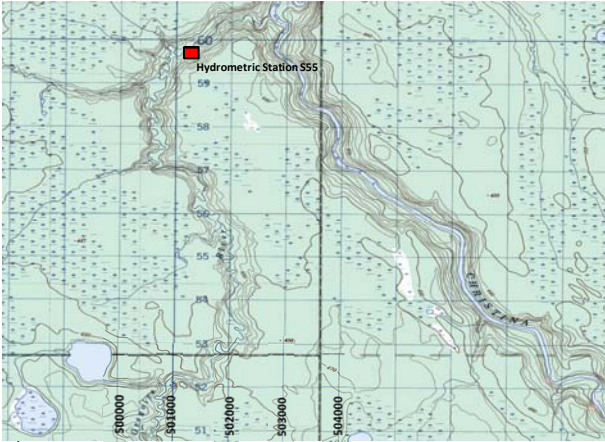
**BM:** RAMP S54-03  
**Elevation:** 99.908 m  
**Basis:** Level Survey from RAMP S54-01  
**Location:** 6m South East of station  
**Description:** 3/4" Pipe



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on the Gregoire River upstream of the Christina River. The station is located 1.7km southeast of the Christina River confluence. The rationale behind this site is to monitor discharge downstream of the Nexen Long Lake.



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,015 km<sup>2</sup>  
**UTM Coordinates:** 510184 mE, 6259986 mN (NAD83)  
**Lat/Long:** 56°29'3"N, 110°50'4"W (NAD83)  
**NTS Map:** 74D/07

**Measurement Details**

**Channel:** The channel is roughly 14m wide and the substrate is dominated by boulders and cobbles.  
**Control:** A downstream riffle acts as channel control  
**Metering Section:** The metering section is right at the station where the channel is straight and can be waded.

**Benchmark**

**BM:** RAMP S55-01  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** Bolt in Spruce tree  
**Description:** 2" Bolt

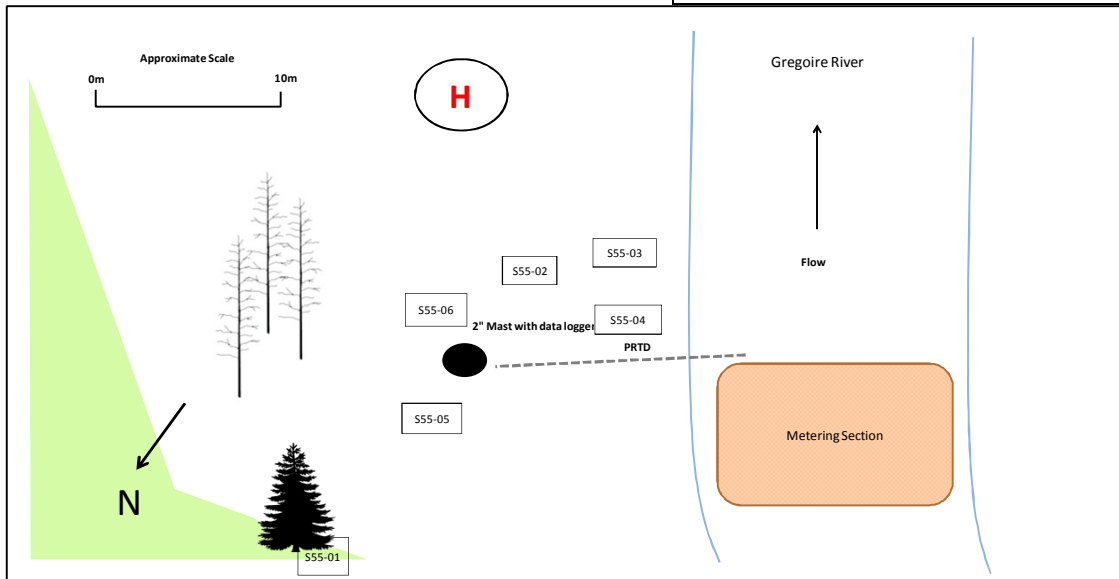
**BM:** RAMP S55-02  
**Elevation:** 100.181m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 2m S of data logger  
**Description:** 3/4" Pipe with pink flagging (destroyed)

**BM:** RAMP S55-03  
**Elevation:** 99.806m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 5m SW of data logger  
**Description:** 3/4" Pipe with pink flagging (destroyed)

**BM:** RAMP S55-04  
**Elevation:** 99.786m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 4m W of data logger  
**Description:** 3/4" Pipe with pink flagging (destroyed)

**BM:** RAMP S55-05  
**Elevation:** 99.811m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 4m N of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S55-06  
**Elevation:** 100.275m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 2m SE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on the Jackfish River downstream of Christina Lake and upstream of the Christina River. The station is located 3.4km NW of the town of Conklin, 100m downstream of the Jackfish River bridge on Hwy 881. The Water Survey of Canada operated hydrometric station 07CE005 at this location between 1982 and 1995. The rationale for this station is to monitor downstream of Christina Lake for MEG, Cenovus, and Devon.



Map Grid Based on UTM NAD 83



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 1,290 km<sup>2</sup> (WSC)  
**UTM Coordinates:** 493741 mE, 6169693 mN (NAD83)  
**Lat/Long:** 55°40'22"N, 111° 5'58"W (NAD83)  
**NTS Map:** 73M/11

**Benchmark Information**

**Channel** The channel is roughly 22m across, the bed is dominated by gravel with some boulders found throughout.  
**Control** The channel morphology serves as a control for this station location.  
**Metering Section** The metering section is located directly in front of the station and can easily be crossed by wading, or paddled across with a belly boat

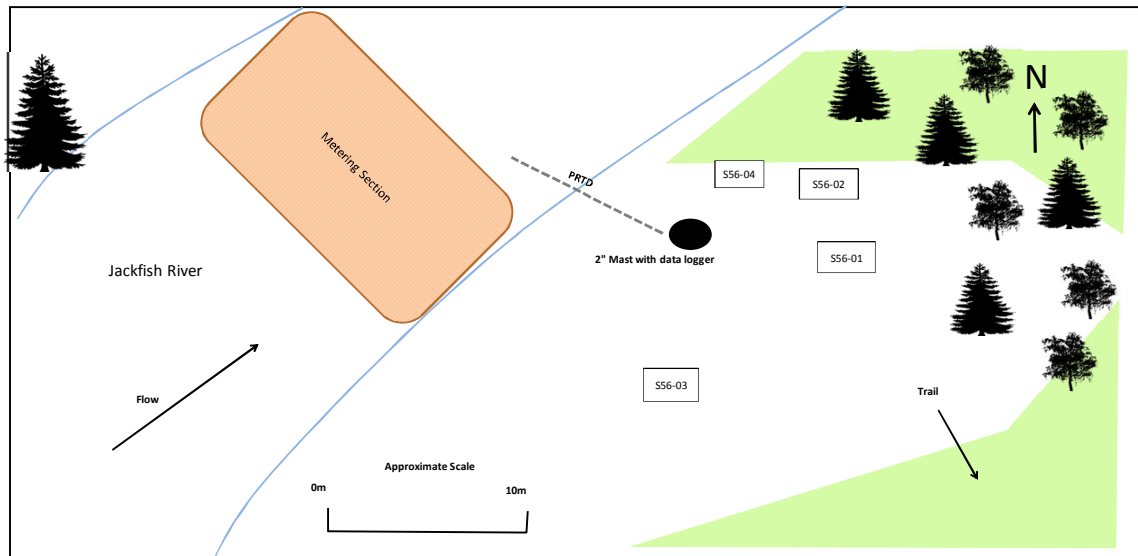
**Benchmark Information**

**BM:** RAMP S56-01  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 3m SE of data logger  
**Description:** T-post

**BM:** RAMP S56-02  
**Elevation:** 99.967m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 2m E of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S56-03  
**Elevation:** 100.084m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 4m S of data logger  
**Description:** 3/4" Pipe

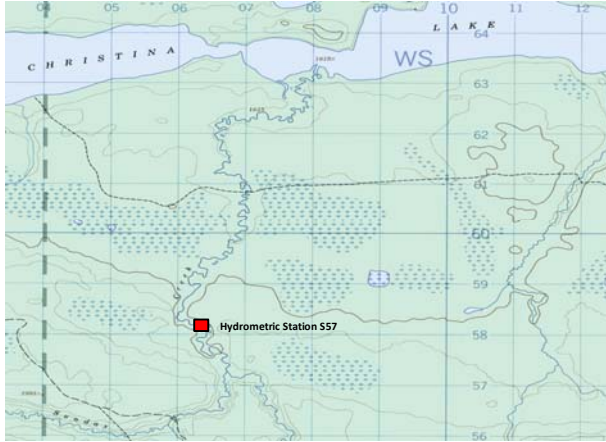
**BM:** RAMP S56-04  
**Elevation:** 100.089m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 3m NW of data logger  
**Description:** 3/4" Pipe



Revised 20 March 2014

**Location and Purpose:**

Established to monitor discharge on Sunday Creek upstream of Christina Lake and downstream of both Devon and Cenovus. This station is located 1.6km northeast of Cenovus Christina Lake main security gate and 13 km from Conklin.



Map Grid Based on UTM NAD 27



**Station Details**

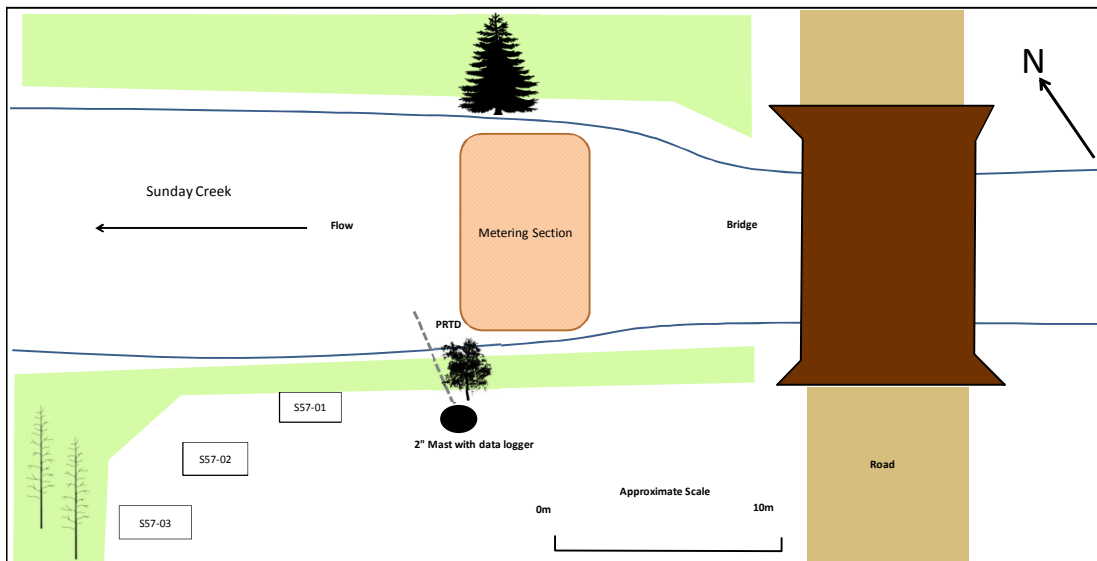
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** 2WD road via Cenovus Christina Lake Mine  
**Drainage Area:** 374 km<sup>2</sup>  
**UTM Coordinates:** 506210 mE, 6158391 mN (NAD83)  
**Lat/Long:** 55°34'17"N, 110°54'46"W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

**Channel:** The channel is roughly 13m wide with a dominant substrate of sand and silts.  
**Control:** The channel morphology serves as a control for this station.  
**Metering Section:** The metering section is located directly in front of the station. This straight reach can be easily crossed by wading.

**Benchmark Information**

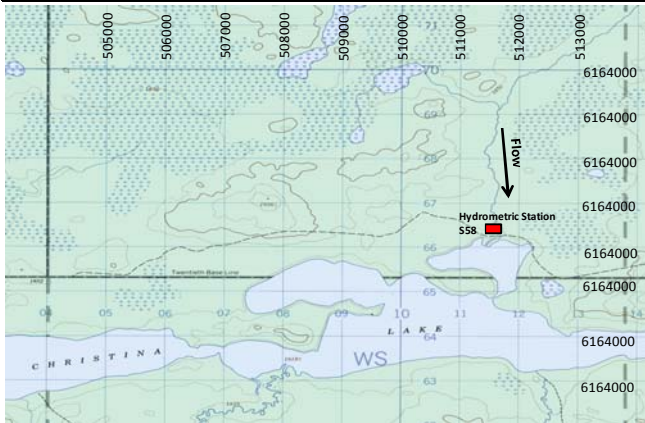
**BM:** RAMP S57-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2 m West of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S57-02  
**Elevation:** 99.961 m  
**Basis:** Level Survey from RAMP S57-01  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S57-03  
**Elevation:** 100.060 m  
**Basis:** Level Survey from RAMP S57-01  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe



Revised 26 March 2014

**Location and Purpose:**

Established to monitor discharge on Sawbones Creek upstream of Christina Lake and downstream of both MEG and Cenovus. This station is located 4.5km northwest of the MEG Energy Airport, 20m upstream of the Sawbones Creek bridge on the main MEG access road.



Map Grid Based on UTM NAD 27



Looking downstream from near the station. 2013.

**Station Details**

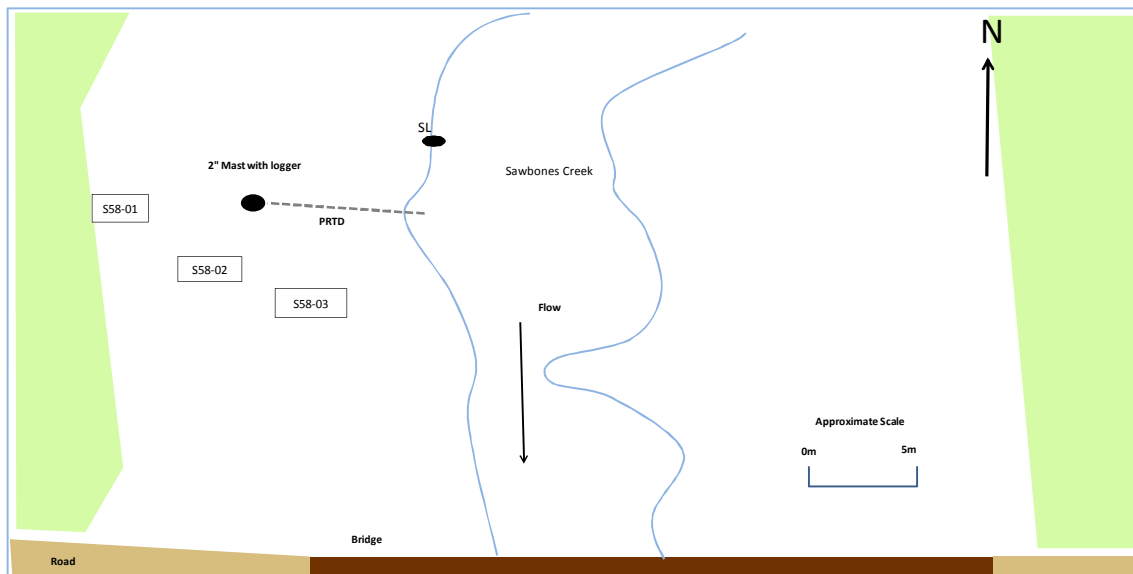
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via the MEG Energy Mine  
**Drainage Area:** 126 km<sup>2</sup>  
**UTM Coordinates:** 511412 mE, 6167165 mN (NAD83)  
**Lat/Long:** 55°39'76"N, 110°49'16"W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

**Channel:** The channel is roughly 5m across and is generally too deep to wade. The monitoring station is located just past a large bend, the substrate is made up of organics.  
**Control:** The channel morphology serves as a control for this station.  
**Metering Section:** The metering section is located under the bridge 20m downstream of the station. This is a straight reach and retains defined banks throughout the entire open water season, measurements are done from a belly boat.

**Benchmark Information**

**BM:** RAMP S58-01  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 6m W of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S58-02  
**Elevation:** 99.872 m  
**Basis:** Level Survey from RAMP S58-01  
**Location:** 5m SW of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S58-03  
**Elevation:** 99.865m  
**Basis:** Level Survey from RAMP S58-01  
**Location:** 5m S of data logger  
**Description:** 3/4" Pipe

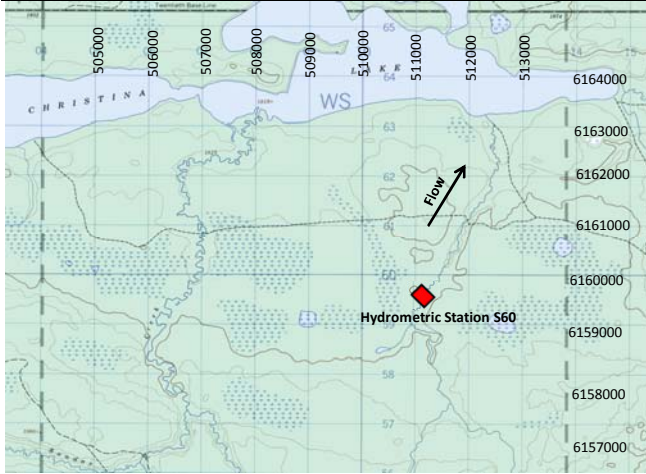




Revised March 26, 2014

**Location and Purpose:**

Established to monitor discharge on Unnamed Creek upstream of Christina Lake. The purpose of this station is to help define regional characteristics and inputs into Christina Lake.



Map Grid Based on UTM NAD 27



Equipment, benchmarks, and a cross-channel view of the flooded river in May, 2013. View

Upstream view at station S60. 2013

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Cenovus Christina Lake Site  
**Drainage Area:** 140 km<sup>2</sup>  
**UTM Coordinates:** 511145 E, 6159877 N (NAD83)  
**Lat/Long:** 55°35'5" N, 110°49'24" W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

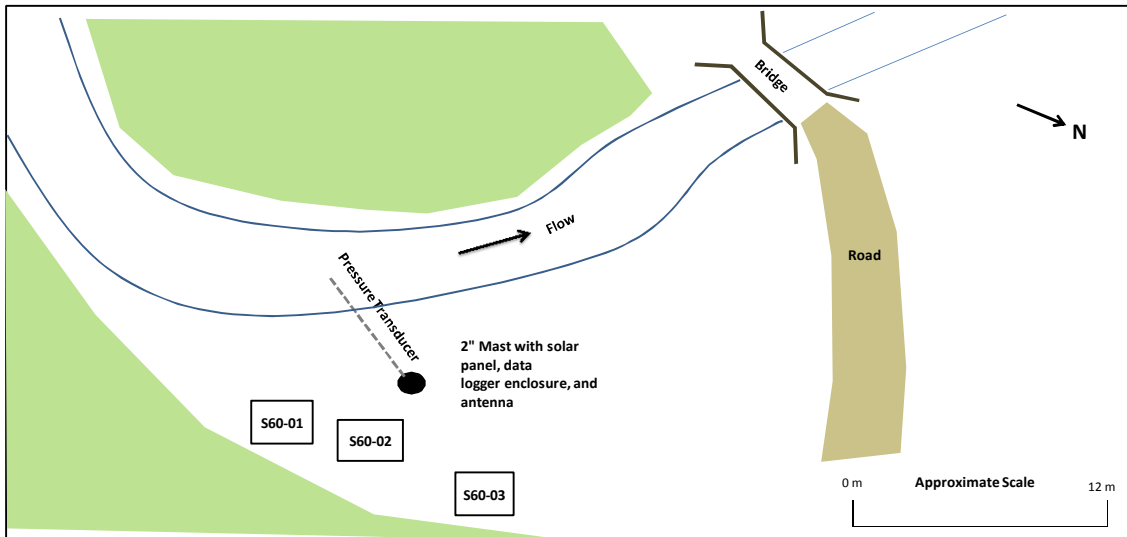
**Channel:** The channel is approximately 4m across and too deep to wade most of the open water season. The substrate is predominately organics with some rock under and around the bridge.  
**Control:** The bridge and bridge rip rap acts as the control at this station.  
**Metering Section:** The metering section is located 40m upstream around the bend where the river straightens out. Depending on the waterlevels a belly boat may have to be used.

**Benchmark Information**

**BM:** RAMP S60-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 8 m NE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S60-02  
**Elevation:** 99.947 m  
**Basis:** Level Survey from RAMP S60-01  
**Location:** 4 m East of data logger  
**Description:** 3/4" Pipe

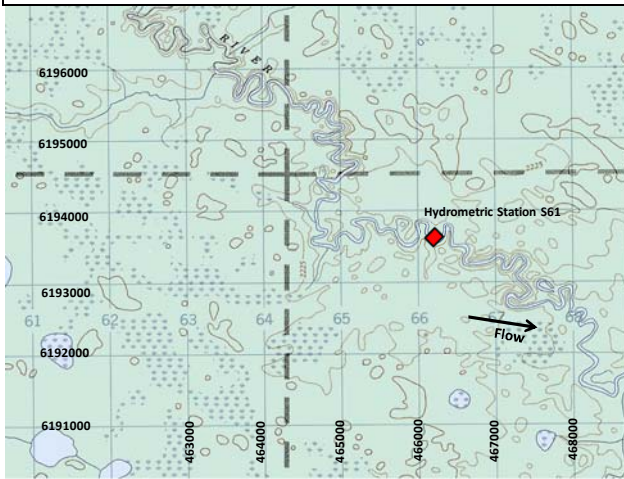
**BM:** RAMP S60-03  
**Elevation:** 99.798 m  
**Basis:** Level Survey from RAMP S60-01  
**Location:** 6 m East of data logger  
**Description:** 3/4" Pipe



Revised 26 March 2014

**Location and Purpose:**

Established in May 2013 to monitor discharge in the upper regions of the Christina River upstream of Statoi Leismer and to act as a reference site for the Christina River. The station is located 40 km northwest of Conklin.



Map Grid Based on UTM NAD 27



Upstream view at RAMP Hydrometric Station S61, Christina River above Statoi Leismer

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 1,028 km<sup>2</sup>  
**UTM Coordinates:** 466037 E, 6193791 N (NAD83)  
**Lat/Long:** 55°53'18" N, 111°32'35" W (NAD83)  
**NTS Map:** 74M/13

**Measurement Details**

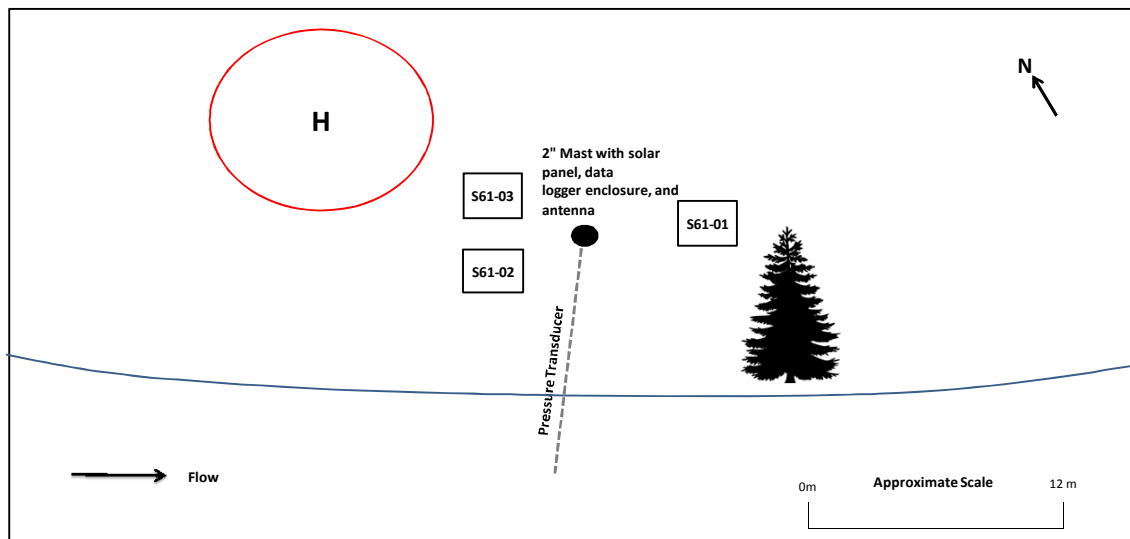
**Channel:** Trapezoidal edge and approximately 20m across. The substrate is predominately made up of silt and sand.  
**Control:** The channel morphology acts as the control at this station.  
**Metering Section:** The metering station is across from the station. During high water a boat is needed to conduct flow measurements because of high flow and deep water. Late in the open water season it becomes shallow enough to wade.

**Benchmark Information**

**BM:** RAMP S61-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 6 m South of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S61-02  
**Elevation:** 100.525 m  
**Basis:** Level Survey from RAMP S61-01  
**Location:** 8 m SW of data logger  
**Description:** 3/4" Pipe

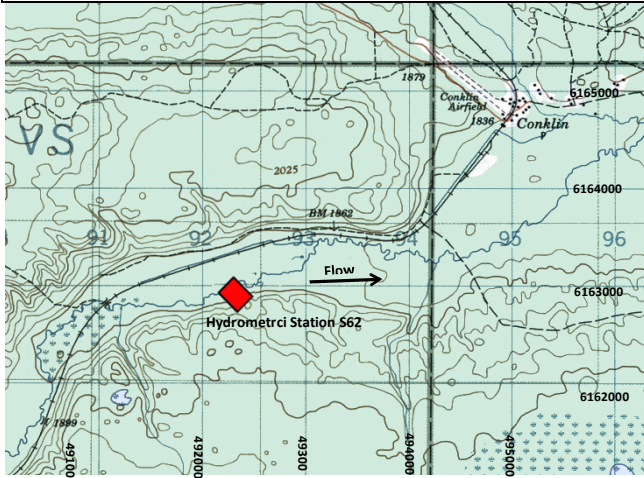
**BM:** RAMP S61-03  
**Elevation:** 100.020 m  
**Basis:** Level Survey from RAMP S61-01  
**Location:** 4 m NW of data logger  
**Description:** 3/4" Pipe



Revised 26 March, 2014

**Location and Purpose:**

Established to monitor discharge on Birch Creek upstream of Christina Lake in order to increase knowledge of regional characteristics and help define inputs into Christina Lake. The station is located 3 km southwest of Conklin.



Map Grid Based on UTM NAD 27



Looking North East towards station.

Looking upstream from near the station, September, 2013

**Station Details**

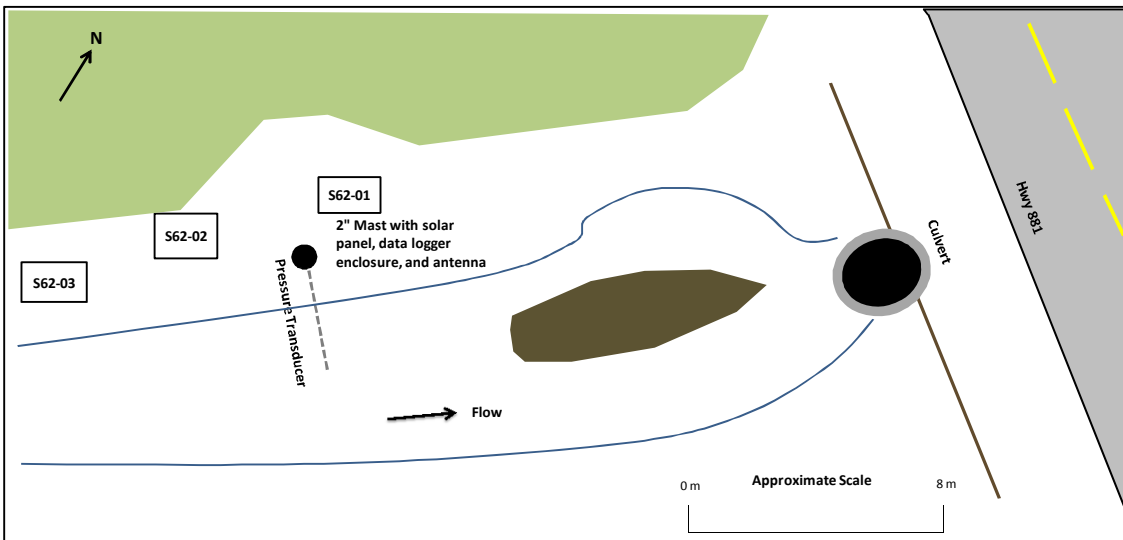
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 197 km<sup>2</sup>  
**UTM Coordinates:** 492149 E, 6163182 N (NAD83)  
**Lat/Long:** 55°36'53" N, 111°7'24" W (NAD83)  
**NTS Map:** 74M/11

**Measurement Details**

**Channel:** The channel is approximately 7m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand.  
**Control:** The culvert acts as the control at this station  
**Metering Section:** The metering section is located across from the station on a straight reach of the river. The banks are steep on either side and the flow is well confined

**Benchmark Information**

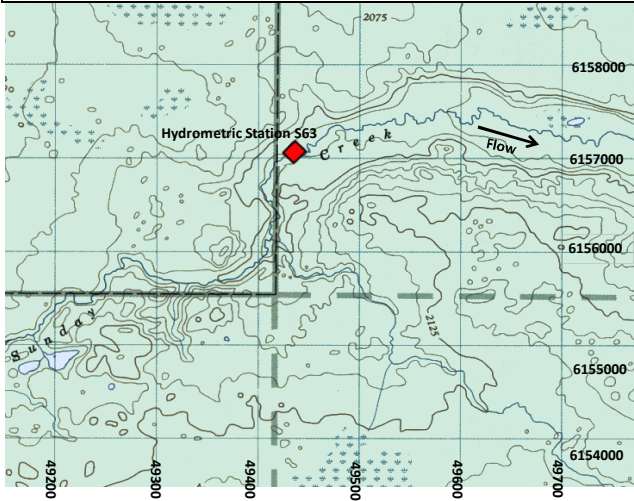
**BM:** RAMP S62-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 2 m North of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S62-02  
**Elevation:** 99.949 m  
**Basis:** Level Survey from RAMP S62-01  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S2-03  
**Elevation:** 100.034 m  
**Basis:** Level Survey from RAMP S62-01  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe



Revised 26 March, 2014

**Location and Purpose:**

Established to monitor discharge on Sunday Creek upstream of Cenovus and Devon oilsands developments. The station is located along Hwy 881 approximately 8 km south of Conklin.



Map Grid Based on UTM NAD 27



Upstream view at Station S63

Downstream view at RAMP Hydrometric Station S63, Sunday Creek at Hwy 881

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 135 km<sup>2</sup>  
**UTM Coordinates:** 494283 E, 6157255 N (NAD83)  
**Lat/Long:** 55°33'41" N, 111°5'26" W (NAD83)  
**NTS Map:** 74M/10

**Measurement Details**

**Channel:** The channel is approximately 6m wide and it has trapezoidal edges. The substrate is predominately sand cobble. There has been Beaver activity upstream of the station. This station can be waded for most of the open water season.

**Control:** The culvert acts as the control at this station.

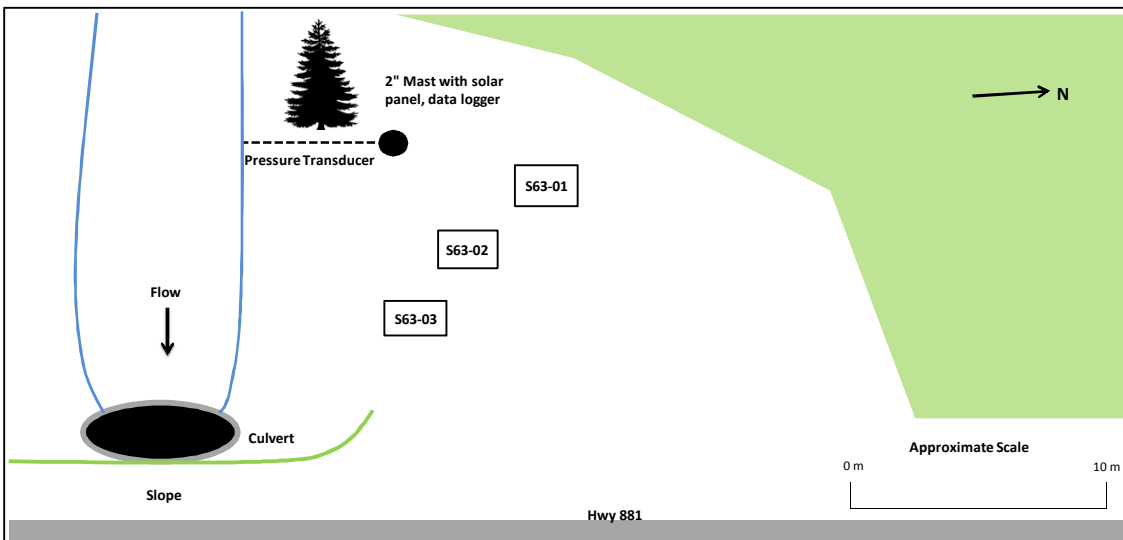
**Metering Section:** The metering section is located across from the station on a straight reach of the river. The banks are well defined.

**Benchmark Information**

**BM:** RAMP S63-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 5 m NE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S63-02  
**Elevation:** 99.830 m  
**Basis:** Level Survey from RAMP S63-01  
**Location:** 7 m East of data logger  
**Description:** 3/4" Pipe

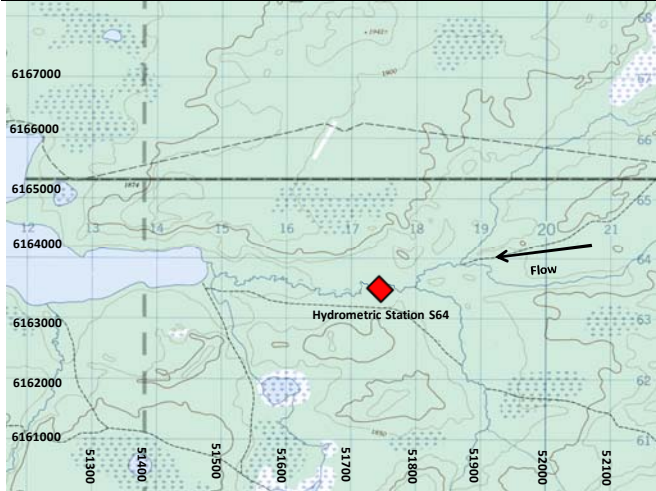
**BM:** RAMP S63-03  
**Elevation:** 99.444 m  
**Basis:** Level Survey from RAMP S63-01  
**Location:** 10 m East of data logger  
**Description:** 3/4" Pipe



Revised 26 March, 2014

**Location and Purpose:**

Established to monitor discharge on Unnamed Creek East of Christina Lake, in order to help define regional characteristics and inputs into Christina Lake. The station is located approximately 3 km east of the eastern tip of Christina Lake.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via MEG Energy Mine Access, Argo  
**Drainage Area:** 171 km<sup>2</sup>  
**UTM Coordinates:** 517644 E, 6163643 N (NAD83)  
**Lat/Long:** 55°37'6" N, 110°43'11" W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

**Channel:** The channel is approximately 5m across and too deep to wade most of the open water season. The substrate is predominately organics.  
**Control:** The channel morphology acts as the downstream control at this station.  
**Metering Section:** The metering section is located 40m upstream around the bend where the river straightens out. Depending on the waterlevels a belly boat may have to be used.

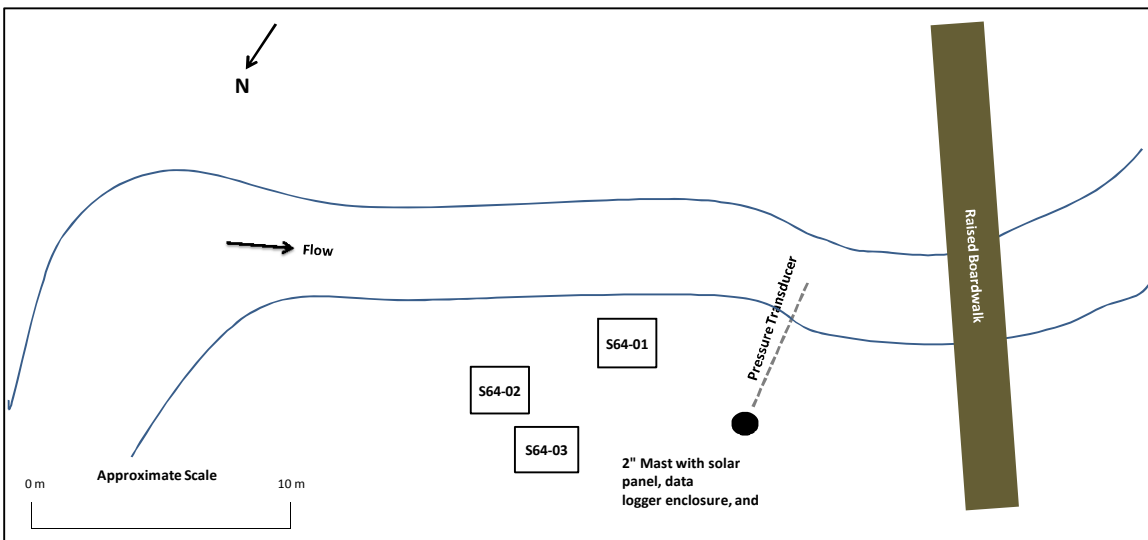
**Benchmark Information**

**BM:** RAMP S64-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 6 m SE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S64-02  
**Elevation:** 99.800 m  
**Basis:** Level Survey from RAMP S64-01  
**Location:** 11 m East of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S64-03  
**Elevation:** 99.847 m  
**Basis:** Level Survey from RAMP S64-01  
**Location:** 8 m East of data logger  
**Description:** 3/4" Pipe



Downstream view at RAMP Hydrometric Station S64, Unnamed

Looking West towards the station



## **C.8 STATION VISIT RECORDS AND MANUAL MEASUREMENTS**

Records of the manual hydrometric measurements made during each station visit are provided below the station description sheets. The perceived quality and expected precision of each manual discharge measurement was assessed considering the hydraulic conditions, at the measurement section, at the time of the measurement.

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

February 4, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.1	13.2
Air Temperature °C:	-12.8	-
RH (%):	75.7	-
Snow Depth (cm):	72.6	-
Wind Speed (m/s):	0.8	-
Wind Direction (deg):	348	-
Solar Radiation (W/m <sup>2</sup> ):	40.760	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.21	-
Datalogger Clock:	11:34	-
Laptop Clock:	11:34	-
Dessicant:	good	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

- Replaced battery

<b>Measurement Details:</b>	
Start Time (MST):	11:30
End Time (MST):	11:50
Station Condition:	good
Weather:	Light snow, light breeze

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	4-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	4-Feb-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	21-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

April 2, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.6	-
Air Temperature °C:	10.5	-
RH (%):	41.1	-
Snow Depth (cm):	61.3	-
Wind Speed (m/s):	4.4	-
Wind Direction (deg):	207	-
Solar Radiation (W/m <sup>2</sup> ):	62.740	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	670.72	-
Datalogger Clock:	15:37	-
Laptop Clock:	15:38	-
Dessicant:	replaced.	-
Logger# (if Δ):	26631	-

**Datalogger / Station Notes:**

- Serial number recorded from wiring panel

<b>Measurement Details:</b>	
Start Time (MST):	15:25
End Time (MST):	15:45
Station Condition:	Good
Weather:	Overcast

**General Notes:**

- Show depth at SR 50: 55.0 cm, 55.5 cm

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	2-Apr-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Apr-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

June 9, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.6	-
Air Temperature °C:	9.1	-
RH (%):	91.9	-
Snow Depth (cm):	39.7	-
Wind Speed (m/s):	17.3	-
Wind Direction (deg):	24	-
Solar Radiation (W/m <sup>2</sup> ):	204.140	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	24.20	-
Datalogger Clock:	12:37	-
Laptop Clock:	12:38	-
Dessicant:	replaced	-
Logger# (if Δ):	26631	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	12:36
End Time (MST):	12:42
Station Condition:	Good
Weather:	Raining, windy

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	9-Jun-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	9-Jun-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	8-Jul-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

August 8, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.2	13.2
Air Temperature °C:	23.8	23.0
RH (%):	30.2	28.9
Snow Depth (cm):	50.8	-1.0
Wind Speed (m/s):	0.8	8.7
Wind Direction (deg):	143	28
Solar Radiation (W/m <sup>2</sup> ):	650.832	608.071
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.00	0.80
Datalogger Clock:	13:37	14:45
Laptop Clock:	13:37	14:46
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

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<b>Measurement Details:</b>	
Start Time (MST):	13:35
End Time (MST):	15:00
Station Condition:	Good
Weather:	Clear, calm

**General Notes:**

- Tested Pluvio - Ok. 0.8 mm
- Installed SPLite2 and mount arm. Removed Licor sensor
- Replace radiation shield for HMP sensor next visit

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Aug-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	8-Aug-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	29-Aug-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

January 17, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	10.2	12.9
Air Temperature °C:	-17.9	-
RH (%):	84.4	-
Snow Depth (cm):	46.6	-
Wind Speed (m/s):	5.8	-
Wind Direction (deg):	253	-
Solar Radiation (W/m <sup>2</sup> ):	37.850	-
Barometric Pressure (kpa):	96.57	-
Precipitation (mm):	0.00	-
Datalogger Clock:	12:52	-
Laptop Clock:	12:53	-
Dessicant:	CHANGED	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		
- Replaced battery		

<b>Measurement Details:</b>	
Start Time (MST):	12:45
End Time (MST):	13:00
Station Condition:	Good
Weather:	Overcast, -25°C. Slight breeze

**General Notes:**

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	17-Jan-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	17-Jan-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	21-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

February 2, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.5	-
Air Temperature °C:	-21.5	-
RH (%):	88.1	-
Snow Depth (cm):	61.4	-
Wind Speed (m/s):	1.3	-
Wind Direction (deg):	23	-
Solar Radiation (W/m <sup>2</sup> ):	37.870	-
Barometric Pressure (kpa):	97.20	-
Precipitation (mm):	0.00	-
Datalogger Clock:	8:28	-
Laptop Clock:	8:28	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:20
End Time (MST):	8:45
Station Condition:	Good
Weather:	Overcast, -20°C

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	2-Feb-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Feb-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	21-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

March 25, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.7	-
Air Temperature °C:	-13.9	-
RH (%):	83.1	-
Snow Depth (cm):	66.7	-
Wind Speed (m/s):	9.9	-
Wind Direction (deg):	315	-
Solar Radiation (W/m <sup>2</sup> ):	225.700	-
Barometric Pressure (kpa):	97.20	-
Precipitation (mm):	0.00	1.55
Datalogger Clock:	7:43	-
Laptop Clock:	7:42	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

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<b>Measurement Details:</b>	
Start Time (MST):	7:30
End Time (MST):	7:55
Station Condition:	Good
Weather:	Clear, calm

**General Notes:**

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<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	25-Mar-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	25-Mar-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

June 24, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.9	12.9
Air Temperature °C:	17.2	17.2
RH (%):	69.9	82.3
Snow Depth (cm):	-1.3	0.1
Wind Speed (m/s):	12.4	2.1
Wind Direction (deg):	349	240
Solar Radiation (W/m <sup>2</sup> ):	90.700	156.251
Barometric Pressure (kpa):	95.30	95.53
Precipitation (mm):	0.00	1.84
Datalogger Clock:	6:53	-
Laptop Clock:	6:52	-
Dessicant:	REPLACED	-
Logger# (if Δ):	-	-

### **Datalogger / Station Notes:**

- Replaced sensors for calibration
- Antifreeze was emptied from Geonor

<b>Measurement Details:</b>	
Start Time (MST):	6:45
End Time (MST):	9:15
Station Condition:	Good
Weather:	Light rain, light breeze

### **General Notes:**

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	24-Jun-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	24-Jun-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	8-Jul-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

October 31, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.9	-
Air Temperature °C:	-1.9	-
RH (%):	87.7	-
Snow Depth (cm):	5.1	-0.6
Wind Speed (m/s):	9.5	-
Wind Direction (deg):	325	-
Solar Radiation (W/m <sup>2</sup> ):	0.000	-
Barometric Pressure (kpa):	94.73	-
Precipitation (mm):	132.83	-
Datalogger Clock:	6:54	-
Laptop Clock:	6:52	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

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<b>Measurement Details:</b>	
Start Time (MST):	6:50
End Time (MST):	7:20
Station Condition:	Good
Weather:	Partial cloud cover, calm

**General Notes:**

SR50 height: 1.469 m  
 Distance to ground in program 1.47 m. No changes were made to program.  
 Grass and debris were cleared from around SR50 cone area.

Emptied precipitation gauge. Added antifreeze to precipitation gauge. 5 gal pail was left at station because of damaged lid. Bring new pail with lid next visit.

<b>Field Personnel:</b>	SM,TR	<b>Trip Date:</b>	31-Oct-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	31-Oct-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	5-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

February 4, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.2	-
Air Temperature °C:	-14.4	-
RH (%):	76.6	-
Snow Depth (cm):	73.4	-
Wind Speed (m/s):	4.9	-
Wind Direction (deg):	103	-
Solar Radiation (W/m <sup>2</sup> ):	34.409	-
Barometric Pressure (kpa):	96.28	-
Precipitation (mm):	0.00	-
Datalogger Clock:	9:22	-
Laptop Clock:	9:21	-
Dessicant:	good	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

- Added antifreeze to Pluvio

<b>Measurement Details:</b>	
Start Time (MST):	9:22
End Time (MST):	9:40
Station Condition:	Good
Weather:	Light snow, light breeze

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	4-Feb-13
<b>Data Entry Personnel:</b>	SM, CJ	<b>Date:</b>	4-Feb-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	21-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

April 1, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.9	-
Air Temperature °C:	-5.1	-
RH (%):	72.7	-
Snow Depth (cm):	38.4	-
Wind Speed (m/s):	4.9	-
Wind Direction (deg):	148	-
Solar Radiation (W/m <sup>2</sup> ):	419.268	-
Barometric Pressure (kpa):	98.62	-
Precipitation (mm):	818.15	-
Datalogger Clock:	8:58	-
Laptop Clock:	8:59	-
Dessicant:	replaced	-
Logger# (if Δ):	26630	-

**Datalogger / Station Notes:**

- Logger S/N recorded from wiring panel

<b>Measurement Details:</b>	
Start Time (MST):	8:57
End Time (MST):	9:10
Station Condition:	Good
Weather:	Clear, light breeze

**General Notes:**

- Snow depth at SR50: 45.0 cm, 45.0 cm

<b>Field Personnel:</b>	SM	<b>Trip Date:</b>	1-Apr-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	1-Apr-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

June 9, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.5	-
Air Temperature °C:	8.7	-
RH (%):	95.1	-
Snow Depth (cm):	3.7	-
Wind Speed (m/s):	23.2	-
Wind Direction (deg):	10	-
Solar Radiation (W/m <sup>2</sup> ):	56.383	-
Barometric Pressure (kpa):	96.65	-
Precipitation (mm):	0.60	-
Datalogger Clock:	8:08	-
Laptop Clock:	8:08	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:00
End Time (MST):	8:20
Station Condition:	Good
Weather:	Raining and windy

**General Notes:**

- Emptied antifreeze from Pluvio. Precipitation was recorded in the past 24 hours

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	9-Jun-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	9-Jun-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Sep-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

September 10, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.4	-
Air Temperature °C:	13.0	-
RH (%):	60.8	-
Snow Depth (cm):	-1.1	-
Wind Speed (m/s):	5.8	-
Wind Direction (deg):	241	-
Solar Radiation (W/m <sup>2</sup> ):	251.419	-
Barometric Pressure (kpa):	97.16	-
Precipitation (mm):	0.00	0.91
Datalogger Clock:	8:14	-
Laptop Clock:	8:13	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

- Tested Pluvio - 0.91mm - Ok

<b>Measurement Details:</b>	
Start Time (MST):	8:12
End Time (MST):	8:56
Station Condition:	Good
Weather:	Clear, calm

**General Notes:**

- Cleaned corrosion from battery terminal
- Installed putty to seal enclosure
- Added a second container of desiccant to reduce humidity inside enclosure

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	10-Sep-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	10-Sep-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Sep-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

April 16, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.3	-
Air Temperature °C:	-1.6	-
RH (%):	42.3	-
Snow Depth (cm):	66.7	-
Wind Speed (m/s):	3.4	-
Wind Direction (deg):	78	-
Solar Radiation (W/m <sup>2</sup> ):	628.104	-
Barometric Pressure (kpa):	99.47	-
Precipitation (mm):	432.10	-
Datalogger Clock:	11:02	-
Laptop Clock:	11:02	-
Dessicant:	replaced	-
Logger# (if Δ):	31938	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:00
End Time (MST):	11:15
Station Condition:	Good
Weather:	Clear, light breeze

**General Notes:**

- Snow depth at SR50: 67.0 cm. 68.0 cm

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	8-Apr-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	8-Apr-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

August 13, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.6	-
Air Temperature °C:	24.0	-
RH (%):	57.8	-
Snow Depth (cm):	26.8	-
Wind Speed (m/s):	3.1	-
Wind Direction (deg):	96	-
Solar Radiation (W/m <sup>2</sup> ):	337.040	-
Barometric Pressure (kpa):	98.39	-
Precipitation (mm):	313.56	-
Datalogger Clock:	11:40	-
Laptop Clock:	11:40	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:35
End Time (MST):	11:48
Station Condition:	Good
Weather:	Overcast, 24°C

**General Notes:**

- Grass removed from below SR50 sensor

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	13-Aug-13
<b>Data Entry Personnel:</b>	DW, TR	<b>Date:</b>	13-Aug-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	29-Aug-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

September 12, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.6	14.2
Air Temperature °C:	15.7	20.6
RH (%):	61.8	47.6
Snow Depth (cm):	-0.7	0.0
Wind Speed (m/s):	5.2	9.7
Wind Direction (deg):	175	199
Solar Radiation (W/m <sup>2</sup> ):	236.601	481.582
Barometric Pressure (kpa):	98.02	97.91
Precipitation (mm):	368.09	0.00
Datalogger Clock:	8:23	10:34
Laptop Clock:	8:23	10:34
Dessicant:	Replaced	-
Logger# (if Δ):	-	-

### **Datalogger / Station Notes:**

- Replaced instruments for calibration

### **Measurement Details:**

Start Time (MST):	8:17
End Time (MST):	10:50
Station Condition:	Good
Weather:	Clear, calm, +15°C

### **General Notes:**

- Pluvio was full of dead insects. Emptied it
- Tested Pluvio - ok. 0.3 mm
- Tested SR 50 - ok

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	12-Sep-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Sep-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	5-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

November 2, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.3	-
Air Temperature °C:	-0.7	-
RH (%):	66.6	-
Snow Depth (cm):	-1.1	-
Wind Speed (m/s):	3.8	-
Wind Direction (deg):	153	-
Solar Radiation (W/m <sup>2</sup> ):	138.294	-
Barometric Pressure (kpa):	97.91	-
Precipitation (mm):	0.00	-
Datalogger Clock:	12:27	-
Laptop Clock:	12:27	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

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<b>Measurement Details:</b>	
Start Time (MST):	12:20
End Time (MST):	12:35
Station Condition:	Good
Weather:	Overcast, breezy. No snow

**General Notes:**

- Added antifreeze to Pluvio
- SR50 distance to ground: 1.710 m - same as data logger program

<b>Field Personnel:</b>	SM,TR	<b>Trip Date:</b>	2-Nov-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Nov-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	5-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: February 13, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	15.0	-
Air Temperature °C:	-5.8	-
RH (%):	88.6	-
Snow Depth (cm):	65.6	-
Wind Speed (m/s):	25.5	-
Wind Direction (deg):	335	-
Solar Radiation (W/m <sup>2</sup> ):	160.071	-
Barometric Pressure (kpa):	94.37	-
Precipitation (mm):	623.55	-
Datalogger Clock:	11:50	-
Laptop Clock:	11:50	-
Dessicant:	replaced.	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**

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<b>Measurement Details:</b>	
Start Time (MST):	11:45
End Time (MST):	12:00
Station Condition:	Good
Weather:	Light snow, windy

**General Notes:**

- Precipitation gauge antifreeze level and condition - OK
- SR50 checked - Ok.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	13-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	13-Feb-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	21-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date:

May 15, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.5	-
Air Temperature °C:	12.3	-
RH (%):	52.4	-
Snow Depth (cm):	0.0	-
Wind Speed (m/s):	8.4	-
Wind Direction (deg):	222	-
Solar Radiation (W/m <sup>2</sup> ):	396.120	-
Barometric Pressure (kpa):	94.36	-
Precipitation (mm):	331.27	-
Datalogger Clock:	7:53	-
Laptop Clock:	7:53	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	7:40
End Time (MST):	8:00
Station Condition:	Good
Weather:	Clear, breezy, 10°C

**General Notes:**

- The field where this station is located was covered with compact gravel to create parking lot
- Antifreeze was emptied from Pluvio
- Check Pluvio operation - Ok

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	15-May-13
<b>Data Entry Personnel:</b>	TR, DW	<b>Date:</b>	15-May-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	8-Jul-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date:

June 23, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.4	14.2
Air Temperature °C:	15.8	18.5
RH (%):	78.6	56.6
Snow Depth (cm):	37.3	0.6
Wind Speed (m/s):	3.8	3.88
Wind Direction (deg):	318	113
Solar Radiation (W/m <sup>2</sup> ):	357.455	313.955
Barometric Pressure (kpa):	94.15	94.2
Precipitation (mm):	45.75	0.0
Datalogger Clock:	11:03	12:26
Laptop Clock:	11:03	12:26
Dessicant:	replaced	-
Logger# (if Δ):	34644	-

**Datalogger / Station Notes:**

--

<b>Measurement Details:</b>	
Start Time (MST):	11:02
End Time (MST):	13:33
Station Condition:	Good
Weather:	Overcast, light breeze

**General Notes:**

- Replaced climate sensors
- No response from pluvio. Need to check manual to diagnose. Wiring is ok, possibly replace old cable

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	23-Jun-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	23-Jun-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	8-Jul-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: September 25, 2013



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.4	-
Air Temperature °C:	14.0	-
RH (%):	39.5	-
Snow Depth (cm):	17.1	3.4
Wind Speed (m/s):	11.9	-
Wind Direction (deg):	308	-
Solar Radiation (W/m <sup>2</sup> ):	486.202	-
Barometric Pressure (kpa):	94.77	-
Precipitation (mm):	0.00	0.3
Datalogger Clock:	13:35	-
Laptop Clock:	13:34	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	13:33
End Time (MST):	14:20
Station Condition:	Good
Weather:	Clear, windy

**General Notes:**

- Tested Pluvio 0.3 mm - Ok
- SR 50 height: 1.827 m
- Replaced Pluvio cable

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	25-Sep-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	25-Sep-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	5-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: January 11, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	-0.201	-
Water (°C):	-1.0	-
Air Temp (°C):	-12.9	-
RH (%):	81.5%	-
Precipitation (mm):	15.70	-
Battery (Main):	12.3	13.1
Datalogger Clock:	14:44	0.62
Laptop Clock:	14:46	0.62
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:40
End Time (MST):	15:15
Station Condition:	Good
Weather:	Overcast, -18°C

<b>Datalogger / Station Notes:</b>
- Changed battery

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01	1.090	295.955		294.865	294.865	Rod Beside Station
L1-02			0.920	295.035	295.036	3/4" Pipe 20 m W of station
L1-03			1.293	294.662	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			1.661	294.294		
Water Level:			1.671	294.284		
Other:						
<b>Setup #2</b>						
L1-01			1.034	294.864	294.865	Rod Beside Station
L1-02	0.863	295.898		295.035	295.036	3/4" Pipe 20 m W of station
L1-03			1.235	294.663	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			1.602	294.296		
Water Level:			1.613	294.285		
Other:						

Closing Error	0.001
WL Check	0.001

Average WL	294.285
Transducer Elevation Before	294.486
Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	11-Jan-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	11-Jan-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	22-Jan-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

<b>General Notes:</b>

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: February 6, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.458	-
Water (°C):	-2.0	-
Air Temp (°C):	-19.7	-
RH (%):	80.8%	-
Precipitation (mm):	29.90	-
Battery (Main):	13.7	-
Datalogger Clock:	10:58	-
Laptop Clock:	10:59	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	10:50
End Time (MST):	11:30
Station Condition:	Good
Weather:	Partly Cloudy, -20°C

**Datalogger / Station Notes:**

- Antifreeze in Geonor is good
- PT appears frozen

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01	1.121	295.986		294.865	294.865	Rod Beside Station
L1-02			0.948	295.038	295.036	3/4" Pipe 20 m W of station
L1-03			1.322	294.664	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			1.685	294.301		
Water Level:			1.673	294.313		
Other:						
<b>Setup #2</b>						
L1-01			1.064	294.866	294.865	Rod Beside Station
L1-02	0.892	295.93		295.038	295.036	3/4" Pipe 20 m W of station
L1-03			1.266	294.664	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			1.628	294.302		
Water Level:			1.619	294.311		
Other:						

Closing Error	-0.001
WL Check	0.002

Average WL	294.312
Transducer Elevation Before	293.854
Transducer Elevation After	-

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	6-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	6-Feb-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

- 25 m from shore depth 60 cm
- 50 m from shore depth is 90 cm

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: February 25, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.311	-
Water (°C):	-1.2	-
Air Temp (°C):	-5.2	-
RH (%):	71.5%	-
Precipitation (mm):	38.29	-
Battery (Main):	15.0	-
Datalogger Clock:	13:29	-
Laptop Clock:	13:31	-
Enclosure Dessicant	Good	
Logger# (if Δ):	9631	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	13:30
End Time (MST):	13:50
Station Condition:	Good
Weather:	Clear, calm

**Datalogger / Station Notes:**

- Geanor antifreeze is good

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01	1.268	296.133		294.865	294.865	Rod Beside Station
L1-02			1.100	295.033	295.036	3/4" Pipe 20m W of station
L1-03			1.473	294.660	294.664	3/4" Pipe 10m W of Station
Ice/PT:			1.795	294.338		
Water Level:			1.800	294.333		
Other:						
<b>Setup #2</b>						
L1-01			1.258	294.864	294.865	Rod Beside Station
L1-02	1.089	296.122		295.033	295.036	3/4" Pipe 20m W of station
L1-03			1.463	294.659	294.664	3/4" Pipe 10m W of Station
Ice/PT:			1.784	294.338		
Water Level:			1.792	294.330		
Other:						

Closing Error	0.001
WL Check	0.003

Average WL	294.332
Transducer Elevation Before	294.021
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	25-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	25-Feb-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: **March 27, 2013**



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.617	-
Water (°C):	-1.4	-
Air Temp (°C):	3.9	-
RH (%):	57.5%	-
Precipitation (mm):	58.60	-
Battery (Main):	14.6	-
Datalogger Clock:	13:23	-
Laptop Clock:	13:24	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

<b>Measurement Details:</b>	
Start Time (MST):	14:19
End Time (MST):	14:50
Station Condition:	Good
Weather:	Partially cloudy, 4°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01			1.490	294.865	294.865	Rod Beside Station
L1-02	1.319	296.355		295.036	295.036	3/4" Pipe 20 m W of station
L1-03			1.693	294.662	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			2.002	294.353		
Water Level:			2.003	294.352		
Other:						
<b>Setup #2</b>						
L1-01			1.481	294.865	294.865	Rod Beside Station
L1-02			1.311	295.035	295.036	3/4" Pipe 20 m W of station
L1-03	1.684	296.346		294.662	294.664	3/4" Pipe 10 m W of Station
Ice/PT:			1.993	294.353		
Water Level:			1.994	294.352		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	294.352
Transducer Elevation Before	293.735
Transducer Elevation After	-

<b>Field Personnel:</b>	CJ, XP	<b>Trip Date:</b>	27-Mar-13
<b>Data Entry Personnel:</b>	CJ, XP	<b>Date:</b>	27-Mar-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	8-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date:

May 12, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.147	-
Water (°C):	0.0	-
Air Temp (°C):	16.7	-
RH (%):	45.3%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.4	-
Datalogger Clock:	10:54	-
Laptop Clock:	10:56	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	10:30
End Time (MST):	11:30
Station Condition:	Good
Weather:	Overcast, calm

<b>Datalogger / Station Notes:</b>
- Adjusted antenna - Modem RSSI -92 - PT still frozen in pipe

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01			1.008	294.866	294.865	Rod Beside Station
L1-02			0.840	295.034	295.036	3/4" Pipe 20 m W of station
L1-03	1.210	295.874		294.664	294.664	3/4" Pipe 10 m W of Station
Ice/PT:						
Water Level:			1.429	294.445		
Other:						
<b>Setup #2</b>						
L1-01			0.988	294.863	294.865	Rod Beside Station
L1-02	0.817	295.851		295.034	295.036	3/4" Pipe 20 m W of station
L1-03			1.189	294.662	294.664	3/4" Pipe 10 m W of Station
Ice/PT:						
Water Level:			1.409	294.442		
Other:						

Closing Error	0.002
WL Check	0.003

Average WL	294.444
Transducer Elevation Before	294.297
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	12-May-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	12-May-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	26-May-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

<b>General Notes:</b>
- There are puddles of water in S35 but no flow. - Next visit replace old datalogger box and install Campbell Scientific datalogger box. - 60% ice/sluch cover



# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: June 14, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.643	-
Water (°C):	13.4	-
Air Temp (°C):	15.5	-
RH (%):	83.9%	-
Precipitation (mm):	134.19	-
Battery (Main):	14.4	-
Datalogger Clock:	11:23	-
Laptop Clock:	11:23	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	11:20
End Time (MST):	11:45
Station Condition:	Good
Weather:	Partly Cloudy, 20°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L1-01			0.957	294.865	294.865	Rod Beside Station
L1-02	0.786	295.822		295.036	295.036	3/4" Pipe 20 m W of station
L1-03			1.159	294.663	294.664	3/4" Pipe 10 m W of Station
Ice/PT:						
Water Level:			1.267	294.555		
Other:						
<b>Setup #2</b>						
L1-01			0.941	294.864	294.865	Rod Beside Station
L1-02			0.769	295.036	295.036	3/4" Pipe 20 m W of station
L1-03	1.142	295.805		294.663	294.664	3/4" Pipe 10 m W of Station
Ice/PT:						
Water Level:			1.248	294.557		
Other:						

Closing Error	0.000
WL Check	0.002

Average WL	294.556
Transducer Elevation Before	293.913
Transducer Elevation After	-

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	14-Jun-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	14-Jun-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	25-Jun-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: August 13, 2013



Datalogger Details:	Before	After
Transducer Reading (m):	0.629	0.659
Water (°C):	20.2	22.7
Air Temp (°C):	17.7	23.23
RH (%):	74.6%	64.8
Precipitation (mm):	235.603	104.34
Battery (Main):	13.1	13.7
Datalogger Clock:	7:51	10:41
Laptop Clock:	7:53	10:40
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	268456	298677
Vent Tube Dessicant	Replaced	

Measurement Details:	
Start Time (MST):	7:45
End Time (MST):	10:50
Station Condition:	Good
Weather:	Sunny, 22°C

**Datalogger / Station Notes:**

- Installed Pluvio
- Bring a bucket to empty the geonor next trip
- Geonor left at L1, remove next trip
- Installed a 45m PLS and Junction Box
- Needs enclosure for Junction Box
- Returned Aug 14, 2013 at 11:45
- Installed a junction box enclosure
- Poured geonor fluid in a bucket and left at the station for removal in the future

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L1-01	1.884	296.749		294.865	294.865	Rod Beside Station	L1-01
L1-02			1.713	295.036	295.036	3/4" Pipe 20 m W of station	L1-02
L1-03			2.087	294.662	294.664	3/4" Pipe 10 m W of Station	L1-03
Ice/PT:							WL
Water Level:			2.201	294.548			WL
Other:							L1-03
<b>Setup #2</b>							L1-02
L1-01			1.874	294.867	294.865	Rod Beside Station	L1-01
L1-02	1.705	296.741		295.036	295.036	3/4" Pipe 20 m W of station	
L1-03			2.079	294.662	294.664	3/4" Pipe 10 m W of Station	
Ice/PT:							
Water Level:			2.193	294.548			
Other:							

START  
↓  
END

Closing Error	-0.002
WL Check	0.000

Average WL	294.548
Transducer Elevation Before	293.919
Transducer Elevation After	293.889

(must close survey loop on survey starting point)

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	13-Aug-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	13-Aug-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	22-Aug-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

**General Notes:**

- No flow at S35

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: September 15, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.582	-
Water (°C):	17.6	-
Air Temp (°C):	26.2	-
RH (%):	32.1%	-
Precipitation (mm):	36.50	-
Battery (Main):	14.0	-
Datalogger Clock:	14:48	-
Laptop Clock:	14:48	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:40
End Time (MST):	15:25
Station Condition:	Good
Weather:	Clear, windy, 20°C

**Datalogger / Station Notes:**

- Solar panel was hanging crooked, repositioned and reattached one of the corners to the fence.

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L1-01	1.846	296.711		294.865	294.865	Rod Beside Station	L1-01
L1-02			1.677	295.034	295.036	3/4" Pipe 20 m W of station	L1-02
L1-03			2.049	294.662	294.664	3/4" Pipe 10 m W of Station	L1-03
Ice/PT:							WL
Water Level:			2.236	294.475			WL
Other:							L1-03
<b>Setup #2</b>							L1-02
L1-01			1.837	294.865	294.865	Rod Beside Station	L1-01
L1-02	1.668	296.702		295.034	295.036	3/4" Pipe 20 m W of station	
L1-03			2.041	294.661	294.664	3/4" Pipe 10 m W of Station	
Ice/PT:							
Water Level:			2.225	294.477			
Other:							

START  
↓  
END

Closing Error	0.000
WL Check	0.002

Average WL	294.476
Transducer Elevation Before	293.894
Transducer Elevation After	-

(must close survey loop on survey starting point)

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	15-Sep-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	15-Sep-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	16-Sep-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

- 6 inch waves on lake  
- Removed old geonor and antifreeze

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: October 18, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.638	-
Water (°C):	7.1	-
Air Temp (°C):	7.8	-
RH (%):	72.6%	-
Precipitation (mm):	0.00	-
Battery (Main):	13.5	-
Datalogger Clock:	13:39	-
Laptop Clock:	13:41	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

<b>Measurement Details:</b>	
Start Time (MST):	13:35
End Time (MST):	14:15
Station Condition:	Good
Weather:	Overcast, calm

**Datalogger / Station Notes:**

- Emptied Pluvio
- Added antifreeze and oil to Pluvio
- Tested Pluvio 0.03 mm

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L1-01	1.941	296.806		294.865	294.865	Rod Beside Station	L1-01
L1-02			1.773	295.033	295.036	3/4" Pipe 20 m W of station	L1-02
L1-03			2.146	294.660	294.664	3/4" Pipe 10 m W of Station	L1-03
Ice/PT:							WL
Water Level:			2.278	294.528		<b>Time WL Surveyed:</b> 14:07	WL
Other:							L1-03
<b>Setup #2</b>							L1-02
L1-01			1.922	294.864	294.865	Rod Beside Station	L1-01
L1-02	1.753	296.786		295.033	295.036	3/4" Pipe 20 m W of station	
L1-03			2.126	294.660	294.664	3/4" Pipe 10 m W of Station	
Ice/PT:							
Water Level:			2.259	294.527		<b>Time WL Surveyed:</b> 14:09	
Other:							

START  
↓  
END

Closing Error	0.001
WL Check	0.001

Average WL	294.528
Transducer Elevation Before	293.890
Transducer Elevation After	-

(must close survey loop on survey starting point)

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	18-Oct-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	18-Oct-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	28-Oct-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: December 11, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.650	-
Water (°C):	0.1	-
Air Temp (°C):	-26.3	-
RH (%):	75.3%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.9	-
Datalogger Clock:	15:11	-
Laptop Clock:	15:11	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:07
End Time (MST):	15:40
Station Condition:	Good
Weather:	Clear, -25°C

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L1-01	1.301	296.166		294.865	294.865	Rod Beside Station	L1-01
L1-02			1.117	295.049	295.036	3/4" Pipe 20 m W of station	L1-02
L1-03			1.508	294.658	294.664	3/4" Pipe 10 m W of Station	L1-03
Ice/PT:			1.586	294.580			WL
Water Level:			1.616	294.550			Ice
Other:							Ice
<b>Setup #2</b>							WL
L1-01			1.268	294.865	294.865	Rod Beside Station	L1-03
L1-02			1.093	295.040	295.036	3/4" Pipe 20 m W of station	L1-02
L1-03	1.475	296.133		294.658	294.664	3/4" Pipe 10 m W of Station	L1-01
Ice/PT:			1.551	294.582			
Water Level:			1.584	294.549			
Other:							
						<b>Time WL Surveyed:</b>	15:18
						<b>Time WL Surveyed:</b>	15:22
						<b>Average WL</b>	294.550
						<b>Transducer Elevation Before</b>	293.900
						<b>Transducer Elevation After</b>	-

START  
↓  
END

**Datalogger / Station Notes:**

Closing Error	0.000
WL Check	0.001

Average WL	294.550
Transducer Elevation Before	293.900
Transducer Elevation After	-

(must close survey loop on survey starting point)

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	11-Dec-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Dec-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	17-Dec-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: January 16, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.18	-
Water (°C):	4.1	-
Air Temp (°C):	-20.7	-
RH (%):	75.7%	-
Precipitation (mm):	249.17	-
Battery (Main):	15.4	15.3
Datalogger Clock:	11:44	-
Laptop Clock:	11:45	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

<b>Measurement Details:</b>	
Start Time (MST):	11:40
End Time (MST):	12:40
Station Condition:	Good
Weather:	Clear, calm

**Datalogger / Station Notes:**

- Replaced battery

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L2-03			1.675	332.394	332.394	Pipe w/flagging south by trail
L2-04	0.843	334.069		333.226	333.226	Pipe with coupling by rebar
L2-05			1.272	332.797	332.798	Pipe w/flagging north of trail
Ice/PT:			2.25	331.819		
Water Level:			2.265	331.804		
Other:					333.324	Rebar w/flagging by trail
<b>Setup #2</b>						
L2-03	1.665	334.059		332.394	332.394	Pipe w/flagging south by trail
L2-04			0.832	333.227	333.226	Pipe with coupling by rebar
L2-05			1.261	332.798	332.798	Pipe w/flagging north of trail
Ice/PT:			2.244	331.815		
Water Level:			2.257	331.802		
Other:					333.324	Rebar w/flagging by trail

Closing Error	-0.001
WL Check	0.002

Average WL	331.803
Transducer Elevation Before	330.623
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	16-Jan-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	16-Jan-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: February 3, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.163	-
Water (°C):	3.8	-
Air Temp (°C):	-16.4	-
RH (%):	74.3%	-
Precipitation (mm):	0.00	-
Battery (Main):	15.2	13.7
Datalogger Clock:	2:33	-
Laptop Clock:	2:33	-
Enclosure Dessicant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:00
End Time (MST):	16:12
Station Condition:	Good
Weather:	Partial, calm, -15°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L2-03			1.81	332.393	332.394	Pipe w/flagging south by trail
L2-04	0.977	334.203	0.977	333.226	333.226	Pipe with coupling by rebar
L2-05			1.408	332.795	332.798	Pipe w/flagging north of trail
Ice/PT:			2.455	331.748		
Water Level:			2.45	331.753		
Other:					333.324	Rebar w/flagging by trail
<b>Setup #2</b>						
L2-03	1.795	334.188		332.393	332.394	Pipe w/flagging south by trail
L2-04			0.964	333.224	333.226	Pipe with coupling by rebar
L2-05			1.394	332.794	332.798	Pipe w/flagging north of trail
Ice/PT:			2.442	331.746		
Water Level:			2.433	331.755		
Other:					333.324	Rebar w/flagging by trail

Closing Error	0.002
WL Check	0.002

Average WL	331.754
Transducer Elevation Before	330.591
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	3-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	3-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	12-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: February 27, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.11	-
Water (°C):	3.5	-
Air Temp (°C):	-3.6	-
RH (%):	72.0%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.9	-
Datalogger Clock:	11:27	-
Laptop Clock:	11:28	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	97161	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

**Datalogger / Station Notes:**

<b>Measurement Details:</b>	
Start Time (MST):	11:30
End Time (MST):	12:20
Station Condition:	Good
Weather:	Light cloud , -3.5°C

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L2-03			1.927	332.397	332.394	Pipe w/flagging south by trail
L2-04	1.098	334.324		333.226	333.226	Pipe with coupling by rebar
L2-05			1.526	332.798	332.798	Pipe w/flagging north of trail
Ice/PT:			2.642	331.682		
Water Level:			2.6	331.724		
Other:					333.324	Rebar w/flagging by trail
<b>Setup #2</b>						
L2-03			1.879	332.397	332.394	Pipe w/flagging south by trail
L2-04			1.049	333.227	333.226	Pipe with coupling by rebar
L2-05	1.478	334.276		332.798	332.798	Pipe w/flagging north of trail
Ice/PT:			2.595	331.681		
Water Level:			2.553	331.723		
Other:					333.324	Rebar w/flagging by trail

Closing Error	-0.001
WL Check	0.001

Average WL	331.724
Transducer Elevation Before	330.6135
Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	27-Feb-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	27-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**



# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: March 26, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.967	-
Water (°C):	3.1	-
Air Temp (°C):	1.6	-
RH (%):	30.4%	-
Precipitation (mm):	0.08	-
Battery (Main):	14.7	-
Datalogger Clock:	12:01	-
Laptop Clock:	12:02	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	11:59
End Time (MST):	12:49
Station Condition:	Good
Weather:	Sunny, 0°C

**Datalogger / Station Notes:**

- Geonor: 306 mm
- The bucket is approx. 3/4 full
- Need to empty next time

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L2-03			2.232	332.395	332.394	Pipe w/flagging south by trail
L2-04	1.401	334.627		333.226	333.226	Pipe with coupling by rebar
L2-05			1.829	332.798	332.798	Pipe w/flagging north of trail
Ice/PT:			2.945	331.682		
Water Level:			2.944	331.683		
Other:					333.324	Rebar w/flagging by trail
<b>Setup #2</b>						
L2-03			2.286	332.396	332.394	Pipe w/flagging south by trail
L2-04			1.455	333.227	333.226	Pipe with coupling by rebar
L2-05	1.884	334.682		332.798	332.798	Pipe w/flagging north of trail
Ice/PT:			3	331.682		
Water Level:			2.998	331.684		
Other:					333.324	Rebar w/flagging by trail

Closing Error	-0.001
WL Check	0.001

Average WL	331.684
Transducer Elevation Before	330.717
Transducer Elevation After	-

<b>Field Personnel:</b>	XP, CJ	<b>Trip Date:</b>	26-Mar-13
<b>Data Entry Personnel:</b>	XP	<b>Date:</b>	26-Mar-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: May 2, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.092	-
Water (°C):	2.8	-
Air Temp (°C):	15.3	-
RH (%):	31.0%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.3	-
Datalogger Clock:	15:10	-
Laptop Clock:	15:10	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:10
End Time (MST):	15:20
Station Condition:	Good
Weather:	Clear, breezy

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L2-03					332.394	Pipe w/flagging south by trail
L2-04					333.226	Pipe with coupling by rebar
L2-05					332.798	Pipe w/flagging north of trail
Ice/PT:						
Water Level:						
Other:					333.324	Rebar w/flagging by trail
<b>Setup #2</b>						
L2-03					332.394	Pipe w/flagging south by trail
L2-04					333.226	Pipe with coupling by rebar
L2-05					332.798	Pipe w/flagging north of trail
Ice/PT:						
Water Level:						
Other:					333.324	Rebar w/flagging by trail

Closing Error	-
WL Check	-

Average WL	-
Transducer Elevation Before	-
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-May-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-May-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	21-May-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

- No water level survey due to full ice cover on lake

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: June 11, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.547	1.562
Water (°C):	10.9	12.6
Air Temp (°C):	9.9	-
RH (%):	89.9%	-
Precipitation (mm):	0.82	-
Battery (Main):	14.5	-
Datalogger Clock:	11:06	12:01
Laptop Clock:	11:06	12:01
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	284720	262388
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	11:00
End Time (MST):	12:00
Station Condition:	Good
Weather:	Cloudy, breezy, 10°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L2-03	1.53	333.924		332.394	332.394	Pipe w/flagging south by trail	L2-03
L2-04			0.698	333.226	333.226	Pipe with coupling by rebar	L2-04
L2-05			1.129	332.795	332.798	Pipe w/flagging north of trail	L2-05
Ice/PT:							WL
Water Level:			1.663	332.261	<b>Time WL Surveyed:</b> 11:55		Ice
Other:					333.324	Rebar w/flagging by trail	Ice
<b>Setup #2</b>							WL
L2-03			1.517	332.394	332.394	Pipe w/flagging south by trail	L2-05
L2-04	0.685	333.911		333.226	333.226	Pipe with coupling by rebar	L2-04
L2-05			1.113	332.798	332.798	Pipe w/flagging north of trail	L2-03
Ice/PT:							
Water Level:			1.649	332.262	<b>Time WL Surveyed:</b> 11:56		
Other:					333.324	Rebar w/flagging by trail	

START  
↓  
END

(must close survey loop on survey starting point)

Closing Error	0.000
WL Check	0.001

Average WL	332.262
Transducer Elevation Before	330.715
Transducer Elevation After	330.700

<b>Field Personnel:</b>	SG, CJ	<b>Trip Date:</b>	11-Jun-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Jun-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	17-Jun-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: August 18, 2013



Datalogger Details:	Before	After
Transducer Reading (m):	1.27	-
Water (°C):	14.6	-
Air Temp (°C):	24.7	-
RH (%):	38.1%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.1	-
Datalogger Clock:	11:21	-
Laptop Clock:	11:23	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

Measurement Details:	
Start Time (MST):	11:10
End Time (MST):	11:50
Station Condition:	Good
Weather:	Clear, light breeze, 25°C

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L2-03			1.588	332.393	332.394	Pipe w/flagging south by trail	L2-03
L2-04	0.755	333.981		333.226	333.226	Pipe with coupling by rebar	L2-04
L2-05			1.183	332.798	332.798	Pipe w/flagging north of trail	L2-05
Ice/PT:							WL
Water Level:			2.071	331.910			Ice
Other:					333.324	Rebar w/flagging by trail	Ice
<b>Setup #2</b>							WL
L2-03			1.582	332.394	332.394	Pipe w/flagging south by trail	L2-05
L2-04			0.749	333.227	333.226	Pipe with coupling by rebar	L2-04
L2-05	1.178	333.976		332.798	332.798	Pipe w/flagging north of trail	L2-03
Ice/PT:							
Water Level:			2.068	331.908			
Other:					333.324	Rebar w/flagging by trail	

START  
↓  
END

Datalogger / Station Notes:

(must close survey loop on survey starting point)

Closing Error	-0.001
WL Check	0.002

Average WL	331.909
Transducer Elevation Before	330.639
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	18-Aug-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	18-Aug-13
<b>Data Check Personnel:</b>	C.J	<b>Date:</b>	23-Aug-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: September 19, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.171	0.916
Water (°C):	14.3	13.8
Air Temp (°C):	9.7	-
RH (%):	69.3%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.6	14.4
Datalogger Clock:	12:31	13:34
Laptop Clock:	12:32	13:34
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	262388	304012
Vent Tube Dessicant	Replaced	

<b>Measurement Details:</b>	
Start Time (MST):	12:30
End Time (MST):	13:45
Station Condition:	Good
Weather:	Clear, breezy

**Datalogger / Station Notes:**

- Tested Geonor 2.5 mm
- Changed BM tags
- Changed PT

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L2-03	1.287	333.681		332.394	332.394	Pipe w/flagging south by trail	L2-03
L2-04			0.454	333.227	333.226	Pipe with coupling by rebar	L2-04
L2-05			0.884	332.797	332.798	Pipe w/flagging north of trail	L2-05
Ice/PT:							WL
Water Level:			1.846	331.835	<b>Time WL Surveyed:</b> 13:18		Ice
Other:					333.324	Rebar w/flagging by trail	Ice
<b>Setup #2</b>							
L2-03			1.268	332.393	332.394	Pipe w/flagging south by trail	L2-05
L2-04	0.434	333.661		333.227	333.226	Pipe with coupling by rebar	L2-04
L2-05			0.864	332.797	332.798	Pipe w/flagging north of trail	L2-03
Ice/PT:							
Water Level:			1.824	331.837	<b>Time WL Surveyed:</b> 13:20		
Other:					333.324	Rebar w/flagging by trail	

START  
↓  
END

(must close survey loop on survey starting point)

Closing Error	0.001
WL Check	0.002

Average WL	331.836
Transducer Elevation Before	330.665
Transducer Elevation After	330.920

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	19-Sep-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	19-Sep-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	26-Sep-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: October 27, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.022	-
Water (°C):	8.7	-
Air Temp (°C):	-5.2	-
RH (%):	61.3%	-
Precipitation (mm):	214.08	72.520
Battery (Main):	14.9	-
Datalogger Clock:	12:11	-
Laptop Clock:	12:12	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	12:10
End Time (MST):	12:34
Station Condition:	Good
Weather:	Clear, light breeze

**Datalogger / Station Notes:**

- Replace temp/RH sensor for calibration in December
- Emptied Geonor, added antifreeze

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L2-03			1.268	332.393	332.394	Pipe w/flagging south by trail	L2-03
L2-04	0.435	333.661		333.226	333.226	Pipe with coupling by rebar	L2-04
L2-05			0.867	332.794	332.798	Pipe w/flagging north of trail	L2-05
Ice/PT:							WL
Water Level:			1.733	331.928	<b>Time WL Surveyed:</b> 12:18		Ice
Other:					333.324	Rebar w/flagging by trail	Ice
<b>Setup #2</b>							WL
L2-03	1.254	333.647		332.393	332.394	Pipe w/flagging south by trail	L2-05
L2-04			0.423	333.224	333.226	Pipe with coupling by rebar	L2-04
L2-05			0.853	332.794	332.798	Pipe w/flagging north of trail	L2-03
Ice/PT:							
Water Level:			1.719	331.928	<b>Time WL Surveyed:</b> 12:19		
Other:					333.324	Rebar w/flagging by trail	

START  
↓  
END

Closing Error	0.002
WL Check	0.000

Average WL	331.928
Transducer Elevation Before	330.906
Transducer Elevation After	-

(must close survey loop on survey starting point)

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	27-Oct-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	27-Oct-13
<b>Data Check Personnel:</b>	C,J	<b>Date:</b>	4-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: December 2, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.953	-
Water (°C):	4.7	-
Air Temp (°C):	-12.8	-
RH (%):	84.1%	-
Precipitation (mm):	0.00	-
Battery (Main):	14.0	-
Datalogger Clock:	13:41	-
Laptop Clock:	13:42	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	13:41
End Time (MST):	14:00
Station Condition:	Good
Weather:	Snowing, windy

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L2-03			1.206	332.395	332.394	Pipe w/flagging south by trail	L2-03
L2-04	0.375	333.601		333.226	333.226	Pipe with coupling by rebar	L2-04
L2-05			0.804	332.797	332.798	Pipe w/flagging north of trail	L2-05
Ice/PT:			1.735	331.866			WL
Water Level:			1.745	331.856			Ice
Other:					333.324	Rebar w/flagging by trail	Ice
<b>Setup #2</b>							WL
L2-03			1.171	332.396	332.394	Pipe w/flagging south by trail	L2-05
L2-04			0.34	333.227	333.226	Pipe with coupling by rebar	L2-04
L2-05	0.77	333.567		332.797	332.798	Pipe w/flagging north of trail	L2-03
Ice/PT:			1.71	331.857			
Water Level:			1.708	331.859			
Other:					333.324	Rebar w/flagging by trail	

START  
↓  
END

**Datalogger / Station Notes:**  
- Add antifreeze to geonor next visit.

Closing Error	-0.001
WL Check	0.003

Average WL	331.858
Transducer Elevation Before	330.905
Transducer Elevation After	-

(must close survey loop on survey starting point)

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Dec-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Dec-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	31-Mar-14
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: January 30, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.065	-
Water (°C):	3.1	-
Battery (Main):	13.5	-
Datalogger Clock:	16:06	-
Laptop Clock:	16:05	-
Enclosure Dessicant	Good	
Logger# (if Δ):	18204	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	16:00
End Time (MST):	16:30
Station Condition:	Good
Weather:	Clear, calm, -25°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L3-05	0.885	236.422		235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06			1.798	234.624	234.619	3/4" Pipe 30 m S of data logger
L3-07					235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.774	233.648		
Water Level:			2.77	233.652		
Other:					234.506	Rebar
<b>Setup #2</b>						
L3-05			0.873	235.536	235.537	3/4" Pipe 35 m SE of data logger
L3-06	1.785	236.409		234.624	234.619	3/4" Pipe 30 m S of data logger
L3-07					235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.763	233.646		
Water Level:			2.76	233.649		
Other:					234.506	Rebar

Closing Error	0.001
WL Check	0.003

Average WL	233.651
Transducer Elevation Before	232.5855
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Jan-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	30-Jan-13
<b>Data Check Personnel:</b>	C.I	<b>Date:</b>	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

- Appears BM stakes have been moved. Crew could not locate BM.  
1 update BM ID on field sheets.



# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: February 24, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.091	-
Water (°C):	2.7	-
Battery (Main):	14.7	-
Datalogger Clock:	10:36	-
Laptop Clock:	10:36	-
Enclosure Dessicant	Good	
Logger# (if Δ):	18204	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	10:24
End Time (MST):	11:00
Station Condition:	Good
Weather:	Overcast, calm, -8°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L3-05	0.998	236.535		235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06			1.911	234.624	234.619	3/4" Pipe 30 m S of data logger
L3-07			1.155	235.380	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.887	233.648		
Water Level:			2.875	233.660		
Other:					234.506	Rebar
<b>Setup #2</b>						
L3-05			0.985	235.536	235.537	3/4" Pipe 35 m SE of data logger
L3-06	1.897	236.521		234.624	234.619	3/4" Pipe 30 m S of data logger
L3-07			1.143	235.378	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.874	233.647		
Water Level:			2.862	233.659		
Other:					234.506	Rebar

Closing Error	0.001
WL Check	0.001

Average WL	233.660
Transducer Elevation Before	232.5685
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	24-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	24-Feb-13
<b>Data Check Personnel:</b>	C.I	<b>Date:</b>	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: March 11, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.066	-
Water (°C):	2.5	-
Battery (Main):	14.6	-
Datalogger Clock:	14:16	-
Laptop Clock:	14:15	-
Enclosure Dessicant	Good	
Logger# (if Δ):	18204	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:15
End Time (MST):	14:40
Station Condition:	Good
Weather:	P. Cloudy, calm, -1°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L3-05	0.988	236.525		235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06			1.899	234.626	234.619	3/4" Pipe 30 m S of data logger
L3-07			1.145	235.380	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.848	233.677		
Water Level:			2.863	233.662		
Other:					234.506	Rebar
<b>Setup #2</b>						
L3-05			0.902	235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06	1.813	236.439		234.626	234.619	3/4" Pipe 30 m S of data logger
L3-07			1.059	235.380	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.762	233.677		
Water Level:			2.778	233.661		
Other:					234.506	Rebar

Closing Error	0.000
WL Check	0.001

Average WL	233.662
Transducer Elevation Before	232.5955
Transducer Elevation After	-

<b>Field Personnel:</b>	TR and EL	<b>Trip Date:</b>	11-Mar-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	11-Mar-13
<b>Data Check Personnel:</b>	C.I	<b>Date:</b>	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: March 29, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.103	-
Water (°C):	2.3	-
Battery (Main):	14.4	-
Datalogger Clock:	1:52	-
Laptop Clock:	1:51	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:40
End Time (MST):	15:45
Station Condition:	Good
Weather:	Partial, 5°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L3-05	0.944	236.481		235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06					234.619	3/4" Pipe 30 m S of data logger
L3-07			1.098	235.383	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.809	233.672		
Water Level:			2.815	233.666		
Other:					234.506	Rebar
<b>Setup #2</b>						
L3-05			0.93	235.538	235.537	3/4" Pipe 35 m SE of data logger
L3-06					234.619	3/4" Pipe 30 m S of data logger
L3-07	1.085	236.468		235.383	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:			2.798	233.670		
Water Level:			2.800	233.668		
Other:					234.506	Rebar

Closing Error	-0.001
WL Check	0.002

Average WL	233.667
Transducer Elevation Before	232.564
Transducer Elevation After	-

<b>Field Personnel:</b>	CJ, XP	<b>Trip Date:</b>	29-Mar-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	29-Mar-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: May 13, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.199	-
Water (°C):	4.3	-
Battery (Main):	13.7	-
Datalogger Clock:	16:36	-
Laptop Clock:	16:36	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	18204	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	16:33
End Time (MST):	16:53
Station Condition:	Good
Weather:	Clear. Breezy, 18°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L3-05	0.669	236.206		235.537	235.537	3/4" Pipe 35 m SE of data logger
L3-06			1.578	234.628	234.619	3/4" Pipe 30 m S of data logger
L3-07			0.825	235.381	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:						
Water Level:			2.425	233.781		
Other:					234.506	Rebar
<b>Setup #2</b>						
L3-05			0.656	235.538	235.537	3/4" Pipe 35 m SE of data logger
L3-06	1.566	236.194		234.628	234.619	3/4" Pipe 30 m S of data logger
L3-07			0.812	235.382	235.380	3/4" Pipe 35 m S of data logger
Ice/PT:						
Water Level:			2.411	233.783		
Other:					234.506	Rebar

Closing Error	-0.001
WL Check	0.002

Average WL	233.782
Transducer Elevation Before	232.583
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	13-May-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	13-May-13
<b>Data Check Personnel:</b>	C.I	<b>Date:</b>	21-May-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

**General Notes:**

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: June 12, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.238	-
Water (°C):	10.6	-
Battery (Main):	14.3	-
Datalogger Clock:	3:18	-
Laptop Clock:	3:18	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:10
End Time (MST):	15:40
Station Condition:	Good
Weather:	Rain, 8°C

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L3-05	0.768	236.305		235.537	235.537	3/4" Pipe 35 m SE of data logger	L3-05
L3-06			1.678	234.627	234.619	3/4" Pipe 30 m S of data logger	L3-06
L3-07			0.923	235.382	235.380	3/4" Pipe 35 m S of data logger	L3-07
Ice/PT:			0.475	235.830		Lag bolt in tree	L3-02
Water Level:			2.484	233.821	<b>Time WL Surveyed:</b> 15:35		L3-03
Other:			1.801	234.504	234.506	Rebar	WL
<b>Setup #2</b>							WL
L3-05			0.759	235.536	235.537	3/4" Pipe 35 m SE of data logger	L3-03
L3-06			1.672	234.623	234.619	3/4" Pipe 30 m S of data logger	L3-02
L3-07	0.913	236.295		235.382	235.380	3/4" Pipe 35 m S of data logger	L3-07
Ice/PT:			0.466	235.829			L3-06
Water Level:			2.475	233.820	<b>Time WL Surveyed:</b> 15:36		L3-05
Other:			1.793	234.502	234.506	Rebar	

START  
 ↓  
 END

Closing Error	0.001
WL Check	0.001

Average WL	233.821
Transducer Elevation Before	232.5825
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SG, CJ	<b>Trip Date:</b>	12-Jun-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Jun-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	17-Jun-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: August 19, 2013



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.244	1.366
Water (°C):	19.8	19.8
Battery (Main):	13.6	13.7
Datalogger Clock:	5:16	5:44
Laptop Clock:	5:16	5:44
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	248902
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	17:10
End Time (MST):	18:00
Station Condition:	Good
Weather:	Clear, windy, 24°C

**Datalogger / Station Notes:**  
 - Installed PLS s/n: 248902

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L3-05	0.897	236.434		235.537	235.537	3/4" Pipe 35 m SE of data logger	L3-05
L3-06			1.706	234.728	234.619	3/4" Pipe 30 m S of data logger	L3-06
L3-07			0.952	235.482	235.380	3/4" Pipe 35 m S of data logger	L3-07
Ice/PT:							WL
Water Level:			2.477	233.957	<b>Time WL Surveyed:</b> 17:55		WL
Other:					234.506	Rebar	L3-07
<b>Setup #2</b>							L3-06
L3-05			0.882	235.536	235.537	3/4" Pipe 35 m SE of data logger	L3-05
L3-06			1.693	234.725	234.619	3/4" Pipe 30 m S of data logger	
L3-07	0.936	236.418		235.482	235.380	3/4" Pipe 35 m S of data logger	
Ice/PT:							
Water Level:			2.462	233.956	<b>Time WL Surveyed:</b> 17:57		
Other:					234.506	Rebar	

START  
 ↓  
 END

Closing Error	0.001
WL Check	0.001

Average WL	233.957
Transducer Elevation Before	232.7125
Transducer Elevation After	232.5905

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	19-Aug-13
<b>Data Entry Personnel:</b>	SM, DW	<b>Date:</b>	19-Aug-13
<b>Data Check Personnel:</b>	C.J	<b>Date:</b>	27-Aug-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: October 22, 2013



Datalogger Details:	Before	After
Transducer Reading (m):	1.408	-
Water (°C):	10.0	-
Battery (Main):	14.2	-
Datalogger Clock:	14:48	-
Laptop Clock:	14:47	-
Enclosure Dessoricant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	248902	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	15:10
Station Condition:	Good
Weather:	Overcast, 10°C, calm

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L3-05	0.712	236.249		235.537	235.537	3/4" Pipe 35 m S of data logger	L3-05
L3-06			1.62	234.629	234.619	3/4" Pipe 30 m S of data logger	L3-06
L3-07			0.867	235.382	235.380	3/4" Pipe 35 m SE of data logger	L3-07
Ice/PT:							WL
Water Level:			2.344	233.905	<b>Time WL Surveyed:</b> 14:53		WL
Other:					234.506	Rebar	L3-07
<b>Setup #2</b>							L3-06
L3-05			0.7	235.537	235.537	3/4" Pipe 35 m S of data logger	L3-05
L3-06	1.608	236.237		234.629	234.619	3/4" Pipe 30 m S of data logger	
L3-07			0.856	235.381	235.380	3/4" Pipe 35 m SE of data logger	
Ice/PT:							
Water Level:			2.332	233.905	<b>Time WL Surveyed:</b> 14:54		
Other:					234.506	Rebar	

START  
↓  
END

Closing Error	0.000
WL Check	0.000

Average WL	233.905
Transducer Elevation Before	232.497
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	22-Oct-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	22-Oct-13
<b>Data Check Personnel:</b>	C.J	<b>Date:</b>	4-Nov-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: December 7, 2013



Datalogger Details:	Before	After
Transducer Reading (m):	1.298	-
Water (°C):	5.3	-
Battery (Main):	13.0	-
Datalogger Clock:	15:32	-
Laptop Clock:	15:32	-
Enclosure Dessoricant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	15:35
Station Condition:	Good
Weather:	Clear, -20°C

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L3-05	0.05	235.587		235.537	235.537	3/4" Pipe 35 m SE of data logger	L3-05
L3-06			0.954	234.633	234.619	3/4" Pipe 30 m S of data logger	L3-06
L3-07			0.204	235.383	235.380	3/4" Pipe 35 m S of data logger	L3-07
Ice/PT:			1.788	233.799			WL
Water Level:			1.79	233.797	<b>Time WL Surveyed:</b>	15:22	Ice
Other:					234.506	Rebar	Ice
<b>Setup #2</b>							WL
L3-05			0.024	235.538	235.537	3/4" Pipe 35 m SE of data logger	L3-07
L3-06	0.929	235.562		234.633	234.619	3/4" Pipe 30 m S of data logger	L3-06
L3-07			0.18	235.382	235.380	3/4" Pipe 35 m S of data logger	L3-05
Ice/PT:			1.762	233.800			
Water Level:			1.762	233.800	<b>Time WL Surveyed:</b>	15:24	
Other:					234.506	Rebar	

START  
↓  
END

Closing Error	-0.001
WL Check	0.003

Average WL	233.799
Transducer Elevation Before	232.501
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	DB, CJ	<b>Trip Date:</b>	7-Dec-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	7-Dec-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	31-Mar-14
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	



# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Winter Flow): 404287 E, 6372528 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: January 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.40	0.00	0.00	0.000	0.000	0.000	0.9	4.40	4.50	0.10	0.07	0.001	0.001	0.01	0.000	0%
1	4.60	0.26		0.004			0.9	4.50	4.78	0.28	0.26	0.004	0.004	0.07	0.000	0%
2	4.95	0.20		0.327			0.9	4.50	5.00	0.23	0.20	0.327	0.294	0.04	0.013	9%
3	5.05	0.23		0.420			0.9	5.00	5.13	0.13	0.23	0.420	0.378	0.03	0.011	7%
4	5.20	0.26		0.360			0.9	5.13	5.33	0.20	0.26	0.360	0.324	0.05	0.017	11%
5	5.45	0.12	0.02	0.032			0.9	5.33	5.53	0.20	0.10	0.032	0.029	0.02	0.001	0%
6	5.60	0.15	0.02	-0.002			0.9	5.53	5.75	0.23	0.13	-0.002	-0.002	0.03	0.000	0%
7	5.90	0.10	0.01	0.011			0.9	5.75	6.10	0.35	0.09	0.011	0.010	0.03	0.000	0%
8	6.30	0.21	0.02	0.041			0.9	6.10	6.40	0.30	0.19	0.041	0.037	0.06	0.002	1%
9	6.50	0.11	0.06	0.399			0.9	6.40	6.58	0.18	0.05	0.399	0.359	0.01	0.003	2%
10	6.65	0.22	0.02	0.417			0.9	6.58	6.78	0.20	0.20	0.417	0.375	0.04	0.015	10%
11	6.90	0.17		0.232			0.9	6.78	6.98	0.20	0.17	0.232	0.209	0.03	0.007	5%
12	7.05	0.25	0.03	0.451			0.9	6.98	7.13	0.15	0.22	0.451	0.406	0.03	0.013	9%
13	7.20	0.27		0.133			0.9	7.13	7.35	0.23	0.27	0.133	0.120	0.06	0.007	5%
14	7.50	0.24	0.04	0.166			0.9	7.35	7.63	0.28	0.20	0.166	0.149	0.06	0.008	5%
15	7.75	0.23	0.10	0.407			0.9	7.63	7.90	0.28	0.13	0.407	0.366	0.04	0.013	9%
16	8.05	0.16	0.03	0.329			0.9	7.90	8.20	0.30	0.13	0.329	0.296	0.04	0.012	7%
17	8.35	0.23	0.05	0.282			0.9	8.20	8.48	0.28	0.18	0.282	0.254	0.05	0.013	8%
18	8.60	0.20	0.06	0.139			0.9	8.48	8.70	0.23	0.14	0.139	0.125	0.03	0.004	3%
19	8.80	0.25	0.07	0.029			0.9	8.70	8.95	0.25	0.18	0.029	0.026	0.05	0.001	1%
20	9.10	0.17	0.03	0.332			0.9	8.95	9.25	0.30	0.14	0.332	0.299	0.04	0.013	8%
LB	9.40	0.00	0.00	0.00	0.00	0.00	1.0	9.25	9.40	0.15	0.04	0.083	0.083	0.01	0.000	0%
<b>Total Flow</b>														<b>0.154</b>		

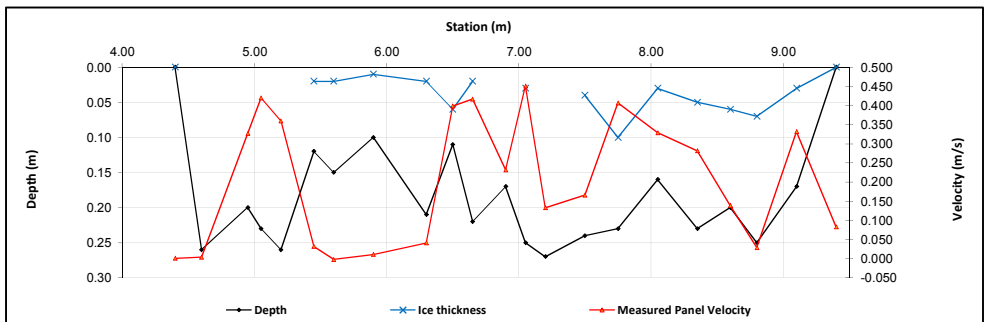
Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	13:35
Equipment:	ADV
Method:	Ice
Lake/River Condition:	Frozen
Quality/Error (see reverse):	Fair
Weather:	Partly sunny, -15°C

Flow characteristics:	
Total Flow:	0.154 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.82 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.164 (m)
Mean Velocity:	0.188 (m/s)
Froude Number:	0.148

Logger Details:		
	Before	After
Transducer Reading (m):	1.182	-
Water (°C):	0.8	-
Battery (Main):	12.3	12.85
Datalogger Clock:	11:40	-
Laptop Clock:	11:40	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
-	Added two batteries

General Notes:	
-	The ice is above the WL in some spots
-	No water was found upstream of the December measurement location so the measurement was taken approximately 4m downstream of the December measurement
-	Flow measurement was conducted at the "winter" site 404287 E, 6372528 N



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L4-01			0.934	100.003	100.000	3/4" Pipe 4 m NW of Station
L4-02	0.882	100.937		100.055	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.807	100.130	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			3.106	97.831		
Water Level:			3.109	97.828		
Other:						
<b>Setup #2</b>						
L4-01	0.926	100.929		100.003	100.000	3/4" Pipe 4 m NW of Station
L4-02			0.872	100.057	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.798	100.131	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			3.098	97.831		
Water Level:			3.101	97.828		
Other:						

Closing Error	-0.002	Average WL	97.828
WL Check	0.000	Transducer Elevation Before	96.646
		Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	Trip Date:	10-Jan-13
Data Entry Personnel:	DW, TR	Date:	10-Jan-13
Data Check Personnel:	DW	Date:	22-Jan-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: February 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	1.15	0.15	0.03	0.000	0.000	0.00	0.000	0%
1	1.30	0.25	0.15	0.000			1.0	1.15	1.43	0.28	0.10	0.000	0.000	0.03	0.000	0%
2	1.55	0.19	0.14	0.000			1.0	1.43	1.73	0.30	0.05	0.000	0.000	0.02	0.000	0%
3	1.90	0.20	0.10	0.187			0.9	1.73	2.00	0.28	0.10	0.187	0.168	0.03	0.005	23%
4	2.10	0.25	0.10	-0.001			0.9	2.00	2.18	0.18	0.15	-0.001	-0.001	0.03	0.000	0%
5	2.25	0.15	0.07	0.307			0.9	2.18	2.35	0.18	0.08	0.307	0.276	0.01	0.004	19%
6	2.45	0.25	0.10	0.129			0.9	2.35	2.53	0.18	0.15	0.129	0.116	0.03	0.003	15%
7	2.60	0.23	0.14	0.185			0.9	2.53	2.68	0.15	0.09	0.185	0.167	0.01	0.002	11%
8	2.75	0.27	0.15	0.207			0.9	2.68	2.80	0.13	0.12	0.207	0.186	0.02	0.003	14%
9	2.85	0.25	0.15	0.005			0.9	2.80	2.95	0.15	0.10	0.005	0.005	0.02	0.000	0%
10	3.05	0.20	0.13	-0.002			0.9	2.95	3.10	0.15	0.07	-0.002	-0.002	0.01	0.000	0%
11	3.15	0.20	0.15	0.143			0.9	3.10	3.28	0.18	0.05	0.143	0.129	0.01	0.001	5%
12	3.40	0.22	0.17	0.000			1.0	3.28	3.45	0.18	0.05	0.000	0.000	0.01	0.000	0%
13	3.50	0.20	0.15	0.000			1.0	3.45	3.58	0.13	0.05	0.000	0.000	0.01	0.000	0%
14	3.65	0.17	0.12	0.004			0.9	3.58	3.70	0.13	0.05	0.004	0.004	0.01	0.000	0%
15	3.75	0.25	0.20	0.126			0.9	3.70	3.95	0.25	0.05	0.126	0.113	0.01	0.001	7%
16	4.15	0.27	0.20	-0.020			0.9	3.95	4.20	0.25	0.07	-0.020	-0.018	0.02	0.000	-2%
17	4.25	0.26	0.20	0.000			1.0	4.20	4.40	0.20	0.06	0.000	0.000	0.01	0.000	0%
18	4.55	0.25	0.20	0.158			0.9	4.40	4.63	0.23	0.05	0.158	0.142	0.01	0.002	8%
19	4.70	0.25	0.20	-0.001			0.9	4.63	4.80	0.18	0.05	-0.001	-0.001	0.01	0.000	0%
LB	4.90	0.00	0.00	0.00	0.00	0.00	1.0	4.80	4.90	0.10	0.01	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.021</b>		

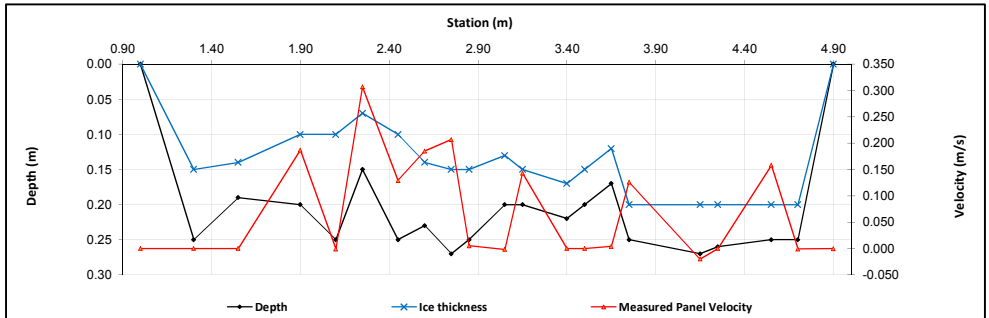
Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	16:35
Equipment:	ADV
Method:	Ice
Lake/River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	P.Cloudy, -10°C, Breezy

Flow characteristics:	
Total Flow:	0.021 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	0.29 (m <sup>2</sup> )
Wetted Width:	3.90 (m)
Hydraulic Depth:	0.074 (m)
Mean Velocity:	0.071 (m/s)
Froude Number:	0.084

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.213	-
Battery (Main):	0.9	-
Datalogger Clock:	13.0	-
Laptop Clock:	15:59	-
Enclosure Dessiccant:	15:58	-
Logger# (if Δ):	Good	-
PT# (if Δ):	20962	-
Vent Tube Dessiccant:	-	-
	Good	-

Datalogger / Station Notes:	

General Notes:	
- Very little water below the ice and slush is present	
- Flow measurement was conducted at the "winter" site 404287 E, 6372528 N	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
L4-01			0.763	99.999	100.000	3/4" Pipe 4 m NW of Station
L4-02	0.707	100.762		100.055	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.634	100.128	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			2.963	97.799		
Water Level:			2.903	97.859		
Other:						
<b>Setup #2</b>						
L4-01			0.713	100.000	100.000	3/4" Pipe 4 m NW of Station
L4-02			0.657	100.056	100.055	3/4" Pipe 5 m SE of Station
L4-03	0.585	100.713		100.128	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			2.913	97.800		
Water Level:			2.853	97.860		
Other:						

Closing Error	-0.001	Average WL	97.860
WL Check	0.001	Transducer Elevation Before	96.647
		Transducer Elevation After	-

Field Personnel:	TR, SM	Trip Date:	10-Feb-13
Data Entry Personnel:	TR	Date:	10-Feb-13
Data Check Personnel:	DW	Date:	12-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: March 11, 2013



Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.20	0.00	0.00	0.000	0.000	0.000	0.9	1.20	1.28	0.08	0.07	0.108	0.097	0.01	0.001	0%
1	1.35	0.29		0.433			0.9	1.28	1.50	0.23	0.29	0.433	0.390	0.07	0.025	11%
2	1.65	0.30		0.196			0.9	1.50	1.72	0.22	0.30	0.196	0.176	0.06	0.011	5%
3	1.78	0.23	0.04	0.444			0.9	1.72	1.92	0.20	0.19	0.444	0.400	0.04	0.015	7%
4	2.05	0.39	0.02	0.515			0.9	1.92	2.12	0.20	0.37	0.515	0.464	0.07	0.034	15%
5	2.18	0.30	0.05	0.526			0.9	2.12	2.27	0.15	0.25	0.526	0.473	0.04	0.018	8%
6	2.35	0.20	0.05	0.426			0.9	2.27	2.52	0.25	0.15	0.426	0.383	0.04	0.014	6%
7	2.68	0.30		0.305			0.9	2.52	2.73	0.22	0.30	0.305	0.275	0.06	0.018	8%
8	2.78	0.30		0.257			0.9	2.73	2.93	0.20	0.30	0.257	0.231	0.06	0.014	6%
9	3.08	0.30	0.00	0.174			0.9	2.93	3.21	0.28	0.30	0.174	0.157	0.08	0.013	6%
10	3.34	0.29	0.03	0.080			0.9	3.21	3.46	0.25	0.26	0.080	0.072	0.07	0.005	2%
11	3.58	0.30	0.15	-0.014			0.9	3.46	3.73	0.27	0.15	-0.014	-0.013	0.04	-0.001	0%
12	3.88	0.30	0.22	0.013			0.9	3.73	4.02	0.29	0.08	0.013	0.012	0.02	0.000	0%
13	4.16	0.31	0.23	0.243			0.9	4.02	4.28	0.26	0.08	0.243	0.219	0.02	0.005	2%
14	4.40	0.29	0.24	-0.001			0.9	4.28	4.53	0.25	0.05	-0.001	-0.001	0.01	0.000	0%
15	4.66	0.22	0.16	0.059			0.9	4.53	4.73	0.20	0.06	0.059	0.053	0.01	0.001	0%
16	4.80	0.29	0.14	0.122			0.9	4.73	4.94	0.21	0.15	0.122	0.110	0.03	0.003	1%
17	5.08	0.29	0.04	0.173			0.9	4.94	5.20	0.26	0.25	0.173	0.156	0.07	0.010	4%
18	5.32	0.24	0.02	0.142			0.9	5.20	5.48	0.28	0.22	0.142	0.128	0.06	0.008	3%
19	5.64	0.24	0.03	0.133			0.9	5.48	5.76	0.28	0.21	0.133	0.120	0.06	0.007	3%
20	5.88	0.20		0.477			0.9	5.76	6.00	0.24	0.20	0.477	0.429	0.05	0.021	9%
21	6.12	0.24		0.169			0.9	6.00	6.23	0.23	0.24	0.169	0.152	0.06	0.008	4%
22	6.34	0.19		-0.002			0.9	6.23	6.42	0.19	0.19	-0.002	-0.002	0.04	0.000	0%
LB	6.50	0.00	0.00	0.00	0.00	0.00	1.0	6.42	6.50	0.08	0.05	-0.001	-0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.231</b>	

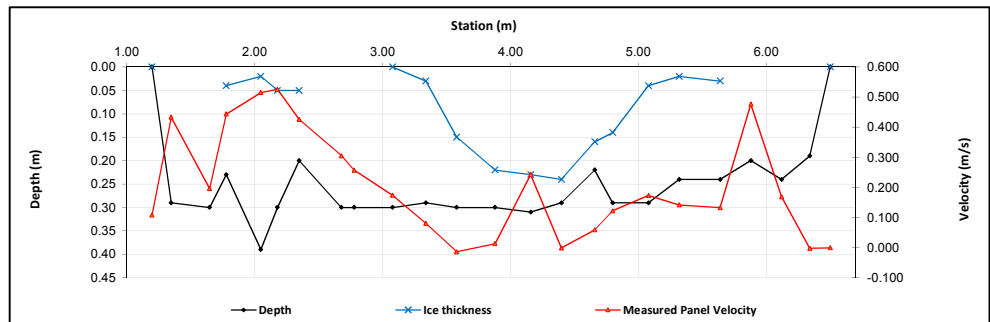
Measurement Details:	
Start Time (MST):	8:35
End Time (MST):	11:10
Equipment:	ADV
Method:	Ice
Lake/River Condition:	full ice
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, breezy, -8°C

Flow characteristics:		
Total Flow:	0.231	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.06	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.201	(m)
Mean Velocity:	0.217	(m/s)
Froude Number:	0.155	

Logger Details:		
	Before	After
Transducer Reading (m):	1.220	-
Water (°C):	0.8	-
Battery (Main):	12.9	-
Datalogger Clock:	8:42	-
Laptop Clock:	8:43	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	20962	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Flow measurement was conducted at the "winter" site 404287 E, 6372528 N	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
L4-01	0.709	100.709		100.000	100.000	3/4" Pipe 4 m NW of Station
L4-02			0.657	100.052	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.583	100.126	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			2.843	97.866		
Water Level:			2.849	97.860		
Other:						
<b>Setup #2</b>						
L4-01			0.748	99.998	100.000	3/4" Pipe 4 m NW of Station
L4-02	0.694	100.746		100.052	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.621	100.125	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			2.881	97.865		
Water Level:			2.889	97.857		
Other:						

Closing Error	0.002
WL Check	0.003

Average WL	97.859
Transducer Elevation Before	96.639
Transducer Elevation After	-

Field Personnel:	TR, BL	Trip Date:	11-Mar-13
Data Entry Personnel:	EL	Date:	11-Mar-13
Data Check Personnel:	DW	Date:	12-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: March 29, 2013

UTM Location (Winter Flow): 404287 E, 6372528 N

UTM Location (Flow): 402900 E, 6370580 N



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.00	0.00	0.00	0.000	0.000	0.000	0.9	0.00	0.38	0.38	0.07	0.078	0.070	0.03	0.002	1%
1	0.75	0.36	0.08	0.312			0.9	0.38	0.84	0.46	0.28	0.312	0.281	0.13	0.036	29%
2	0.92	0.38	0.20	0.292			0.9	0.84	1.04	0.20	0.18	0.292	0.263	0.04	0.009	8%
3	1.15	0.35	0.22	0.332			0.9	1.04	1.23	0.19	0.13	0.332	0.299	0.02	0.007	6%
4	1.30	0.45	0.25	0.302			0.9	1.23	1.35	0.13	0.20	0.302	0.272	0.03	0.007	6%
5	1.40	0.42	0.30	0.195			0.9	1.35	1.50	0.15	0.12	0.195	0.176	0.02	0.003	3%
6	1.60	0.40	0.30	0.197			0.9	1.50	1.70	0.20	0.10	0.197	0.177	0.02	0.004	3%
7	1.80	0.30	0.28	0.000			1.0	1.70	1.87	0.17	0.02	0.000	0.000	0.00	0.000	0%
8	1.94	0.30	0.28	0.287			0.9	1.87	2.05	0.18	0.02	0.287	0.258	0.00	0.001	1%
9	2.15	0.30	0.29	0.334			0.9	2.05	2.23	0.19	0.01	0.334	0.301	0.00	0.001	0%
10	2.31	0.30	0.29	0.001			0.9	2.23	2.42	0.19	0.01	0.001	0.001	0.00	0.000	0%
11	2.53	0.48	0.42	0.081			0.9	2.42	2.62	0.20	0.06	0.081	0.073	0.01	0.001	1%
12	2.71	0.35	0.32	-0.001			0.9	2.62	2.79	0.17	0.03	-0.001	-0.001	0.01	0.000	0%
13	2.87	0.38	0.30	0.205			0.9	2.79	2.94	0.15	0.08	0.205	0.185	0.01	0.002	2%
14	3.00	0.40	0.32	0.001			0.9	2.94	3.09	0.16	0.08	0.001	0.001	0.01	0.000	0%
15	3.18	0.30	0.29	0.045			0.9	3.09	3.27	0.18	0.01	0.045	0.041	0.00	0.000	0%
16	3.35	0.35	0.34	0.000			1.0	3.27	3.48	0.21	0.01	0.000	0.000	0.00	0.000	0%
17	3.60	0.50	0.30	0.374			0.9	3.48	3.67	0.20	0.20	0.374	0.337	0.04	0.013	11%
18	3.74	0.48	0.30	0.479			0.9	3.67	3.82	0.15	0.18	0.479	0.431	0.03	0.012	9%
19	3.90	0.50	0.30	0.523			0.9	3.82	3.98	0.16	0.20	0.523	0.471	0.03	0.015	12%
20	4.06	0.40	0.30	0.395			0.9	3.98	4.26	0.28	0.10	0.395	0.356	0.03	0.010	8%
RB	4.45	0.00	0.00	0.00	0.00	0.00	1.0	4.26	4.45	0.20	0.03	0.099	0.099	0.00	0.000	0%
<b>Total Flow</b>															<b>0.123</b>	

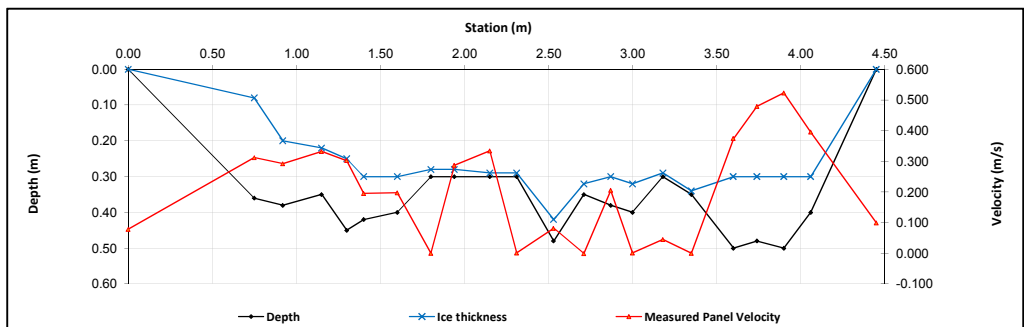
Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	8:34
Equipment:	ADV
Method:	Ice
Lake/River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Clear, -15°C

Flow characteristics:	
Total Flow:	0.123 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	0.46 (m <sup>2</sup> )
Wetted Width:	4.45 (m)
Hydraulic Depth:	0.104 (m)
Mean Velocity:	0.265 (m/s)
Froude Number:	0.262

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.234	-
Battery (Main):	0.8	-
Datalogger Clock:	12.8	-
Laptop Clock:	7:10	-
Enclosure Dessiccant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessiccant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Q start at 8:43; end at 9:24	
- Very little water under the ice	
- Flow measurement was conducted at the "winter" site 404287 E, 6372528 N	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
L4-01	0.943	100.943		100.000	100.000	3/4" Pipe 4 m NW of Station
L4-02			0.888	100.055	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.816	100.127	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			3.078	97.865		
Water Level:			3.084	97.859		
Other:						
<b>Setup #2</b>						
L4-01			0.886	100.001	100.000	3/4" Pipe 4 m NW of Station
L4-02	0.832	100.887		100.055	100.055	3/4" Pipe 5 m SE of Station
L4-03			0.758	100.129	100.127	3/4" Pipe 2 m SE of Station
Ice/PT:			3.023	97.864		
Water Level:			3.026	97.861		
Other:						

Closing Error	-0.001	Average WL	97.860
WL Check	0.002	Transducer Elevation Before	96.626
		Transducer Elevation After	-

<b>Field Personnel:</b>	C.J, XP	Trip Date:	29-Mar-13
Data Entry Personnel:	XP	Date:	29-Mar-13
Data Check Personnel:	DW	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: May 16, 2013  
Site Visit Time (MST): 14:00

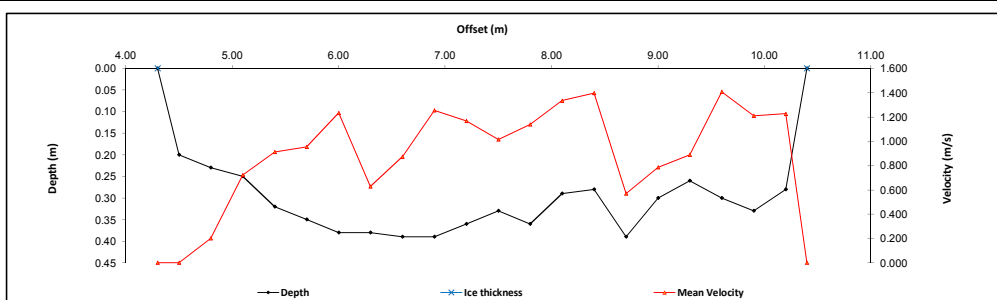


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	4.50	0.20		0.12	0.000					1.00	0.25	0.20	0.000	0.05	0.000	0%
2	4.80	0.23		0.14	0.200					1.00	0.30	0.23	0.200	0.07	0.014	1%
3	5.10	0.25		0.15	0.722					1.00	0.30	0.25	0.722	0.08	0.054	3%
4	5.40	0.32		0.19	0.913					1.00	0.30	0.32	0.913	0.10	0.088	5%
5	5.70	0.35		0.21	0.955					1.00	0.30	0.35	0.955	0.11	0.100	5%
6	6.00	0.38		0.23	1.233					1.00	0.30	0.38	1.233	0.11	0.141	8%
7	6.30	0.38		0.23	0.627					1.00	0.30	0.38	0.627	0.11	0.071	4%
8	6.60	0.39		0.23	0.872					1.00	0.30	0.39	0.872	0.12	0.102	6%
9	6.90	0.39		0.23	1.255					1.00	0.30	0.39	1.255	0.12	0.147	8%
10	7.20	0.36		0.22	1.169					1.00	0.30	0.36	1.169	0.11	0.126	7%
11	7.50	0.33		0.20	1.014					1.00	0.30	0.33	1.014	0.10	0.100	5%
12	7.80	0.36		0.22	1.140					1.00	0.30	0.36	1.140	0.11	0.123	7%
13	8.10	0.29		0.17	1.335					1.00	0.30	0.29	1.335	0.09	0.116	6%
14	8.40	0.28		0.17	1.398					1.00	0.30	0.28	1.398	0.08	0.117	6%
15	8.70	0.39		0.23	0.571					1.00	0.30	0.39	0.571	0.12	0.067	4%
16	9.00	0.30		0.18	0.786					1.00	0.30	0.30	0.786	0.09	0.071	4%
17	9.30	0.26		0.16	0.888					1.00	0.30	0.26	0.888	0.08	0.069	4%
18	9.60	0.30		0.18	1.408					1.00	0.30	0.30	1.408	0.09	0.127	7%
19	9.90	0.33		0.20	1.210					1.00	0.30	0.33	1.210	0.10	0.120	7%
20	10.20	0.28		0.17	1.227					1.00	0.25	0.28	1.227	0.07	0.086	5%
RB	10.40	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.84</b>	<b>100%</b>	

**Flow Measurement Details:**

**Metering Section Location (describe):**

Meas. Start Time (MST):	13:30
Meas. End Time (MST):	13:55
Equipment:	ADV
Method:	Wading
River Condition:	High flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, breezy, 17°C



**Flow characteristics:**

Total Flow:	1.84	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.89	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.98	(m/s)
Froude Number:	0.56	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.385	-
Water (°C):	4.6	-
Datalogger Clock:	14:07	-
Laptop Clock:	14:08	-
Battery (Main):	14.4	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement conducted at winter measurement location. Lots of large rocks, in channel 404287 E, 6372528 N

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L4-01	0.629	100.629		100.000	100.000	3/4" Pipe 4 m NW of Station	L4-01
L4-02			0.574	100.055	100.055	3/4" Pipe 5 m SE of Station	L4-02
L4-03			0.501	100.128	100.127	3/4" Pipe 2 m SE of Station	L4-03
Ice/PT:							WL
Water Level:			2.577	98.052			L4-03
Other:							L4-02
<b>Setup #2</b>							L4-01
L4-01			0.613	99.999	100.000	3/4" Pipe 4 m NW of Station	
L4-02			0.558	100.054	100.055	3/4" Pipe 5 m SE of Station	
L4-03	0.484	100.612		100.128	100.127	3/4" Pipe 2 m SE of Station	
Ice/PT:							
Water Level:			2.564	98.048			L4-03
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.128			
Water Level:							Time WL Surveyed:
Water Level:							Time WL Surveyed:
BM:				100.128			

**WL Survey Summary**

	Before	After
Average WL:	98.050	-
Transducer Elevation:	96.665	-
Closing Error:	0.001	-
WL Check:	0.004	-

**Site Rating Information**

Measured Discharge:	1.84
Expected Discharge:	0.00
Shift from Existing Rating (m <sup>3</sup> /s):	-1.84
Shift from Existing Rating (%):	-100%

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	16-May-13
Data Check Personnel:	SM	Date:	16-May-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	26-May-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: June 7, 2013

Site Visit Time (MST): 11:15

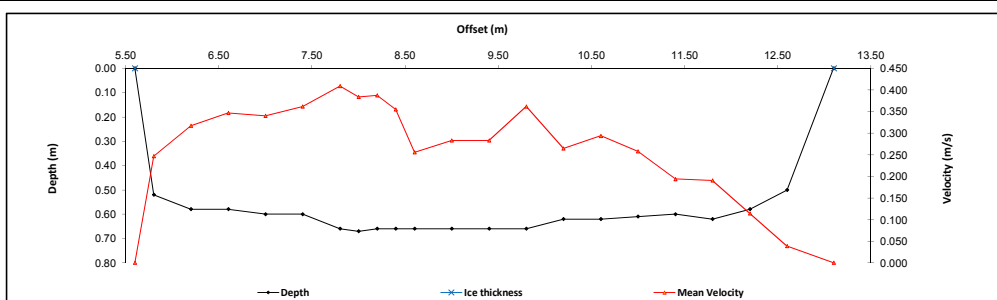


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	5.60	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	5.80	0.52		0.31	0.247					1.00	0.30	0.52	0.247	0.16	0.039	3%
2	6.20	0.58		0.35	0.317					1.00	0.40	0.58	0.317	0.23	0.074	6%
3	6.60	0.58		0.35	0.347					1.00	0.40	0.58	0.347	0.23	0.081	7%
4	7.00	0.60		0.36	0.340					1.00	0.40	0.60	0.340	0.24	0.082	7%
5	7.40	0.60		0.36	0.362					1.00	0.40	0.60	0.362	0.24	0.087	7%
6	7.80	0.66		0.40	0.409					1.00	0.30	0.66	0.409	0.20	0.081	7%
7	8.00	0.67		0.40	0.384					1.00	0.20	0.67	0.384	0.13	0.051	4%
8	8.20	0.66		0.40	0.388					1.00	0.20	0.66	0.388	0.13	0.051	4%
9	8.40	0.66		0.40	0.355					1.00	0.20	0.66	0.355	0.13	0.047	4%
10	8.60	0.66		0.40	0.256					1.00	0.30	0.66	0.256	0.20	0.051	4%
11	9.00	0.66		0.40	0.283					1.00	0.40	0.66	0.283	0.26	0.075	6%
12	9.40	0.66		0.40	0.283					1.00	0.40	0.66	0.283	0.26	0.075	6%
13	9.80	0.66		0.40	0.362					1.00	0.40	0.66	0.362	0.26	0.096	8%
14	10.20	0.62		0.37	0.265					1.00	0.40	0.62	0.265	0.25	0.066	5%
15	10.60	0.62		0.37	0.294					1.00	0.40	0.62	0.294	0.25	0.073	6%
16	11.00	0.61		0.37	0.258					1.00	0.40	0.61	0.258	0.24	0.063	5%
17	11.40	0.60		0.36	0.194					1.00	0.40	0.60	0.194	0.24	0.047	4%
18	11.80	0.62		0.37	0.191					1.00	0.40	0.62	0.191	0.25	0.047	4%
19	12.20	0.58		0.35	0.114					1.00	0.40	0.58	0.114	0.23	0.026	2%
20	12.60	0.50		0.30	0.039					1.00	0.45	0.50	0.039	0.23	0.009	1%
LB	13.10	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.22</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:50
Meas. End Time (MST):	12:15
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 20°C



**Flow characteristics:**

Total Flow:	1.22	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.37	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.479	1.471
Water (°C):	12.5	12.3
Datalogger Clock:	11:21	12:38
Laptop Clock:	11:21	12:37
Battery (Main):	14.0	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement was conducted near the outlet

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L4-01	0.526	100.526		100.000	100.000	3/4" Pipe 4 m NW of Station	L4-01
L4-02			0.471	100.055	100.055	3/4" Pipe 5 m SE of Station	L4-02
L4-03			0.398	100.128	100.127	3/4" Pipe 2 m SE of Station	L4-03
Ice/PT:							WL
Water Level:			2.405	98.121			L4-03
Other:							L4-02
<b>Setup #2</b>							L4-01
L4-01			0.515	100.001	100.000	3/4" Pipe 4 m NW of Station	
L4-02	0.461	100.516		100.055	100.055	3/4" Pipe 5 m SE of Station	
L4-03			0.385	100.131	100.127	3/4" Pipe 2 m SE of Station	
Ice/PT:							
Water Level:			2.398	98.118			L4-03
Other:							L4-02
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	L4-01	0.515	100.516	100.000			
Water Level:			2.393	98.122			L4-03
Water Level:			2.387	98.118			L4-02
BM	L4-01	0.505	100.505	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.120	98.120
Transducer Elevation:	96.641	96.649
Closing Error:	-0.001	-
WL Check:	0.003	0.004

**Site Rating Information**

Measured Discharge:	1.22
Expected Discharge:	0.00
Shift from Existing Rating (m <sup>3</sup> /s):	-1.22
Shift from Existing Rating (%):	-100%

**Field Personnel:**

Data Entry Personnel:	SM, CJ	Trip Date:	7-Jun-13
Data Check Personnel:	CJ	Date:	7-Jun-13
Entered Digitally in the Field:	DW	Date:	13-Jun-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: August 14, 2013

Site Visit Time (MST): 14:45



## Flow Measurement:

Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.60	0.00	0.00							1.00	0.15	0.00	0.000	0.00	0.000	
1	0.90	0.26		0.16	0.650					1.00	0.30	0.26	0.650	0.08	0.051	4%
2	1.20	0.22		0.13	0.836					1.00	0.30	0.22	0.836	0.07	0.055	5%
3	1.50	0.22		0.13	0.680					1.00	0.30	0.22	0.680	0.07	0.045	4%
4	1.80	0.34		0.20	0.613					1.00	0.30	0.34	0.613	0.10	0.063	5%
5	2.10	0.34		0.20	0.765					1.00	0.30	0.34	0.765	0.10	0.078	6%
6	2.40	0.34		0.20	0.484					1.00	0.30	0.34	0.484	0.10	0.049	4%
7	2.70	0.40		0.24	0.678					1.00	0.30	0.40	0.678	0.12	0.081	7%
8	3.00	0.35		0.21	0.866					1.00	0.30	0.35	0.866	0.11	0.091	7%
9	3.30	0.35		0.21	0.911					1.00	0.23	0.35	0.911	0.08	0.072	6%
10	3.45	0.33		0.20	0.851					1.00	0.15	0.33	0.851	0.05	0.042	3%
11	3.60	0.34		0.20	0.470					1.00	0.23	0.34	0.470	0.08	0.036	3%
12	3.90	0.37		0.22	0.567					1.00	0.30	0.37	0.567	0.11	0.063	5%
13	4.20	0.26		0.16	0.974					1.00	0.30	0.26	0.974	0.08	0.076	6%
14	4.50	0.28		0.17	0.837					1.00	0.30	0.28	0.837	0.08	0.070	6%
15	4.80	0.30		0.18	0.802					1.00	0.30	0.30	0.802	0.09	0.072	6%
16	5.10	0.24		0.14	1.048					1.00	0.30	0.24	1.048	0.07	0.075	6%
17	5.40	0.26		0.16	0.971					1.00	0.30	0.26	0.971	0.08	0.076	6%
18	5.70	0.25		0.15	0.920					1.00	0.30	0.25	0.920	0.07	0.069	6%
19	6.00	0.35		0.21	0.290					1.00	0.30	0.35	0.290	0.11	0.030	2%
20	6.30	0.30		0.18	0.450					1.00	0.20	0.30	0.450	0.06	0.027	2%
LB	6.40	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.22</b>	<b>100%</b>

## Flow Measurement Details:

**Metering Section Location (describe):**  
- across from heli landing

Meas. Start Time (MST): 15:48  
 Meas. End Time (MST): 16:15  
 Equipment: ADV  
 Method: Wading  
 River Condition: Moderate flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: P.cloudy, calm, 21°C

## Flow characteristics:

Total Flow: 1.22 (m<sup>3</sup>/s)  
 Perceived Measurement Quality: Excellent  
 Cross Section Area: 1.70 (m<sup>2</sup>)  
 Wetted Width: 5.80 (m)  
 Hydraulic Depth: 0.29 (m)  
 Mean Velocity: 0.72 (m/s)  
 Froude Number: 0.42

## Logger Details:

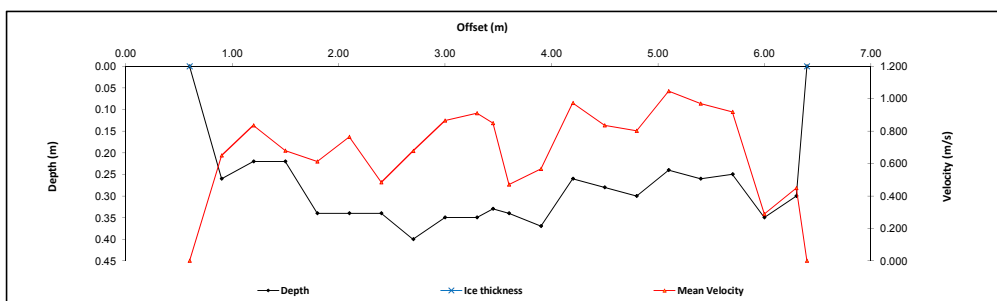
	Before	After
Transducer Reading (m):	1.567	1.550
Water (°C):	19.4	19.5
Datalogger Clock:	14:21	16:40
Laptop Clock:	14:21	16:40
Battery (Main):	13.5	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- 15.0 cm waves on lake during during the first survey

## General Notes:

- Flow measurement was conducted at the "winter" site 404287, 6372528N



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L4-01			0.890	100.001	100.000	3/4" Pipe 4 m NW of Station	L4-01
L4-02	0.836	100.891		100.055	100.055	3/4" Pipe 5 m SE of Station	L4-02
L4-03			0.762	100.129	100.127	3/4" Pipe 2 m SE of Station	L4-03
Ice/PT:							WL
Water Level:			2.623	98.268		Time WL Surveyed: 14:25	L4-03
Other:							L4-02
<b>Setup #2</b>							L4-01
L4-01	0.833	100.834		100.001	100.000	3/4" Pipe 4 m NW of Station	L4-01
L4-02			0.778	100.056	100.055	3/4" Pipe 5 m SE of Station	L4-02
L4-03			0.705	100.129	100.127	3/4" Pipe 2 m SE of Station	L4-03
Ice/PT:							
Water Level:			2.566	98.268		Time WL Surveyed: 14:27	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	L4-02	0.961	101.016	100.055			
Water Level:			2.742	98.274		Time WL Surveyed: 16:37	
Water Level:			2.713	98.273		Time WL Surveyed: 16:38	
BM:	L4-02	0.931	100.986	100.055			

WL Survey Summary	Before	After
Average WL:	98.268	98.274
Transducer Elevation:	96.701	96.724
Closing Error:	-0.001	-
WL Check:	0.000	0.001

## Site Rating Information

Measured Discharge:	1.22
Expected Discharge:	0.00
Shift from Existing Rating (m <sup>3</sup> /s):	-1.22
Shift from Existing Rating (%):	-100%

Field Personnel:	TR, DW	Trip Date:	14-Aug-13
Data Entry Personnel:	TR	Date:	14-Aug-13
Data Check Personnel:	DW	Date:	22-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date:

September 14, 2013

Site Visit Time (MST):

07:33

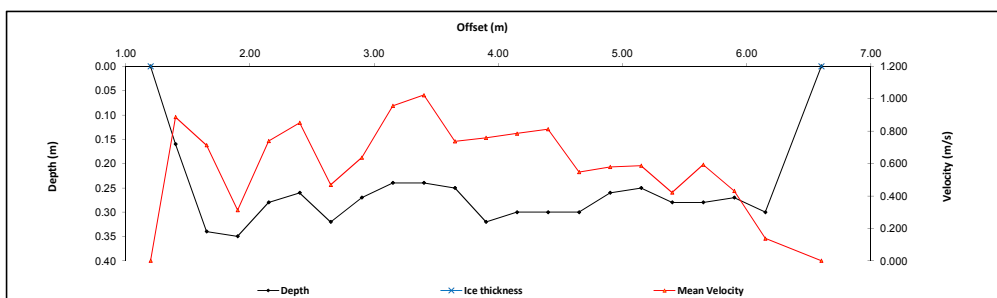


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.40	0.16		0.10	0.888					1.00	0.23	0.16	0.888	0.04	0.032	4%
2	1.65	0.34		0.20	0.714					1.00	0.25	0.34	0.714	0.09	0.061	7%
3	1.90	0.35		0.21	0.312					1.00	0.25	0.35	0.312	0.09	0.027	3%
4	2.15	0.28		0.17	0.740					1.00	0.25	0.28	0.740	0.07	0.052	6%
5	2.40	0.26		0.16	0.852					1.00	0.25	0.26	0.852	0.07	0.055	6%
6	2.65	0.32		0.19	0.469					1.00	0.25	0.32	0.469	0.08	0.038	4%
7	2.90	0.27		0.16	0.636					1.00	0.25	0.27	0.636	0.07	0.043	5%
8	3.15	0.24		0.14	0.957					1.00	0.25	0.24	0.957	0.06	0.057	7%
9	3.40	0.24		0.14	1.023					1.00	0.25	0.24	1.023	0.06	0.061	7%
10	3.65	0.25		0.15	0.738					1.00	0.25	0.25	0.738	0.06	0.046	5%
11	3.90	0.32		0.19	0.760					1.00	0.25	0.32	0.760	0.08	0.061	7%
12	4.15	0.30		0.18	0.786					1.00	0.25	0.30	0.786	0.08	0.059	7%
13	4.40	0.30		0.18	0.812					1.00	0.25	0.30	0.812	0.08	0.061	7%
14	4.65	0.30		0.18	0.548					1.00	0.25	0.30	0.548	0.08	0.041	5%
15	4.90	0.26		0.16	0.580					1.00	0.25	0.26	0.580	0.07	0.038	4%
16	5.15	0.25		0.15	0.587					1.00	0.25	0.25	0.587	0.06	0.037	4%
17	5.40	0.28		0.17	0.421					1.00	0.25	0.28	0.421	0.07	0.029	3%
18	5.65	0.28		0.17	0.594					1.00	0.25	0.28	0.594	0.07	0.042	5%
19	5.90	0.27		0.16	0.431					1.00	0.25	0.27	0.431	0.07	0.029	3%
20	6.15	0.30		0.18	0.138					1.00	0.35	0.30	0.138	0.11	0.014	2%
RB	6.60	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.883</b>	<b>100%</b>	

**Flow Measurement Details:**

**Metering Section Location (describe):**

Meas. Start Time (MST):	8:20
Meas. End Time (MST):	8:54
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 10°C



**Flow characteristics:**

Total Flow:	0.883	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.42	(m <sup>2</sup> )
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.62	(m/s)
Froude Number:	0.39	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.485	1.478
Water (°C):	15.5	15.7
Datalogger Clock:	07:36	09:16
Laptop Clock:	07:36	09:15
Battery (Main):	12.7	12.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement was conducted at the "winter" site 404287E, 6372528N

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L4-01	0.867	100.867		100.000	100.000	3/4" Pipe 4 m NW of Station	L4-01
L4-02			0.812	100.055	100.055	3/4" Pipe 5 m SE of Station	L4-02
L4-03			0.738	100.129	100.127	3/4" Pipe 2 m SE of Station	L4-03
Ice/PT:							WL
Water Level:			2.735	98.132		Time WL Surveyed: 7:52	L4-03
Other:							L4-02
<b>Setup #2</b>							L4-01
L4-01			0.854	100.000	100.000	3/4" Pipe 4 m NW of Station	
L4-02	0.799	100.854		100.055	100.055	3/4" Pipe 5 m SE of Station	
L4-03			0.726	100.128	100.127	3/4" Pipe 2 m SE of Station	
Ice/PT:							
Water Level:			2.723	98.131		Time WL Surveyed: 7:53	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	L4-01	0.855	100.855		100.000		
Water Level:			2.720	98.135		Time WL Surveyed: 9:10	
Water Level:			2.707	98.137		Time WL Surveyed: 9:11	
BM:	L4-01	0.844	100.844		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.132	98.136
Transducer Elevation:	96.547	96.658
Closing Error:	0.000	
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	0.883
Expected Discharge:	0.00
Shift from Existing Rating (m <sup>3</sup> /s):	-0.88
Shift from Existing Rating (%):	-100%

**Field Personnel:**

DW, CJ	Trip Date:	14-Sep-13
DW	Date:	14-Sep-13
DW	Date:	16-Sep-13
Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow): 402900 E, 6370580 N

Site Visit Date: October 21, 2013

Site Visit Time (MST): 08:10

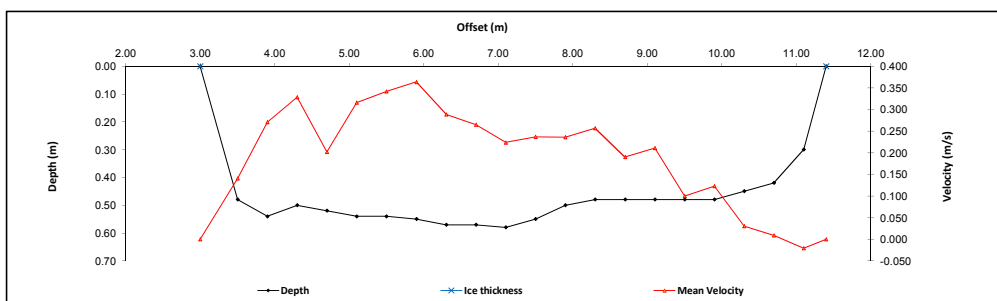


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.50	0.48		0.29	0.141					1.00	0.45	0.48	0.141	0.22	0.030	4%
2	3.90	0.54		0.32	0.271					1.00	0.40	0.54	0.271	0.22	0.059	7%
3	4.30	0.50		0.30	0.329					1.00	0.40	0.50	0.329	0.20	0.066	8%
4	4.70	0.52		0.31	0.202					1.00	0.40	0.52	0.202	0.21	0.042	5%
5	5.10	0.54		0.32	0.316					1.00	0.40	0.54	0.316	0.22	0.068	8%
6	5.50	0.54		0.32	0.342					1.00	0.40	0.54	0.342	0.22	0.074	8%
7	5.90	0.55		0.33	0.364					1.00	0.40	0.55	0.364	0.22	0.080	9%
8	6.30	0.57		0.34	0.289					1.00	0.40	0.57	0.289	0.23	0.066	8%
9	6.70	0.57		0.34	0.265					1.00	0.40	0.57	0.265	0.23	0.060	7%
10	7.10	0.58		0.35	0.224					1.00	0.40	0.58	0.224	0.23	0.052	6%
11	7.50	0.55		0.33	0.237					1.00	0.40	0.55	0.237	0.22	0.052	6%
12	7.90	0.50		0.30	0.236					1.00	0.40	0.50	0.236	0.20	0.047	5%
13	8.30	0.48		0.29	0.257					1.00	0.40	0.48	0.257	0.19	0.049	6%
14	8.70	0.48		0.29	0.190					1.00	0.40	0.48	0.190	0.19	0.036	4%
15	9.10	0.48		0.29	0.211					1.00	0.40	0.48	0.211	0.19	0.041	5%
16	9.50	0.48		0.29	0.100					1.00	0.40	0.48	0.100	0.19	0.019	2%
17	9.90	0.48		0.29	0.123					1.00	0.40	0.48	0.123	0.19	0.024	3%
18	10.30	0.45		0.27	0.030					1.00	0.40	0.45	0.030	0.18	0.005	1%
19	10.70	0.42		0.25	0.009					1.00	0.40	0.42	0.009	0.17	0.002	0%
20	11.10	0.30		0.18	-0.021					1.00	0.35	0.30	-0.021	0.11	-0.002	0%
LB	11.40	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.870</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 40m DS of outlet

Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:11
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 10°C



**Flow characteristics:**

Total Flow:	0.870	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.01	(m <sup>2</sup> )
Wetted Width:	8.40	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.387	1.390
Water (°C):	6.9	7.0
Datalogger Clock:	08:16	09:24
Laptop Clock:	08:16	09:24
Battery (Main):	12.8	12.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- WL fluctuating 2.0 cm
- Flow measurement was conducted near the outlet

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
L4-01			0.458	100.002	100.000	3/4" Pipe 4 m NW of Station	L4-03
L4-02	0.405	100.460		100.055	100.055	3/4" Pipe 5 m SE of Station	L4-01
L4-03			0.331	100.129	100.127	3/4" Pipe 2 m SE of Station	WL
Ice/PT:							WL
Water Level:			2.431	98.029		Time WL Surveyed: 8:22	L4-01
Other:							L4-02
<b>Setup #2</b>							L4-03
L4-01	0.429	100.431		100.002	100.000	3/4" Pipe 4 m NW of Station	
L4-02			0.374	100.057	100.055	3/4" Pipe 5 m SE of Station	
L4-03			0.301	100.130	100.127	3/4" Pipe 2 m SE of Station	
Ice/PT:							
Water Level:			2.401	98.030		Time WL Surveyed: 8:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	L4-01	0.384	100.386		100.002		
Water Level:			2.353	98.033		Time WL Surveyed: 9:34	
Water Level:			2.373	98.033		Time WL Surveyed: 9:35	
BM:	L4-01	0.404	100.406		100.002		

**WL Survey Summary**

	Before	After
Average WL:	98.030	98.033
Transducer Elevation:	96.643	96.643
Closing Error:	-0.002	
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	0.87
Expected Discharge:	0.00
Shift from Existing Rating (m <sup>3</sup> /s):	-0.87
Shift from Existing Rating (%):	-100%

**Field Personnel:**

TR, DW	Trip Date:	21-Oct-13
TR	Date:	21-Oct-13
DW	Date:	29-Oct-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: December 7, 2013  
 Site Visit Time (MST): 09:45

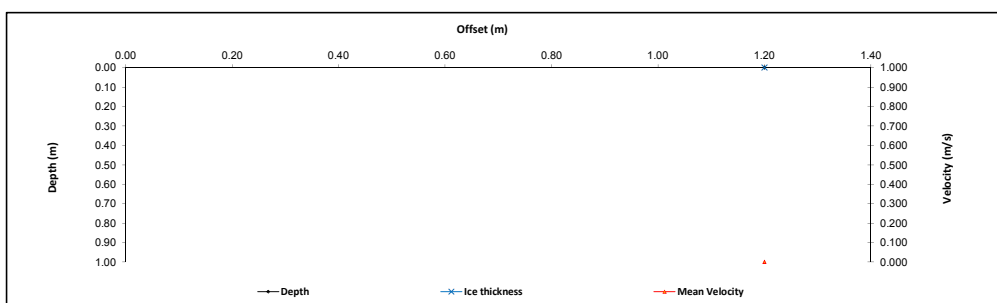


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
RB	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00						
1										1.00											
2										1.00											
3										1.00											
4										1.00											
5										1.00											
6										1.00											
7										1.00											
8										1.00											
9										1.00											
10										1.00											
11										1.00											
12										1.00											
13										1.00											
14										1.00											
15										1.00											
16										1.00											
17										1.00											
18										1.00											
19										1.00											
20										1.00											
21										1.00											
22										1.00											
23										1.00											
24										1.00											
25										1.00											
26										1.00											
27										1.00											
28										1.00											
29										1.00											
30										1.00											
RB	1.20	0.00	0.00		0.00		0.00			1.00	0.60	0.00	0.00	0.00	0.00	0%					
<b>Total Flow</b>																<b>0%</b>					

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Open at the outlet
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	-



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.283	1.280
Water (°C):	1.1	1.1
Datalogger Clock:	10:00	11:01
Laptop Clock:	10:00	11:01
Battery (Main):	12.5	12.8
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

There was open water up until 100 m upstream of 404287 E, 6372528. At this site it was frozen to depth for majority of cross section. A little running water present but not measurable due to highly fractured ice sheets. See photos.

- Bring waders in the future to conduct the flow measurement at the mouth.

**General Notes:**

- There was open water up until 100 m upstream of 404287 E, 6372528. At this site it was frozen to depth for majority of cross section. A little running water present but not measurable due to highly fractured ice sheets. See photos.

- Bring waders in the future to conduct the flow measurement at the mouth.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							L4-01
L4-01	0.595	100.595		100.000	100.000	3/4" Pipe 4 m NW of Station	L4-02
L4-02			0.540	100.055	100.055	3/4" Pipe 5 m SE of Station	L4-03
L4-03			0.467	100.128	100.127	3/4" Pipe 2 m SE of Station	WL
Ice/PT:			2.590	98.005			WL
Water Level:			2.660	97.935		Time WL Surveyed: 10:00	L4-03
Other:							L4-02
<b>Setup #2</b>							L4-01
L4-01			0.555	100.000	100.000	3/4" Pipe 4 m NW of Station	
L4-02			0.500	100.055	100.055	3/4" Pipe 5 m SE of Station	
L4-03	0.427	100.555		100.128	100.127	3/4" Pipe 2 m SE of Station	
Ice/PT:			2.551	98.004			
Water Level:			2.619	97.936		Time WL Surveyed: 10:05	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	L4-01	0.555	100.555		100.000		
Water Level:				2.619	97.936	Time WL Surveyed: 11:04	
Water Level:				2.604	97.940	Time WL Surveyed: 11:05	
BM:	L4-01	0.544	100.544		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.936	97.938
Transducer Elevation:	96.653	96.658
Closing Error:	0.000	-
WL Check:	0.001	-0.004

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

DB, CJ	Trip Date:	7-Dec-13	
Data Entry Personnel:	CJ	Date:	7-Dec-13
Data Check Personnel:	DW	Date:	13-Dec-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road

UTM Location: 474961 E, 6344087 N

Site Visit Date:

January 15, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.70	0.00	0.00	0.000	0.000	0.000	0.9	4.70	4.80	0.10	0.06	0.000	0.000	0.01	0.000	0%
1	4.90	0.38	0.15	0.001			0.9	4.80	5.15	0.35	0.23	0.001	0.001	0.08	0.000	0%
2	5.40	0.47	0.19	0.031			0.9	5.15	5.58	0.43	0.28	0.031	0.028	0.12	0.003	3%
3	5.75	0.53	0.26	0.035			0.9	5.58	6.03	0.45	0.27	0.035	0.032	0.12	0.004	3%
4	6.30	0.61	0.25	0.047			0.9	6.03	6.55	0.52	0.36	0.047	0.042	0.19	0.008	6%
5	6.80	0.67	0.25	0.051			0.9	6.55	7.00	0.45	0.42	0.051	0.046	0.19	0.009	7%
6	7.20	0.70	0.20	0.054			0.9	7.00	7.40	0.40	0.50	0.054	0.049	0.20	0.010	8%
7	7.60	0.74	0.25	0.051			0.9	7.40	7.85	0.45	0.49	0.051	0.046	0.22	0.010	8%
8	8.10	0.65	0.25	0.067			0.9	7.85	8.30	0.45	0.40	0.067	0.060	0.18	0.011	8%
9	8.50	0.65	0.26	0.062			0.9	8.30	8.70	0.40	0.39	0.062	0.056	0.16	0.009	7%
10	8.90	0.62	0.27	0.075			0.9	8.70	9.03	0.33	0.35	0.075	0.068	0.11	0.008	6%
11	9.15	0.60	0.27	0.076			0.9	9.03	9.35	0.33	0.33	0.076	0.068	0.11	0.007	6%
12	9.55	0.58	0.27	0.074			0.9	9.35	9.73	0.38	0.31	0.074	0.067	0.12	0.008	6%
13	9.90	0.58	0.25	0.068			0.9	9.73	10.10	0.38	0.33	0.068	0.061	0.12	0.008	6%
14	10.30	0.30	0.22	0.089			0.9	10.10	10.50	0.40	0.08	0.089	0.080	0.03	0.003	2%
15	10.70	0.45	0.20	0.079			0.9	10.50	10.95	0.45	0.25	0.079	0.071	0.11	0.008	6%
16	11.20	0.40	0.15	0.085			0.9	10.95	11.40	0.45	0.25	0.085	0.077	0.11	0.009	7%
17	11.60	0.45	0.02	0.045			0.9	11.40	11.88	0.48	0.43	0.045	0.041	0.20	0.008	6%
18	12.15	0.42	0.02	0.008			0.9	11.88	12.43	0.55	0.40	0.008	0.007	0.22	0.002	1%
19	12.70	0.28	0.01	0.056			0.9	12.43	12.90	0.47	0.27	0.056	0.050	0.13	0.006	5%
RB	13.10	0.00	0.00	0.00	0.00	0.00	1.0	12.90	13.10	0.20	0.07	0.014	0.014	0.01	0.000	0%
<b>Total Flow</b>															<b>0.129</b>	

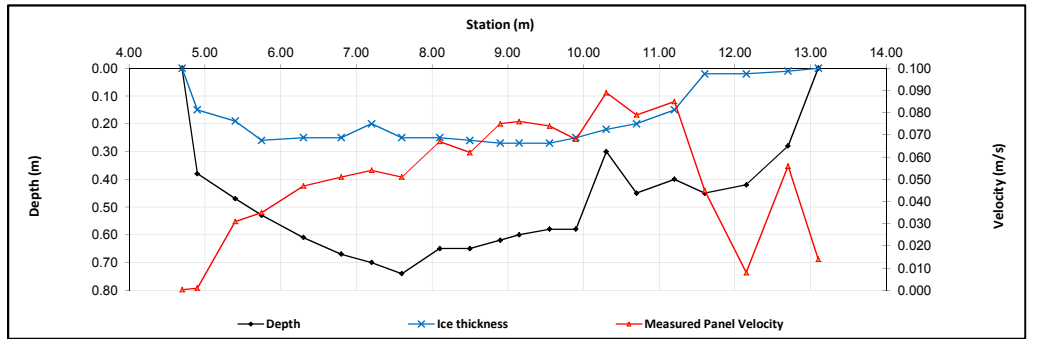
Measurement Details:	
Start Time (MST):	11:20
End Time (MST):	14:15
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -15°C

Flow characteristics:	
Total Flow:	0.129 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.75 (m <sup>2</sup> )
Wetted Width:	8.40 (m)
Hydraulic Depth:	0.327 (m)
Mean Velocity:	0.047 (m/s)
Froude Number:	0.026

Logger Details:		
	Before	After
Transducer Reading (m):	0.570	-
Water (°C):	0.1	-
Battery (Main):	13.9	-
Datalogger Clock:	13:28	-
Laptop Clock:	13:28	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

**General Notes:**  
 - BM 1 and 2 submerged in ice and can not be surveyed



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S02-02	0.955	299.061		298.106	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.054	297.007		
Water Level:			2.288	296.773		
Other:			1.051	298.010	297.99	Rebar
<b>Setup #2</b>						
S02-02			0.943	298.104	298.106	T-post w/flagging
S02-03				299.047	297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.042	297.005		
Water Level:			2.27	296.777		
Other:	1.037	299.047		298.010		Rebar
Closing Error	0.002		Average WL		296.775	
WL Check	0.004		Transducer Elevation Before		296.205	
			Transducer Elevation After		-	

<b>Field Personnel:</b>	SM, TR, DW	Trip Date:	15-Jan-13
<b>Data Entry Personnel:</b>	TR	Date:	15-Jan-13
<b>Data Check Personnel:</b>	CJ	Date:	22-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date:

February 4, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	4.20	0.20	0.06	0.001	0.001	0.01	0.000	0%
1	4.40	0.50	0.25	0.005			0.9	4.20	4.60	0.40	0.25	0.005	0.005	0.10	0.000	1%
2	4.80	0.70	0.25	0.000			1.0	4.60	5.03	0.43	0.45	0.000	0.000	0.19	0.000	0%
3	5.25	0.75	0.25	0.019			0.9	5.03	5.48	0.45	0.50	0.019	0.017	0.23	0.004	6%
4	5.70	0.80	0.25	0.023			0.9	5.48	5.85	0.38	0.55	0.023	0.021	0.21	0.004	6%
5	6.00	0.82	0.30	0.010			0.9	5.85	6.20	0.35	0.52	0.010	0.009	0.18	0.002	2%
6	6.40	0.85	0.30	0.031			0.9	6.20	6.60	0.40	0.55	0.031	0.028	0.22	0.006	9%
7	6.80	0.60	0.30	-0.001			0.9	6.60	7.03	0.43	0.30	-0.001	-0.001	0.13	0.000	0%
8	7.25	0.90	0.27	0.030			0.9	7.03	7.43	0.40	0.63	0.030	0.027	0.25	0.007	10%
9	7.60	0.80	0.35	0.031			0.9	7.43	7.75	0.33	0.45	0.031	0.028	0.15	0.004	6%
10	7.90	0.76	0.35	0.037			0.9	7.75	8.10	0.35	0.41	0.037	0.033	0.14	0.005	7%
11	8.30	0.75	0.35	0.025			0.9	8.10	8.48	0.38	0.40	0.025	0.023	0.15	0.003	5%
12	8.65	0.70	0.30	0.032			0.9	8.48	8.80	0.32	0.40	0.032	0.029	0.13	0.004	6%
13	8.95	0.72	0.30	0.037			0.9	8.80	9.13	0.32	0.42	0.037	0.033	0.14	0.005	7%
14	9.30	0.60	0.25	0.038			0.9	9.13	9.48	0.35	0.35	0.038	0.034	0.12	0.004	6%
15	9.65	0.50	0.23	0.040			0.9	9.48	9.83	0.35	0.27	0.040	0.036	0.09	0.003	5%
16	10.00	0.28	0.20	0.000			1.0	9.83	10.25	0.43	0.08	0.000	0.000	0.03	0.000	0%
17	10.50	0.40	0.20	0.001			0.9	10.25	10.75	0.50	0.20	0.001	0.001	0.10	0.000	0%
18	11.00	0.40	0.15	0.055			0.9	10.75	11.25	0.50	0.25	0.055	0.050	0.13	0.006	9%
19	11.50	0.35	0.15	0.099			0.9	11.25	11.75	0.50	0.20	0.099	0.089	0.10	0.009	13%
RB	12.00	0.00	0.00	0.00	0.00	0.00	1.0	11.75	12.00	0.25	0.05	0.025	0.025	0.01	0.000	0%
<b>Total Flow</b>															<b>0.067</b>	

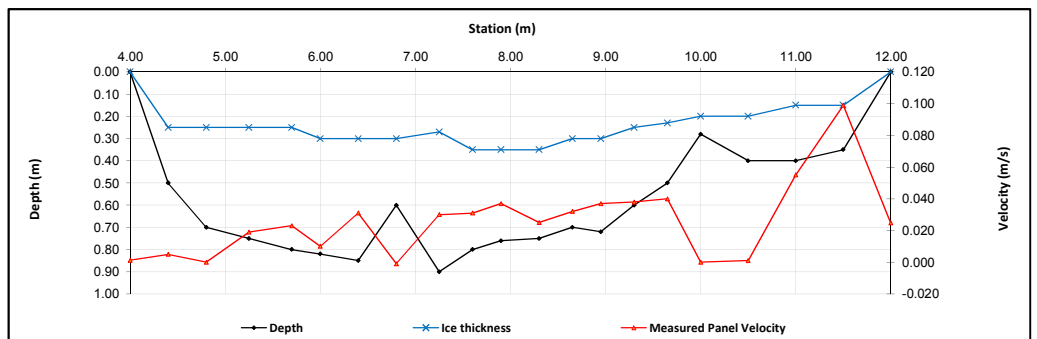
Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	13:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Light snow, -15°C

Flow characteristics:	
Total Flow:	<b>0.067</b> (m <sup>3</sup> /s)
Perceived Measurement Quality:	<b>Good</b>
Cross Section Area:	<b>1.15</b> (m <sup>2</sup> )
Wetted Width:	<b>4.25</b> (m)
Hydraulic Depth:	<b>0.270</b> (m)
Mean Velocity:	<b>0.058</b> (m/s)
Froude Number:	<b>0.036</b>

Logger Details:		
	Before	After
Transducer Reading (m):	0.552	-
Water (°C):	0.1	-
Battery (Main):	15.0	-
Datalogger Clock:	12:33	-
Laptop Clock:	12:33	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Slush found in some flow measurement holes.	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S02-02	1.153	299.259		298.106	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.359	296.900		
Water Level:			2.480	296.779		
Other:			1.258	298.001	297.990	Rebar
<b>Setup #2</b>						
S02-02			1.144	298.104	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.350	296.898		
Water Level:			2.468	296.780		
Other:	1.247	299.248		298.001	297.990	Rebar

Closing Error	0.002
WL Check	0.001

Average WL	296.780
Transducer Elevation Before	296.228
Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	4-Feb-13
Data Entry Personnel:	CJ	Date:	4-Feb-13
Data Check Personnel:	CJ	Date:	12-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date:

March 5, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.20	0.00	0.00	0.000	0.000	0.000	0.9	4.20	4.38	0.18	0.09	0.006	0.006	0.02	0.000	0%
1	4.55	0.45	0.10	0.025			0.9	4.38	4.70	0.32	0.35	0.025	0.022	0.11	0.003	3%
2	4.85	0.40	0.15	0.001			0.9	4.70	4.98	0.28	0.25	0.001	0.001	0.07	0.000	0%
3	5.10	0.50	0.20	0.006			0.9	4.98	5.25	0.28	0.30	0.006	0.005	0.08	0.000	1%
4	5.40	0.50	0.25	0.020			0.9	5.25	5.60	0.35	0.25	0.020	0.018	0.09	0.002	2%
5	5.80	0.55	0.25	0.035			0.9	5.60	5.93	0.33	0.30	0.035	0.031	0.10	0.003	4%
6	6.05	0.60	0.30	0.042			0.9	5.93	6.23	0.30	0.30	0.042	0.037	0.09	0.003	4%
7	6.40	0.60	0.43	0.035			0.9	6.23	6.55	0.33	0.17	0.035	0.031	0.06	0.002	2%
8	6.70	0.75	0.35	0.043			0.9	6.55	6.83	0.27	0.40	0.043	0.038	0.11	0.004	5%
9	6.95	0.70	0.35	0.035			0.9	6.83	7.10	0.27	0.35	0.035	0.031	0.10	0.003	4%
10	7.25	0.90	0.40	0.031			0.9	7.10	7.43	0.33	0.50	0.031	0.027	0.16	0.004	5%
11	7.60	0.95	0.40	0.038			0.9	7.43	7.75	0.33	0.55	0.038	0.033	0.18	0.006	7%
12	7.90	1.05	0.38	0.036			0.9	7.75	8.10	0.35	0.67	0.036	0.032	0.23	0.007	9%
13	8.30	1.00	0.40	0.037			0.9	8.10	8.48	0.38	0.60	0.037	0.033	0.23	0.007	9%
14	8.65	1.00	0.35	0.034			0.9	8.48	8.80	0.32	0.65	0.034	0.030	0.21	0.006	8%
15	8.95	1.00	0.35	0.020			0.9	8.80	9.08	0.27	0.65	0.020	0.018	0.18	0.003	4%
16	9.20	0.95	0.33	0.036			0.9	9.08	9.35	0.28	0.62	0.036	0.032	0.17	0.005	7%
17	9.50	0.90	0.34	0.037			0.9	9.35	9.65	0.30	0.56	0.037	0.033	0.17	0.005	7%
18	9.80	0.90	0.35	0.037			0.9	9.65	9.95	0.30	0.55	0.037	0.033	0.16	0.005	6%
19	10.10	0.85	0.35	0.034			0.9	9.95	10.25	0.30	0.50	0.034	0.030	0.15	0.004	5%
20	10.40	0.85	0.33	0.020			0.9	10.25	10.55	0.30	0.52	0.020	0.018	0.16	0.003	3%
21	10.70	0.80	0.33	0.022			0.9	10.55	10.90	0.35	0.47	0.022	0.019	0.16	0.003	4%
22	11.10	0.55	0.25	0.014			0.9	10.90	11.35	0.45	0.30	0.014	0.012	0.14	0.002	2%
LB	11.60	0.00	0.00	0.00	0.00	0.00	1.0	11.35	11.60	0.25	0.08	0.004	0.004	0.02	0.000	0%
<b>Total Flow</b>														<b>0.083</b>		

Measurement Details:	
Start Time (MST):	13:40
End Time (MST):	14:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast. Calm, -5°C

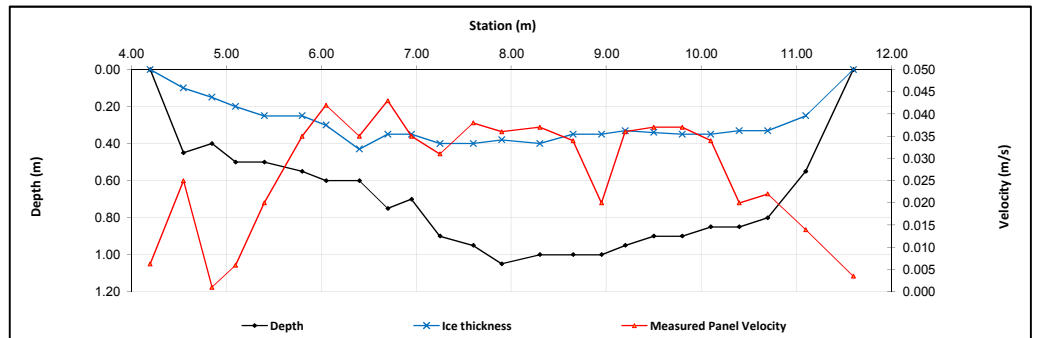
Flow characteristics:	
Total Flow:	0.083 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.32 (m <sup>2</sup> )
Wetted Width:	4.50 (m)
Hydraulic Depth:	0.515 (m)
Mean Velocity:	0.036 (m/s)
Froude Number:	0.016

Logger Details:		
	Before	After
Transducer Reading (m):	0.517	-
Water (°C):	0.1	-
Battery (Main):	14.9	-
Datalogger Clock:	13:45	-
Laptop Clock:	13:45	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:

General Notes:

- A lead opened up just US of station and DS of measurement.
- It has since frozen up a bit



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S02-02	1.108	299.214		298.106	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.269	296.945		
Water Level:			2.480	296.734		
Other:			1.212	298.002	297.990	Rebar
<b>Setup #2</b>						
S02-02			1.096	298.106	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:			2.257	296.942		
Water Level:			2.465	296.734		
Other:	1.197	299.199		298.002		Rebar

Closing Error	0.000
WL Check	0.000

Average WL	296.734
Transducer Elevation Before	296.217
Transducer Elevation After	-

<b>Field Personnel:</b>	TR AND SM	Trip Date:	5-Mar-13
<b>Data Entry Personnel:</b>	TR	Date:	5-Mar-13
<b>Data Check Personnel:</b>	CJ	Date:	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road

UTM Location: 474961 E, 6344087 N

Site Visit Date:

April 2, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
No Flow Measurement Conducted																
<b>Total Flow</b>																

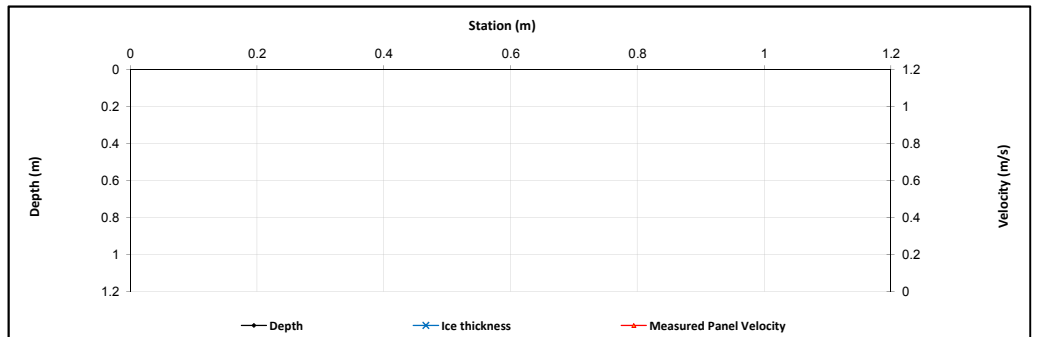
Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	16:20
Equipment:	-
Method:	-
River Condition:	Partial ice cover
Quality/Error (see reverse):	-
Weather:	Overcast, calm, 8°C

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	- (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:	Before	After
Transducer Reading (m):	0.528	-
Water (°C):	0.1	-
Battery (Main):	14.5	-
Datalogger Clock:	16:06	-
Laptop Clock:	16:06	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:

General Notes:
- Flow measurement not performed due to ice safety concerns



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S02-02			1.083	298.093	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:						
Water Level:			2.426	296.750		
Other:	1.186	299.176		297.990	297.99	Rebar
<b>Setup #2</b>						
S02-02	1.063	299.156		298.093	298.106	T-post w/flagging
S02-03					297.336	3/4" Pipe southwest of logger
S02-04					297.256	3/4" Pipe 3 m southeast of logger
Ice/PT:						
Water Level:			2.404	296.752		
Other:			1.167	297.989		Rebar

Closing Error	0.001
WL Check	0.002

Average WL	296.751
Transducer Elevation Before	296.223
Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	2-Apr-13
Data Entry Personnel:	SM	Date:	2-Apr-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road

UTM Location: 474961 E, 6344087 N

Site Visit Date: May 7, 2013

Site Visit Time (MST): 10:00



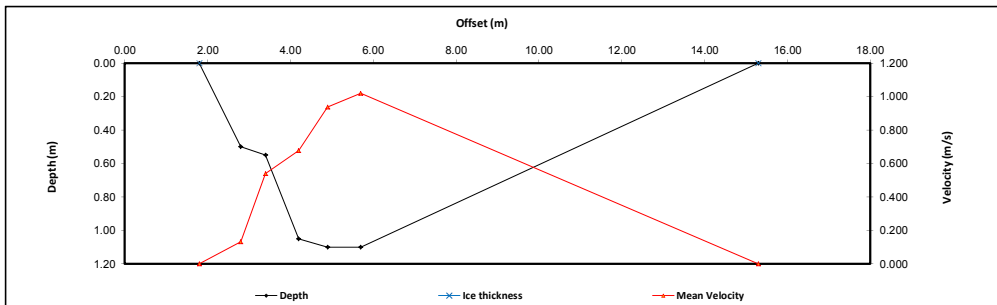
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.80	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	2.80	0.50		0.30	0.132					1.00	0.80	0.50	0.132	0.40	0.053	1%
2	3.40	0.55		0.33	0.539					1.00	0.70	0.55	0.539	0.39	0.208	3%
3	4.20	1.05				0.84	0.810	0.21	0.544	1.00	0.75	1.05	0.677	0.79	0.533	7%
4	4.90	1.10				0.88	1.020	0.22	0.854	1.00	0.75	1.10	0.937	0.83	0.773	10%
5	5.70	1.10				0.88	1.077	0.22	0.963	1.00	5.20	1.10	1.020	5.72	5.834	79%
LB	15.30	0.00	0.00		0.00		0.00		0.00	1.00	4.80	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>7.40</b>	<b>100%</b>

## Flow Measurement Details:

**Metering Section Location (describe):**

Meas. Start Time (MST):	10:25
Meas. End Time (MST):	10:43
Equipment:	ADV
Method:	Fishcat
River Condition:	Very High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Sunny, 6°C



## Flow characteristics:

Total Flow:	7.40	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	8.12	(m <sup>2</sup> )
Wetted Width:	13.50	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.91	(m/s)
Froude Number:	0.38	

## Logger Details:

	Before	After
Transducer Reading (m):	1.477	1.505
Water (°C):	3.1	3.2
Datalogger Clock:	09:52	11:01
Laptop Clock:	9:52	11:01
Battery (Main):	14.6	14.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:

- Could not make it across the stream due to high flow and safety concerns.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S02-03			1.950	297.340	297.336	3/4" Pipe southwest of logger	S02-01
S02-04			2.035	297.255	297.256	3/4" Pipe 3 m southeast of logger	S02-04
S02-05			1.658	297.632		3/4" Pipe	S02-05
Ice/PT:							WL
Water Level:			1.578	297.712			WL
Other:	1.300	299.290		297.990	297.990	Rebar in PVC	S02-05
<b>Setup #2</b>							
S02-03			1.938	297.339	297.336	3/4" Pipe southwest of logger	S02-03
S02-04	2.022	299.277		297.255	297.256	3/4" Pipe 3 m southeast of logger	S02-01
S02-05			1.644	297.633		3/4" Pipe	
Ice/PT:							
Water Level:			1.565	297.712			
Other:			1.286	297.991	297.990	Rebar in PVC	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S02-05	1.643	299.275	1.551	297.724		
Water Level:				1.540	297.722		
BM:	S02-05	1.630	299.262		297.632		

WL Survey Summary	Before	After
Average WL:	297.712	297.723
Transducer Elevation:	296.235	296.218
Closing Error:	-0.003	-
WL Check:	0.000	0.002

Site Rating Information	
Measured Discharge:	7.4
Expected Discharge:	15.11
Shift from Existing Rating (m <sup>3</sup> /s):	7.71
Shift from Existing Rating (%):	104%

Field Personnel:	SM, DW	Trip Date:	7-May-13
Data Entry Personnel:	SM, DW	Date:	7-May-13
Data Check Personnel:	CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: June 9, 2013  
 Site Visit Time (MST): 13:25



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
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21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

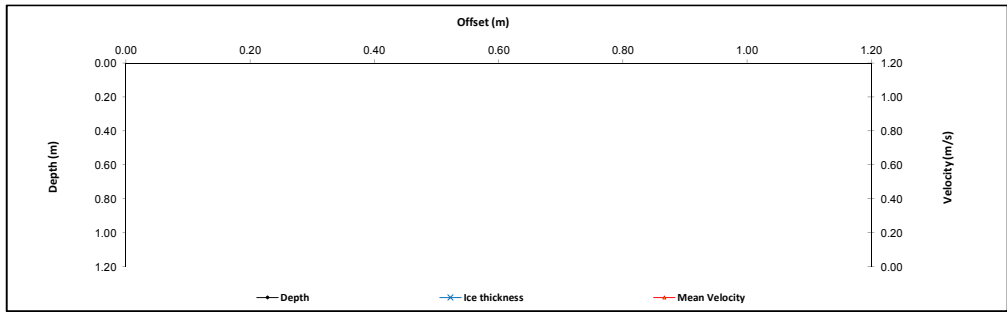
**Logger Details:**

	Before	After
Transducer Reading (m):	1.106	-
Water (°C):	11.9	-
Datalogger Clock:	13:06	-
Laptop Clock:	13:06	-
Battery (Main):	13.4	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

General Notes:

- No flow measurement was conducted.
- The water level is too high and too fast to perform a flow measurement safely



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S02-04
S02-03			2.940	297.339	297.336	3/4" Pipe southwest of Logger	S02-05
S02-04	3.023	300.279		297.256	297.256	3/4" Pipe 3 m southeast of logger	S02-03
S02-05			2.645	297.634	297.336	3/4" Pipe 5 m South of logger	S02-06
S02-06			1.880	298.399		3/4" pipe 20 m ESE of logger	WL
Water Level:			2.952	297.327			WL
Other:			2.281	297.998	297.990	Rebar in PVC	S02-06
<b>Setup #2</b>							S02-03
S02-03	2.923	300.262		297.339	297.336	3/4" Pipe southwest of Logger	S02-05
S02-04			3.007	297.255	297.256	3/4" Pipe 3 m southeast of logger	S02-04
S02-05			2.629	297.633	297.336	3/4" Pipe 5 m South of logger	
S02-06			1.874	298.398			
Water Level:			2.935	297.327			
Other:			2.276	297.986	297.990	Rebar in PVC	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:							Time WL Surveyed:
Water Level:							Time WL Surveyed:
BM:							

**WL Survey Summary**

	Before	After
Average WL:	297.327	-
Transducer Elevation:	296.221	-
Closing Error:	0.001	-
WL Check:	0.000	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	6.58
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, CJ	Trip Date:	9-Jun-13
<b>Data Entry Personnel:</b>	SM	Date:	9-Jun-13
<b>Data Check Personnel:</b>	DW	Date:	13-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: August 8, 2013  
 Site Visit Time (MST): 15:20

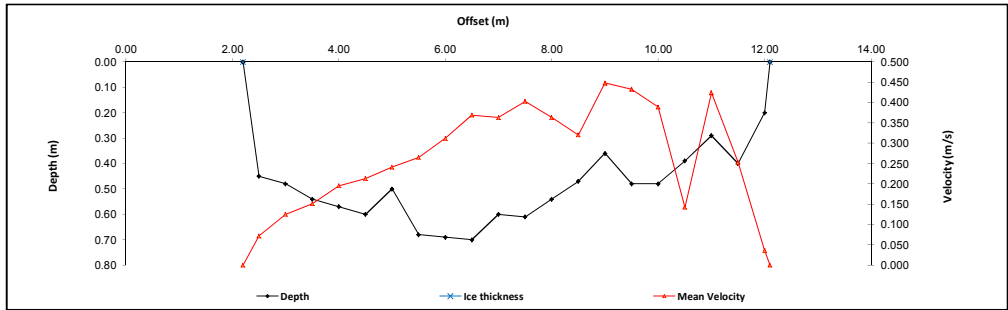


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.50	0.45		0.27	0.072					1.00	0.40	0.45	0.072	0.18	0.013	1%
2	3.00	0.48		0.29	0.125					1.00	0.50	0.48	0.125	0.24	0.030	2%
3	3.50	0.54		0.32	0.151					1.00	0.50	0.54	0.151	0.27	0.041	3%
4	4.00	0.57		0.34	0.195					1.00	0.50	0.57	0.195	0.29	0.056	4%
5	4.50	0.60		0.36	0.213					1.00	0.50	0.60	0.213	0.30	0.064	5%
6	5.00	0.50		0.30	0.241					1.00	0.50	0.50	0.241	0.25	0.060	4%
7	5.50	0.68		0.41	0.265					1.00	0.50	0.68	0.265	0.34	0.090	6%
8	6.00	0.69		0.41	0.312					1.00	0.50	0.69	0.312	0.35	0.108	8%
9	6.50	0.70		0.42	0.369					1.00	0.50	0.70	0.369	0.35	0.129	9%
10	7.00	0.60		0.36	0.363					1.00	0.50	0.60	0.363	0.30	0.109	8%
11	7.50	0.61		0.37	0.403					1.00	0.50	0.61	0.403	0.31	0.123	9%
12	8.00	0.54		0.32	0.363					1.00	0.50	0.54	0.363	0.27	0.098	7%
13	8.50	0.47		0.28	0.320					1.00	0.50	0.47	0.320	0.24	0.075	5%
14	9.00	0.36		0.22	0.448					1.00	0.50	0.36	0.448	0.18	0.081	6%
15	9.50	0.48		0.29	0.433					1.00	0.50	0.48	0.433	0.24	0.104	7%
16	10.00	0.48		0.29	0.389					1.00	0.50	0.48	0.389	0.24	0.093	7%
17	10.50	0.39		0.23	0.142					1.00	0.50	0.39	0.142	0.20	0.028	2%
18	11.00	0.29		0.17	0.424					1.00	0.50	0.29	0.424	0.15	0.061	4%
19	11.50	0.40		0.24	0.253					1.00	0.50	0.40	0.253	0.20	0.051	4%
20	12.00	0.20		0.12	0.036					1.00	0.30	0.20	0.036	0.06	0.002	0%
RB	12.10	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.42</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m upstream of station

Meas. Start Time (MST):	15:43
Meas. End Time (MST):	16:03
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, Calm, 22°C



**Flow characteristics:**

Total Flow:	1.42	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.93	(m <sup>2</sup> )
Wetted Width:	9.90	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.753	0.751
Water (°C):	17.0	17.1
Datalogger Clock:	15:20	16:15
Laptop Clock:	15:20	16:15
Battery (Main):	14.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S02-03				297.990	297.990	3/4" Pipe southwest of Logger	S02-05
S02-04	3.333	300.589		297.256	297.256	3/4" Pipe 3 m southeast of logger	S02-04
S02-05			2.954	297.635	297.635	3/4" Pipe 5 m South of logger	WL
S02-06			2.202	298.387	298.387	3/4" Pipe 20 m ESE of logger	WL
Water Level:			3.625	296.964	296.964	Time WL Surveyed: 15:38	S02-06
Other:					298.106	T-Post	S02-05
<b>Setup #2</b>							S02-04
S02-03				297.990	297.990	3/4" Pipe southwest of Logger	
S02-04			3.317	297.258	297.256	3/4" Pipe 3 m southeast of logger	
S02-05	2.940	300.575		297.635	297.636	3/4" Pipe 5 m South of logger	
S02-06			2.187	298.388	298.388		
Water Level:			3.609	296.966	296.965	Time WL Surveyed: 15:39	
Other:					298.106	T-Post	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S02-05	2.940	300.575	297.635	297.635	Time WL Surveyed: 16:11	
Water Level:			3.610	296.965	296.965	Time WL Surveyed: 16:13	
Water Level:			3.597	296.965	296.965		
BM:	S02-05	2.927	300.562	297.635	297.635		

**WL Survey Summary**

	Before	After
Average WL:	296.965	296.965
Transducer Elevation:	296.212	296.214
Closing Error:	-0.002	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	1.42
Expected Discharge:	1.61
Shift from Existing Rating (m <sup>3</sup> /s):	0.19
Shift from Existing Rating (%):	14%

**Field Personnel:**

SM, TR	Trip Date:	8-Aug-13
SM	Date:	8-Aug-13
CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: September 10, 2013  
 Site Visit Time (MST): 14:00

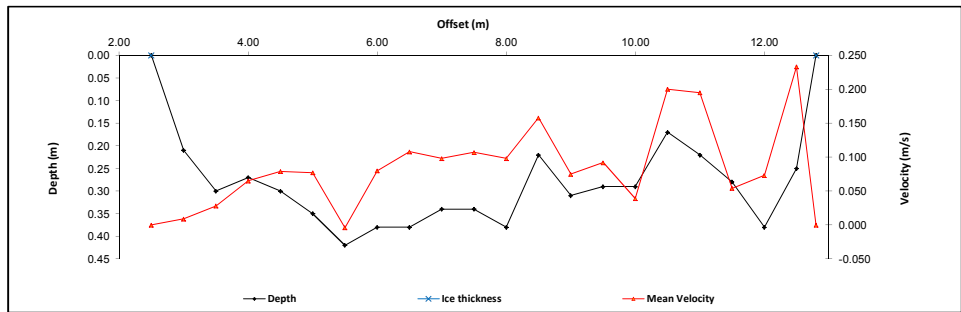


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.50	0.00			0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.00	0.21		0.13	0.009					1.00	0.50	0.21	0.009	0.11	0.001	0%
2	3.50	0.30		0.18	0.028					1.00	0.50	0.30	0.028	0.15	0.004	2%
3	4.00	0.27		0.16	0.065					1.00	0.50	0.27	0.065	0.14	0.009	3%
4	4.50	0.30		0.18	0.079					1.00	0.50	0.30	0.079	0.15	0.012	5%
5	5.00	0.35		0.21	0.077					1.00	0.50	0.35	0.077	0.18	0.013	5%
6	5.50	0.42		0.25	-0.004					1.00	0.50	0.42	-0.004	0.21	-0.001	0%
7	6.00	0.38		0.23	0.080					1.00	0.50	0.38	0.080	0.19	0.015	6%
8	6.50	0.38		0.23	0.108					1.00	0.50	0.38	0.108	0.19	0.021	8%
9	7.00	0.34		0.20	0.098					1.00	0.50	0.34	0.098	0.17	0.017	6%
10	7.50	0.34		0.20	0.107					1.00	0.50	0.34	0.107	0.17	0.018	7%
11	8.00	0.38		0.23	0.098					1.00	0.50	0.38	0.098	0.19	0.019	7%
12	8.50	0.22		0.13	0.158					1.00	0.50	0.22	0.158	0.11	0.017	7%
13	9.00	0.31		0.19	0.075					1.00	0.50	0.31	0.075	0.16	0.012	4%
14	9.50	0.29		0.17	0.092					1.00	0.50	0.29	0.092	0.15	0.013	5%
15	10.00	0.29		0.17	0.039					1.00	0.50	0.29	0.039	0.15	0.006	2%
16	10.50	0.17		0.10	0.200					1.00	0.50	0.17	0.200	0.09	0.017	7%
17	11.00	0.22		0.13	0.195					1.00	0.50	0.22	0.195	0.11	0.021	6%
18	11.50	0.28		0.17	0.054					1.00	0.50	0.28	0.054	0.14	0.008	3%
19	12.00	0.38		0.23	0.073					1.00	0.50	0.38	0.073	0.19	0.014	5%
20	12.50	0.25		0.15	0.233					1.00	0.40	0.25	0.233	0.10	0.023	9%
LB	12.80	0.00	0.00		0.00				0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.259</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m DS of bridge

Meas. Start Time (MST):	14:25
Meas. End Time (MST):	14:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 21°C



**Flow characteristics:**

Total Flow:	0.259	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.02	(m <sup>2</sup> )
Wetted Width:	10.30	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.65	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.601	0.616
Water (°C):	14.6	15.1
Datalogger Clock:	13:11	15:01
Laptop Clock:	13:11	15:01
Battery (Main):	14.1	14.1
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Replaced
PT# (if replaced):	284725	268453
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced PLS
- Installed modem mount.

**General Notes:**

- Installed BM 7
- Performed bank survey

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S02-06
S02-07			2.229	298.432		15 m SSE of logger	S02-05
S02-05			3.013	297.648		3/4" Pipe 3 m SE of logger	S02-07
S02-06	2.262	300.661		298.399	298.399	3/4" Pipe southeast of logger	WL
Ice/PT:							WL
Water Level:			3.835	296.826		Time WL Surveyed: 14:09	S02-07
Other:						BM 7 (new 3/4" Pipe)	S02-05
<b>Setup #2</b>							S02-06
S02-07			2.216	298.432		15 m SSE of logger	
S02-05	3.000	300.648		297.648		3/4" Pipe 3 m SE of logger	
S02-06			2.248	298.400	298.399	3/4" Pipe southeast of logger	
Ice/PT:							
Water Level:			3.822	296.826		Time WL Surveyed: 14:11	(must close survey loop on survey starting point)
Other:						BM 7 (new 3/4" Pipe)	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S02-05	3.000	300.648		297.648		
Water Level:				3.825	296.822	Time WL Surveyed: 14:54	
Water Level:				3.816	296.820	Time WL Surveyed: 14:56	
BM	S02-05	2.988	300.636		297.648		

**WL Survey Summary**

	Before	After
Average WL:	296.826	296.821
Transducer Elevation:	296.225	296.205
Closing Error:	-0.001	-
WL Check:	0.000	0.002

**Site Rating Information**

Measured Discharge:	0.259
Expected Discharge:	0.56
Shift from Existing Rating (m <sup>3</sup> /s):	0.30
Shift from Existing Rating (%):	116%

**Field Personnel:**

SM, TR	Trip Date:	10-Sep-13
SM	Date:	10-Sep-13
CJ	Date:	25-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: October 28, 2013  
 Site Visit Time (MST): 13:20

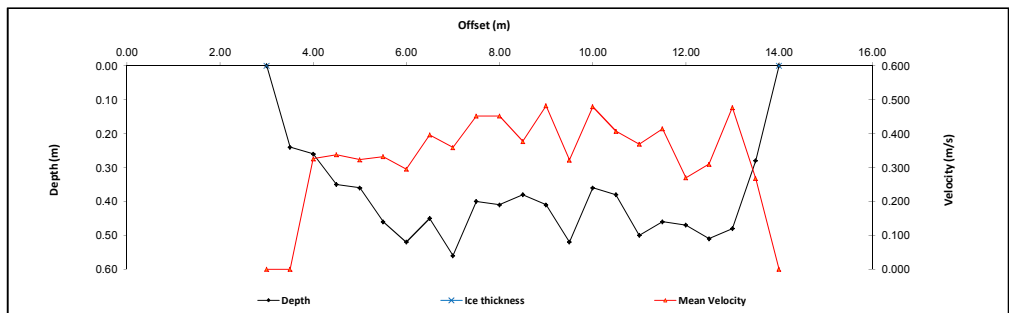


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
LB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000						
1	3.50	0.24		0.14	0.000					1.00	0.50	0.24	0.000	0.12	0.000	0%					
2	4.00	0.26		0.16	0.326					1.00	0.50	0.26	0.326	0.13	0.042	3%					
3	4.50	0.35		0.21	0.338					1.00	0.50	0.35	0.338	0.18	0.059	4%					
4	5.00	0.36		0.22	0.323					1.00	0.50	0.36	0.323	0.18	0.058	4%					
5	5.50	0.46		0.28	0.332					1.00	0.50	0.46	0.332	0.23	0.076	5%					
6	6.00	0.52		0.31	0.295					1.00	0.50	0.52	0.295	0.26	0.077	5%					
7	6.50	0.45		0.27	0.396					1.00	0.50	0.45	0.396	0.23	0.089	6%					
8	7.00	0.56		0.34	0.359					1.00	0.50	0.56	0.359	0.28	0.101	6%					
9	7.50	0.40		0.24	0.452					1.00	0.50	0.40	0.452	0.20	0.090	6%					
10	8.00	0.41		0.25	0.452					1.00	0.50	0.41	0.452	0.21	0.093	6%					
11	8.50	0.38		0.23	0.377					1.00	0.50	0.38	0.377	0.19	0.072	5%					
12	9.00	0.41		0.25	0.482					1.00	0.50	0.41	0.482	0.21	0.099	6%					
13	9.50	0.52		0.31	0.322					1.00	0.50	0.52	0.322	0.26	0.084	5%					
14	10.00	0.36		0.22	0.479					1.00	0.50	0.36	0.479	0.18	0.086	5%					
15	10.50	0.38		0.23	0.407					1.00	0.50	0.38	0.407	0.19	0.077	5%					
16	11.00	0.50		0.30	0.369					1.00	0.50	0.50	0.369	0.25	0.092	6%					
17	11.50	0.46		0.28	0.414					1.00	0.50	0.46	0.414	0.23	0.095	6%					
18	12.00	0.47		0.28	0.270					1.00	0.50	0.47	0.270	0.24	0.063	4%					
19	12.50	0.51		0.31	0.310					1.00	0.50	0.51	0.310	0.26	0.079	5%					
20	13.00	0.48		0.29	0.477					1.00	0.50	0.48	0.477	0.24	0.114	7%					
21	13.50	0.28		0.17	0.268					1.00	0.50	0.28	0.268	0.14	0.038	2%					
RB	14.00	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000						
<b>Total Flow</b>														<b>1.59</b>	<b>100%</b>						

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m DS of bridge

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:10
Equipment:	ADV
Method:	Wading
River Condition:	Good Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, light breeze, -6°C



**Flow characteristics:**

Total Flow:	1.59	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.38	(m <sup>2</sup> )
Wetted Width:	11.00	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.784	0.790
Water (°C):	0.0	0.0
Datalogger Clock:	13:31	14:20
Laptop Clock:	13:31	14:20
Battery (Main):	14.8	14.8
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ice forming alongs banks

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S02-01			2.307	298.001	297.990	Rebar in PVC	S02-06
S02-05			2.661	297.647	297.256	3/4" Pipe 3 m SE of logger	S02-01
S02-06	1.909	300.308		298.399	298.399	3/4" Pipe southwest of logger	WL
Ice/PT:							WL
Water Level:			3.315	296.993		Time WL Surveyed: 13:42	S02-01
BM7			1.878	298.430		BM 7 (new 3/4" Pipe)	S02-05
<b>Setup #2</b>							S02-06
S02-01			2.292	298.003	297.990	Rebar in PVC	
S02-05	2.648	300.295		297.647	297.256	3/4" Pipe 3 m SE of logger	
S02-06			1.894	298.401	298.399	3/4" Pipe southwest of logger	
Ice/PT:							
Water Level:			3.300	296.995		Time WL Surveyed: 13:44	(must close survey loop on survey starting point)
BM7			1.863	298.432	0.000	BM 7 (new 3/4" Pipe)	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S02-05	2.647	300.294		297.647		
Water Level:			3.292	297.002		Time WL Surveyed: 14:15	
Water Level:			3.281	296.999		Time WL Surveyed: 14:17	
BM	S02-05	2.633	300.280		297.647		

**WL Survey Summary**

	Before	After
Average WL:	296.994	297.001
Transducer Elevation:	296.210	296.211
Closing Error:	-0.002	-
WL Check:	0.002	0.003

**Site Rating Information**

Measured Discharge:	1.59
Expected Discharge:	1.90
Shift from Existing Rating (m <sup>3</sup> /s):	0.31
Shift from Existing Rating (%):	19%

**Field Personnel:**

SM, TR	Trip Date:	28-Oct-13
SM	Date:	28-Oct-13
CJ	Date:	4-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: December 1, 2014  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	5.60	0.31	0.17	0.24	0.056				0.88	0.48	0.14	0.049	0.07	0.003	3%	
2	5.95	0.28	0.17	0.23	0.029				0.88	0.38	0.11	0.026	0.04	0.001	1%	
3	6.35	0.29	0.22	0.26	-0.002				0.88	0.48	0.07	-0.002	0.03	0.000	0%	
4	6.90	0.40	0.21	0.31	0.051				0.88	0.48	0.19	0.045	0.09	0.004	3%	
5	7.30	0.39	0.17	0.28	0.094				0.88	0.45	0.22	0.083	0.10	0.008	7%	
6	7.80	0.39	0.15	0.27	0.071				0.88	0.45	0.24	0.062	0.11	0.007	5%	
7	8.20	0.43	0.15	0.29	0.079				0.88	0.40	0.28	0.070	0.11	0.008	6%	
8	8.60	0.35	0.12	0.24	0.074				0.88	0.35	0.23	0.065	0.08	0.005	4%	
9	8.90	0.28	0.13	0.21	0.088				0.88	0.30	0.15	0.077	0.05	0.003	3%	
10	9.20	0.38	0.12	0.25	0.078				0.88	0.32	0.26	0.069	0.08	0.006	5%	
11	9.55	0.30	0.06	0.18	0.101				0.88	0.30	0.24	0.089	0.07	0.006	5%	
12	9.80	0.31	0.05	0.18	0.066				0.88	0.32	0.26	0.058	0.08	0.005	4%	
13	10.20	0.26	0.04	0.15	0.105				0.88	0.38	0.22	0.092	0.08	0.008	6%	
14	10.55	0.29	0.01	0.15	0.100				0.88	0.38	0.28	0.088	0.11	0.009	8%	
15	10.95	0.27	0.01	0.14	0.048				0.88	0.40	0.26	0.042	0.10	0.004	4%	
16	11.35	0.21	0.01	0.11	0.162				0.88	0.30	0.20	0.143	0.06	0.009	7%	
17	11.55	0.20	0.01	0.11	0.183				0.88	0.18	0.19	0.161	0.03	0.005	4%	
18	11.70	0.21	0.00	0.11	0.219				0.88	0.23	0.21	0.193	0.05	0.009	7%	
19	12.00	0.22	0.01	0.12	0.131				0.88	0.30	0.21	0.115	0.06	0.007	6%	
20	12.30	0.20	0.01	0.11	0.123				0.88	0.35	0.19	0.108	0.07	0.007	6%	
21	12.70	0.21	0.01	0.11	-0.001				0.88	0.40	0.20	-0.001	0.08	0.000	0%	
22	13.10	0.27	0.01	0.14	0.079				0.88	0.40	0.26	0.070	0.10	0.007	6%	
RB	13.50	0.00	0.00		0.00				0.88	0.20	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.123</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	12:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light snow, breezy, -7°C

**Flow characteristics:**

Total Flow:	0.123	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.66	(m <sup>2</sup> )
Wetted Width:	8.50	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.05	

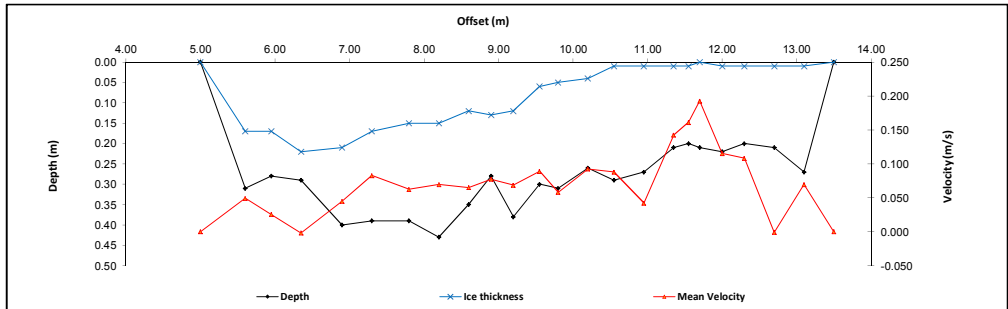
**Logger Details:**

	Before	After
Transducer Reading (m):	0.576	0.576
Water (°C):	0.0	0.0
Datalogger Clock:	12:04	13:03
Laptop Clock:	12:04	13:03
Battery (Main):	13.4	12.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- 4 holes near right bank.  
 - Water surface was below ice



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S02-01					297.990	Rebar in PVC	S02-01
S02-04			2.875	297.648	297.256	3/4" Pipe 3 m SE of logger	S02-04
S02-06	2.124	300.523		298.399	298.399	3/4" Pipe southwest of logger	WL
Ice/PT:			3.691	296.832			Ice
Water Level:			3.744	296.779			Ice
BM7			2.094	298.429			WL
<b>Setup #2</b>							
S02-01					297.990	Rebar in PVC	S02-04
S02-04	2.890	300.538		297.648	297.256	3/4" Pipe 3 m SE of logger	S02-01
S02-06			2.138	298.400	298.399	3/4" Pipe southwest of logger	
Ice/PT:			3.704	296.834			
Water Level:			3.758	296.780			
BM7			2.108	298.430	0.000		
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S02-04	2.876	300.524	297.648	296.774		
Water Level:				3.734	296.773		
BM:	S02-04	2.859	300.507	297.648	296.774		

**WL Survey Summary**

	Before	After
Average WL:	296.780	296.774
Transducer Elevation:	296.204	296.198
Closing Error:	-0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.123
Expected Discharge:	0.32
Shift from Existing Rating (m <sup>3</sup> /s):	0.20
Shift from Existing Rating (%):	163%

**Field Personnel:**

SM, TR	Trip Date:	1-Dec-13
SM	Date:	1-Dec-13
DW	Date:	31-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: May 5, 2013  
 Site Visit Time (MST): 12:00

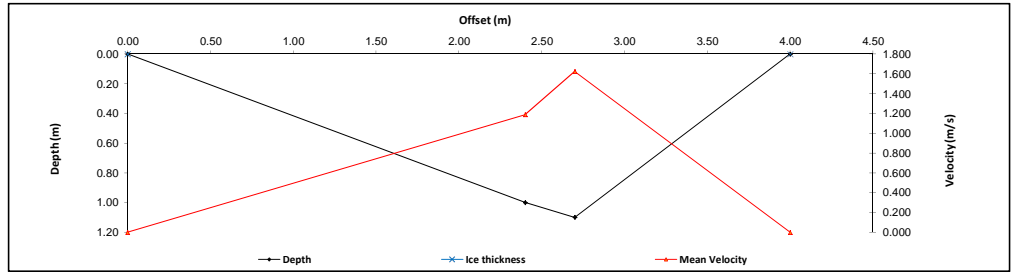


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	1.20	0.00	0.000	0.00	0.000	
1	2.40	1.00			1.188	0.80		0.20		1.00	1.35	1.00	1.188	1.35	1.604	53%
2	2.70	1.10			1.623	0.88		0.22		1.00	0.80	1.10	1.623	0.88	1.428	47%
RB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	0.65	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.03</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	High flow, ice along banks.
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, breezy, 20°C



**Flow characteristics:**

Total Flow:	3.03	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.23	(m <sup>2</sup> )
Wetted Width:	4.00	(m)
Hydraulic Depth:	0.56	(m)
Mean Velocity:	1.36	(m/s)
Froude Number:	0.58	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.933	0.949
Water (°C):	0.2	0.2
Rainfall (mm):	0.50	0.00
Datalogger Clock:	12:10	12:48
Laptop Clock:	12:10	12:48
Battery (Main):	14.0	13.7
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessiccant:	New	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	304016	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modern operational RSSI -94
- Tested precip gauge - Ok

**General Notes:**

- Flow measurement not conducted due to safety concerns
- 2 measurements conducted by reaching into channel

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S03-03			1.331	361.381	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04			1.148	361.564	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05	1.124	362.712		361.588	361.588	3/4" Pipe 10 m NW of logger	S03-04
Ice/PT:							WL
Water Level:			2.932	359.780	Time WL Surveyed:	12:25	WL
Other (BM2):					361.201	Rebar	S03-04
<b>Setup #2</b>							S03-03
S03-03			1.315	361.382	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04	1.133	362.697		361.564	361.565	3/4" Pipe 5 m W of logger	
S03-05			1.108	361.589	361.588	3/4" Pipe 10 m NW of logger	
Ice/PT:							
Water Level:			2.915	359.782	Time WL Surveyed:	12:26	(must close survey loop on survey starting point)
Other (BM2):					361.201	Rebar	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S03-04	1.132	362.696		361.564		
Water Level:			2.890	359.806	Time WL Surveyed:	12:50	
Water Level:			2.874	359.807	Time WL Surveyed:	12:52	
BM:	S03-04	1.117	362.681		361.588		

**WL Survey Summary**

	Before	After
Average WL:	359.781	359.807
Transducer Elevation:	358.848	358.858
Closing Error:	-0.001	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	3.03
Expected Discharge:	6.46
Shift from Existing Rating (m <sup>3</sup> /s):	3.43
Shift from Existing Rating (%):	113%

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	5-May-13
Data Check Personnel:	SM	Date:	5-May-13
Entered Digitally in the Field:	CJ	Date:	21-May-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 15, 2013  
 Site Visit Time (MST): 11:50

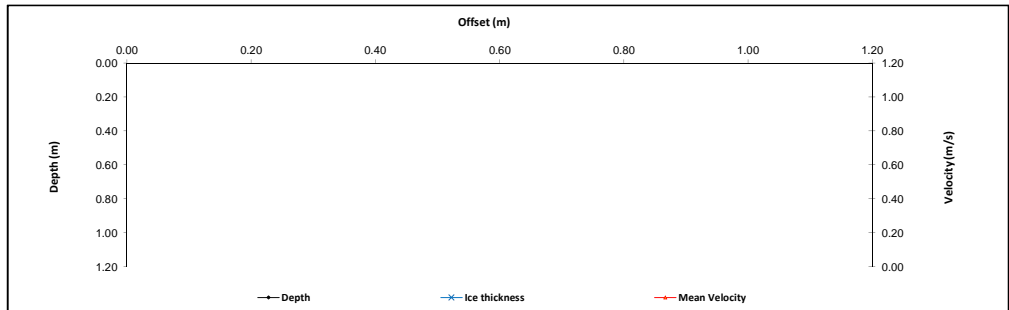


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High and fast
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Overcast, light rain, breezy, 17°C



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.917	-
Water (°C):	12.6	-
Rainfall (mm):	0.00	-
Datalogger Clock:	11:56	-
Laptop Clock:	11:56	-
Battery (Main):	13.6	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- No flow measurement possible due to safety concerns from extremely high water and fast flow

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S03-03			1.183	361.385	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04	1.003	362.568		361.565	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05			0.978	361.590	361.588	3/4" Pipe 10 m NW of logger	S03-04
Ice/PT:							WL
Water Level:		2.849		359.719		Time WL Surveyed: 12:02	WL
Other (BM2):					360.514	Rebar	S03-04
<b>Setup #2</b>							S03-03
S03-03	1.112	362.497		361.385	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04			0.932	361.565	361.565	3/4" Pipe 5 m W of logger	
S03-05			0.907	361.590	361.588	3/4" Pipe 10 m NW of logger	
Ice/PT:							
Water Level:		2.781		359.716		Time WL Surveyed: 12:03	(must close survey loop on survey starting point)
Other (BM2):					360.514	Rebar	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:							

**WL Survey Summary**

	Before	After
Average WL:	359.718	-
Transducer Elevation:	358.801	-
Closing Error:	0.000	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	5.37
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, SG	Trip Date:	15-Jun-13
<b>Data Entry Personnel:</b>	TR, SG	Date:	15-Jun-13
<b>Data Check Personnel:</b>	CJ	Date:	18-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 14:45



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.30	0.30		0.18	0.061					1.00	0.18	0.30	0.061	0.05	0.003	4%
2	1.45	0.36		0.22	0.072					1.00	0.15	0.36	0.072	0.05	0.004	5%
3	1.60	0.37		0.22	0.077					1.00	0.15	0.37	0.077	0.06	0.004	5%
4	1.75	0.36		0.22	0.080					1.00	0.15	0.36	0.080	0.05	0.004	5%
5	1.90	0.20		0.12	0.140					1.00	0.15	0.20	0.140	0.03	0.004	5%
6	2.05	0.17		0.10	0.179					1.00	0.15	0.17	0.179	0.03	0.005	5%
7	2.20	0.34		0.20	0.093					1.00	0.15	0.34	0.093	0.05	0.005	6%
8	2.35	0.33		0.20	0.078					1.00	0.15	0.33	0.078	0.05	0.004	5%
9	2.50	0.38		0.23	0.137					1.00	0.11	0.38	0.137	0.04	0.006	7%
10	2.57	0.38		0.23	0.179					1.00	0.07	0.38	0.179	0.03	0.005	6%
11	2.65	0.37		0.22	0.175					1.00	0.08	0.37	0.175	0.03	0.005	6%
12	2.72	0.37		0.22	0.158					1.00	0.07	0.37	0.158	0.03	0.004	5%
13	2.80	0.31		0.19	0.129					1.00	0.12	0.31	0.129	0.04	0.005	5%
14	2.95	0.32		0.19	0.118					1.00	0.15	0.32	0.118	0.05	0.006	7%
15	3.10	0.34		0.20	0.109					1.00	0.15	0.34	0.109	0.05	0.006	7%
16	3.25	0.32		0.19	0.093					1.00	0.15	0.32	0.093	0.05	0.004	5%
17	3.40	0.28		0.17	0.088					1.00	0.15	0.28	0.088	0.04	0.004	4%
18	3.55	0.26		0.16	0.074					1.00	0.15	0.26	0.074	0.04	0.003	3%
19	3.70	0.24		0.14	0.002					1.00	0.15	0.24	0.002	0.04	0.000	0%
20	3.85	0.16		0.10	0.082					1.00	0.30	0.16	0.082	0.05	0.004	5%
LB	4.30	0.00	0.00		0.00		0.00			1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.084</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	15:05
Meas. End Time (MST):	15:24
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 22°C

**Flow characteristics:**

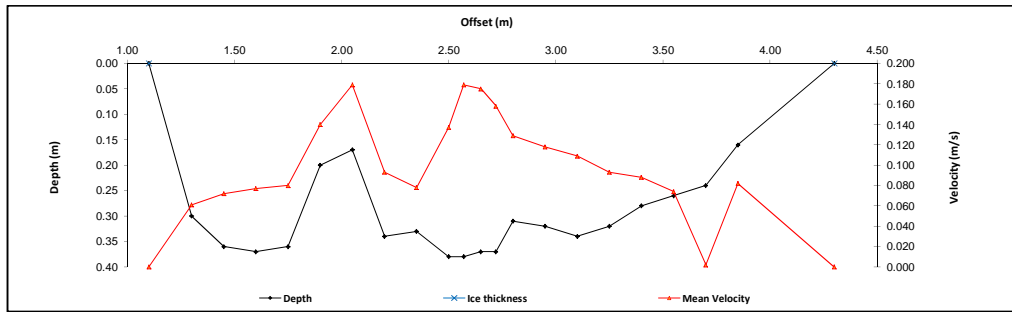
Total Flow:	0.084	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.85	(m <sup>2</sup> )
Wetted Width:	3.20	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.66	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.296	0.295
Water (°C):	16.2	16.2
Rainfall (mm):	0.00	0.00
Datalogger Clock:	14:46	15:32
Laptop Clock:	14:45	15:32
Battery (Main):	13.5	13.5
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	Replaced
Vent Tube Dessicant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S03-03	1.323	362.705		361.382	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04			1.142	361.563	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05			1.116	361.589	361.588	3/4" Pipe 10 m NW of logger	S03-04
Ice/PT:							WL
Water Level:			3.587	359.118		Time WL Surveyed: 14:57	WL
Other (BM2):					361.201	Rebar	S03-04
<b>Setup #2</b>							
S03-03			1.311	361.383	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04			1.129	361.565	361.565	3/4" Pipe 5 m W of logger	
S03-05	1.105	362.694		361.589	361.588	3/4" Pipe 10 m NW of logger	
Ice/PT:							
Water Level:			3.576	359.118		Time WL Surveyed: 14:59	
Other (BM2):					361.201	Rebar	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S03-04	1.128	362.691		361.563		Time WL Surveyed: 15:28	
Water Level:				359.114		Time WL Surveyed: 15:30	
Water Level:				3.565			
BM: S03-04	1.113	362.676		361.589			

**WL Survey Summary**

	Before	After
Average WL:	359.118	359.113
Transducer Elevation:	358.822	358.818
Closing Error:	-0.001	-
WL Check:	0.000	0.003

**Site Rating Information**

Measured Discharge:	0.084
Expected Discharge:	0.40
Shift from Existing Rating (m <sup>3</sup> /s):	0.32
Shift from Existing Rating (%):	379%

**Field Personnel:**

SM, TR	Trip Date:	11-Aug-13
SM	Date:	11-Aug-13
CJ	Date:	23-Aug-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kearl Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: September 13, 2013  
 Site Visit Time (MST): 08:45

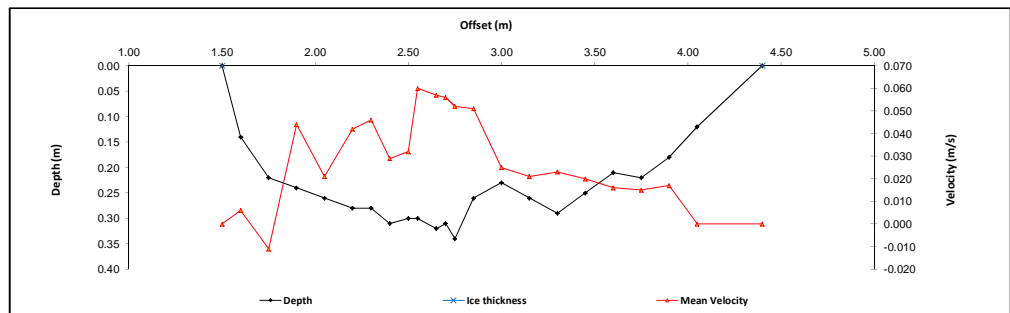


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.60	0.14		0.08	0.006					1.00	0.13	0.14	0.006	0.02	0.000	1%
2	1.75	0.22		0.13	-0.011					1.00	0.15	0.22	-0.011	0.03	0.000	-2%
3	1.90	0.24		0.14	0.044					1.00	0.15	0.24	0.044	0.04	0.002	9%
4	2.05	0.26		0.16	0.021					1.00	0.15	0.26	0.021	0.04	0.001	5%
5	2.20	0.28		0.17	0.042					1.00	0.13	0.28	0.042	0.04	0.001	8%
6	2.30	0.28		0.17	0.046					1.00	0.10	0.28	0.046	0.03	0.001	7%
7	2.40	0.31		0.19	0.029					1.00	0.10	0.31	0.029	0.03	0.001	5%
8	2.50	0.30		0.18	0.032					1.00	0.07	0.30	0.032	0.02	0.001	4%
9	2.55	0.30		0.18	0.060					1.00	0.07	0.30	0.060	0.02	0.001	7%
10	2.65	0.32		0.19	0.057					1.00	0.08	0.32	0.057	0.02	0.001	8%
11	2.70	0.31		0.19	0.056					1.00	0.05	0.31	0.056	0.02	0.001	5%
12	2.75	0.34		0.20	0.052					1.00	0.07	0.34	0.052	0.03	0.001	7%
13	2.85	0.26		0.16	0.051					1.00	0.13	0.26	0.051	0.03	0.002	9%
14	3.00	0.23		0.14	0.025					1.00	0.15	0.23	0.025	0.03	0.001	5%
15	3.15	0.26		0.16	0.021					1.00	0.15	0.26	0.021	0.04	0.001	5%
16	3.30	0.29		0.17	0.023					1.00	0.15	0.29	0.023	0.04	0.001	6%
17	3.45	0.25		0.15	0.020					1.00	0.15	0.25	0.020	0.04	0.001	4%
18	3.60	0.21		0.13	0.016					1.00	0.15	0.21	0.016	0.03	0.001	3%
19	3.75	0.22		0.13	0.015					1.00	0.15	0.22	0.015	0.03	0.000	3%
20	3.90	0.18		0.11	0.017					1.00	0.15	0.18	0.017	0.03	0.000	3%
21	4.05	0.12		0.07	0.000					1.00	0.25	0.12	0.000	0.03	0.000	0%
LB	4.40	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.018</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5 m DS of pressure transducer

Meas. Start Time (MST):	9:10
Meas. End Time (MST):	9:35
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 15°C



**Flow characteristics:**

Total Flow:	0.018	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.64	(m <sup>2</sup> )
Wetted Width:	2.90	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.63	(m/s)
Froude Number:	0.62	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.207	0.211
Water (°C):	10.5	10.7
Rainfall (mm):	0.00	0.00
Datalogger Clock:	08:59	09:52
Laptop Clock:	08:59	09:52
Battery (Main):	13.8	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Large rocks in channel

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S03-03			1.452	361.379	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04			1.266	361.565	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05	1.243	362.831		361.588	361.588	3/4" Pipe 10 m NW of logger	S03-04
Ice/PT:							WL
Water Level:			3.804	359.027		Time WL Surveyed: 9:03	WL
Other (BM2):					361.201	Rebar	S03-04
<b>Setup #2</b>							S03-03
S03-03			1.444	361.380	361.382	3/4" Pipe 3 m E of logger	S03-05
S03-04	1.259	362.824		361.565	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05			1.236	361.588	361.588	3/4" Pipe 10 m NW of logger	
Ice/PT:							
Water Level:			3.794	359.030		Time WL Surveyed: 9:05	
Other (BM2):					361.201	Rebar	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S03-03	1.444	362.823		361.379		
Water Level:			3.798	359.025		Time WL Surveyed: 9:42	
Water Level:			3.787	359.026		Time WL Surveyed: 9:43	
BM:	S03-03	1.436	362.815		361.379		

**WL Survey Summary**

	Before	After
Average WL:	359.029	359.027
Transducer Elevation:	358.822	358.816
Closing Error:	0.000	-
WL Check:	0.003	-0.003

**Site Rating Information**

Measured Discharge:	0.018
Expected Discharge:	0.21
Shift from Existing Rating (m <sup>3</sup> /s):	0.19
Shift from Existing Rating (%):	1066%

**Field Personnel:**

	DW, CJ	Trip Date:	13-Sep-13
Data Entry Personnel:	CJ	Date:	13-Sep-13
Data Check Personnel:	CJ	Date:	25-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

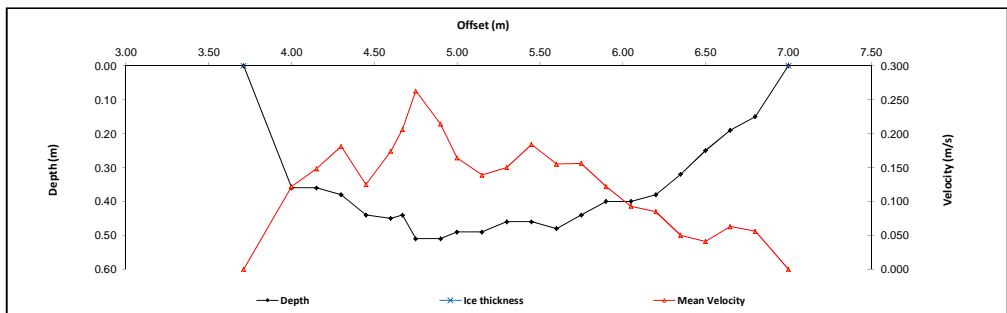
Site Visit Date: November 1, 2013  
 Site Visit Time (MST): 10:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.71	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.00	0.36		0.22	0.122					1.00	0.22	0.36	0.122	0.08	0.010	6%
2	4.15	0.36		0.22	0.148					1.00	0.15	0.36	0.148	0.05	0.008	5%
3	4.30	0.38		0.23	0.181					1.00	0.15	0.38	0.181	0.06	0.010	6%
4	4.45	0.44		0.26	0.125					1.00	0.15	0.44	0.125	0.07	0.008	5%
5	4.60	0.45		0.27	0.174					1.00	0.11	0.45	0.174	0.05	0.009	5%
6	4.67	0.44		0.26	0.206					1.00	0.08	0.44	0.206	0.03	0.007	4%
7	4.75	0.51		0.31	0.263					1.00	0.12	0.51	0.263	0.06	0.015	9%
8	4.90	0.51		0.31	0.214					1.00	0.13	0.51	0.214	0.06	0.014	8%
9	5.00	0.49		0.29	0.164					1.00	0.13	0.49	0.164	0.06	0.010	6%
10	5.15	0.49		0.29	0.139					1.00	0.15	0.49	0.139	0.07	0.010	6%
11	5.30	0.46		0.28	0.150					1.00	0.15	0.46	0.150	0.07	0.010	6%
12	5.45	0.46		0.28	0.184					1.00	0.15	0.46	0.184	0.07	0.013	7%
13	5.60	0.48		0.29	0.155					1.00	0.15	0.48	0.155	0.07	0.011	7%
14	5.75	0.44		0.26	0.156					1.00	0.15	0.44	0.156	0.07	0.010	6%
15	5.90	0.40		0.24	0.122					1.00	0.15	0.40	0.122	0.06	0.007	4%
16	6.05	0.40		0.24	0.093					1.00	0.15	0.40	0.093	0.06	0.006	3%
17	6.20	0.38		0.23	0.085					1.00	0.15	0.38	0.085	0.06	0.005	3%
18	6.35	0.32		0.19	0.050					1.00	0.15	0.32	0.050	0.05	0.002	1%
19	6.50	0.25		0.15	0.041					1.00	0.15	0.25	0.041	0.04	0.002	1%
20	6.65	0.19		0.11	0.063					1.00	0.15	0.19	0.063	0.03	0.002	1%
21	6.80	0.15		0.09	0.056					1.00	0.18	0.15	0.056	0.03	0.001	1%
LB	7.00	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.170</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	11:16
Meas. End Time (MST):	11:36
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear calm, 2°C



**Flow characteristics:**

Total Flow:	0.170	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	3.29	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.88	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.369	0.373
Water (°C):	0.8	0.8
Rainfall (mm):	0.00	0.00
Datalogger Clock:	11:00	11:43
Laptop Clock:	11:00	11:43
Battery (Main):	12.7	12.8
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	304016	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Logger mast needs to be stabilized or replaced
- PLS removed for winter

**General Notes:**

- Some ice cover present
- Anchor cable and weight left at base of conifer marked with blue ribbon

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S03-03			1.370	361.380	361.382	3/4" Pipe 6 m NW of logger	S03-05
S03-04			1.186	361.564	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05	1.162	362.750		361.588	361.588	3/4" Pipe 4 m NE of logger	S03-04
Ice/PT:							WL
Water Level:			3.547	359.203		Time WL Surveyed: 11:10	WL
Other (BM2):					361.201	Rebar	S03-04
<b>Setup #2</b>							S03-03
S03-03			1.354	361.381	361.382	3/4" Pipe 6 m NW of logger	S03-05
S03-04	1.171	362.735		361.564	361.565	3/4" Pipe 5 m W of logger	S03-03
S03-05			1.148	361.587	361.588	3/4" Pipe 4 m NE of logger	S03-04
Ice/PT:							WL
Water Level:			3.536	359.199		Time WL Surveyed: 11:12	WL
Other (BM2):					361.201	Rebar	S03-04
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S03-04	1.171	362.735		361.564		
Water Level:			3.545	359.190		Time WL Surveyed: 11:39	
Water Level:			3.528	359.191		Time WL Surveyed: 11:40	
BM:	S03-04	1.155	362.719		361.588		

**WL Survey Summary**

	Before	After
Average WL:	359.201	359.191
Transducer Elevation:	358.832	358.818
Closing Error:	0.001	-
WL Check:	0.004	-0.001

**Site Rating Information**

Measured Discharge:	0.17
Expected Discharge:	0.67
Shift from Existing Rating (m <sup>3</sup> /s):	0.50
Shift from Existing Rating (%):	292%

**Field Personnel:**

	SM, TR	Trip Date:	1-Nov-13
Data Entry Personnel:	SM	Date:	1-Nov-13
Data Check Personnel:	CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date:

January 9, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.20	0.00	0.00	0.000	0.000	0.000	1.0	1.20	1.60	0.40	0.28	0.007	0.007	0.11	0.001	0%
1	2.00	1.40	0.30	0.016	0.036		1.0	1.60	2.18	0.58	1.10	0.026	0.026	0.63	0.016	4%
2	2.35	1.40	0.35	0.030	0.032		1.0	2.18	2.55	0.38	1.05	0.031	0.031	0.39	0.012	3%
3	2.75	1.50	0.35	0.043	0.040		1.0	2.55	2.93	0.38	1.15	0.042	0.042	0.43	0.018	5%
4	3.10	1.60	0.45	0.037	0.029		1.0	2.93	3.30	0.38	1.15	0.033	0.033	0.43	0.014	4%
5	3.50	1.60	0.45	0.053	0.044		1.0	3.30	3.63	0.33	1.15	0.049	0.049	0.37	0.018	5%
6	3.75	1.60	0.45	0.060	0.060		1.0	3.63	3.88	0.25	1.15	0.060	0.060	0.29	0.017	4%
7	4.00	1.60	0.45	0.044	0.045		1.0	3.88	4.15	0.28	1.15	0.045	0.045	0.32	0.014	4%
8	4.30	1.65	0.50	0.053	0.052		1.0	4.15	4.50	0.35	1.15	0.053	0.053	0.40	0.021	5%
9	4.70	1.65	0.50	0.062	0.049		1.0	4.50	4.88	0.38	1.15	0.056	0.056	0.43	0.024	6%
10	5.05	1.70	0.50	0.065	0.057		1.0	4.88	5.28	0.40	1.20	0.061	0.061	0.48	0.029	7%
11	5.50	1.70	0.55	0.063	0.061		1.0	5.28	5.70	0.43	1.15	0.062	0.062	0.49	0.030	8%
12	5.90	1.70	0.50	0.057	0.059		1.0	5.70	6.00	0.30	1.20	0.058	0.058	0.36	0.021	5%
13	6.10	1.65	0.50	0.062	0.061		1.0	6.00	6.30	0.30	1.15	0.062	0.062	0.35	0.021	5%
14	6.50	1.70	0.50	0.047	0.050		1.0	6.30	6.65	0.35	1.20	0.049	0.049	0.42	0.020	5%
15	6.80	1.65	0.45	0.054	0.054		1.0	6.65	6.93	0.27	1.20	0.054	0.054	0.33	0.018	4%
16	7.05	1.70	0.45	0.043	0.052		1.0	6.93	7.23	0.30	1.25	0.048	0.048	0.38	0.018	4%
17	7.40	1.65	0.45	0.047	0.052		1.0	7.23	7.55	0.33	1.20	0.050	0.050	0.39	0.019	5%
18	7.70	1.60	0.45	0.036	0.055		1.0	7.55	7.90	0.35	1.15	0.046	0.046	0.40	0.018	5%
19	8.10	1.55	0.40	0.045	0.059		1.0	7.90	8.30	0.40	1.15	0.052	0.052	0.46	0.024	6%
20	8.50	1.40	0.35	0.041	0.046		1.0	8.30	8.75	0.45	1.05	0.044	0.044	0.47	0.021	5%
LB	9.00	0.00	0.00	0.00	0.00	0.00	1.0	8.75	9.00	0.25	0.26	0.011	0.011	0.07	0.001	0%
<b>Total Flow</b>															<b>0.396</b>	

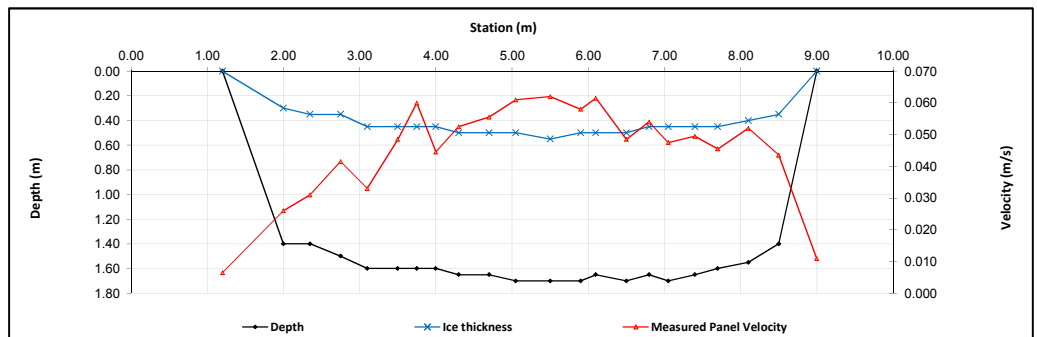
Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	13:23
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, -12°C

Flow characteristics:		
Total Flow:	0.396	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.40	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	1.077	(m)
Mean Velocity:	0.047	(m/s)
Froude Number:	0.015	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.632	-
Battery (Main):	0.5	-
Datalogger Clock:	12.5	13.07
Laptop Clock:	12.04	-
Dessicant:	Good	-
Logger# (if Δ):	13900	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S05-01	1.392	99.761		98.369	98.369	Old 3/4" Pipe
S05-02			1.234	98.527	98.516	3/4" Pipe 12 m SW of logger
S05-03			1.351	98.410	98.395	T-post close to logger
Ice/PT:			2.322	97.439		
Water Level:			2.346	97.415		
Other:						
<b>Setup #2</b>						
S05-01			1.36	98.366	98.369	Old 3/4" Pipe
S05-02			1.202	98.524	98.516	3/4" Pipe 12 m SW of logger
S05-03	1.316	99.726		98.410	98.395	T-post close to logger
Ice/PT:			2.291	97.435		
Water Level:			2.308	97.418		
Other:						

Closing Error	0.003
WL Check	0.003

Average WL	97.417
Transducer Elevation Before	95.785
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	9-Jan-13
Data Entry Personnel:	DW	Date:	9-Jan-13
Data Check Personnel:	CJ	Date:	22-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

February 9, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.30	0.00	0.00	0.000	0.000	0.000	1.0	5.30	5.70	0.40	0.28	0.008	0.008	0.11	0.001	0%
1	6.10	1.35	0.25	0.035	0.025	0.025	1.0	5.70	6.35	0.65	1.10	0.030	0.030	0.72	0.021	7%
2	6.60	1.45	0.30	0.033	0.015	0.015	1.0	6.35	6.80	0.45	1.15	0.024	0.024	0.52	0.012	4%
3	7.00	1.55	0.35	0.040	0.022	0.022	1.0	6.80	7.18	0.38	1.20	0.031	0.031	0.45	0.014	5%
4	7.35	1.50	0.45	0.045	0.041	0.041	1.0	7.18	7.58	0.40	1.05	0.043	0.043	0.42	0.018	6%
5	7.80	1.65	0.50	0.054	0.017	0.017	1.0	7.58	7.98	0.40	1.15	0.036	0.036	0.46	0.016	6%
6	8.15	1.60	0.65	0.052	0.038	0.038	1.0	7.98	8.38	0.40	0.95	0.045	0.045	0.38	0.017	6%
7	8.60	1.65	0.65	0.060	0.041	0.041	1.0	8.38	8.80	0.43	1.00	0.051	0.051	0.43	0.021	7%
8	9.00	1.65	0.70	0.056	0.040	0.040	1.0	8.80	9.20	0.40	0.95	0.048	0.048	0.38	0.018	6%
9	9.40	1.65	0.65	0.048	0.051	0.051	1.0	9.20	9.60	0.40	1.00	0.050	0.050	0.40	0.020	7%
10	9.80	1.70	0.70	0.048	0.056	0.056	1.0	9.60	10.00	0.40	1.00	0.052	0.052	0.40	0.021	7%
11	10.20	1.65	0.65	0.049	0.050	0.050	1.0	10.00	10.28	0.27	1.00	0.050	0.050	0.27	0.014	5%
12	10.35	1.70	0.65	0.052	0.048	0.048	1.0	10.28	10.48	0.20	1.05	0.050	0.050	0.21	0.011	4%
13	10.60	1.60	0.60	0.042	0.048	0.048	1.0	10.48	10.68	0.20	1.00	0.045	0.045	0.20	0.009	3%
14	10.75	1.60	0.55	0.055	0.049	0.049	1.0	10.68	10.93	0.25	1.05	0.052	0.052	0.26	0.014	5%
15	11.10	1.55	0.55	0.040	0.047	0.047	1.0	10.93	11.18	0.25	1.00	0.044	0.044	0.25	0.011	4%
16	11.25	1.50	0.55	0.042	0.047	0.047	1.0	11.18	11.48	0.30	0.95	0.045	0.045	0.28	0.013	4%
17	11.70	1.55	0.45	0.044	0.037	0.037	1.0	11.48	11.85	0.38	1.10	0.041	0.041	0.41	0.017	6%
18	12.00	1.40	0.45	0.045	0.043	0.043	1.0	11.85	12.30	0.45	0.95	0.044	0.044	0.43	0.019	7%
LB	12.60	0.00	0.00	0.00	0.00	0.00	1.0	12.30	12.60	0.30	0.24	0.011	0.011	0.07	0.001	0%
<b>Total Flow</b>														<b>0.287</b>		

Measurement Details:	
Start Time (MST):	15:10
End Time (MST):	16:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -10°C

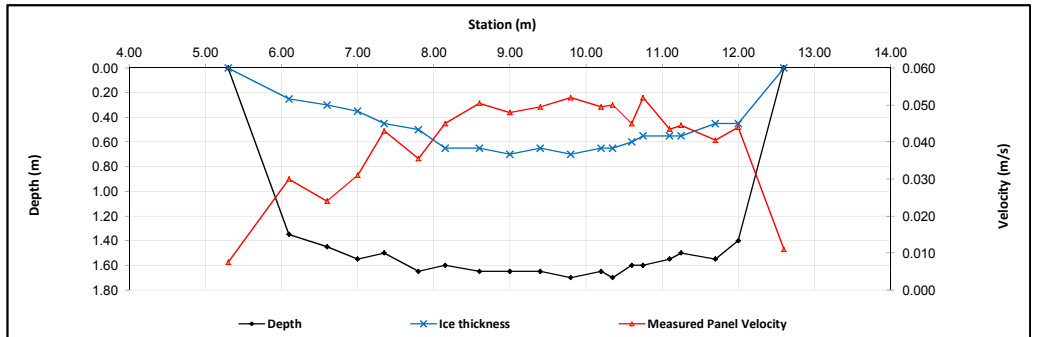
Flow characteristics:	
Total Flow:	0.287 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	7.05 (m <sup>2</sup> )
Wetted Width:	7.30 (m)
Hydraulic Depth:	0.966 (m)
Mean Velocity:	0.041 (m/s)
Froude Number:	0.013

Logger Details:		
	Before	After
Transducer Reading (m):	1.598	-
Water (°C):	0.6	-
Battery (Main):	13.3	-
Datalogger Clock:	15:16	-
Laptop Clock:	15:14	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

**General Notes:**

- Someone has augered holes US of the flow measurement near the station station



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S05-01	1.152	99.521		98.369	98.369	Old 3/4" Pipe
S05-02			0.997	98.524	98.516	3/4" Pipe 12 m SW of logger
S05-03			1.113	98.408	98.395	T-post close to logger
Ice/PT:			2.115	97.406		
Water Level:			2.145	97.376		
Other:						
<b>Setup #2</b>						
S05-01			1.139	98.369	98.369	Old 3/4" Pipe
S05-02	0.984	99.508		98.524	98.516	3/4" Pipe 12 m SW of logger
S05-03			1.101	98.407	98.395	T-post close to logger
Ice/PT:			2.102	97.406		
Water Level:			2.128	97.380		
Other:						

Closing Error	0.000	Average WL	97.378
WL Check	0.004	Transducer Elevation Before	95.78
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, SM	Trip Date:	9-Feb-13
<b>Data Entry Personnel:</b>	TR	Date:	9-Feb-13
<b>Data Check Personnel:</b>	CJ	Date:	12-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

March 3, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.60	0.00	0.00	0.000	0.000	0.000	1.0	4.60	4.90	0.30	0.25	0.005	0.005	0.07	0.000	0%
1	5.20	1.13	0.14	0.007	0.034	0.034	1.0	4.90	5.45	0.55	0.99	0.021	0.021	0.54	0.011	4%
2	5.70	1.28	0.14	0.026	0.030	0.030	1.0	5.45	5.90	0.45	1.14	0.028	0.028	0.51	0.014	5%
3	6.10	1.35	0.24	0.030	0.041	0.041	1.0	5.90	6.25	0.35	1.11	0.036	0.036	0.39	0.014	5%
4	6.40	1.40	0.25	0.031	0.038	0.038	1.0	6.25	6.50	0.25	1.15	0.035	0.035	0.29	0.010	3%
5	6.60	1.62	0.35	0.033	0.043	0.043	1.0	6.50	6.85	0.35	1.27	0.038	0.038	0.44	0.017	6%
6	7.10	1.65	0.44	0.044	0.045	0.045	1.0	6.85	7.23	0.38	1.21	0.045	0.045	0.45	0.020	7%
7	7.35	1.69	0.52	0.040	0.047	0.047	1.0	7.23	7.53	0.30	1.17	0.044	0.044	0.35	0.015	5%
8	7.70	1.63	0.58	0.040	0.043	0.043	1.0	7.53	7.83	0.30	1.05	0.042	0.042	0.32	0.013	4%
9	7.95	1.67	0.65	0.042	0.038	0.038	1.0	7.83	8.10	0.27	1.02	0.040	0.040	0.28	0.011	4%
10	8.25	1.72	0.66	0.040	0.040	0.040	1.0	8.10	8.45	0.35	1.06	0.040	0.040	0.37	0.015	5%
11	8.65	1.75	0.73	0.042	0.030	0.030	1.0	8.45	8.80	0.35	1.02	0.036	0.036	0.36	0.013	4%
12	8.95	1.72	0.74	0.040	0.044	0.044	1.0	8.80	9.08	0.27	0.98	0.042	0.042	0.27	0.011	4%
13	9.20	1.71	0.73	0.038	0.043	0.043	1.0	9.08	9.30	0.23	0.98	0.041	0.041	0.22	0.009	3%
14	9.40	1.70	0.74	0.041	0.040	0.040	1.0	9.30	9.55	0.25	0.96	0.041	0.041	0.24	0.010	3%
15	9.70	1.74	0.69	0.038	0.034	0.034	1.0	9.55	9.93	0.38	1.05	0.036	0.036	0.39	0.014	5%
16	10.15	1.69	0.71	0.028	0.042	0.042	1.0	9.93	10.33	0.40	0.98	0.035	0.035	0.39	0.014	5%
17	10.50	1.70	0.70	0.022	0.048	0.048	1.0	10.33	10.70	0.38	1.00	0.035	0.035	0.38	0.013	4%
18	10.90	1.57	0.65	0.035	0.043	0.043	1.0	10.70	11.10	0.40	0.92	0.039	0.039	0.37	0.014	5%
19	11.30	1.68	0.64	0.038	0.041	0.041	1.0	11.10	11.48	0.38	1.04	0.040	0.040	0.39	0.015	5%
20	11.65	1.57	0.55	0.034	0.032	0.032	1.0	11.48	11.83	0.35	1.02	0.033	0.033	0.36	0.012	4%
21	12.00	1.52	0.48	0.028	0.030	0.030	1.0	11.83	12.18	0.35	1.04	0.029	0.029	0.36	0.011	4%
22	12.35	1.40	0.42	0.024	0.023	0.023	1.0	12.18	12.55	0.38	0.98	0.024	0.024	0.37	0.009	3%
23	12.75	1.28	0.36	0.019	0.020	0.020	1.0	12.55	13.08	0.52	0.92	0.020	0.020	0.48	0.009	3%
RB	13.40	0.00	0.00	0.00	0.00	0.00	1.0	13.08	13.40	0.33	0.23	0.005	0.005	0.07	0.000	0%
<b>Total Flow</b>														<b>0.295</b>		

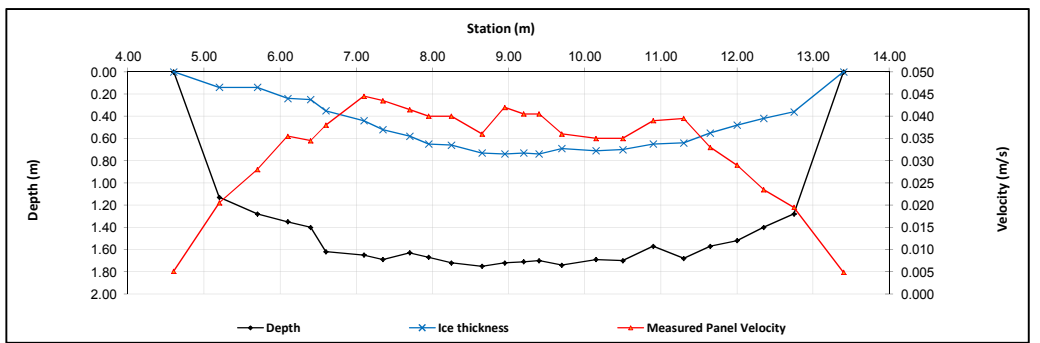
Measurement Details:	
Start Time (MST):	13:25
End Time (MST):	15:01
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Overcast, light snow, -5°C

Flow characteristics:		
Total Flow:	0.295	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.68	(m <sup>2</sup> )
Wetted Width:	8.80	(m)
Hydraulic Depth:	0.986	(m)
Mean Velocity:	0.034	(m/s)
Froude Number:	0.011	

Logger Details:		
Transducer Reading (m):	1.598	-
Water (°C):	0.6	-
Battery (Main):	13.5	-
Datalogger Clock:	13:28	-
Laptop Clock:	13:31	-
Dessicant:	Replaced	-
Logger# (if Δ):	13900	-
PT# (if Δ):	304017	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- YSI has been installed by someone 15 m US	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S05-01	1.349	99.718		98.369	98.369	Old 3/4" Pipe
S05-02			1.195	98.523	98.516	3/4" Pipe 12 m SW of logger
S05-03			1.307	98.411	98.395	T-post close to logger
Ice/PT:			2.342	97.376		
Water Level:			2.339	97.379		
Other:						
<b>Setup #2</b>						
S05-01			1.337	98.369	98.369	Old 3/4" Pipe
S05-02	1.183	99.706		98.523	98.516	3/4" Pipe 12 m SW of logger
S05-03			1.298	98.408	98.395	T-post close to logger
Ice/PT:			2.33	97.376		
Water Level:			2.328	97.378		
Other:						

Closing Error	0.000	Average WL	97.379
WL Check	0.001	Transducer Elevation Before	95.7805
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, DW	Trip Date:	3-Mar-13
Data Entry Personnel:	TR	Date:	3-Mar-13
Data Check Personnel:	CJ	Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

March 30, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.70	0.00	0.00	0.000	0.000	0.000	1.0	4.70	5.15	0.45	0.18	0.007	0.007	0.08	0.001	0%
1	5.60	1.33	0.60	0.026	0.026	0.026	1.0	5.15	5.85	0.70	0.73	0.026	0.026	0.51	0.013	6%
2	6.10	1.60	0.70	0.026	0.033	0.033	1.0	5.85	6.38	0.53	0.90	0.030	0.030	0.47	0.014	6%
3	6.65	1.66	0.73	0.028	0.041	0.041	1.0	6.38	6.88	0.50	0.93	0.035	0.035	0.47	0.016	7%
4	7.10	1.66	0.75	0.024	0.036	0.036	1.0	6.88	7.20	0.32	0.91	0.030	0.030	0.30	0.009	4%
5	7.30	1.67	0.80	0.025	0.030	0.030	1.0	7.20	7.45	0.25	0.87	0.028	0.028	0.22	0.006	3%
6	7.60	1.67	0.80	0.028	0.035	0.035	1.0	7.45	7.70	0.25	0.87	0.032	0.032	0.22	0.007	3%
7	7.80	1.67	0.80	0.029	0.037	0.037	1.0	7.70	7.95	0.25	0.87	0.033	0.033	0.22	0.007	3%
8	8.10	1.70	0.80	0.037	0.037	0.037	1.0	7.95	8.20	0.25	0.90	0.037	0.037	0.23	0.008	4%
9	8.30	1.65	0.80	0.034	0.040	0.040	1.0	8.20	8.40	0.20	0.85	0.037	0.037	0.17	0.006	3%
10	8.50	1.70	0.80	0.037	0.043	0.043	1.0	8.40	8.57	0.17	0.90	0.040	0.040	0.15	0.006	3%
11	8.64	1.73	0.80	0.031	0.043	0.043	1.0	8.57	8.80	0.23	0.93	0.037	0.037	0.21	0.008	3%
12	8.95	1.73	0.75	0.035	0.045	0.045	1.0	8.80	9.23	0.43	0.98	0.040	0.040	0.42	0.017	7%
13	9.50	1.67	0.65	0.035	0.041	0.041	1.0	9.23	9.75	0.53	1.02	0.038	0.038	0.54	0.020	9%
14	10.00	1.63	0.55	0.025	0.036	0.036	1.0	9.75	10.50	0.75	1.08	0.031	0.031	0.81	0.025	11%
15	11.00	1.40	0.35	0.036	0.034	0.034	1.0	10.50	11.23	0.73	1.05	0.035	0.035	0.76	0.027	11%
16	11.45	1.40	0.35	0.023	0.032	0.032	1.0	11.23	11.70	0.48	1.05	0.028	0.028	0.50	0.014	6%
17	11.95	1.30	0.30	0.013	0.030	0.030	1.0	11.70	12.18	0.48	1.00	0.022	0.022	0.48	0.010	4%
18	12.40	1.15	0.25	0.032	0.032	0.032	0.9	12.18	12.85	0.68	0.90	0.032	0.029	0.61	0.017	8%
RB	13.30	0.00	0.00	0.00	0.00	0.00	1.0	12.85	13.30	0.45	0.23	0.008	0.008	0.10	0.001	0%
<b>Total Flow</b>														<b>0.232</b>		

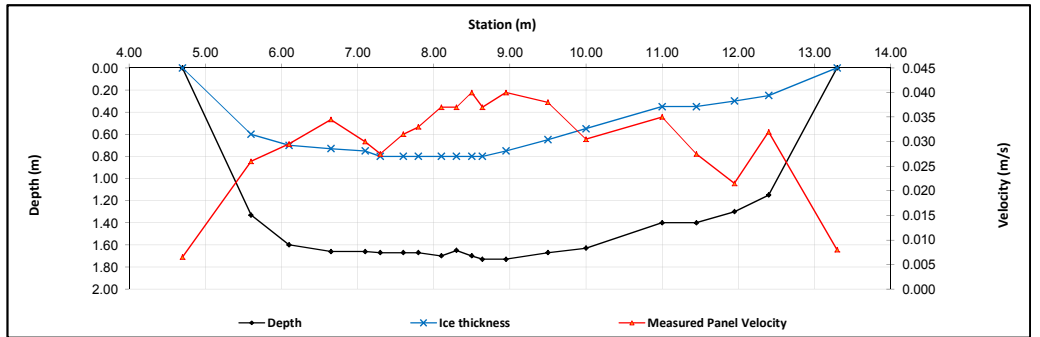
Measurement Details:	
Start Time (MST):	17:00
End Time (MST):	18:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 2°C

Flow characteristics:		
Total Flow:	0.232	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.45	(m <sup>2</sup> )
Wetted Width:	8.60	(m)
Hydraulic Depth:	0.866	(m)
Mean Velocity:	0.031	(m/s)
Froude Number:	0.011	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.560	-
Battery (Main):	0.6	-
Datalogger Clock:	14.7	-
Laptop Clock:	4:03	-
Dessicant:	4:03	-
Logger# (if Δ):	Replaced	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S05-01					98.369	Old 3/4" Pipe
S05-02					98.516	3/4" Pipe 12 m SW of logger
S05-03					98.395	T-post close to logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
S05-01					98.369	Old 3/4" Pipe
S05-02					98.516	3/4" Pipe 12 m SW of logger
S05-03					98.395	T-post close to logger
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation Before	
		Transducer Elevation After	-

Field Personnel:	CJ, XP	Trip Date:	30-Mar-13
Data Entry Personnel:	CJ	Date:	30-Mar-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: May 16, 2013  
 Site Visit Time (MST): 15:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.000	0.00	0.000	-
<b>Total Flow</b>																

No Flow Measurement Conducted

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High flow, flooded banks
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

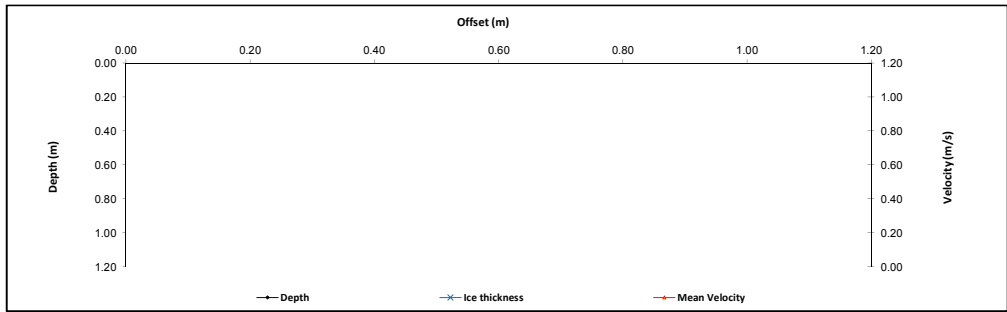
	Before	After
Transducer Reading (m):	2.844	-
Water (°C):	14.4	-
Datalogger Clock:	16:08	-
Laptop Clock:	16:09	-
Battery (Main):	13.7	-
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modem was removed because of water damage from the flooding

**General Notes:**

- No flow measurement was possible because of extensive flooding at station



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S05-03
S05-01	1.506	99.875		98.369	98.369	Old 3/4" Pipe	S05-02
S05-02			1.342	98.533	98.516	3/4" Pipe 12 m SW of logger	S05-01
S05-03			1.406	98.469	98.395	T-post close to logger	WL
Ice/PT:							Ice
Water Level:		1.266		98.609		Time WL Surveyed: 15:58	Ice
Other:							WL
<b>Setup #2</b>							S05-01
S05-01			1.493	98.369	98.369	Old 3/4" Pipe	S05-02
S05-02			1.327	98.535	98.516	3/4" Pipe 12 m SW of logger	S05-03
S05-03	1.393	99.862		98.469	98.395	T-post close to logger	
Ice/PT:							
Water Level:			1.254	98.608		Time WL Surveyed: 16:00	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				98.469		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				98.469			

**WL Survey Summary**

	Before	After
Average WL:	98.608	-
Transducer Elevation:	95.785	-
Closing Error:	0.000	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	16-May-13
<b>Data Entry Personnel:</b>	SM	Date:	16-May-13
<b>Data Check Personnel:</b>	CJ	Date:	21-May-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 14, 2013  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
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16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):

Meas. End Time (MST):

Equipment:

Method:

River Condition:

Channel Edges:

Quality/Error (see reverse):

Weather:

**Flow characteristics:**

Total Flow: - (m<sup>3</sup>/s)

Perceived Measurement Quality: -

Cross Section Area: 0.00 (m<sup>2</sup>)

Wetted Width: - (m)

Hydraulic Depth: - (m)

Mean Velocity: - (m/s)

Froude Number: -

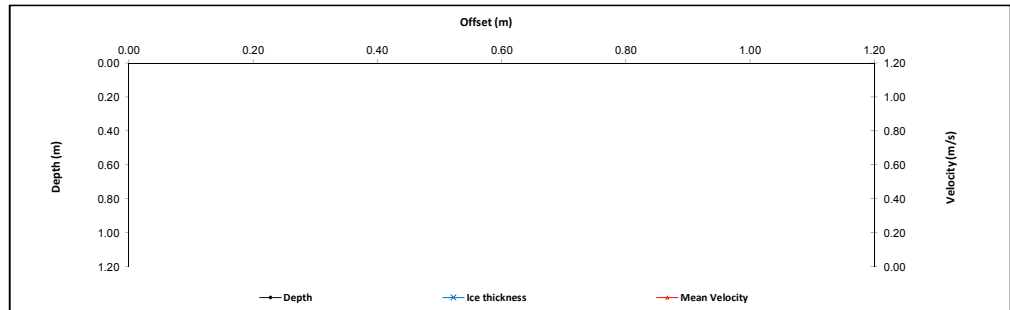
**Logger Details:**

	Before	After
Transducer Reading (m):		
Water (°C):		
Datalogger Clock:		
Laptop Clock:		
Battery (Main):		
Battery Condition:		
Battery Serial #:		
Enclosure Dessicant:		
Vent Tube Dessicant:		
PT# (if replaced):		
Logger# (if replaced):		

**Datalogger / Station Notes:**

**General Notes:**

- No station visit possible, station and landing sites are under water
- Water level is about 1.5 m higher than normal
- Water level at top of enclosure



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S05-01					98.369	Old 3/4" Pipe	
S05-02					98.516	3/4" Pipe 12 m SW of logger	
S05-03					98.395	T-post close to logger	
Ice/PT:							
Water Level:							
Other:							
<b>Setup #2</b>							
S05-01					98.369	Old 3/4" Pipe	
S05-02					98.516	3/4" Pipe 12 m SW of logger	
S05-03					98.395	T-post close to logger	
Ice/PT:							
Water Level:							
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:							
Water Level:							
BM:							

**WL Survey Summary**

	Before	After
Average WL:	-	-
Transducer Elevation:	-	-
Closing Error:	-	-
WL Check:	-	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, SG	Trip Date:	14 June 2013
<b>Data Entry Personnel:</b>	SG	Date:	14-Jun-13
<b>Data Check Personnel:</b>	CJ	Date:	18-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: Aug 14, 2013  
 Site Visit Time (MST): 8:00

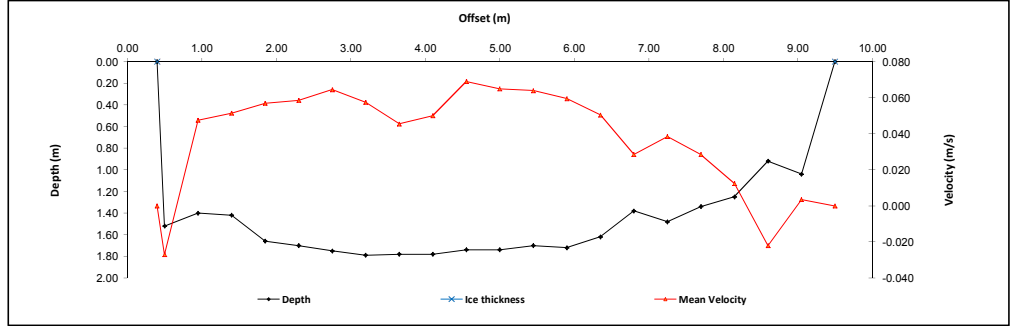


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.40	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.50	1.52				1.22	-0.086	0.30	0.032	1.00	0.28	1.52	-0.027	0.42	-0.011	-2%
2	0.95	1.40				1.12	0.053	0.28	0.042	1.00	0.45	1.40	0.048	0.63	0.030	5%
3	1.40	1.42				1.14	0.047	0.28	0.056	1.00	0.45	1.42	0.052	0.64	0.033	5%
4	1.85	1.66				1.33	0.059	0.33	0.055	1.00	0.45	1.66	0.057	0.75	0.043	7%
5	2.30	1.70				1.36	0.051	0.34	0.066	1.00	0.45	1.70	0.059	0.77	0.045	7%
6	2.75	1.75				1.40	0.052	0.35	0.077	1.00	0.45	1.75	0.065	0.79	0.051	8%
7	3.20	1.79				1.43	0.067	0.36	0.048	1.00	0.45	1.79	0.058	0.81	0.046	8%
8	3.65	1.78				1.42	0.062	0.36	0.029	1.00	0.45	1.78	0.046	0.80	0.036	6%
9	4.10	1.78				1.42	0.059	0.36	0.041	1.00	0.45	1.78	0.050	0.80	0.040	7%
10	4.55	1.74				1.39	0.079	0.35	0.059	1.00	0.45	1.74	0.069	0.78	0.054	9%
11	5.00	1.74				1.39	0.061	0.35	0.089	1.00	0.45	1.74	0.065	0.78	0.051	8%
12	5.45	1.70				1.36	0.060	0.34	0.088	1.00	0.45	1.70	0.064	0.77	0.049	8%
13	5.90	1.72				1.38	0.055	0.34	0.064	1.00	0.45	1.72	0.060	0.77	0.046	8%
14	6.35	1.62				1.30	0.054	0.32	0.047	1.00	0.45	1.62	0.051	0.73	0.037	6%
15	6.80	1.38				1.10	0.033	0.28	0.024	1.00	0.45	1.38	0.029	0.62	0.018	3%
16	7.25	1.45				1.18	0.039	0.30	0.038	1.00	0.45	1.48	0.039	0.67	0.026	4%
17	7.70	1.34				1.07	0.032	0.27	0.025	1.00	0.45	1.34	0.029	0.60	0.017	3%
18	8.15	1.25				1.00	0.017	0.25	0.008	1.00	0.45	1.25	0.013	0.56	0.007	1%
19	8.60	0.92				0.74	-0.043	0.18	-0.001	1.00	0.45	0.92	-0.022	0.41	-0.009	-1%
20	9.05	1.04				0.83	0.006	0.21	0.001	1.00	0.45	1.04	0.004	0.47	0.002	0%
RB	9.50	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.609</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5 m DS of station

Meas. Start Time (MST):	9:57
Meas. End Time (MST):	10:45
Equipment:	ADV
Method:	Fishcat
River Condition:	Low
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 25°C



**Flow characteristics:**

Total Flow:	0.609	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.56	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	1.49	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.652	1.392
Water (°C):	15.2	17.4
Datalogger Clock:	08:08	09:31
Laptop Clock:	08:05	09:31
Battery (Main):	14.0	12.9
Battery Condition:		Replaced
Battery Serial #:		
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Replaced
PT# (if replaced):	304017	284728
Logger# (if replaced):	13900	26850

**Datalogger / Station Notes:**

- Station appears to be working fine, even after being flooded
- Installed new 2" mast and moved station
- New modem
- RSSI: -85
- Replaced PT
- WL: 1.395
- Temp: 17.19
- Battery: 13.95
- Clocks: 11:06

**General Notes:**

- Beaver dam is still present US of station

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S05-01	1.173	99.542		98.369	98.369	Old 3/4" Pipe, 4 m North of logger	S05-03
S05-02			1.014	98.528	98.516	3/4" Pipe 8 m SW of logger	S05-01
S05-03			1.080	98.462	98.400	T-post close to old stilling well	WL
Ice/PT:							WL
Water Level:			2.127	97.415		Time WL Surveyed: 9:45	S05-01
Other:							S05-02
Setup #2							S05-03
S05-01			1.151	98.370	98.369	Old 3/4" Pipe, 4 m North of logger	
S05-02	0.993	99.521		98.528	98.516	3/4" Pipe 8 m SW of logger	
S05-03			1.058	98.463	98.400	T-post close to old stilling well	
Ice/PT:							
Water Level:			2.103	97.418		Time WL Surveyed: 9:46	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	BM3	1.058	99.520		98.462		
Water Level:				2.103	97.417	Time WL Surveyed: 10:59	
Water Level:				2.095	97.419	Time WL Surveyed: 11:00	
BM	BM3	1.052	99.514		98.462		

**WL Survey Summary**

	Before	After
Average WL:	97.417	97.418
Transducer Elevation:	95.765	96.026
Closing Error:	-0.001	-
WL Check:	0.003	-0.002

**Site Rating Information**

Measured Discharge:	0.609
Expected Discharge:	0.43
Shift from Existing Rating (m <sup>3</sup> /s):	-0.18
Shift from Existing Rating (%):	-29%

**Field Personnel:**

Field Personnel:	DW, TR	Trip Date:	14-Aug-13
Data Entry Personnel:	DW	Date:	14-Aug-13
Data Check Personnel:	CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: September 23, 2013  
 Site Visit Time (MST): 14:25

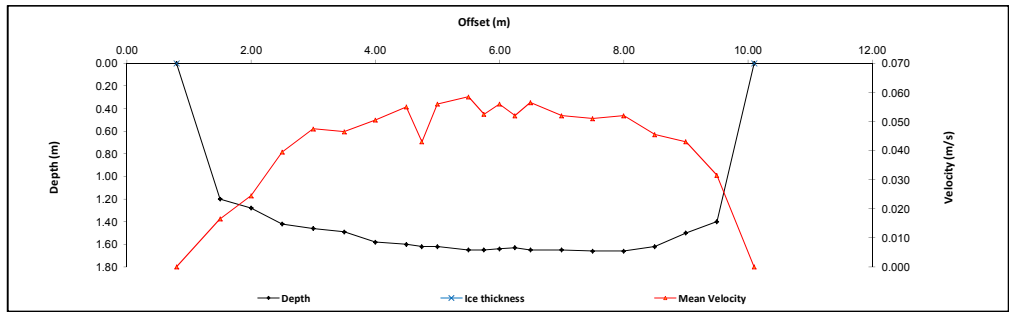


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	1.50	1.20			0.96	0.024	0.24	0.009		1.00	0.60	1.20	0.017	0.72	0.012	2%
2	2.00	1.28			1.02	0.030	0.26	0.019		1.00	0.50	1.28	0.025	0.64	0.016	3%
3	2.50	1.42			1.14	0.040	0.28	0.039		1.00	0.50	1.42	0.040	0.71	0.028	5%
4	3.00	1.46			1.17	0.052	0.29	0.043		1.00	0.50	1.46	0.048	0.73	0.035	6%
5	3.50	1.49			1.19	0.043	0.30	0.050		1.00	0.50	1.49	0.047	0.75	0.035	6%
6	4.00	1.58			1.26	0.053	0.32	0.048		1.00	0.50	1.58	0.051	0.79	0.040	7%
7	4.50	1.60			1.28	0.048	0.32	0.062		1.00	0.38	1.60	0.055	0.60	0.033	5%
8	4.75	1.62			1.30	0.041	0.32	0.045		1.00	0.25	1.62	0.043	0.41	0.017	3%
9	5.00	1.62			1.30	0.050	0.32	0.062		1.00	0.38	1.62	0.056	0.61	0.034	6%
10	5.50	1.65			1.32	0.070	0.33	0.047		1.00	0.38	1.65	0.059	0.62	0.036	6%
11	5.75	1.65			1.32	0.072	0.33	0.033		1.00	0.25	1.65	0.053	0.41	0.022	4%
12	6.00	1.64			1.31	0.057	0.33	0.055		1.00	0.25	1.64	0.056	0.41	0.023	4%
13	6.25	1.63			1.30	0.059	0.33	0.045		1.00	0.25	1.63	0.052	0.41	0.021	3%
14	6.50	1.65			1.32	0.064	0.33	0.049		1.00	0.38	1.65	0.057	0.62	0.035	6%
15	7.00	1.65			1.32	0.064	0.33	0.040		1.00	0.50	1.65	0.052	0.83	0.043	7%
16	7.50	1.66			1.33	0.046	0.33	0.056		1.00	0.50	1.66	0.051	0.83	0.042	7%
17	8.00	1.66			1.33	0.046	0.33	0.058		1.00	0.50	1.66	0.052	0.83	0.043	7%
18	8.50	1.62			1.30	0.037	0.32	0.054		1.00	0.50	1.62	0.046	0.81	0.037	6%
19	9.00	1.50			1.20	0.041	0.30	0.045		1.00	0.50	1.50	0.043	0.75	0.032	5%
20	9.50	1.40			1.12	0.028	0.28	0.035		1.00	0.55	1.40	0.032	0.77	0.024	4%
LB	10.10	0.00	0.00		0.00	0.00	0.00	0.00		1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.608</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20 m DS of PT

Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:40
Equipment:	ADV
Method:	Fishcat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 15°C



**Flow characteristics:**

Total Flow:	0.608	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.23	(m <sup>2</sup> )
Wetted Width:	9.30	(m)
Hydraulic Depth:	1.42	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.442	1.444
Water (°C):	10.4	10.5
Datalogger Clock:	14:30	15:45
Laptop Clock:	14:30	15:45
Battery (Main):	13.2	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S05-01	1.391	99.760		98.369	98.369	Old 3/4" Pipe, 4 m North of logger	S05-03
S05-02			1.229	98.531	98.516	3/4" Pipe 8 m SW of logger	S05-02
S05-03			1.294	98.466	98.400	T-post close to old stilling well	S05-01
Ice/PT:							WL
Water Level:			2.275	97.485		Time WL Surveyed: 14:37	S05-01
Other:							S05-02
<b>Setup #2</b>							S05-03
S05-01			1.378	98.370	98.369	Old 3/4" Pipe, 4 m North of logger	
S05-02			1.217	98.531	98.516	3/4" Pipe 8 m SW of logger	
S05-03	1.282	99.748		98.466	98.400	T-post close to old stilling well	
Ice/PT:							
Water Level:			2.263	97.485		Time WL Surveyed: 14:39	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	BM3	1.283	99.749		98.466		
Water Level:			2.262	97.487		Time WL Surveyed: 15:43	
Water Level:			2.243	97.488		Time WL Surveyed: 15:45	
BM:	BM3	1.265	99.731		98.466		

**WL Survey Summary**

	Before	After
Average WL:	97.485	97.488
Transducer Elevation:	96.043	96.044
Closing Error:	-0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.608
Expected Discharge:	0.70
Shift from Existing Rating (m <sup>3</sup> /s):	0.09
Shift from Existing Rating (%):	15%

**Field Personnel:**

SM, TR	Trip Date:	23-Sep-13
SM	Date:	23-Sep-13
CJ	Date:	25-Sep-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: October 18, 2013  
 Site Visit Time (MST): 11:20

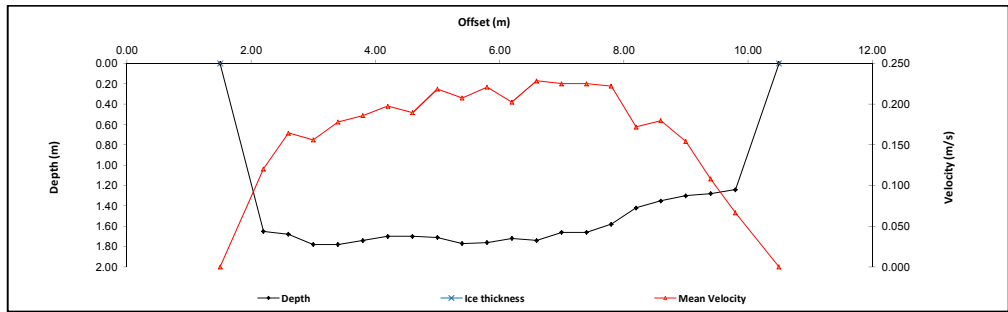


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	2.20	1.65				1.32	0.087	0.33	0.154	1.00	0.55	1.65	0.121	0.91	0.109	5%
2	2.60	1.68				1.34	0.157	0.34	0.172	1.00	0.40	1.68	0.165	0.67	0.111	5%
3	3.00	1.78				1.42	0.130	0.36	0.182	1.00	0.40	1.78	0.156	0.71	0.111	5%
4	3.40	1.78				1.42	0.170	0.36	0.186	1.00	0.40	1.78	0.178	0.71	0.127	5%
5	3.80	1.74				1.39	0.163	0.35	0.209	1.00	0.40	1.74	0.186	0.70	0.129	5%
6	4.20	1.70				1.36	0.196	0.34	0.199	1.00	0.40	1.70	0.198	0.68	0.134	6%
7	4.60	1.70				1.36	0.167	0.34	0.212	1.00	0.40	1.70	0.190	0.68	0.129	5%
8	5.00	1.71				1.37	0.203	0.34	0.234	1.00	0.40	1.71	0.219	0.68	0.149	6%
9	5.40	1.77				1.42	0.191	0.35	0.224	1.00	0.40	1.77	0.208	0.71	0.147	6%
10	5.80	1.76				1.41	0.198	0.35	0.244	1.00	0.40	1.76	0.221	0.70	0.156	6%
11	6.20	1.72				1.38	0.220	0.34	0.185	1.00	0.40	1.72	0.203	0.69	0.139	6%
12	6.60	1.74				1.39	0.235	0.35	0.222	1.00	0.40	1.74	0.229	0.70	0.159	7%
13	7.00	1.66				1.33	0.216	0.33	0.234	1.00	0.40	1.66	0.225	0.66	0.149	6%
14	7.40	1.66				1.33	0.223	0.33	0.227	1.00	0.40	1.66	0.225	0.66	0.149	6%
15	7.80	1.58				1.26	0.220	0.32	0.224	1.00	0.40	1.58	0.222	0.63	0.140	6%
16	8.20	1.42				1.14	0.114	0.28	0.230	1.00	0.40	1.42	0.172	0.57	0.098	4%
17	8.60	1.35				1.08	0.191	0.27	0.178	1.00	0.40	1.35	0.180	0.54	0.097	4%
18	9.00	1.30				1.04	0.143	0.26	0.165	1.00	0.40	1.30	0.154	0.52	0.090	3%
19	9.40	1.28				1.02	0.034	0.26	0.182	1.00	0.40	1.28	0.108	0.51	0.055	2%
20	9.80	1.24				0.99	-0.022	0.25	0.155	1.00	0.55	1.24	0.067	0.68	0.045	2%
LB	10.50	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.42</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
 Adjacent to station

Meas. Start Time (MST):	11:55
Meas. End Time (MST):	12:51
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 6°C



**Flow characteristics:**

Total Flow:	2.42	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.32	(m <sup>2</sup> )
Wetted Width:	9.00	(m)
Hydraulic Depth:	1.48	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.714	1.713
Water (°C):	3.4	4.4
Datalogger Clock:	11:25	13:08
Laptop Clock:	11:25	13:08
Battery (Main):	-	-
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessoricant:	-	Replaced
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Updated S05-01 description

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S05-01	1.350	99.719		98.369	98.369	Old 3/4" Pipe, 4 m West of logger	S05-03
S05-02			1.187	98.532	98.516	3/4" Pipe 8 m SW of logger	S05-02
S05-03			1.252	98.467	98.400	T-post close to old stilling well	S05-01
Ice/PT:							WL
Water Level:			1.969	97.750		Time WL Surveyed: 11:38	S05-01
Other:							S05-02
<b>Setup #2</b>							
S05-01			1.332	98.370	98.369	Old 3/4" Pipe, 4 m West of logger	S05-03
S05-02	1.170	99.702		98.532	98.516	3/4" Pipe 8 m SW of logger	S05-02
S05-03			1.234	98.468	98.400	T-post close to old stilling well	S05-01
Ice/PT:							WL
Water Level:			1.953	97.749		Time WL Surveyed: 11:40	S05-01
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	BM3	1.234	99.701		98.467		
Water Level:				1.954	97.747	Time WL Surveyed: 12:56	
Water Level:				1.944	97.748	Time WL Surveyed: 12:57	
BM	BM3	1.225	99.692		98.467		

**WL Survey Summary**

	Before	After
Average WL:	97.750	97.748
Transducer Elevation:	96.036	96.035
Closing Error:	-0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	2.42
Expected Discharge:	2.18
Shift from Existing Rating (m <sup>3</sup> /s):	-0.24
Shift from Existing Rating (%):	-10%

**Field Personnel:**

	DW, SM	Trip Date:	18-Oct-13
Data Entry Personnel:	DW	Date:	18-Oct-17
Data Check Personnel:	CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: December 12, 2013  
 Site Visit Time (MST): 11:20

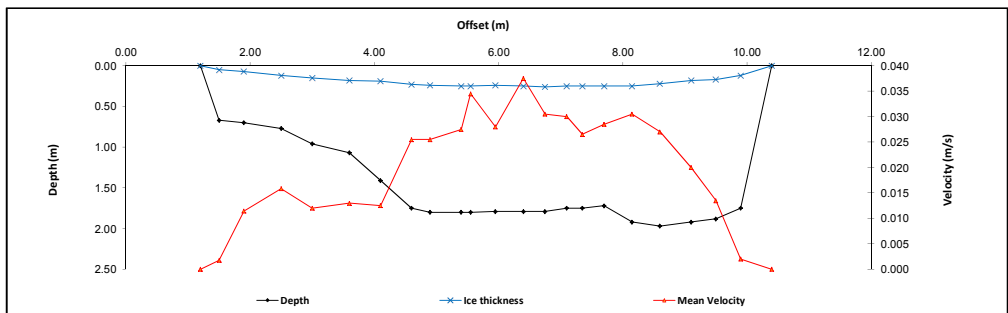


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	1.50	0.67	0.05	0.36	0.002					0.88	0.35	0.62	0.002	0.22	0.000	0%
2	1.90	0.70	0.07	0.39	0.013					0.88	0.50	0.63	0.011	0.32	0.004	1%
3	2.50	0.77	0.12	0.45	0.018					0.88	0.55	0.65	0.016	0.36	0.006	2%
4	3.00	0.96	0.15			0.80	0.009	0.31	0.015	1.00	0.55	0.81	0.012	0.45	0.005	2%
5	3.60	1.07	0.18			0.89	0.004	0.36	0.022	1.00	0.55	0.89	0.013	0.49	0.006	2%
6	4.10	1.41	0.19			1.17	0.000	0.43	0.025	1.00	0.50	1.22	0.013	0.61	0.008	3%
7	4.60	1.75	0.23			1.45	0.019	0.53	0.032	1.00	0.40	1.52	0.026	0.61	0.016	6%
8	4.90	1.80	0.24			1.49	0.025	0.55	0.026	1.00	0.40	1.56	0.026	0.62	0.016	6%
9	5.40	1.80	0.25			1.49	0.025	0.56	0.030	1.00	0.32	1.55	0.028	0.50	0.014	5%
10	5.55	1.80	0.25			1.49	0.035	0.56	0.034	1.00	0.28	1.55	0.035	0.43	0.015	6%
11	5.95	1.79	0.24			1.48	0.019	0.55	0.037	1.00	0.43	1.55	0.028	0.66	0.018	7%
12	6.40	1.79	0.25			1.48	0.034	0.56	0.041	1.00	0.40	1.54	0.038	0.62	0.023	9%
13	6.75	1.79	0.26			1.48	0.020	0.57	0.041	1.00	0.35	1.53	0.031	0.54	0.016	6%
14	7.10	1.75	0.25			1.45	0.026	0.55	0.034	1.00	0.30	1.50	0.030	0.45	0.014	5%
15	7.35	1.75	0.25			1.45	0.024	0.55	0.029	1.00	0.30	1.50	0.027	0.45	0.012	5%
16	7.70	1.72	0.25			1.43	0.022	0.54	0.035	1.00	0.40	1.47	0.029	0.59	0.017	6%
17	8.15	1.92	0.25			1.59	0.014	0.58	0.047	1.00	0.45	1.67	0.031	0.75	0.023	9%
18	8.60	1.97	0.22			1.62	0.021	0.67	0.033	1.00	0.48	1.75	0.027	0.83	0.022	9%
19	9.10	1.92	0.18			1.57	0.011	0.53	0.029	1.00	0.45	1.74	0.020	0.78	0.016	6%
20	9.50	1.88	0.17			1.54	0.012	0.51	0.015	1.00	0.40	1.71	0.014	0.68	0.009	4%
21	9.90	1.75	0.12			1.42	0.004	0.45	0.000	1.00	0.45	1.63	0.002	0.73	0.001	1%
LB	10.40	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.261</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10.0 m DS of PT

Meas. Start Time (MST):	12:15
Meas. End Time (MST):	13:10
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, -25°C



**Flow characteristics:**

Total Flow:	0.261	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.68	(m <sup>2</sup> )
Wetted Width:	8.70	(m)
Hydraulic Depth:	1.34	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.231	1.232
Water (°C):	0.3	0.3
Datalogger Clock:	11:33	13:20
Laptop Clock:	11:33	12:20
Battery (Main):	15.0	15.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S05-01			1.204	98.306	98.369	Old 3/4" Pipe, 4 m North of logger	S05-03
S05-02			1.048	98.462	98.516	3/4" Pipe 8 m SW of logger	S05-01
S05-03	1.110	99.510		98.400	98.400	T-post close to old stilling well	WL
Ice/PT:			2.775	96.735			Ice
Water Level:			2.307	97.203			WL
Other:							WL
<b>Setup #2</b>							S05-01
S05-01	1.226	99.532		98.306	98.369	Old 3/4" Pipe, 4 m North of logger	S05-02
S05-02			1.068	98.464	98.516	3/4" Pipe 8 m SW of logger	S05-03
S05-03			1.133	98.399	98.400	T-post close to old stilling well	
Ice/PT:			2.299	97.233			
Water Level:			2.328	97.204			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S05-03	1.111	99.511		98.400		
Water Level:			2.301	97.210			
Water Level:			2.273	97.209			
BM:	S05-03	1.082	99.482		96.400		
Time WL Surveyed:						12:05	
Time WL Surveyed:						11:54	
Time WL Surveyed:						13:16	
Time WL Surveyed:						13:17	

**WL Survey Summary**

	Before	After
Average WL:	97.204	97.210
Transducer Elevation:	95.973	95.978
Closing Error:	0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

	TR, DB	Trip Date:	12-Dec-13
Data Entry Personnel:	DB	Date:	12-Dec-13
Data Check Personnel:	DW	Date:	31-Mar-14
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

January 14, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	5.00	0.00	0.00	0.000	0.000	0.000	1.0	5.00	5.68	0.68	0.26	0.001	0.001	0.18	0.000	0%
1	6.35	1.30	0.25	0.007	0.004		1.0	5.68	6.60	0.93	1.05	0.006	0.006	0.97	0.005	1%
2	6.85	1.40	0.30	0.012	0.008		1.0	6.60	7.03	0.43	1.10	0.010	0.010	0.47	0.005	1%
3	7.20	1.50	0.32	0.038	0.004		1.0	7.03	7.40	0.38	1.18	0.021	0.021	0.44	0.009	2%
4	7.60	1.55	0.35	0.042	0.008		1.0	7.40	7.75	0.35	1.20	0.025	0.025	0.42	0.011	2%
5	7.90	1.60	0.40	0.047	0.024		1.0	7.75	8.10	0.35	1.20	0.036	0.036	0.42	0.015	3%
6	8.30	1.60	0.37	0.061	0.009		1.0	8.10	8.50	0.40	1.23	0.035	0.035	0.49	0.017	4%
7	8.70	1.60	0.45	0.059	0.023		1.0	8.50	8.85	0.35	1.15	0.041	0.041	0.40	0.017	4%
8	9.00	1.60	0.40	0.067	0.040		1.0	8.85	9.18	0.33	1.20	0.054	0.054	0.39	0.021	5%
9	9.35	1.65	0.45	0.065	0.044		1.0	9.18	9.53	0.35	1.20	0.055	0.055	0.42	0.023	5%
10	9.70	1.70	0.50	0.082	0.057		1.0	9.53	9.90	0.38	1.20	0.070	0.070	0.45	0.031	7%
11	10.10	1.70	0.45	0.086	0.074		1.0	9.90	10.30	0.40	1.25	0.080	0.080	0.50	0.040	9%
12	10.50	1.65	0.45	0.068	0.079		1.0	10.30	10.70	0.40	1.20	0.074	0.074	0.48	0.035	8%
13	10.90	1.55	0.45	0.071	0.086		1.0	10.70	11.13	0.43	1.10	0.079	0.079	0.47	0.037	8%
14	11.35	1.60	0.45	0.085	0.075		1.0	11.13	11.53	0.40	1.15	0.080	0.080	0.46	0.037	8%
15	11.70	1.60	0.45	0.083	0.073		1.0	11.53	11.88	0.35	1.15	0.078	0.078	0.40	0.031	7%
16	12.05	1.55	0.45	0.075	0.074		1.0	11.88	12.23	0.35	1.10	0.075	0.075	0.39	0.029	6%
17	12.40	1.60	0.45	0.061	0.047		1.0	12.23	12.55	0.32	1.15	0.054	0.054	0.37	0.020	4%
18	12.70	1.70	0.45	0.102	-0.042		1.0	12.55	12.95	0.40	1.25	0.030	0.030	0.50	0.015	3%
19	13.20	1.70	0.45	0.045	0.026		1.0	12.95	13.45	0.50	1.25	0.036	0.036	0.63	0.022	5%
20	13.70	1.70	0.45	0.031	0.021		1.0	13.45	14.05	0.60	1.25	0.026	0.026	0.75	0.020	4%
21	14.40	1.40	0.40	0.019	0.007		1.0	14.05	14.75	0.70	1.00	0.013	0.013	0.70	0.009	2%
22	15.10	1.30	0.30	0.019	-0.007		1.0	14.75	15.55	0.80	1.00	0.006	0.006	0.80	0.005	1%
RB	16.00	0.00	0.00	0.00	0.00	0.00	1.0	15.55	16.00	0.45	0.25	0.002	0.002	0.11	0.000	0%
<b>Total Flow</b>															<b>0.454</b>	

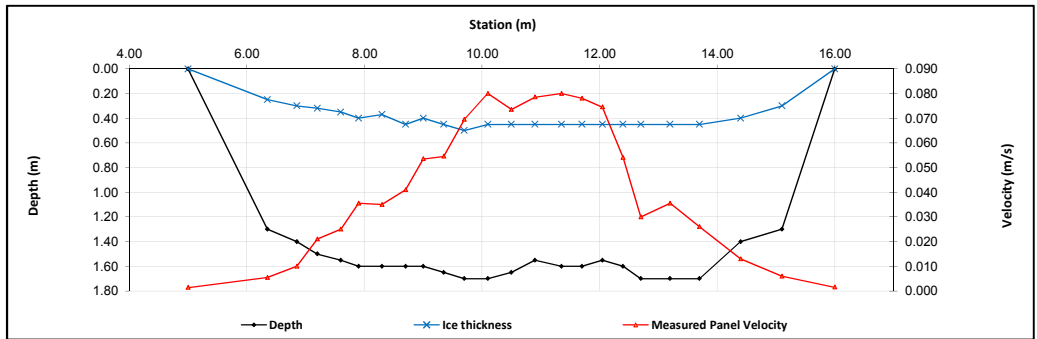
Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	13:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, -15°C

Flow characteristics:	
Total Flow:	0.454 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	7.01 (m <sup>2</sup> )
Wetted Width:	6.48 (m)
Hydraulic Depth:	1.082 (m)
Mean Velocity:	0.065 (m/s)
Froude Number:	0.020

Logger Details:		
	Before	After
Transducer Reading (m):	1.607	-
Water (°C):	0.1	-
Barometric Pressure (kPa):	97.32	-
Battery (Main):	13.9	-
Datalogger Clock:	11:46	-
Laptop Clock:	11:47	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	6105	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S5A-01			1.084	282.697	282.697	T-post 4 m NW of logger
S5A-02			1.619	282.162	282.159	3/4" Pipe 10 m W of logger
S5A-03	1.428	283.781		282.353	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.653	281.128		
Water Level:			2.666	281.115		
Other:						
<b>Setup #2</b>						
S5A-01	1.072	283.769		282.697	282.697	T-post 4 m NW of logger
S5A-02			1.607	282.162	282.159	3/4" Pipe 10 m W of logger
S5A-03			1.416	282.353	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.64	281.129		
Water Level:			2.654	281.115		
Other:						

Closing Error	0.000
WL Check	0.000

Average WL	281.115
Transducer Elevation Before	279.508
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	14-Jan-13
Data Entry Personnel:	DW	Date:	14-Jan-13
Data Check Personnel:	CJ	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek

UTM Location: 476100 E, 6351600 N

Site Visit Date:

February 7, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.70	0.00	0.00	0.000	0.000	0.000	1.0	4.70	5.08	0.38	0.26	-0.001	-0.001	0.10	0.000	0%
1	5.45	1.30	0.25	-0.005	-0.005		1.0	5.08	5.68	0.60	1.05	-0.005	-0.005	0.63	-0.003	-1%
2	5.90	1.47	0.30	0.019	0.003		1.0	5.68	6.15	0.48	1.17	0.011	0.011	0.56	0.006	2%
3	6.40	1.50	0.30	0.028	0.000		1.0	6.15	6.60	0.45	1.20	0.014	0.014	0.54	0.008	2%
4	6.80	1.60	0.30	0.032	0.005		1.0	6.60	7.03	0.43	1.30	0.019	0.019	0.55	0.010	3%
5	7.25	1.60	0.30	0.032	0.021		1.0	7.03	7.48	0.45	1.30	0.027	0.027	0.58	0.016	5%
6	7.70	1.60	0.35	0.039	0.026		1.0	7.48	7.90	0.43	1.25	0.033	0.033	0.53	0.017	6%
7	8.10	1.57	0.37	0.048	0.045		1.0	7.90	8.28	0.37	1.20	0.047	0.047	0.45	0.021	7%
8	8.45	1.57	0.40	0.065	0.030		1.0	8.28	8.68	0.40	1.17	0.048	0.048	0.47	0.022	7%
9	8.90	1.60	0.40	0.060	0.060		1.0	8.68	9.10	0.43	1.20	0.060	0.060	0.51	0.031	10%
10	9.30	1.55	0.40	0.061	0.063		1.0	9.10	9.48	0.38	1.15	0.062	0.062	0.43	0.027	9%
11	9.65	1.50	0.40	0.075	0.064		1.0	9.48	9.85	0.38	1.10	0.070	0.070	0.41	0.029	9%
12	10.05	1.55	0.45	0.065	0.063		1.0	9.85	10.23	0.38	1.10	0.064	0.064	0.41	0.026	9%
13	10.40	1.50	0.45	0.059	0.065		1.0	10.23	10.60	0.38	1.05	0.062	0.062	0.39	0.024	8%
14	10.80	1.48	0.45	0.050	0.044		1.0	10.60	11.03	0.42	1.03	0.047	0.047	0.44	0.021	7%
15	11.25	1.40	0.40	0.042	0.036		1.0	11.03	11.45	0.42	1.00	0.039	0.039	0.42	0.017	5%
16	11.65	1.50	0.40	0.022	0.024		1.0	11.45	11.93	0.48	1.10	0.023	0.023	0.52	0.012	4%
17	12.20	1.70	0.40	0.013	0.019		1.0	11.93	12.48	0.55	1.30	0.016	0.016	0.71	0.011	4%
18	12.75	1.70	0.40	0.019	0.013		1.0	12.48	13.00	0.53	1.30	0.016	0.016	0.68	0.011	4%
19	13.25	1.50	0.40	0.006	-0.002		1.0	13.00	13.50	0.50	1.10	0.002	0.002	0.55	0.001	0%
20	13.75	1.35	0.40	0.005	0.005	-0.003	1.0	13.50	14.00	0.50	0.95	0.001	0.001	0.48	0.000	0%
21	14.25	1.18	0.40	-0.005			0.9	14.00	14.58	0.57	0.78	-0.005	-0.005	0.45	-0.002	-1%
RB	14.90	0.00	0.00	0.00	0.00	0.00	1.0	14.58	14.90	0.33	0.20	-0.001	-0.001	0.06	0.000	0%
<b>Total Flow</b>														<b>0.304</b>		

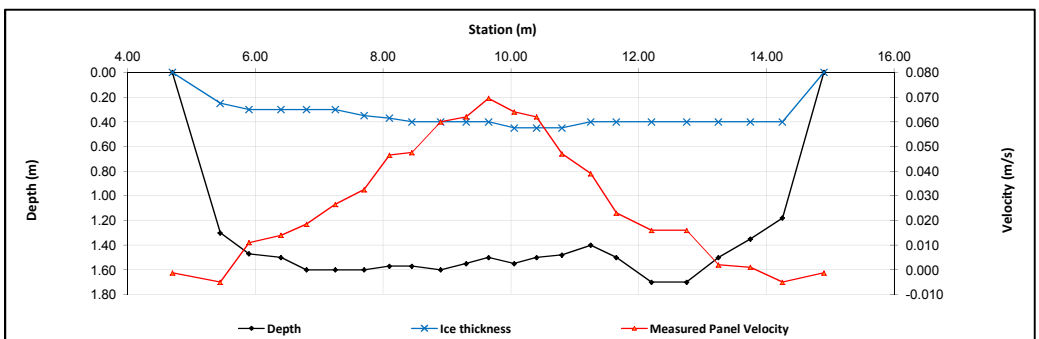
Measurement Details:	
Start Time (MST):	10:25
End Time (MST):	12:20
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -10°C

Flow characteristics:	
Total Flow:	0.304 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	10.89 (m <sup>2</sup> )
Wetted Width:	10.20 (m)
Hydraulic Depth:	1.068 (m)
Mean Velocity:	0.028 (m/s)
Froude Number:	0.009

Logger Details:		
	Before	After
Transducer Reading (m):	1.582	-
Water (°C):	0.1	-
Barometric Pressure (kPa):	97.9	-
Battery (Main):	13.4	-
Datalogger Clock:	10:46	-
Laptop Clock:	10:46	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:

General Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S5A-01			1.212	282.695	282.697	T-post 4 m NW of logger
S5A-02	1.748	283.907		282.159	282.159	3/4" Pipe 10 m W of logger
S5A-03			1.556	282.351	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.576	281.331		
Water Level:			2.814	281.093		
Other:						
<b>Setup #2</b>						
S5A-01			1.197	282.695	282.697	T-post 4 m NW of logger
S5A-02			1.733	282.159	282.159	3/4" Pipe 10 m W of logger
S5A-03	1.541	283.892		282.351	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.565	281.327		
Water Level:			2.801	281.091		
Other:						

Closing Error	0.000
WL Check	0.002

Average WL	281.092
Transducer Elevation Before	279.51
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	7-Feb-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	7-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	12-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

February 28, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	7.10	0.00	0.00	0.000	0.000	0.000	1.0	7.10	7.30	0.20	0.21	0.001	0.001	0.04	0.000	0%
1	7.50	1.20	0.35		0.003	0.004	1.0	7.30	7.80	0.50	0.85	0.004	0.004	0.43	0.001	0%
2	8.10	1.40	0.35		-0.008	0.003	1.0	7.80	8.40	0.60	1.05	-0.003	-0.003	0.63	-0.002	0%
3	8.70	1.50	0.39		-0.007	-0.010	1.0	8.40	9.03	0.63	1.11	-0.009	-0.009	0.69	-0.006	-2%
4	9.35	1.50	0.45		0.027	0.000	1.0	9.03	9.53	0.50	1.05	0.014	0.014	0.53	0.007	2%
5	9.70	1.60	0.47		0.029	0.013	1.0	9.53	9.95	0.43	1.13	0.021	0.021	0.48	0.010	3%
6	10.20	1.52	0.51		0.030	0.023	1.0	9.95	10.35	0.40	1.01	0.027	0.027	0.40	0.011	3%
7	10.50	1.50	0.51		0.057	0.035	1.0	10.35	10.73	0.38	0.99	0.046	0.046	0.37	0.017	5%
8	10.95	1.51	0.51		0.062	0.052	1.0	10.73	11.10	0.38	1.00	0.057	0.057	0.38	0.021	6%
9	11.25	1.59	0.51		0.071	0.071	1.0	11.10	11.48	0.38	1.08	0.071	0.071	0.41	0.029	8%
10	11.70	1.58	0.46		0.085	0.077	1.0	11.48	11.85	0.38	1.12	0.081	0.081	0.42	0.034	10%
11	12.00	1.60	0.45		0.087	0.064	1.0	11.85	12.18	0.33	1.15	0.076	0.076	0.37	0.028	8%
12	12.35	1.58	0.45		0.074	0.089	1.0	12.18	12.53	0.35	1.13	0.082	0.082	0.40	0.032	9%
13	12.70	1.62	0.45		0.088	0.086	1.0	12.53	12.93	0.40	1.17	0.087	0.087	0.47	0.041	12%
14	13.15	1.62	0.45		0.080	0.054	1.0	12.93	13.40	0.48	1.17	0.067	0.067	0.56	0.037	11%
15	13.65	1.64	0.43		0.064	0.031	1.0	13.40	13.83	0.42	1.21	0.048	0.048	0.51	0.024	7%
16	14.00	1.60	0.42		0.056	0.034	1.0	13.83	14.25	0.43	1.18	0.045	0.045	0.50	0.023	7%
17	14.50	1.52	0.35		0.043	0.017	1.0	14.25	14.68	0.43	1.17	0.030	0.030	0.50	0.015	4%
18	14.85	1.45	0.35		0.029	0.022	1.0	14.68	15.10	0.42	1.10	0.026	0.026	0.47	0.012	3%
19	15.35	1.37	0.35		0.023	0.000	1.0	15.10	15.55	0.45	1.02	0.012	0.012	0.46	0.005	2%
20	15.75	1.10	0.33		0.004	0.000	1.0	15.55	15.98	0.42	0.77	0.002	0.002	0.33	0.001	0%
21	16.20	0.88	0.30		-0.002		0.9	15.98	16.35	0.38	0.58	-0.002	-0.002	0.22	0.000	0%
LB	16.50	0.00	0.00	0.00	0.00	0.00	1.0	16.35	16.50	0.15	0.15	-0.001	-0.001	0.02	0.000	0%
<b>Total Flow</b>														<b>0.341</b>		

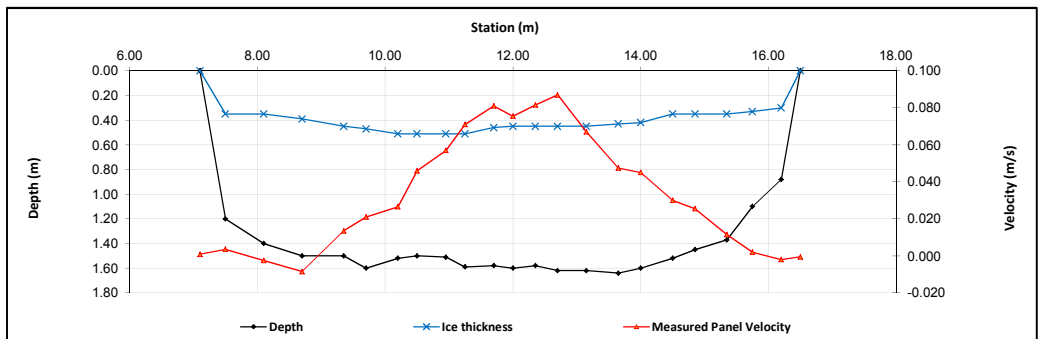
Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -5°C

Flow characteristics:	
Total Flow:	0.341 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	9.57 (m <sup>2</sup> )
Wetted Width:	9.40 (m)
Hydraulic Depth:	1.018 (m)
Mean Velocity:	0.036 (m/s)
Froude Number:	0.011

Logger Details:		
	Before	After
Transducer Reading (m):	1.569	-
Water (°C):	0.1	-
Barometric Pressure (kPa):	98.2	-
Battery (Main):	14.9	14.8
Datalogger Clock:	9:52	-
Laptop Clock:	9:53	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	6105	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S5A-01	1.167	283.864		282.697	282.697	T-post 4 m NW of logger
S5A-02			1.705	282.159	282.159	3/4" Pipe 10 m W of logger
S5A-03			1.512	282.352	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.751	281.113		
Water Level:			2.789	281.075		
Other:						
<b>Setup #2</b>						
S5A-01			1.178	282.697	282.697	T-post 4 m NW of logger
S5A-02			1.715	282.160	282.159	3/4" Pipe 10 m W of logger
S5A-03	1.523	283.875		282.352	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.763	281.112		
Water Level:			2.803	281.072		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	281.074
Transducer Elevation Before	279.505
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	28-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	28-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek

UTM Location: 476100 E, 6351600 N

Site Visit Date:

April 2, 2013



Flow Measurement:							Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow							
RB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	4.18	0.18	0.09	-0.001	-0.001	0.02	0.000	0%							
1	4.35	0.65	0.30	-0.005			0.9	4.18	4.75	0.58	0.35	-0.005	-0.005	0.20	-0.001	0%							
2	5.15	0.95	0.40	-0.003			0.9	4.75	5.43	0.68	0.55	-0.003	-0.003	0.37	-0.001	0%							
3	5.70	1.20	0.40		0.000	-0.002	1.0	5.43	6.00	0.57	0.80	-0.001	-0.001	0.46	0.000	0%							
4	6.30	1.35	0.45		0.005	-0.007	1.0	6.00	6.63	0.63	0.90	-0.001	-0.001	0.56	-0.001	0%							
5	6.95	1.50	0.45		0.010	0.002	1.0	6.63	7.23	0.60	1.05	0.006	0.006	0.63	0.004	1%							
6	7.50	1.60	0.50		0.032	0.033	1.0	7.23	7.70	0.48	1.10	0.033	0.033	0.52	0.017	5%							
7	7.90	1.60	0.55		0.031	0.020	1.0	7.70	8.10	0.40	1.05	0.026	0.026	0.42	0.011	3%							
8	8.30	1.70	0.55		0.036	0.054	1.0	8.10	8.45	0.35	1.15	0.045	0.045	0.40	0.018	6%							
9	8.60	1.65	0.55		0.062	0.078	1.0	8.45	8.80	0.35	1.10	0.070	0.070	0.39	0.027	8%							
10	9.00	1.60	0.55		0.079	0.082	1.0	8.80	9.35	0.55	1.05	0.081	0.081	0.58	0.046	15%							
11	9.70	1.65	0.50		0.077	0.099	1.0	9.35	9.95	0.60	1.15	0.088	0.088	0.69	0.061	19%							
12	10.20	1.70	0.45		0.083	0.082	1.0	9.95	10.48	0.53	1.25	0.083	0.083	0.66	0.054	17%							
13	10.75	1.65	0.45		0.072	0.052	1.0	10.48	10.98	0.50	1.20	0.062	0.062	0.60	0.037	12%							
14	11.20	1.60	0.45		0.056	0.046	1.0	10.98	11.40	0.42	1.15	0.051	0.051	0.49	0.025	8%							
15	11.60	1.55	0.50		0.025	0.032	1.0	11.40	11.83	0.43	1.05	0.029	0.029	0.45	0.013	4%							
16	12.05	1.40	0.45		0.008	0.017	1.0	11.83	12.20	0.38	0.95	0.013	0.013	0.36	0.004	1%							
17	12.35	1.30	0.40		0.007	0.014	1.0	12.20	12.55	0.35	0.90	0.011	0.011	0.32	0.003	1%							
18	12.75	1.05	0.40	-0.001			0.9	12.55	12.98	0.42	0.65	-0.001	-0.001	0.28	0.000	0%							
19	13.20	1.00	0.35	0.008			0.9	12.98	13.60	0.63	0.65	0.008	0.007	0.41	0.003	1%							
LB	14.00	0.00	0.00	0.00	0.00	0.00	1.0	13.60	14.00	0.40	0.16	0.002	0.002	0.07	0.000	0%							
<b>Total Flow</b>														<b>0.320</b>									

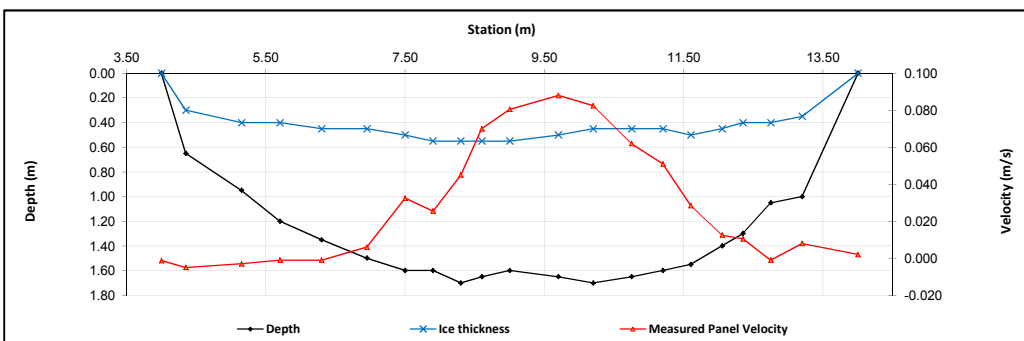
Measurement Details:	
Start Time (MST):	10:45
End Time (MST):	12:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Some cloud, windy, 3°C

Flow characteristics:		
Total Flow:	0.320	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	8.85	(m <sup>2</sup> )
Wetted Width:	10.00	(m)
Hydraulic Depth:	0.885	(m)
Mean Velocity:	0.036	(m/s)
Froude Number:	0.012	

Logger Details:		
	Before	After
Transducer Reading (m):	1.546	-
Water (°C):	0.1	-
Barometric Pressure (kPa):	97.04	-
Battery (Main):	14.5	-
Datalogger Clock:	10:48	-
Laptop Clock:	10:47	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	6105	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Update BM descriptors.	
- BM2:10 m W	
- T post: 4m NW	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S5A-01	1.275	283.972		282.697	282.697	T-post 4 m NW of logger
S5A-02			1.801	282.171	282.159	3/4" Pipe 10 m W of logger
S5A-03			1.62	282.352	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.872	281.100		
Water Level:			2.915	281.057		
Other:						
<b>Setup #2</b>						
S5A-01			1.258	282.699	282.697	T-post 4 m NW of logger
S5A-02			1.795	282.162	282.159	3/4" Pipe 10 m W of logger
S5A-03	1.605	283.957		282.352	282.353	3/4" Pipe 3 m N of logger
Ice/PT:			2.867	281.090		
Water Level:			2.898	281.059		
Other:						

Closing Error	-0.002	Average WL	281.058
WL Check	0.002	Transducer Elevation Before	279.512
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	2-Apr-13
Data Entry Personnel:	SM	Date:	2-Apr-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: May 8, 2013  
 Site Visit Time (MST): 11:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
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21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
<b>No Flow Measurement Conducted</b>																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High flow, flooded banks
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

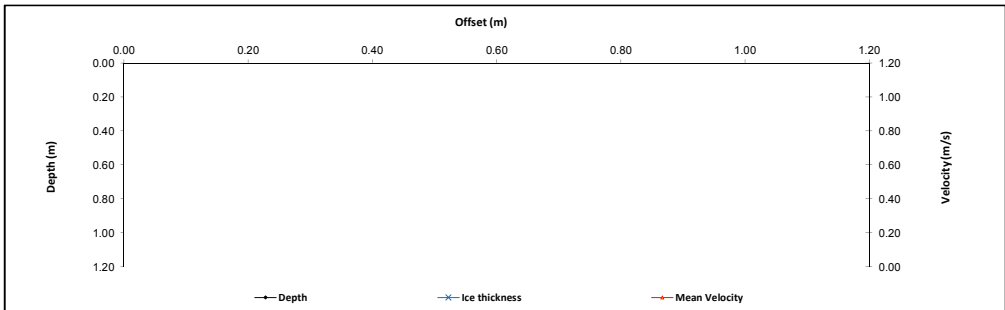
	Before	After
Transducer Reading (m):	2.921	2.937
Water (°C):	0.0	5.6
Barometric Pressure (kPa):	99.65	98.95
Datalogger Clock:	11:07	12:24
Laptop Clock:	11:07	12:24
Battery (Main):	11.6	12.7
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

- Barometric pressure
- Wiring: Barometric: WHT 1H, BLK GRN CLR - AG, RED 12V
- Sensor s/n: BPA 2151

**General Notes:**

- No flow measurement conducted due to very high flow and flooding of stream banks.



Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>	SSA-01			0.937	282.689	282.697	T-post 4 m NW of logger	SSA-03
	SSA-02	1.467	283.626		282.159	282.159	3/4" Pipe 10 m W of logger	SSA-02
	SSA-03			1.274	282.352	282.353	3/4" Pipe 3 m N of logger	WL
	Ice/PT:							WL
	Water Level:			1.180	282.446		Time WL Surveyed: 12:20	SSA-01
<b>Setup #2</b>	SSA-01			0.915	282.699	282.697	T-post 4 m NW of logger	SSA-03
	SSA-02			1.456	282.158	282.159	3/4" Pipe 10 m W of logger	SSA-02
	SSA-03	1.262	283.614		282.352	282.353	3/4" Pipe 3 m N of logger	WL
	Ice/PT:							WL
	Water Level:			1.167	282.447		Time WL Surveyed: 12:21	SSA-01
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
BM:				282.352				
Water Level:							Time WL Surveyed:	
Water Level:							Time WL Surveyed:	
BM:				282.352				

**WL Survey Summary**

	Before	After
Average WL:	282.447	-
Transducer Elevation:	279.526	-
Closing Error:	0.001	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	10.13
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, DW	Trip Date:	8-May-13
<b>Data Entry Personnel:</b>	SM	Date:	8-May-13
<b>Data Check Personnel:</b>	CJ	Date:	21-May-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: June 20, 2013  
 Site Visit Time (MST): 11:53



Flow Measurement:										Measured Data							Calculated Data						
Bank/	Offset	Depth from bottom to WS	WS to bottom of ice	Depth of Obs. @ 0.6 Depth	Velocity @ 0.6 Depth	Depth of Obs. @ 0.8 Depth	Velocity @ 0.8 Depth	Depth of Obs. @ 0.2 Depth	Velocity @ 0.2 Depth	Velocity Correction Factor	Pannel Width	Effective Pannel Depth	Effective Average Pannel Velocity	Pannel Area	Pannel Discharge	Percent of total flow							
Mmt #	(m)	(m)	(m)	(m)	(m/s)	(m)	(m/s)	(m)	(m/s)	(m)	(m)	(m)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	(%)							
RB	0.00	0.00		0.000	0.000		0.000		0.000	0.00	#VALUE!	0.00	0.000	-	#VALUE!	#VALUE!							
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
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27																							
28																							
29																							
30																							
LB																							
No flow measurement conducted																							
															<b>Total Flow</b>		-						

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	Clear, calm, +20°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

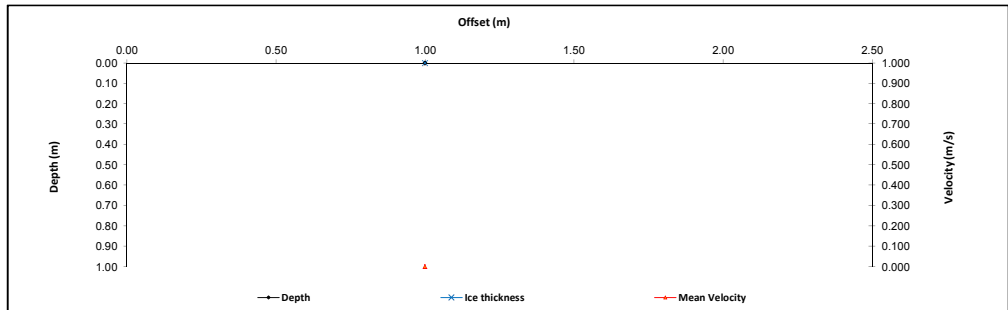
	Before	After
Transducer Reading (m):	2.836	2.833
Water (°C):	19.0	19.3
Barometric Pressure (kPa):	98.46	98.28
Datalogger Clock:	11:56	12:58
Laptop Clock:	11:56	12:58
Battery (Main):	13.7	14.0
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

- Installed new modem, RSSI -85
- Replaced solar controller and battery

**General Notes:**

- Flow measurement not conducted because station area was flooded with water about 50 cm deep. Water was observed flowing from the channel to surrounding area.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							SSA-03
SSA-01			0.967	282.698	282.697	T-post 4 m NW of logger	SSA-02
SSA-02	1.506	283.665		282.159	282.159	3/4" Pipe 10 m W of logger	SSA-01
SSA-03			1.314	282.351	282.353	3/4" Pipe 3 m N of logger	WL
Ice/PT:							WL
Water Level:		1.165		282.500		Time WL Surveyed: 12:52	SSA-01
Other:							SSA-02
<b>Setup #2</b>							SSA-03
SSA-01			0.952	282.697	282.697	T-post 4 m NW of logger	
SSA-02			1.490	282.159	282.159	3/4" Pipe 10 m W of logger	
SSA-03	1.298	283.649		282.351	282.353	3/4" Pipe 3 m N of logger	
Ice/PT:							
Water Level:			1.149	282.500		Time WL Surveyed: 12:54	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				282.351			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				282.351			

**WL Survey Summary**

	Before	After
Average WL:	282.500	-
Transducer Elevation:	279.664	-
Closing Error:	0.000	-
WL Check:	0.000	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	10.75
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	20-Jun-13
<b>Data Entry Personnel:</b>	SM, TR	Date:	20-Jun-13
<b>Data Check Personnel:</b>	CJ	Date:	21-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: August 16, 2013  
 Site Visit Time (MST): 09:50

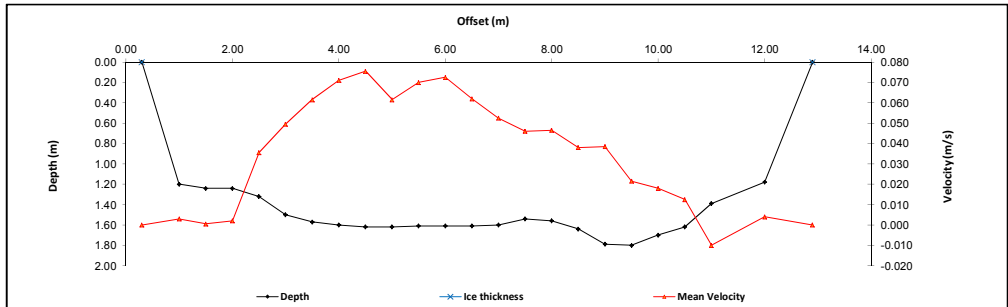


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	1.00	1.20			0.96	0.001	0.24	0.005		1.00	0.60	1.20	0.003	0.72	0.002	0%
2	1.50	1.24			0.99	0.003	0.25	-0.002		1.00	0.50	1.24	0.001	0.62	0.000	0%
3	2.00	1.24			0.99	-0.003	0.25	0.007		1.00	0.50	1.24	0.002	0.62	0.001	0%
4	2.50	1.32			1.06	0.016	0.26	0.055		1.00	0.50	1.32	0.036	0.66	0.023	4%
5	3.00	1.50			1.20	0.041	0.30	0.058		1.00	0.50	1.50	0.050	0.75	0.037	6%
6	3.50	1.57			1.26	0.062	0.31	0.061		1.00	0.50	1.57	0.062	0.79	0.048	7%
7	4.00	1.60			1.28	0.075	0.32	0.067		1.00	0.50	1.60	0.071	0.80	0.057	9%
8	4.50	1.62			1.30	0.065	0.32	0.086		1.00	0.50	1.62	0.076	0.81	0.061	9%
9	5.00	1.62			1.30	0.069	0.32	0.054		1.00	0.50	1.62	0.062	0.81	0.050	8%
10	5.50	1.61			1.29	0.069	0.32	0.071		1.00	0.50	1.61	0.070	0.81	0.056	8%
11	6.00	1.61			1.29	0.085	0.32	0.080		1.00	0.50	1.61	0.073	0.81	0.058	9%
12	6.50	1.61			1.29	0.058	0.32	0.068		1.00	0.50	1.61	0.062	0.81	0.050	8%
13	7.00	1.60			1.28	0.046	0.32	0.059		1.00	0.50	1.60	0.053	0.80	0.042	6%
14	7.50	1.54			1.23	0.054	0.31	0.038		1.00	0.50	1.54	0.046	0.77	0.035	5%
15	8.00	1.56			1.25	0.052	0.31	0.041		1.00	0.50	1.56	0.047	0.78	0.036	5%
16	8.50	1.64			1.31	0.041	0.33	0.035		1.00	0.50	1.64	0.038	0.82	0.031	5%
17	9.00	1.79			1.43	0.050	0.36	0.027		1.00	0.50	1.79	0.039	0.90	0.034	5%
18	9.50	1.80			1.44	0.024	0.36	0.019		1.00	0.50	1.80	0.022	0.90	0.019	3%
19	10.00	1.70			1.36	0.018	0.34	0.018		1.00	0.50	1.70	0.018	0.85	0.015	2%
20	10.50	1.62			1.30	0.010	0.32	0.015		1.00	0.50	1.62	0.013	0.81	0.010	2%
21	11.00	1.39			1.11	-0.005	0.28	-0.015		1.00	0.75	1.39	-0.010	1.04	-0.010	-2%
22	12.00	1.18			0.94	0.003	0.24	0.005		1.00	0.95	1.18	0.004	1.12	0.004	1%
RB	12.90	0.00	0.00		0.00	0.00	0.00	0.00		1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.663</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:12
Meas. End Time (MST):	10:40
Equipment:	ADV
Method:	Fishcat
River Condition:	Med flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Overcast. Calm. 22°C



**Flow characteristics:**

Total Flow:	0.663	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.78	(m <sup>2</sup> )
Wetted Width:	12.60	(m)
Hydraulic Depth:	1.41	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.532	1.522
Water (°C):	17.9	17.9
Barometric Pressure (kPa):	97.28	97.27
Datalogger Clock:	09:52	11:26
Laptop Clock:	9:52	11:26
Battery (Main):	14.1	14.0
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

**General Notes:**

- Both banks eroded from high flows. See photos.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							SSA-03
SSA-01			0.977	282.693	282.697	T-post 4 m NW of logger	SSA-02
SSA-02			1.515	282.155	282.159	3/4" Pipe 10 m W of logger	SSA-01
SSA-03	1.318	283.670		282.352	282.352	Pipe 3 m N of logger	WL
Water Level:			2.493	281.177			SSA-01
Other:							SSA-02
<b>Setup #2</b>							SSA-03
SSA-01			0.965	282.692	282.697	T-post 4 m NW of logger	
SSA-02	1.502	283.657		282.155	282.159	3/4" Pipe 10 m W of logger	
SSA-03			1.306	282.351	282.352	Pipe 3 m N of logger	
Water Level:			2.477	281.180			SSA-01
Other:							SSA-02
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: SSA-03	1.306	283.658		282.352			
Water Level:			2.477	281.181			SSA-01
Water Level:			2.466	281.180			SSA-02
BM: SSA-03	1.294	283.646		282.352			

**WL Survey Summary**

	Before	After
Average WL:	281.179	281.181
Transducer Elevation:	279.647	279.659
Closing Error:	0.001	-
WL Check:	0.003	0.001

**Site Rating Information**

Measured Discharge:	0.663
Expected Discharge:	1.04
Shift from Existing Rating (m <sup>3</sup> /s):	0.38
Shift from Existing Rating (%):	57%

**Field Personnel:**

SM, DW	Trip Date:	16-Aug-13
SM	Date:	16-Aug-13
CJ	Date:	19-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: September 18, 2013  
 Site Visit Time (MST): 09:50

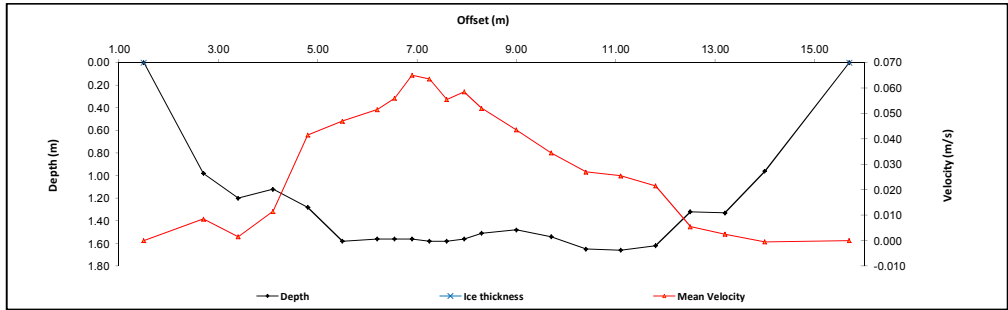


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	2.70	0.98				0.78	0.001	0.20	0.016	1.00	0.95	0.98	0.009	0.93	0.008	1%
2	3.40	1.20				0.96	-0.001	0.24	0.004	1.00	0.70	1.20	0.002	0.84	0.001	0%
3	4.10	1.12				0.90	0.012	0.22	0.011	1.00	0.70	1.12	0.012	0.78	0.009	2%
4	4.80	1.28				1.02	0.042	0.26	0.041	1.00	0.70	1.28	0.042	0.90	0.037	7%
5	5.50	1.58				1.26	0.037	0.32	0.057	1.00	0.70	1.58	0.047	1.11	0.052	10%
6	6.20	1.56				1.25	0.039	0.31	0.064	1.00	0.53	1.56	0.052	0.82	0.042	8%
7	6.55	1.56				1.25	0.049	0.31	0.063	1.00	0.35	1.56	0.056	0.55	0.031	6%
8	6.90	1.56				1.25	0.058	0.31	0.072	1.00	0.35	1.56	0.065	0.55	0.035	7%
9	7.25	1.58				1.26	0.053	0.32	0.074	1.00	0.35	1.58	0.064	0.55	0.035	7%
10	7.60	1.58				1.26	0.049	0.32	0.062	1.00	0.35	1.58	0.056	0.55	0.031	6%
11	7.95	1.56				1.25	0.059	0.31	0.068	1.00	0.35	1.56	0.059	0.55	0.032	6%
12	8.30	1.51				1.21	0.058	0.30	0.048	1.00	0.53	1.51	0.052	0.79	0.041	8%
13	9.00	1.48				1.18	0.040	0.30	0.047	1.00	0.70	1.48	0.044	1.04	0.045	9%
14	9.70	1.54				1.23	0.035	0.31	0.034	1.00	0.70	1.54	0.035	1.08	0.037	7%
15	10.40	1.65				1.32	0.026	0.33	0.028	1.00	0.70	1.65	0.027	1.16	0.031	6%
16	11.10	1.66				1.33	0.023	0.33	0.028	1.00	0.70	1.66	0.026	1.16	0.030	6%
17	11.80	1.62				1.30	0.015	0.32	0.028	1.00	0.70	1.62	0.022	1.13	0.024	5%
18	12.50	1.32				1.06	0.004	0.26	0.007	1.00	0.70	1.32	0.006	0.92	0.005	1%
19	13.20	1.33				1.06	0.000	0.27	0.005	1.00	0.75	1.33	0.003	1.00	0.002	0%
20	14.00	0.96				0.77	-0.002	0.19	0.001	1.00	1.25	0.96	-0.001	1.20	-0.001	0%
RB	15.70	0.00	0.00		0.00		0.00		0.00	1.00	0.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.529</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:34
Meas. End Time (MST):	11:27
Equipment:	ADV
Method:	Fishcat
River Condition:	low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, Calm, 10°C



**Flow characteristics:**

Total Flow:	0.529	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.60	(m <sup>2</sup> )
Wetted Width:	14.20	(m)
Hydraulic Depth:	1.24	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.503	1.508
Water (°C):	12.4	12.4
Barometric Pressure (kPa):	97.37	97.46
Datalogger Clock:	09:57	11:47
Laptop Clock:	09:58	11:47
Battery (Main):	13.4	13.7
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

- New station mast installed

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							SSA-03
SSA-01			0.888	282.694	282.697	T-post 4 m NW of logger	SSA-02
SSA-02			1.424	282.158	282.159	3/4" Pipe 10 m W of logger	SSA-01
SSA-03	1.230	283.582		282.352	282.352	Pipe 3 m N of logger	WL
Ice/PT:							SSA-01
Water Level:			2.423	281.159		Time WL Surveyed: 10:04	SSA-02
Other:							SSA-03
Setup #2							
SSA-01			0.868	282.695	282.697	T-post 4 m NW of logger	
SSA-02	1.405	283.563		282.158	282.159	3/4" Pipe 10 m W of logger	
SSA-03			1.209	282.354	282.352	Pipe 3 m N of logger	
Ice/PT:							
Water Level:			2.400	281.163		Time WL Surveyed: 10:06	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	SSA-03	1.209	283.561	282.352		Time WL Surveyed: 11:37	
Water Level:			2.399	281.162		Time WL Surveyed: 11:39	
Water Level:			2.382	281.162			
BM:	SSA-03	1.192	283.544	282.352			

**WL Survey Summary**

	Before	After
Average WL:	281.161	281.162
Transducer Elevation:	279.658	279.654
Closing Error:	-0.002	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	0.529
Expected Discharge:	0.98
Shift from Existing Rating (m <sup>3</sup> /s):	0.46
Shift from Existing Rating (%):	86%

**Field Personnel:**

Field Personnel:	SM, CJ	Trip Date:	18-Sep-13
Data Entry Personnel:	SM, CJ	Date:	18-Sep-13
Data Check Personnel:	DW	Date:	23-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: October 25, 2013  
 Site Visit Time (MST): 08:30

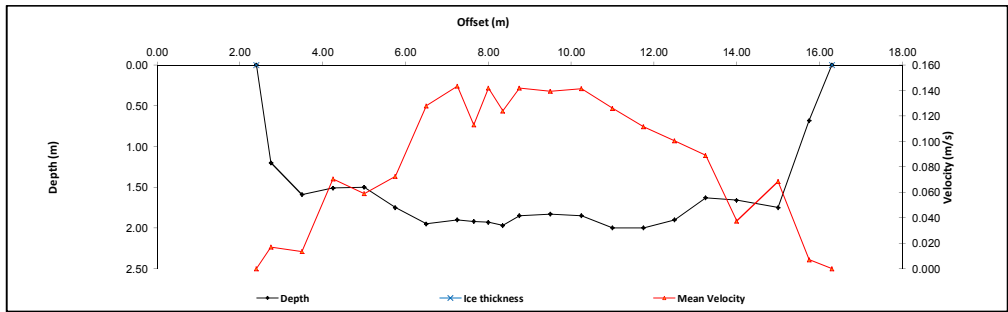


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000						
1	2.75	1.20			0.96	0.000	0.24	0.034	1.00	0.55	1.20	0.017	0.66	0.011	1%						
2	3.50	1.59			1.27	-0.004	0.32	0.031	1.00	0.75	1.59	0.014	1.19	0.016	1%						
3	4.25	1.51			1.21	0.018	0.30	0.123	1.00	0.75	1.51	0.071	1.13	0.080	4%						
4	5.00	1.50			1.20	0.070	0.30	0.048	1.00	0.75	1.50	0.059	1.13	0.066	3%						
5	5.75	1.75			1.40	0.054	0.35	0.091	1.00	0.75	1.75	0.073	1.31	0.095	4%						
6	6.50	1.95			1.56	0.097	0.39	0.159	1.00	0.75	1.95	0.128	1.46	0.187	9%						
7	7.25	1.90			1.52	0.152	0.38	0.135	1.00	0.58	1.90	0.144	1.09	0.157	7%						
8	7.65	1.92			1.54	0.147	0.38	0.079	1.00	0.38	1.92	0.113	0.72	0.081	4%						
9	8.00	1.93			1.54	0.148	0.39	0.136	1.00	0.35	1.93	0.142	0.68	0.096	4%						
10	8.35	1.97			1.58	0.104	0.39	0.144	1.00	0.38	1.97	0.124	0.74	0.092	4%						
11	8.75	1.85			1.48	0.135	0.37	0.149	1.00	0.57	1.85	0.142	1.06	0.151	7%						
12	9.50	1.83			1.46	0.116	0.37	0.163	1.00	0.75	1.83	0.140	1.37	0.191	9%						
13	10.25	1.85			1.48	0.139	0.37	0.144	1.00	0.75	1.85	0.142	1.39	0.196	9%						
14	11.00	2.00			1.60	0.082	0.40	0.170	1.00	0.75	2.00	0.126	1.50	0.189	9%						
15	11.75	2.00			1.60	0.041	0.40	0.162	1.00	0.75	2.00	0.112	1.50	0.167	8%						
16	12.50	1.90			1.52	0.048	0.38	0.153	1.00	0.75	1.90	0.101	1.43	0.143	7%						
17	13.25	1.83			1.30	0.055	0.33	0.123	1.00	0.75	1.63	0.089	1.22	0.109	5%						
18	14.00	1.66			1.33	0.007	0.33	0.068	1.00	0.88	1.66	0.038	1.45	0.054	2%						
19	15.00	1.75			1.40	0.127	0.35	0.010	1.00	0.88	1.75	0.069	1.53	0.105	5%						
20	15.75	0.68	0.41	0.007	0.000				1.00	0.65	0.68	0.007	0.44	0.003	0%						
RB	16.30	0.00	0.00		0.00		0.00		1.00	0.28	0.00	0.000	0.00	0.000							
<b>Total Flow</b>														<b>2.19</b>	<b>100%</b>						

**Flow Measurement Details:**

Metering Section Location (describe):  
Adjacent to station

Meas. Start Time (MST):	8:57
Meas. End Time (MST):	9:48
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 5°C



**Flow characteristics:**

Total Flow:	2.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	23.01	(m <sup>2</sup> )
Wetted Width:	13.90	(m)
Hydraulic Depth:	1.66	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.850	1.850
Water (°C):	2.7	2.7
Barometric Pressure (kPa):	98.54	96.61
Datalogger Clock:	08:33	09:50
Laptop Clock:	08:33	09:50
Battery (Main):	14.7	14.6
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

- Bring omni antenna next visit  
 - Updated BM tags

**General Notes:**

- Ran ADV test: good results  
 - Updated BM tags

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
SSA-01			0.894	282.697	282.697	T-post 4 m NW of logger	SSA-03
SSA-02	1.432	283.591		282.159	282.159	3/4" Pipe 10 m W of logger	SSA-02
SSA-03			1.237	282.354	282.352	Pipe 3 m N of logger	SSA-01
Ice/PT:							WL
Water Level:			2.082	281.509		Time WL Surveyed: 8:51	SSA-01
Other:							SSA-02
<b>Setup #2</b>							SSA-03
SSA-01			0.874	282.697	282.697	T-post 4 m NW of logger	
SSA-02			1.412	282.159	282.159	3/4" Pipe 10 m W of logger	
SSA-03	1.217	283.571		282.354	282.352	Pipe 3 m N of logger	
Ice/PT:							
Water Level:			2.060	281.511		Time WL Surveyed: 8:52	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	SSA-03	1.217	283.571	282.354			
Water Level:			2.064	281.507		Time WL Surveyed: 9:55	
Water Level:			2.052	281.505		Time WL Surveyed: 9:57	
BM:	SSA-03	1.203	283.557	282.354			

**WL Survey Summary**

	Before	After
Average WL:	281.510	281.506
Transducer Elevation:	279.660	279.656
Closing Error:	0.000	-
WL Check:	0.002	0.002

**Site Rating Information**

Measured Discharge:	2.19
Expected Discharge:	2.44
Shift from Existing Rating (m <sup>3</sup> /s):	0.25
Shift from Existing Rating (%):	11%

**Field Personnel:**

Field Personnel:	SM, DW	Trip Date:	25-Oct-13
Data Entry Personnel:	SM	Date:	25-Oct-13
Data Check Personnel:	CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: December 12, 2013  
 Site Visit Time (MST): 09:50

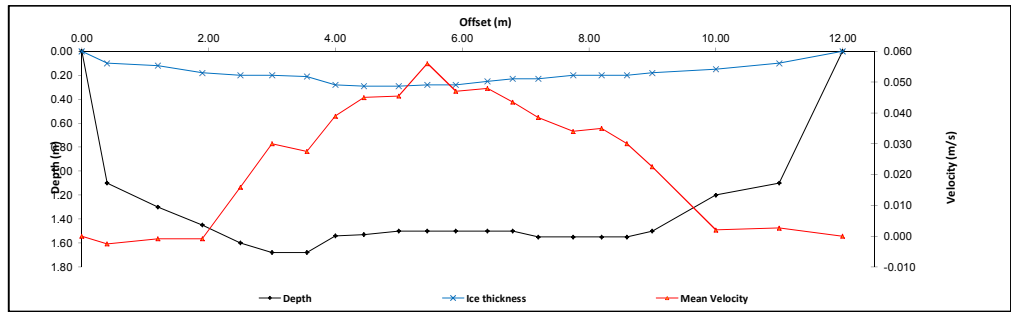


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	0.40	1.10	0.10		-0.001	0.90	-0.002	0.30	-0.003	1.00	0.60	1.00	-0.003	0.60	-0.002	0%
2	1.20	1.30	0.12		-0.001	1.06	0.36			0.88	0.75	1.18	-0.001	0.89	-0.001	0%
3	1.90	1.45	0.18		-0.001	1.20	0.43			0.88	0.65	1.27	-0.001	0.83	-0.001	0%
4	2.50	1.60	0.20	0.018		1.32	0.48			0.88	0.55	1.40	0.016	0.77	0.012	4%
5	3.00	1.68	0.20			1.38	0.30	0.50	0.030	1.00	0.53	1.48	0.030	0.78	0.023	7%
6	3.55	1.68	0.21			1.39	0.030	0.50	0.025	1.00	0.50	1.47	0.028	0.74	0.020	6%
7	4.00	1.54	0.28			1.29	0.039	0.53	0.039	1.00	0.45	1.26	0.039	0.57	0.022	6%
8	4.45	1.53	0.29			1.28	0.046	0.54	0.044	1.00	0.50	1.24	0.045	0.62	0.028	8%
9	5.00	1.50	0.29			1.26	0.043	0.53	0.048	1.00	0.50	1.21	0.046	0.61	0.028	8%
10	5.45	1.50	0.28			1.26	0.054	0.52	0.058	1.00	0.45	1.22	0.056	0.55	0.031	9%
11	5.90	1.50	0.28			1.26	0.046	0.52	0.048	1.00	0.48	1.22	0.047	0.58	0.027	8%
12	6.40	1.50	0.25			1.25	0.047	0.50	0.049	1.00	0.45	1.25	0.048	0.56	0.027	8%
13	6.80	1.50	0.23			1.25	0.049	0.48	0.038	1.00	0.40	1.27	0.044	0.51	0.022	6%
14	7.20	1.55	0.23			1.29	0.042	0.49	0.035	1.00	0.48	1.32	0.039	0.63	0.024	7%
15	7.75	1.55	0.20			1.28	0.038	0.47	0.030	1.00	0.50	1.35	0.034	0.68	0.023	7%
16	8.20	1.55	0.20			1.28	0.038	0.47	0.032	1.00	0.42	1.35	0.035	0.57	0.020	6%
17	8.60	1.55	0.20			1.28	0.029	0.47	0.031	1.00	0.40	1.35	0.030	0.54	0.016	5%
18	9.00	1.50	0.18			1.24	0.023	0.44	0.022	1.00	0.70	1.32	0.023	0.92	0.021	6%
19	10.00	1.20	0.15			0.99	-0.006	0.36	0.010	1.00	1.00	1.05	0.002	1.05	0.002	1%
20	11.00	1.10	0.10		0.003	0.90		0.30		0.88	1.00	1.00	0.003	1.00	0.003	1%
LB	12.00	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.346</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:44
Meas. End Time (MST):	11:34
Equipment:	ADV
Method:	Ice
River Condition:	Full ice come
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -26°C



**Flow characteristics:**

Total Flow:	0.346	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.97	(m <sup>2</sup> )
Wetted Width:	12.00	(m)
Hydraulic Depth:	1.16	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.429	1.428
Water (°C):	0.2	0.2
Barometric Pressure (kPa):	99.58	99.64
Datalogger Clock:	10:04	11:39
Laptop Clock:	10:04	11:39
Battery (Main):	13.7	15.0
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
SSA-01			1.092	282.704	282.697	T-post 4 m NW of logger	SSA-03
SSA-02	1.637	283.796		282.159	282.159	3/4" Pipe 10 m W of logger	SSA-02
SSA-03			1.442	282.354	282.352	Pipe 3 m N of logger	SSA-01
Ice/PT:			2.633	281.163			WL
Water Level:			2.715	281.081		Time WL Surveyed: -	Ice
Other:							Ice
<b>Setup #2</b>							WL
SSA-01			1.079	282.704	282.697	T-post 4 m NW of logger	SSA-01
SSA-02			1.624	282.159	282.159	3/4" Pipe 10 m W of logger	SSA-02
SSA-03	1.429	283.783		282.354	282.352	Pipe 3 m N of logger	SSA-03
Ice/PT:			2.621	281.162			
Water Level:			2.701	281.082		Time WL Surveyed: -	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: SSA-03	1.430	283.784		282.354		Time WL Surveyed: -	
Water Level:			2.704	281.080		Time WL Surveyed: 11:44	
Water Level:			2.689	281.078		Time WL Surveyed: 11:46	
BM: SSA-03	1.413	283.767		282.354			

**WL Survey Summary**

	Before	After
Average WL:	281.082	281.079
Transducer Elevation:	279.653	279.651
Closing Error:	0.000	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, CJ	Trip Date:	12-Dec-13
CJ	Date:	12-Dec-13
DW	Date:	31-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: January 14, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.70	0.00	0.00	0.000	0.000	0.000	1.0	0.70	0.75	0.05	0.05	-0.001	-0.001	0.00	0.000	0%
1	0.80	0.18		-0.004			1.0	0.75	0.83	0.08	0.18	-0.004	-0.004	0.01	0.000	-1%
2	0.85	0.17		-0.001			1.0	0.83	0.88	0.05	0.17	-0.001	-0.001	0.01	0.000	0%
3	0.90	0.17		0.001			1.0	0.88	0.93	0.05	0.17	0.001	0.001	0.01	0.000	0%
4	0.95	0.18		-0.004			1.0	0.93	0.98	0.05	0.18	-0.004	-0.004	0.01	0.000	-1%
5	1.00	0.18		-0.004			1.0	0.98	1.03	0.05	0.18	-0.004	-0.004	0.01	0.000	-1%
6	1.05	0.20		0.014			1.0	1.03	1.08	0.05	0.20	0.014	0.014	0.01	0.000	2%
7	1.10	0.19		0.051			1.0	1.08	1.13	0.05	0.19	0.051	0.051	0.01	0.000	7%
8	1.15	0.21		0.059			1.0	1.13	1.18	0.05	0.21	0.059	0.059	0.01	0.001	9%
9	1.20	0.20		0.048			1.0	1.18	1.23	0.05	0.20	0.048	0.048	0.01	0.000	7%
10	1.25	0.21		0.039			1.0	1.23	1.27	0.04	0.21	0.039	0.039	0.01	0.000	5%
11	1.28	0.19		0.039			1.0	1.27	1.29	0.02	0.19	0.039	0.039	0.00	0.000	3%
12	1.30	0.20		0.062			1.0	1.29	1.31	0.02	0.20	0.062	0.062	0.00	0.000	4%
13	1.33	0.15		0.057			1.0	1.31	1.34	0.02	0.15	0.057	0.057	0.00	0.000	3%
14	1.35	0.20		0.080			1.0	1.34	1.36	0.03	0.20	0.080	0.080	0.01	0.000	6%
15	1.38	0.17		0.103			1.0	1.36	1.39	0.02	0.17	0.103	0.103	0.00	0.000	6%
16	1.40	0.15		0.124			1.0	1.39	1.41	0.03	0.15	0.124	0.124	0.00	0.000	6%
17	1.43	0.15		0.148			1.0	1.41	1.44	0.02	0.15	0.148	0.148	0.00	0.001	8%
18	1.45	0.15		0.172			1.0	1.44	1.46	0.02	0.15	0.172	0.172	0.00	0.001	9%
19	1.48	0.14		0.183			1.0	1.46	1.49	0.03	0.14	0.183	0.183	0.00	0.001	9%
20	1.50	0.12		0.181			1.0	1.49	1.55	0.06	0.12	0.181	0.181	0.01	0.001	19%
LB	1.60	0.00	0.00	0.00	0.00	0.00	1.0	1.55	1.60	0.05	0.03	0.045	0.045	0.00	0.000	1%
<b>Total Flow</b>														<b>0.007</b>		

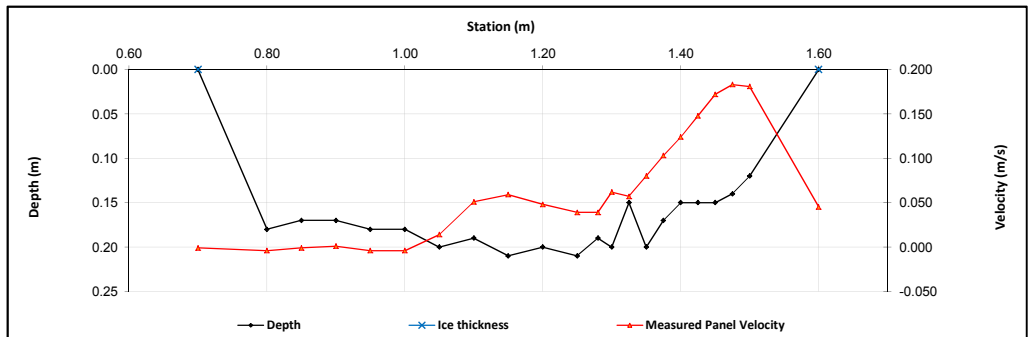
Measurement Details:	
Start Time (MST):	13:50
End Time (MST):	14:35
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Quality/Error (see reverse):	Fair
Weather:	Overcast, -12°C

Flow characteristics:		
Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.15	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.161	(m)
Mean Velocity:	0.049	(m/s)
Froude Number:	0.039	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.651	-
Battery (Main):	13.1	-
Datalogger Clock:	13:55	-
Laptop Clock:	13:56	-
Dessicant:	Good	
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S06-01			1.37	273.592	273.600	Rebar
S06-03			0.838	274.124	274.118	3/4" Pipe 6 m NW of data logger
S06-04	0.849	274.962		274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.924	272.038		
Other:						
<b>Setup #2</b>						
S06-01			1.359	273.593	273.600	Rebar
S06-03	0.828	274.952		274.124	274.118	3/4" Pipe 6 m NW of data logger
S06-04			0.839	274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.914	272.038		
Other:						

Closing Error	0.000
WL Check	0.000

Average WL	272.038
Transducer Elevation Before	271.387
Transducer Elevation After	-

Field Personnel:	DW, SM	Trip Date:	14-Jan-13
Data Entry Personnel:	DW	Date:	14-Jan-13
Data Check Personnel:	CJ	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

February 7, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.15	0.00	0.00	0.000	0.000	0.000	1.0	0.15	0.18	0.03	0.03	0.028	0.028	0.00	0.000	0%
1	0.20	0.10		0.112			1.0	0.18	0.23	0.05	0.10	0.112	0.112	0.01	0.001	11%
2	0.25	0.10		0.097			1.0	0.23	0.28	0.05	0.10	0.097	0.097	0.01	0.000	9%
3	0.30	0.10		0.131			1.0	0.28	0.31	0.04	0.10	0.131	0.131	0.01	0.000	10%
4	0.33	0.08		0.133			1.0	0.31	0.34	0.03	0.08	0.133	0.133	0.00	0.000	5%
5	0.35	0.17		0.132			1.0	0.34	0.36	0.03	0.17	0.132	0.132	0.00	0.001	11%
6	0.38	0.15		0.109			1.0	0.36	0.39	0.03	0.15	0.109	0.109	0.00	0.000	8%
7	0.40	0.10		0.138			1.0	0.39	0.41	0.03	0.10	0.138	0.138	0.00	0.000	7%
8	0.43	0.15		0.140			1.0	0.41	0.44	0.03	0.15	0.140	0.140	0.00	0.001	10%
9	0.45	0.18		0.102			1.0	0.44	0.46	0.03	0.18	0.102	0.102	0.00	0.000	9%
10	0.48	0.18		0.078			1.0	0.46	0.49	0.03	0.18	0.078	0.078	0.00	0.000	7%
11	0.50	0.20		0.050			1.0	0.49	0.51	0.03	0.20	0.050	0.050	0.00	0.000	5%
12	0.53	0.19		0.039			1.0	0.51	0.54	0.03	0.19	0.039	0.039	0.00	0.000	4%
13	0.55	0.12		0.025			1.0	0.54	0.58	0.04	0.12	0.025	0.025	0.00	0.000	2%
14	0.60	0.15		0.004			1.0	0.58	0.63	0.05	0.15	0.004	0.004	0.01	0.000	1%
15	0.65	0.18		0.011			1.0	0.63	0.68	0.05	0.18	0.011	0.011	0.01	0.000	2%
16	0.70	0.20		0.007			1.0	0.68	0.73	0.05	0.20	0.007	0.007	0.01	0.000	1%
17	0.75	0.20		0.002			1.0	0.73	0.78	0.05	0.20	0.002	0.002	0.01	0.000	0%
18	0.80	0.19		-0.010			1.0	0.78	0.83	0.05	0.19	-0.010	-0.010	0.01	0.000	-2%
19	0.85	0.20		-0.005			1.0	0.83	0.88	0.05	0.20	-0.005	-0.005	0.01	0.000	-1%
20	0.90	0.18		0.002			1.0	0.88	0.98	0.10	0.18	0.002	0.002	0.02	0.000	1%
LB	1.05	0.00	0.00	0.00	0.00	0.00	1.0	0.98	1.05	0.08	0.05	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>														<b>0.005</b>		

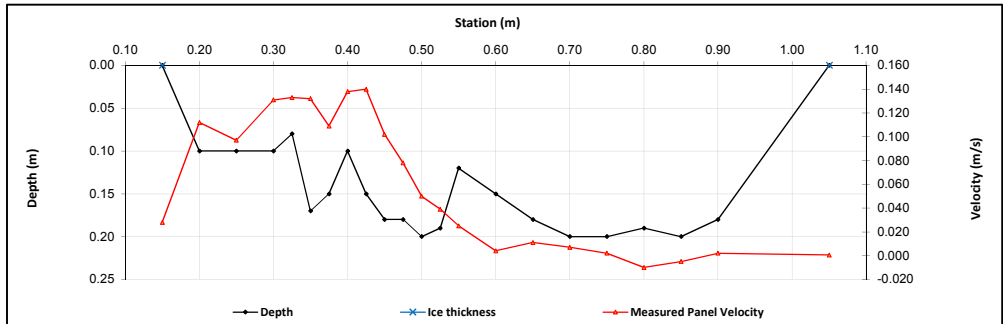
Measurement Details:	
Start Time (MST):	15:30
End Time (MST):	16:17
Equipment:	ADV
Method:	Wading
River Condition:	Open
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -10°C

Flow characteristics:		
Total Flow:	0.005	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.146	(m)
Mean Velocity:	0.039	(m/s)
Froude Number:	0.033	

Logger Details:		
	Before	After
Transducer Reading (m):	0.640	-
Water (°C):	1.2	-
Battery (Main):	13.6	-
Datalogger Clock:	3:41	-
Laptop Clock:	3:41	-
Dessicant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S06-01			1.673	273.585	273.600	Rebar
S06-03			1.134	274.124	274.118	3/4" Pipe 6 m NW of data logger
S06-04	1.145	275.258		274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.232	272.026		
Other:						
<b>Setup #2</b>						
S06-01			1.663	273.586	273.600	Rebar
S06-03	1.125	275.249		274.124	274.118	3/4" Pipe 6 m NW of data logger
S06-04			1.135	274.114	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.223	272.026		
Other:						

Closing Error	-0.001
WL Check	0.000

Average WL	272.026
Transducer Elevation Before	271.386
Transducer Elevation After	-

Field Personnel:	SM,CJ	Trip Date:	7-Feb-13
Data Entry Personnel:	CJ	Date:	7-Feb-13
Data Check Personnel:	CJ	Date:	12-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

February 28, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	1.10	0.00	0.00	0.000	0.000	0.000	1.0	1.10	1.15	0.05	0.03	0.000	0.000	0.00	0.000	0%
1	1.20	0.10		-0.001			1.0	1.15	1.23	0.08	0.10	-0.001	-0.001	0.01	0.000	0%
2	1.25	0.12		0.000			1.0	1.23	1.28	0.05	0.12	0.000	0.000	0.01	0.000	0%
3	1.30	0.15		0.002			1.0	1.28	1.33	0.05	0.15	0.002	0.002	0.01	0.000	0%
4	1.35	0.10		0.007			1.0	1.33	1.38	0.05	0.10	0.007	0.007	0.00	0.000	1%
5	1.40	0.10		-0.005			1.0	1.38	1.43	0.05	0.10	-0.005	-0.005	0.00	0.000	-1%
6	1.45	0.10		0.019			1.0	1.43	1.48	0.05	0.10	0.019	0.019	0.01	0.000	2%
7	1.50	0.15		0.054			1.0	1.48	1.53	0.05	0.15	0.054	0.054	0.01	0.000	9%
8	1.55	0.18		0.013			1.0	1.53	1.58	0.05	0.18	0.013	0.013	0.01	0.000	3%
9	1.60	0.16		0.013			1.0	1.58	1.63	0.05	0.16	0.013	0.013	0.01	0.000	2%
10	1.65	0.14		0.018			1.0	1.63	1.67	0.04	0.14	0.018	0.018	0.01	0.000	2%
11	1.68	0.15		0.036			1.0	1.67	1.69	0.02	0.15	0.036	0.036	0.00	0.000	3%
12	1.70	0.17		0.100			1.0	1.69	1.71	0.02	0.17	0.100	0.100	0.00	0.000	9%
13	1.73	0.10		0.096			1.0	1.71	1.74	0.03	0.10	0.096	0.096	0.00	0.000	5%
14	1.75	0.10		0.153			1.0	1.74	1.77	0.03	0.10	0.153	0.153	0.00	0.000	9%
15	1.78	0.15		0.132			1.0	1.77	1.79	0.02	0.15	0.132	0.132	0.00	0.000	11%
16	1.80	0.15		0.083			1.0	1.79	1.83	0.04	0.15	0.083	0.083	0.01	0.000	10%
17	1.85	0.07		0.073			1.0	1.83	1.88	0.05	0.07	0.073	0.073	0.00	0.000	6%
18	1.90	0.10		0.090			1.0	1.88	1.93	0.05	0.10	0.090	0.090	0.00	0.000	10%
19	1.95	0.10		0.072			1.0	1.93	1.98	0.05	0.10	0.072	0.072	0.01	0.000	8%
20	2.00	0.07		0.086			1.0	1.98	2.05	0.07	0.07	0.086	0.086	0.01	0.000	10%
RB	2.10	0.00	0.00	0.000	0.000	0.000	1.0	2.05	2.10	0.05	0.02	0.022	0.022	0.00	0.000	0%
<b>Total Flow</b>														<b>0.004</b>		

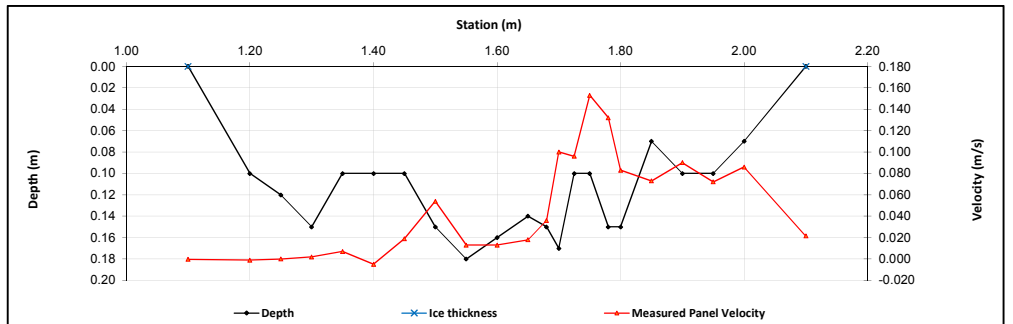
Measurement Details:	
Start Time (MST):	13:55
End Time (MST):	14:45
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -2°C

Flow characteristics:		
Total Flow:	0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.11	(m <sup>2</sup> )
Wetted Width:	1.00	(m)
Hydraulic Depth:	0.109	(m)
Mean Velocity:	0.041	(m/s)
Froude Number:	0.040	

Logger Details:		
	Before	After
Transducer Reading (m):	0.634	-
Water (°C):	1.1	-
Battery (Main):	14.9	-
Datalogger Clock:	14:00	-
Laptop Clock:	14:00	-
Dessicant:	Good	-
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S06-01			1.782	273.584	273.600	Rebar
S06-03			1.244	274.122	274.118	3/4" Pipe 6 m NW of data logger
S06-04	1.253	275.366		274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.345	272.021		
Other:						
<b>Setup #2</b>						
S06-01			1.769	273.584	273.600	Rebar
S06-03	1.231	275.353		274.122	274.118	3/4" Pipe 6 m NW of data logger
S06-04			1.239	274.114	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.332	272.021		
Other:						

Closing Error	-0.001
WL Check	0.000

Average WL	272.021
Transducer Elevation Before	271.387
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	28-Feb-13
Data Entry Personnel:	SM	Date:	28-Feb-13
Data Check Personnel:	CJ	Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

January 14, 2013



Flow Measurement: Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.10	0.00	0.00	0.000	0.000	0.000	1.0	0.10	0.15	0.05	0.02	0.017	0.017	0.00	0.000	0%
1	0.20	0.07		0.066			1.0	0.15	0.25	0.10	0.07	0.066	0.066	0.01	0.000	7%
2	0.30	0.07		0.069			1.0	0.25	0.33	0.08	0.07	0.069	0.069	0.01	0.000	5%
3	0.35	0.07		0.064			1.0	0.33	0.38	0.05	0.07	0.064	0.064	0.01	0.000	3%
4	0.40	0.12		0.125			1.0	0.38	0.43	0.05	0.12	0.125	0.125	0.01	0.001	11%
5	0.45	0.15		0.171			1.0	0.43	0.46	0.04	0.15	0.171	0.171	0.01	0.001	14%
6	0.48	0.03		0.173			1.0	0.46	0.49	0.03	0.03	0.173	0.173	0.00	0.000	2%
7	0.50	0.15		0.183			1.0	0.49	0.51	0.03	0.15	0.183	0.183	0.00	0.001	10%
8	0.53	0.19		0.172			1.0	0.51	0.54	0.03	0.19	0.172	0.172	0.00	0.001	12%
9	0.55	0.17		0.062			1.0	0.54	0.56	0.02	0.17	0.062	0.062	0.00	0.000	4%
10	0.58	0.18		0.251			1.0	0.56	0.59	0.02	0.18	0.251	0.251	0.00	0.001	17%
11	0.60	0.18		0.030			1.0	0.59	0.61	0.03	0.18	0.030	0.030	0.00	0.000	2%
12	0.63	0.15		0.000			1.0	0.61	0.64	0.02	0.15	0.000	0.000	0.00	0.000	0%
13	0.65	0.13		0.009			1.0	0.64	0.68	0.04	0.13	0.009	0.009	0.00	0.000	1%
14	0.70	0.15		0.020			1.0	0.68	0.73	0.05	0.15	0.020	0.020	0.01	0.000	2%
15	0.75	0.12		0.038			1.0	0.73	0.78	0.05	0.12	0.038	0.038	0.01	0.000	3%
16	0.80	0.12		0.035			1.0	0.78	0.83	0.05	0.12	0.035	0.035	0.01	0.000	3%
17	0.85	0.15		0.044			1.0	0.83	0.88	0.05	0.15	0.044	0.044	0.01	0.000	5%
18	0.90	0.18		-0.005			1.0	0.88	0.95	0.08	0.18	-0.005	-0.005	0.01	0.000	-1%
19	1.00	0.12		0.000			1.0	0.95	1.05	0.10	0.12	0.000	0.000	0.01	0.000	0%
LB	1.10	0.00	0.00	0.00	0.00	0.00	1.0	1.05	1.10	0.05	0.03	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.007</b>		

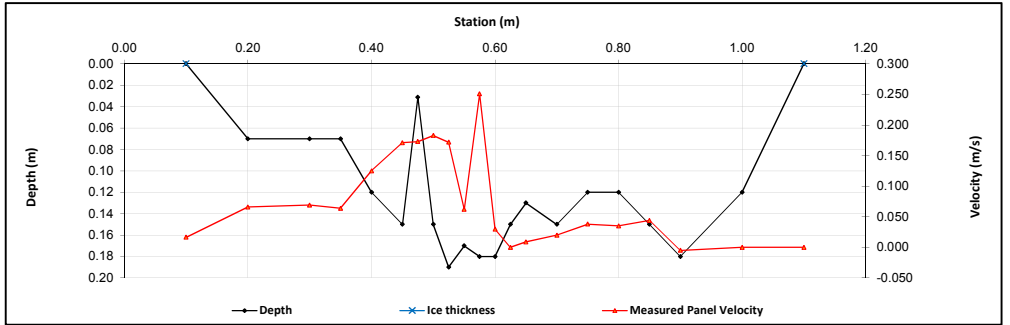
Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	11:26
Equipment:	ADV
Method:	Wading
River Condition:	Open, low flow
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -3°C

Flow characteristics:	
Total Flow:	0.007 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.11 (m <sup>2</sup> )
Wetted Width:	1.00 (m)
Hydraulic Depth:	0.113 (m)
Mean Velocity:	0.060 (m/s)
Froude Number:	0.057

Logger Details:		
	Before	After
Transducer Reading (m):	0.632	-
Water (°C):	1.0	-
Battery (Main):	14.9	-
Datalogger Clock:	10:37	-
Laptop Clock:	10:37	-
Dessicant:	Replaced	-
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S06-01			1.724	273.582	273.600	Rebar
S06-03			1.183	274.123	274.118	3/4" Pipe 6 m NW of data logger
S06-04	1.193	275.306		274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.29	272.016		
Other:						
<b>Setup #2</b>						
S06-01			1.735	273.582	273.600	Rebar
S06-03	1.194	275.317		274.123	274.118	3/4" Pipe 6 m NW of data logger
S06-04			1.205	274.112	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.305	272.012		
Other:						

Closing Error	0.001	Average WL	272.014
WL Check	0.004	Transducer Elevation Before	271.382
		Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	Trip Date:	1-Apr-13
Data Entry Personnel:	CJ	Date:	1-Apr-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: May 8, 2013  
 Site Visit Time (MST): 14:04

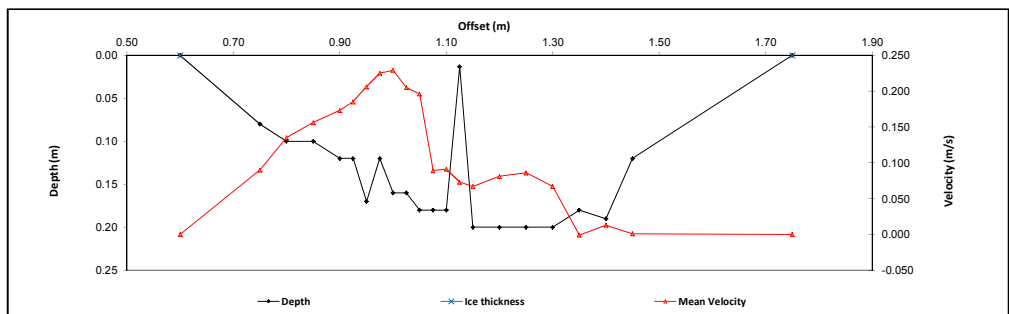


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.75	0.08		0.05	0.090					1.00	0.10	0.08	0.090	0.01	0.001	6%
2	0.80	0.10		0.06	0.135					1.00	0.05	0.10	0.135	0.00	0.001	6%
3	0.85	0.10		0.06	0.156					1.00	0.05	0.10	0.156	0.01	0.001	7%
4	0.90	0.12		0.07	0.173					1.00	0.04	0.12	0.173	0.00	0.001	7%
5	0.93	0.12		0.07	0.185					1.00	0.02	0.12	0.185	0.00	0.001	5%
6	0.95	0.17		0.10	0.206					1.00	0.02	0.17	0.206	0.00	0.001	8%
7	0.98	0.12		0.07	0.225					1.00	0.03	0.12	0.225	0.00	0.001	6%
8	1.00	0.16		0.10	0.229					1.00	0.02	0.16	0.229	0.00	0.001	8%
9	1.03	0.16		0.10	0.205					1.00	0.03	0.16	0.205	0.00	0.001	7%
10	1.05	0.18		0.11	0.196					1.00	0.02	0.18	0.196	0.00	0.001	8%
11	1.08	0.18		0.11	0.089					1.00	0.02	0.18	0.089	0.00	0.000	3%
12	1.10	0.18		0.11	0.091					1.00	0.03	0.18	0.091	0.00	0.000	4%
13	1.13	0.01		0.01	0.073					1.00	0.02	0.01	0.073	0.00	0.000	0%
14	1.15	0.20		0.12	0.067					1.00	0.04	0.20	0.067	0.01	0.001	4%
15	1.20	0.20		0.12	0.081					1.00	0.05	0.20	0.081	0.01	0.001	7%
16	1.25	0.20		0.12	0.086					1.00	0.05	0.20	0.086	0.01	0.001	7%
17	1.30	0.20		0.12	0.067					1.00	0.05	0.20	0.067	0.01	0.001	6%
18	1.35	0.18		0.11	-0.001					1.00	0.05	0.18	-0.001	0.01	0.000	0%
19	1.40	0.19		0.11	0.013					1.00	0.05	0.19	0.013	0.01	0.000	1%
20	1.45	0.12		0.07	0.001					1.00	0.18	0.12	0.001	0.02	0.000	0%
LB	1.75	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.012</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:17
Meas. End Time (MST):	14:42
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 5°C



**Flow characteristics:**

Total Flow:	0.012	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	1.15	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.699	0.697
Water (°C):	4.4	4.4
Datalogger Clock:	14:05	14:50
Laptop Clock:	14:05	14:50
Battery (Main):	14.6	14.8
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01			1.487	273.583	273.600	Rebar	S06-01
S06-03			0.948	274.122	274.118	3/4" Pipe 6 m NW of data logger	S06-03
S06-04	0.957	275.070		274.113	274.113	3/4" Pipe 7 m W of data logger	S06-04
Ice/PT:							WL
Water Level:			3.013	272.057		Time WL Surveyed:	14:13
Other:							S06-04
<b>Setup #2</b>							S06-03
S06-01	1.472	275.055		273.583	273.600	Rebar	BM3
S06-03			0.933	274.122	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			0.942	274.113	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.998	272.057		Time WL Surveyed:	14:14
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S06-03	0.933	275.055	274.122	272.056	Time WL Surveyed:	14:45
Water Level:				2.988	272.057	Time WL Surveyed:	14:46
BM:	S06-03	0.923	275.045	274.122			

**WL Survey Summary**

	Before	After
Average WL:	272.057	272.057
Transducer Elevation:	271.358	271.360
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.0115
Expected Discharge:	0.01
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	-18%

**Field Personnel:**

SM, DW	Trip Date:	8-May-13
SM	Date:	8-May-13
CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: June 9, 2013  
 Site Visit Time (MST): 14:20

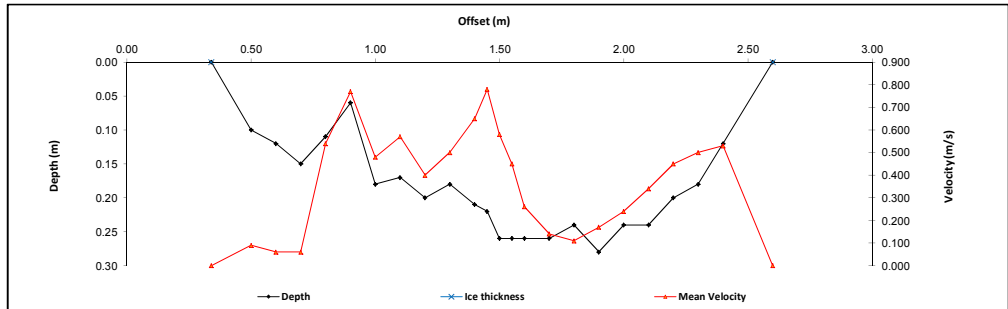


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.34	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.50	0.10		0.06	0.090					1.00	0.13	0.10	0.090	0.01	0.001	1%
2	0.60	0.12		0.07	0.060					1.00	0.10	0.12	0.060	0.01	0.001	1%
3	0.70	0.15		0.09	0.060					1.00	0.10	0.15	0.060	0.02	0.001	1%
4	0.80	0.11		0.07	0.540					1.00	0.10	0.11	0.540	0.01	0.006	4%
5	0.90	0.06		0.04	0.770					1.00	0.10	0.06	0.770	0.01	0.005	3%
6	1.00	0.18		0.11	0.480					1.00	0.10	0.18	0.480	0.02	0.009	6%
7	1.10	0.17		0.10	0.570					1.00	0.10	0.17	0.570	0.02	0.010	7%
8	1.20	0.20		0.12	0.400					1.00	0.10	0.20	0.400	0.02	0.008	6%
9	1.30	0.18		0.11	0.500					1.00	0.10	0.18	0.500	0.02	0.009	7%
10	1.40	0.21		0.13	0.650					1.00	0.07	0.21	0.650	0.02	0.010	7%
11	1.45	0.22		0.13	0.780					1.00	0.05	0.22	0.780	0.01	0.009	6%
12	1.50	0.26		0.16	0.580					1.00	0.05	0.26	0.580	0.01	0.008	5%
13	1.55	0.26		0.16	0.450					1.00	0.05	0.26	0.450	0.01	0.006	4%
14	1.60	0.26		0.16	0.260					1.00	0.07	0.26	0.260	0.02	0.005	4%
15	1.70	0.26		0.16	0.140					1.00	0.10	0.26	0.140	0.03	0.004	3%
16	1.80	0.24		0.14	0.110					1.00	0.10	0.24	0.110	0.02	0.003	2%
17	1.90	0.28		0.17	0.170					1.00	0.10	0.28	0.170	0.03	0.005	3%
18	2.00	0.24		0.14	0.240					1.00	0.10	0.24	0.240	0.02	0.006	4%
19	2.10	0.24		0.14	0.340					1.00	0.10	0.24	0.340	0.02	0.008	6%
20	2.20	0.20		0.12	0.450					1.00	0.10	0.20	0.450	0.02	0.009	7%
21	2.30	0.18		0.11	0.500					1.00	0.10	0.18	0.500	0.02	0.009	7%
22	2.40	0.12		0.07	0.530					1.00	0.15	0.12	0.530	0.02	0.010	7%
LB	2.60	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.138</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:41
Meas. End Time (MST):	15:01
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Raining, breezy, t 10



**Flow characteristics:**

Total Flow:	0.138	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.36	(m <sup>2</sup> )
Wetted Width:	2.26	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.28	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.960	0.965
Water (°C):	11.3	11.3
Datalogger Clock:	14: 23	15: 09
Laptop Clock:	14: 23	15: 09
Battery (Main):	14.6	14.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01			1.608	273.583	273.600	Rebar	S06-01
S06-03			1.068	274.123	274.118	3/4" Pipe 6 m NW of data logger	S06-03
S06-04	1.078	275.191		274.113	274.113	3/4" Pipe 7 m W of data logger	S06-04
Ice/PT:							WL
Water Level:			2.877	272.314		Time WL Surveyed:	S06-04
Other:							S06-03
<b>Setup #2</b>							S06-01
S06-01			1.627	273.584	273.600	Rebar	
S06-03	1.088	275.211		274.123	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			1.098	274.113	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.895	272.316		Time WL Surveyed:	S06-01
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S06-01	1.607	275.190	273.583		Time WL Surveyed:	
Water Level:			2.875	272.315		Time WL Surveyed:	15:03
Water Level:			2.854	272.317		Time WL Surveyed:	15:04
BM:	S06-01	1.588	275.171	273.583			

**WL Survey Summary**

	Before	After
Average WL:	272.315	272.316
Transducer Elevation:	271.355	271.351
Closing Error:	0.000	-
WL Check:	0.002	-0.002

**Site Rating Information**

Measured Discharge:	0.138
Expected Discharge:	0.12
Shift from Existing Rating (m <sup>3</sup> /s):	-0.02
Shift from Existing Rating (%):	-14%

**Field Personnel:**

SM, CJ	Trip Date:	9-Jun-13
SM, CJ	Date:	9-Jun-13
CJ	Date:	18-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: August 15, 2013  
 Site Visit Time (MST): 15:10

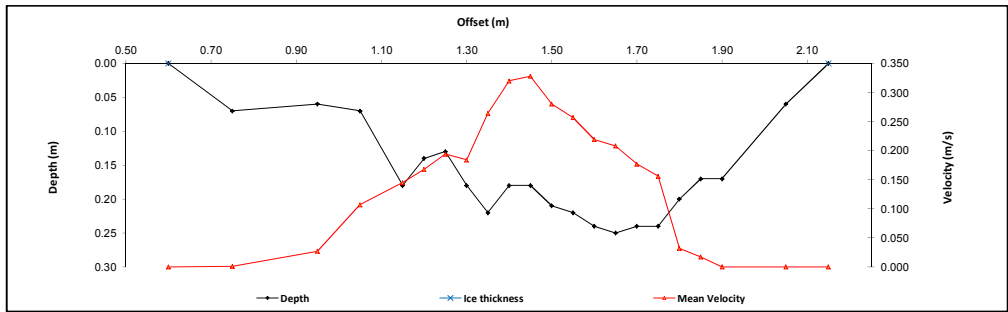


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.75	0.07		0.04	0.001					1.00	0.18	0.07	0.001	0.01	0.000	0%
2	0.95	0.06		0.04	0.027					1.00	0.15	0.06	0.027	0.01	0.000	1%
3	1.05	0.07		0.04	0.107					1.00	0.10	0.07	0.107	0.01	0.001	2%
4	1.15	0.18		0.11	0.145					1.00	0.07	0.18	0.145	0.01	0.002	6%
5	1.20	0.14		0.08	0.168					1.00	0.05	0.14	0.168	0.01	0.001	4%
6	1.25	0.13		0.08	0.194					1.00	0.05	0.13	0.194	0.01	0.001	4%
7	1.30	0.18		0.11	0.184					1.00	0.05	0.18	0.184	0.01	0.002	5%
8	1.35	0.22		0.13	0.264					1.00	0.05	0.22	0.264	0.01	0.003	9%
9	1.40	0.18		0.11	0.320					1.00	0.05	0.18	0.320	0.01	0.003	9%
10	1.45	0.18		0.11	0.328					1.00	0.05	0.18	0.328	0.01	0.003	9%
11	1.50	0.21		0.13	0.280					1.00	0.05	0.21	0.280	0.01	0.003	9%
12	1.55	0.22		0.13	0.257					1.00	0.05	0.22	0.257	0.01	0.003	9%
13	1.60	0.24		0.14	0.219					1.00	0.05	0.24	0.219	0.01	0.003	8%
14	1.65	0.25		0.15	0.208					1.00	0.05	0.25	0.208	0.01	0.003	8%
15	1.70	0.24		0.14	0.177					1.00	0.05	0.24	0.177	0.01	0.002	7%
16	1.75	0.24		0.14	0.156					1.00	0.05	0.24	0.156	0.01	0.002	6%
17	1.80	0.20		0.12	0.032					1.00	0.05	0.20	0.032	0.01	0.000	1%
18	1.85	0.17		0.10	0.017					1.00	0.05	0.17	0.017	0.01	0.000	0%
19	1.90	0.17		0.10	0.000					1.00	0.10	0.17	0.000	0.02	0.000	0%
20	2.05	0.06		0.04	0.000					1.00	0.13	0.06	0.000	0.01	0.000	0%
LB	2.15	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.031</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5 m Ds of weir

Meas. Start Time (MST):	15:25
Meas. End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, light breeze, 25°C



**Flow characteristics:**

Total Flow:	0.031	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.21	(m <sup>2</sup> )
Wetted Width:	1.55	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.793	0.791
Water (°C):	14.0	14.0
Datalogger Clock:	15:11	15:50
Laptop Clock:	15:11	15:50
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Mast needs to be replaced

**General Notes:**

- Vegetation growing along banks

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01			1.047	273.586	273.600	Rebar	S06-01
S06-03			0.511	274.122	274.118	3/4" Pipe 6 m NW of data logger	S06-03
S06-04	0.520	274.633		274.113	274.113	3/4" Pipe 7 m W of data logger	WL
Ice/PT:							WL
Water Level:			2.458	272.175		Time WL Surveyed: 15:18	S06-04
Other:							S06-03
<b>Setup #2</b>							S06-01
S06-01	1.032	274.618		273.586	273.600	Rebar	
S06-03			0.496	274.122	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			0.506	274.112	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.443	272.175		Time WL Surveyed: 15:20	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S06-01	1.032	274.618	273.586		Time WL Surveyed: 15:47	
Water Level:			2.443	272.175		Time WL Surveyed: 15:49	
Water Level:			2.432	272.176			
BM:	S06-01	1.022	274.608	273.586			

**WL Survey Summary**

	Before	After
Average WL:	272.175	272.176
Transducer Elevation:	271.382	271.385
Closing Error:	0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.0312
Expected Discharge:	0.04
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	27%

**Field Personnel:**

Field Personnel:	TR, SM	Trip Date:	15-Aug-13
Data Entry Personnel:	TR	Date:	15-Aug-13
Data Check Personnel:	CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: September 22, 2013  
 Site Visit Time (MST): 14:00

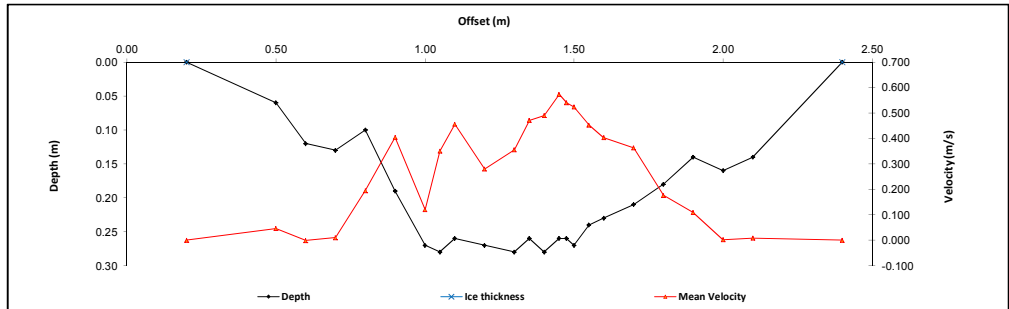


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	0.50	0.06		0.04	0.046					1.00	0.20	0.06	0.046	0.01	0.001	1%
2	0.60	0.12		0.07	-0.001					1.00	0.10	0.12	-0.001	0.01	0.000	0%
3	0.70	0.13		0.08	0.010					1.00	0.10	0.13	0.010	0.01	0.000	0%
4	0.80	0.10		0.06	0.195					1.00	0.10	0.10	0.195	0.01	0.002	2%
5	0.90	0.19		0.11	0.404					1.00	0.10	0.19	0.404	0.02	0.008	8%
6	1.00	0.27		0.16	0.120					1.00	0.08	0.27	0.120	0.02	0.002	3%
7	1.05	0.28		0.17	0.350					1.00	0.05	0.28	0.350	0.01	0.005	5%
8	1.10	0.26		0.16	0.456					1.00	0.07	0.26	0.456	0.02	0.009	9%
9	1.20	0.27		0.16	0.280					1.00	0.10	0.27	0.280	0.03	0.008	8%
10	1.30	0.28		0.17	0.355					1.00	0.08	0.28	0.355	0.02	0.007	8%
11	1.35	0.26		0.16	0.471					1.00	0.05	0.26	0.471	0.01	0.006	7%
12	1.40	0.28		0.17	0.490					1.00	0.05	0.28	0.490	0.01	0.007	7%
13	1.45	0.26		0.16	0.573					1.00	0.04	0.26	0.573	0.01	0.006	6%
14	1.48	0.26		0.16	0.540					1.00	0.03	0.26	0.540	0.01	0.004	4%
15	1.50	0.27		0.16	0.524					1.00	0.04	0.27	0.524	0.01	0.005	6%
16	1.55	0.24		0.14	0.453					1.00	0.05	0.24	0.453	0.01	0.005	6%
17	1.60	0.23		0.14	0.403					1.00	0.07	0.23	0.403	0.01	0.007	7%
18	1.70	0.21		0.13	0.363					1.00	0.10	0.21	0.363	0.02	0.008	8%
19	1.80	0.18		0.11	0.176					1.00	0.10	0.18	0.176	0.02	0.003	3%
20	1.90	0.14		0.08	0.109					1.00	0.10	0.14	0.109	0.01	0.002	2%
21	2.00	0.16		0.10	0.002					1.00	0.10	0.16	0.002	0.02	0.000	0%
22	2.10	0.14		0.08	0.008					1.00	0.20	0.14	0.008	0.03	0.000	0%
RB	2.40	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.094</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:22
Meas. End Time (MST):	14:48
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy +20°C



**Flow characteristics:**

Total Flow:	0.094	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.35	(m <sup>2</sup> )
Wetted Width:	2.20	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.22	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.906	0.895
Water (°C):	11.6	11.6
Datalogger Clock:	13:16	14:53
Laptop Clock:	13:16	14:53
Battery (Main):	14.4	14.3
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved logger and enclosure to new mast.
- Reinforced stilling well with old mast.
- See photos

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01			1.327	273.586	273.600	Rebar	S06-01
S06-03			0.791	274.122	274.118	3/4" Pipe 6 m NW of data logger	S06-03
S06-04	0.800	274.913		274.113	274.113	3/4" Pipe 7 m W of data logger	S06-04
Ice/PT:							WL
Water Level:			2.636	272.277			S06-04
Other:							S06-03
<b>Setup #2</b>							S06-01
S06-01	1.312	274.898		273.586	273.600	Rebar	
S06-03			0.775	274.123	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			0.785	274.113	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.621	272.277			
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S06-01	1.312	274.898		273.586			
Water Level:			2.623	272.275			Time WL Surveyed: 14:49
Water Level:			2.603	272.275			Time WL Surveyed: 14:51
BM: S06-01	1.292	274.878		273.586			

**WL Survey Summary**

	Before	After
Average WL:	272.277	272.275
Transducer Elevation:	271.371	271.380
Closing Error:	0.000	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	0.0939
Expected Discharge:	0.09
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	-3%

**Field Personnel:**

SM, TR	Trip Date:	22-Sep-13
SM	Date:	22-Sep-13
CJ	Date:	27-Sep-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: October 23, 2003  
 Site Visit Time (MST): 08:10

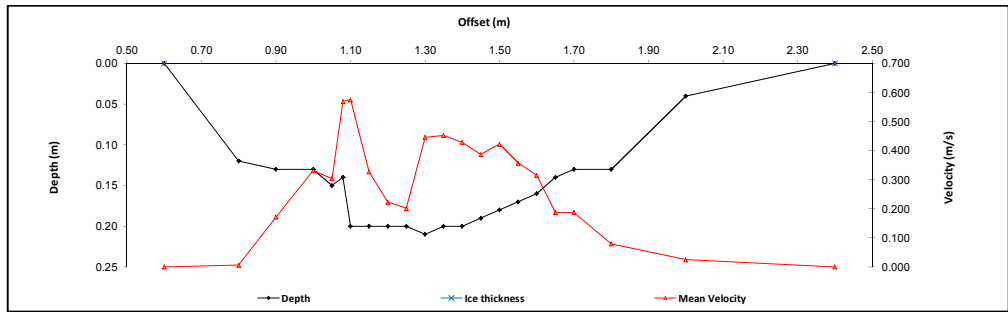


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.60	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.80	0.12		0.07	0.006					1.00	0.15	0.12	0.006	0.02	0.000	0%
2	0.90	0.13		0.08	0.172					1.00	0.10	0.13	0.172	0.01	0.002	4%
3	1.00	0.13		0.08	0.331					1.00	0.08	0.13	0.331	0.01	0.003	6%
4	1.05	0.15		0.09	0.304					1.00	0.04	0.15	0.304	0.01	0.002	3%
5	1.08	0.14		0.08	0.569					1.00	0.03	0.14	0.569	0.00	0.002	4%
6	1.10	0.20		0.12	0.575					1.00	0.03	0.20	0.575	0.01	0.004	8%
7	1.15	0.20		0.12	0.327					1.00	0.05	0.20	0.327	0.01	0.003	6%
8	1.20	0.20		0.12	0.223					1.00	0.05	0.20	0.223	0.01	0.002	4%
9	1.25	0.20		0.12	0.202					1.00	0.05	0.20	0.202	0.01	0.002	4%
10	1.30	0.21		0.13	0.446					1.00	0.05	0.21	0.446	0.01	0.005	9%
11	1.35	0.20		0.12	0.452					1.00	0.05	0.20	0.452	0.01	0.005	9%
12	1.40	0.20		0.12	0.428					1.00	0.05	0.20	0.428	0.01	0.004	8%
13	1.45	0.19		0.11	0.387					1.00	0.05	0.19	0.387	0.01	0.004	7%
14	1.50	0.18		0.11	0.422					1.00	0.05	0.18	0.422	0.01	0.004	7%
15	1.55	0.17		0.10	0.357					1.00	0.05	0.17	0.357	0.01	0.003	6%
16	1.60	0.16		0.10	0.315					1.00	0.05	0.16	0.315	0.01	0.003	5%
17	1.65	0.14		0.08	0.187					1.00	0.05	0.14	0.187	0.01	0.001	2%
18	1.70	0.13		0.08	0.187					1.00	0.08	0.13	0.187	0.01	0.002	3%
19	1.80	0.13		0.08	0.079					1.00	0.15	0.13	0.079	0.02	0.002	3%
20	2.00	0.04		0.02	0.025					1.00	0.30	0.04	0.025	0.01	0.000	1%
RB	2.40	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.052</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Approx. 5 m downstream of weir

Meas. Start Time (MST):	8:26
Meas. End Time (MST):	8:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 0°C



**Flow characteristics:**

Total Flow:	0.052	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.20	(m <sup>2</sup> )
Wetted Width:	1.80	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.25	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.809	0.810
Water (°C):	7.2	7.2
Datalogger Clock:	08:12	08:56
Laptop Clock:	08:12	08:56
Battery (Main):	12.9	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01			1.342	273.588	273.600	Rebar	S06-01
S06-03			0.805	274.125	274.118	3/4" Pipe 6 m NW of data logger	S06-03
S06-04	0.817	274.930		274.113	274.113	3/4" Pipe 7 m W of data logger	S06-04
Ice/PT:							WL
Water Level:			2.740	272.190		Time WL Surveyed: 8:20	S06-04
Other:							S06-03
<b>Setup #2</b>							S06-01
S06-01	1.328	274.916		273.588	273.600	Rebar	
S06-03			0.293	274.623	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			0.804	274.112	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.727	272.189		Time WL Surveyed: 8:22	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S06-01	1.328	274.916		273.588		Time WL Surveyed: 8:52	
Water Level:			2.727	272.189		Time WL Surveyed: 8:54	
Water Level:			2.715	272.190			
BM: S06-01	1.317	274.905		273.588			

**WL Survey Summary**

	Before	After
Average WL:	272.190	272.190
Transducer Elevation:	271.381	271.380
Closing Error:	0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	0.0524
Expected Discharge:	0.05
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-13%

**Field Personnel:**

DW, TR	Trip Date:	23-Oct-13
DW	Date:	23-Oct-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: December 12, 2014  
 Site Visit Time (MST): 15:00

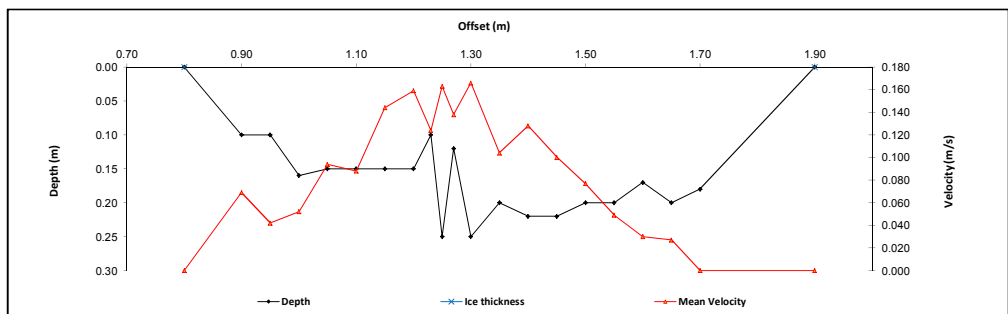


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.90	0.10		0.06	0.069					1.00	0.08	0.10	0.069	0.01	0.001	4%
2	0.95	0.10		0.06	0.042					1.00	0.05	0.10	0.042	0.00	0.000	2%
3	1.00	0.16		0.10	0.052					1.00	0.05	0.16	0.052	0.01	0.000	3%
4	1.05	0.15		0.09	0.094					1.00	0.05	0.15	0.094	0.01	0.001	5%
5	1.10	0.15		0.09	0.088					1.00	0.05	0.15	0.088	0.01	0.001	5%
6	1.15	0.15		0.09	0.144					1.00	0.05	0.15	0.144	0.01	0.001	8%
7	1.20	0.15		0.09	0.159					1.00	0.04	0.15	0.159	0.01	0.001	7%
8	1.23	0.10		0.06	0.124					1.00	0.03	0.10	0.124	0.00	0.000	2%
9	1.25	0.25		0.15	0.163					1.00	0.02	0.25	0.163	0.01	0.001	6%
10	1.27	0.12		0.07	0.138					1.00	0.03	0.12	0.138	0.00	0.000	3%
11	1.30	0.25		0.15	0.166					1.00	0.04	0.25	0.166	0.01	0.002	13%
12	1.35	0.20		0.12	0.104					1.00	0.05	0.20	0.104	0.01	0.001	8%
13	1.40	0.22		0.13	0.128					1.00	0.05	0.22	0.128	0.01	0.001	11%
14	1.45	0.22		0.13	0.100					1.00	0.05	0.22	0.100	0.01	0.001	8%
15	1.50	0.20		0.12	0.077					1.00	0.05	0.20	0.077	0.01	0.001	6%
16	1.55	0.20		0.12	0.049					1.00	0.05	0.20	0.049	0.01	0.000	4%
17	1.60	0.17		0.10	0.030					1.00	0.05	0.20	0.030	0.01	0.000	2%
18	1.65	0.20		0.12	0.027					1.00	0.05	0.20	0.027	0.01	0.000	2%
19	1.70	0.18		0.11	0.000					1.00	0.13	0.18	0.000	0.02	0.000	0%
LB	1.90	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.013</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:55
Equipment:	ADV
Method:	Wading
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -24°C



**Flow characteristics:**

Total Flow:	0.013	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.16	(m <sup>2</sup> )
Wetted Width:	1.10	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.692	0.691
Water (°C):	2.4	2.4
Datalogger Clock:	15:10	16:05
Laptop Clock:	15:10	16:05
Battery (Main):	14.1	13.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S06-01	1.363	274.963		273.600	273.600	Rebar	S06-01
S06-03			0.811	274.152	274.118	3/4" Pipe 6 m NW of data logger	S06-04
S06-04			0.819	274.144	274.113	3/4" Pipe 7 m W of data logger	WL
Ice/PT:							WL
Water Level:			2.878	272.085		Time WL Surveyed: 15:19	S06-04
Other:							S06-03
<b>Setup #2</b>							S06-01
S06-01			1.341	273.602	273.600	Rebar	
S06-03	0.791	274.943		274.152	274.118	3/4" Pipe 6 m NW of data logger	
S06-04			0.800	274.143	274.113	3/4" Pipe 7 m W of data logger	
Ice/PT:							
Water Level:			2.857	272.086		Time WL Surveyed: 15:21	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S06-01	1.343	274.943	273.600			
Water Level:			2.857	272.086		Time WL Surveyed: 16:01	
Water Level:			2.842	272.084		Time WL Surveyed: 16:03	
BM:	S06-01	1.326	274.926	273.600			

**WL Survey Summary**

	Before	After
Average WL:	272.086	272.085
Transducer Elevation:	271.394	271.394
Closing Error:	-0.002	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, CJ	Trip Date:	12-Dec-13
SM	Date:	12-Dec-13
DW	Date:	28-Mar-14
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

January 7, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	3.80	0.00	0.00	0.000	0.000	0.000	0.9	3.80	3.90	0.10	0.11	-0.002	-0.001	0.01	0.000	0%
1	4.00	0.68	0.23	-0.006			0.9	3.90	4.50	0.60	0.45	-0.006	-0.005	0.27	-0.001	0%
2	5.00	0.70	0.35	0.078			0.9	4.50	5.75	1.25	0.35	0.078	0.070	0.44	0.031	3%
3	6.50	0.65	0.35	0.181			0.9	5.75	7.10	1.35	0.30	0.181	0.163	0.41	0.066	6%
4	7.70	0.60	0.40	0.311			0.9	7.10	8.05	0.95	0.20	0.311	0.280	0.19	0.053	5%
5	8.40	0.65	0.40	0.286			0.9	8.05	8.80	0.75	0.25	0.286	0.257	0.19	0.048	4%
6	9.20	0.70	0.40	0.286			0.9	8.80	9.50	0.70	0.30	0.286	0.257	0.21	0.054	5%
7	9.80	0.70	0.40	0.295			0.9	9.50	10.15	0.65	0.30	0.295	0.266	0.20	0.052	5%
8	10.50	0.80	0.40	0.282			0.9	10.15	10.85	0.70	0.40	0.282	0.254	0.28	0.071	6%
9	11.20	0.85	0.35	0.241			0.9	10.85	11.50	0.65	0.50	0.241	0.217	0.33	0.070	6%
10	11.80	0.86	0.35	0.263			0.9	11.50	12.05	0.55	0.51	0.263	0.237	0.28	0.066	6%
11	12.30	0.85	0.40	0.263			0.9	12.05	12.58	0.52	0.45	0.263	0.237	0.24	0.056	5%
12	12.85	0.82	0.37	0.272			0.9	12.58	13.08	0.50	0.45	0.272	0.245	0.23	0.055	5%
13	13.30	0.88	0.43	0.278			0.9	13.08	13.60	0.53	0.45	0.278	0.250	0.24	0.059	5%
14	13.90	0.86	0.40	0.278			0.9	13.60	14.20	0.60	0.46	0.278	0.250	0.28	0.069	6%
15	14.50	0.80	0.44	0.263			0.9	14.20	14.80	0.60	0.36	0.263	0.237	0.22	0.051	5%
16	15.10	0.80	0.45	0.263			0.9	14.80	15.40	0.60	0.35	0.263	0.237	0.21	0.050	4%
17	15.70	0.65	0.45	0.204			0.9	15.40	16.00	0.60	0.20	0.204	0.184	0.12	0.022	2%
18	16.30	0.67	0.32	0.227			0.9	16.00	16.65	0.65	0.35	0.227	0.204	0.23	0.046	4%
19	17.00	0.55	0.40	0.063			0.9	16.65	17.50	0.85	0.15	0.063	0.057	0.13	0.007	1%
20	18.00	0.65	0.32	0.209			0.9	17.50	18.45	0.95	0.33	0.209	0.188	0.31	0.059	5%
21	18.90	0.65	0.30	0.229			0.9	18.45	19.35	0.90	0.35	0.229	0.206	0.32	0.065	6%
22	19.80	0.55	0.20	0.223			0.9	19.35	20.40	1.05	0.35	0.223	0.201	0.37	0.074	7%
LB	21.00	0.00	0.00	0.000	0.000	0.000	1.0	20.40	21.00	0.60	0.09	0.056	0.056	0.05	0.003	0%
<b>Total Flow</b>															<b>1.13</b>	

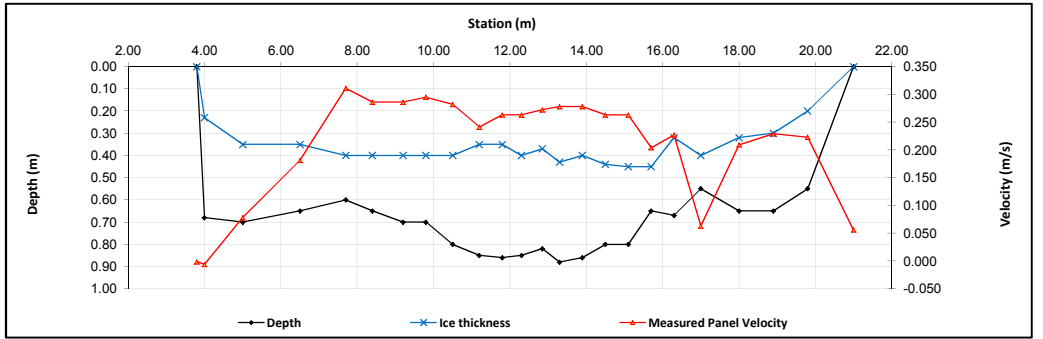
Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -5°C

Flow characteristics:	
Total Flow:	1.13 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	5.71 (m <sup>2</sup> )
Wetted Width:	17.20 (m)
Hydraulic Depth:	0.332 (m)
Mean Velocity:	0.198 (m/s)
Froude Number:	0.110

Logger Details:		
	Before	After
Transducer Reading (m):	0.495	-
Water (°C):	0.2	-
Battery (Main):	13.8	12.93
Datalogger Clock:	11:42	-
Laptop Clock:	11:42	-
Dessicant:	Good	-
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Replaced Battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S07-03	0.777	276.275		275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04			1.451	274.824	274.826	3/4" Pipe 10 m W of data logger
S07-05			1.067	275.208	275.208	3/4" Pipe 2 m S of data logger
Ice/PT:			4.174	272.101		
Water Level:			4.186	272.089		
Other:					275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
S07-03			0.746	275.499	275.498	3/4" Pipe 8 m W of data logger
S07-04	1.421	276.245		274.824	274.826	3/4" Pipe 10 m W of data logger
S07-05			1.036	275.209	275.208	3/4" Pipe 2 m S of data logger
Ice/PT:			4.143	272.102		
Water Level:			4.159	272.086		
Other:					275.406	

Closing Error	-0.001
WL Check	0.003

Average WL	272.088
Transducer Elevation Before	271.593
Transducer Elevation After	-

Field Personnel:	JG,DW,SM	Trip Date:	7-Jan-13
Data Entry Personnel:	DW	Date:	7-Jan-13
Data Check Personnel:	CJ	Date:	24-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

February 8, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.20	0.00	0.00	0.000	0.000	0.000	0.9	4.20	4.50	0.30	0.09	0.042	0.038	0.03	0.001	0%
1	4.80	0.50	0.15	0.168			0.9	4.50	5.00	0.50	0.35	0.168	0.151	0.18	0.026	4%
2	5.20	0.45	0.20	0.200			0.9	5.00	5.40	0.40	0.25	0.200	0.180	0.10	0.018	3%
3	5.60	0.50	0.25	0.185			0.9	5.40	5.88	0.48	0.25	0.185	0.167	0.12	0.020	3%
4	6.15	0.60	0.25	0.188			0.9	5.88	6.48	0.60	0.35	0.188	0.169	0.21	0.036	5%
5	6.80	0.65	0.30	0.165			0.9	6.48	7.15	0.68	0.35	0.165	0.149	0.24	0.035	5%
6	7.50	0.65	0.35	0.138			0.9	7.15	7.83	0.68	0.30	0.138	0.124	0.20	0.025	4%
7	8.15	0.60	0.35	0.048			0.9	7.83	8.50	0.68	0.25	0.048	0.043	0.17	0.007	1%
8	8.85	0.70	0.44	0.171			0.9	8.50	9.28	0.77	0.26	0.171	0.154	0.20	0.031	5%
9	9.70	0.75	0.45	0.196			0.9	9.28	10.13	0.85	0.30	0.196	0.176	0.26	0.045	7%
10	10.55	0.70	0.35	0.205			0.9	10.13	10.93	0.80	0.35	0.205	0.185	0.28	0.052	8%
11	11.30	0.80	0.40	0.194			0.9	10.93	11.63	0.70	0.40	0.194	0.175	0.28	0.049	7%
12	11.95	0.75	0.40	0.210			0.9	11.63	12.28	0.65	0.35	0.210	0.189	0.23	0.043	6%
13	12.60	0.75	0.35	0.192			0.9	12.28	12.95	0.68	0.40	0.192	0.173	0.27	0.047	7%
14	13.30	0.75	0.35	0.209			0.9	12.95	13.63	0.68	0.40	0.209	0.188	0.27	0.051	8%
15	13.95	0.75	0.35	0.204			0.9	13.63	14.30	0.68	0.40	0.204	0.184	0.27	0.050	7%
16	14.65	0.70	0.35	0.226			0.9	14.30	15.00	0.70	0.35	0.226	0.203	0.25	0.050	7%
17	15.35	0.65	0.40	0.205			0.9	15.00	15.63	0.63	0.25	0.205	0.185	0.16	0.029	4%
18	15.90	0.62	0.45	0.189			0.9	15.63	16.20	0.57	0.17	0.189	0.170	0.10	0.017	2%
19	16.50	0.61	0.45	0.117			0.9	16.20	16.85	0.65	0.16	0.117	0.105	0.10	0.011	2%
20	17.20	0.58	0.35	0.219			0.9	16.85	17.50	0.65	0.23	0.219	0.197	0.15	0.029	4%
RB	17.80	0.00	0.00	0.00	0.00	0.00	1.0	17.50	17.80	0.30	0.06	0.055	0.055	0.02	0.001	0%
<b>Total Flow</b>														<b>0.671</b>		

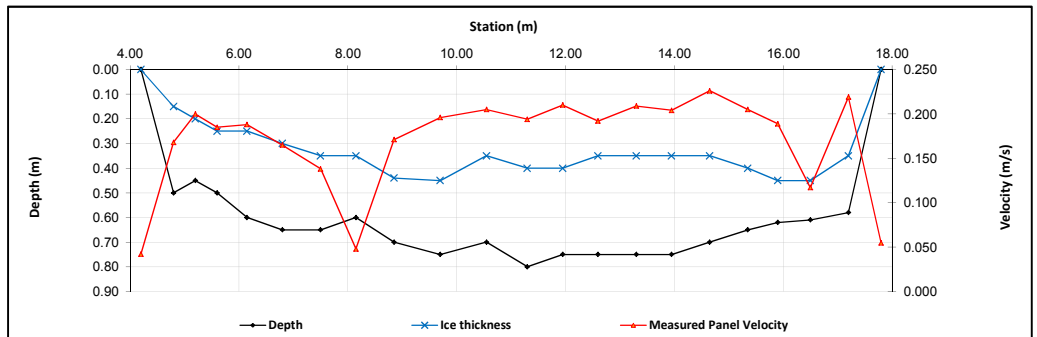
Measurement Details:	
Start Time (MST):	12:12
End Time (MST):	13:16
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -3°C

Flow characteristics:		
Total Flow:	0.671	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.06	(m <sup>2</sup> )
Wetted Width:	13.60	(m)
Hydraulic Depth:	0.299	(m)
Mean Velocity:	0.165	(m/s)
Froude Number:	0.097	

Logger Details:		
Transducer Reading (m):	Before	After
	0.440	-
Water (°C):	0.2	-
Battery (Main):	14.8	14.7
Datalogger Clock:	12:15	-
Laptop Clock:	12:16	-
Dessicant:	Replaced	
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S07-03			0.755	275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04			1.429	274.824	274.826	3/4" Pipe 10 m W of data logger
S07-05	1.045	276.253		275.208	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:			4.23	272.023		
Water Level:			4.218	272.035		
Other:					275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
S07-03			0.772	275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04	1.446	276.27		274.824	274.826	3/4" Pipe 10 m W of data logger
S07-05			1.062	275.208	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:			4.25	272.020		
Water Level:			4.232	272.038		
Other:					275.406	

Closing Error	0.000
WL Check	0.003

Average WL	272.037
Transducer Elevation Before	271.5965
Transducer Elevation After	-

Field Personnel:	SM, TR, JG, HH	Trip Date:	8-Feb-13
Data Entry Personnel:	SM	Date:	8-Feb-13
Data Check Personnel:	CJ	Date:	12-Feb-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

February 28, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	4.50	0.50	0.08	0.037	0.033	0.04	0.001	0%
1	5.00	0.62	0.31	0.148			0.9	4.50	5.70	1.20	0.31	0.148	0.133	0.37	0.050	8%
2	6.40	0.60	0.35	0.209			0.9	5.70	6.65	0.95	0.25	0.209	0.188	0.24	0.045	7%
3	6.90	0.65	0.35	0.225			0.9	6.65	7.23	0.57	0.30	0.225	0.203	0.17	0.035	6%
4	7.55	0.70	0.35	0.200			0.9	7.23	7.93	0.70	0.35	0.200	0.180	0.25	0.044	7%
5	8.30	0.70	0.35	0.219			0.9	7.93	8.50	0.57	0.35	0.219	0.197	0.20	0.040	6%
6	8.70	0.70	0.35	0.214			0.9	8.50	8.95	0.45	0.35	0.214	0.193	0.16	0.030	5%
7	9.20	0.75	0.35	0.191			0.9	8.95	9.43	0.48	0.40	0.191	0.172	0.19	0.033	5%
8	9.65	0.75	0.40	0.168			0.9	9.43	9.90	0.48	0.35	0.168	0.151	0.17	0.025	4%
9	10.15	0.70	0.40	0.164			0.9	9.90	10.40	0.50	0.30	0.164	0.148	0.15	0.022	4%
10	10.65	0.70	0.35	0.188			0.9	10.40	10.83	0.42	0.35	0.188	0.169	0.15	0.025	4%
11	11.00	0.70	0.35	0.200			0.9	10.83	11.30	0.48	0.35	0.200	0.180	0.17	0.030	5%
12	11.60	0.65	0.40	0.180			0.9	11.30	11.75	0.45	0.25	0.180	0.162	0.11	0.018	3%
13	11.90	0.65	0.45	0.202			0.9	11.75	12.10	0.35	0.20	0.202	0.182	0.07	0.013	2%
14	12.30	0.70	0.40	0.225			0.9	12.10	12.55	0.45	0.30	0.225	0.203	0.14	0.027	4%
15	12.80	0.70	0.45	0.206			0.9	12.55	13.03	0.48	0.25	0.206	0.185	0.12	0.022	4%
16	13.25	0.55	0.40	0.081			0.9	13.03	13.53	0.50	0.15	0.081	0.073	0.08	0.005	1%
17	13.80	0.50	0.35	0.208			0.9	13.53	14.25	0.73	0.15	0.208	0.187	0.11	0.020	3%
18	14.70	0.60	0.30	0.197			0.9	14.25	15.05	0.80	0.30	0.197	0.177	0.24	0.043	7%
19	15.40	0.65	0.30	0.190			0.9	15.05	15.75	0.70	0.35	0.190	0.171	0.25	0.042	7%
20	16.10	0.60	0.25	0.111			0.9	15.75	16.65	0.90	0.35	0.111	0.100	0.32	0.031	5%
21	17.20	0.50	0.15	0.085			0.9	16.65	17.45	0.80	0.35	0.085	0.077	0.28	0.021	3%
LB	17.70	0.00	0.00	0.00	0.00	0.00	1.0	17.45	17.70	0.25	0.09	0.021	0.021	0.02	0.000	0%
<b>Total Flow</b>														<b>0.624</b>		

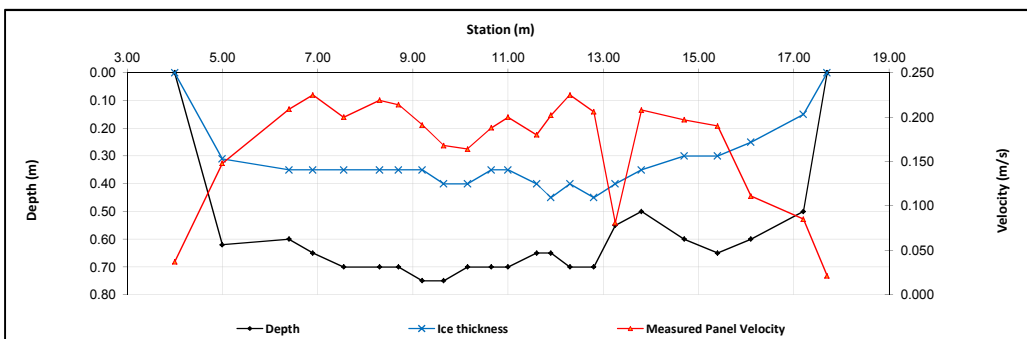
Measurement Details:	
Start Time (MST):	15:10
End Time (MST):	16:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 0.0°C

Flow characteristics:	
Total Flow:	0.624 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.97 (m <sup>2</sup> )
Wetted Width:	13.70 (m)
Hydraulic Depth:	0.290 (m)
Mean Velocity:	0.157 (m/s)
Froude Number:	0.093

Logger Details:		
	Before	After
Transducer Reading (m):	0.400	-
Water (°C):	0.2	-
Battery (Main):	13.5	-
Datalogger Clock:	15:11	-
Laptop Clock:	15:11	-
Dessicant:	Good	-
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S07-03			0.933	275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04	1.605	276.431		274.826	274.826	3/4" Pipe 10 m W of data logger
S07-05			1.222	275.209	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:			4.426	272.005		
Water Level:			4.434	271.997		
Other:					275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
S07-03			0.922	275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04			1.595	274.825	274.826	3/4" Pipe 10 m W of data logger
S07-05	1.211	276.42		275.209	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:			4.414	272.006		
Water Level:			4.424	271.996		
Other:					275.406	

Closing Error	0.001
WL Check	0.001

Average WL	271.997
Transducer Elevation Before	271.5965
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	28-Feb-13
Data Entry Personnel:	SM, DW	Date:	28-Feb-13
Data Check Personnel:	CJ	Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

March 26, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	4.75	0.75	0.00	0.001	0.001	0.00	0.000	0%
1	5.50	0.55	0.55	0.005			0.9	4.75	5.65	0.90	0.00	0.005	0.005	0.00	0.000	0%
2	5.80	0.55	0.52	0.003			0.9	5.65	6.00	0.35	0.03	0.003	0.003	0.01	0.000	0%
3	6.2	0.65	0.55	0.071			0.9	6.00	6.25	0.25	0.10	0.071	0.064	0.03	0.002	1%
4	6.30	0.65	0.52	0.030			0.9	6.25	6.40	0.15	0.13	0.030	0.027	0.02	0.001	0%
5	6.50	0.65	0.50	0.114			0.9	6.40	6.55	0.15	0.15	0.114	0.103	0.02	0.002	1%
6	6.60	0.65	0.54	0.178			0.9	6.55	6.80	0.25	0.11	0.178	0.160	0.03	0.004	3%
7	7.00	0.65	0.50	0.266			0.9	6.80	7.35	0.55	0.15	0.266	0.239	0.08	0.020	13%
8	7.70	0.65	0.50	0.303			0.9	7.35	7.75	0.40	0.15	0.303	0.273	0.06	0.016	10%
9	7.80	0.65	0.50	0.323			0.9	7.75	7.98	0.23	0.15	0.323	0.291	0.03	0.010	6%
10	8.15	0.67	0.50	0.358			0.9	7.98	8.38	0.40	0.17	0.358	0.322	0.07	0.022	14%
11	8.60	0.65	0.51	0.329			0.9	8.38	8.70	0.32	0.14	0.329	0.296	0.05	0.013	9%
12	8.80	0.70	0.52	0.337			0.9	8.70	9.00	0.30	0.18	0.337	0.303	0.05	0.016	10%
13	9.20	0.70	0.55	0.338			0.9	9.00	9.30	0.30	0.15	0.338	0.304	0.05	0.014	9%
14	9.40	0.65	0.57	-0.001			0.9	9.30	9.68	0.38	0.08	-0.001	-0.001	0.03	0.000	0%
15	9.95	0.65	0.55	0.333			0.9	9.68	10.18	0.50	0.10	0.333	0.300	0.05	0.015	10%
16	10.40	0.63	0.50	0.264			0.9	10.18	10.65	0.48	0.13	0.264	0.238	0.06	0.015	9%
17	10.90	0.63	0.56	0.001			0.9	10.65	11.15	0.50	0.07	0.001	0.001	0.04	0.000	0%
18	11.40	0.65	0.58	0.106			0.9	11.15	11.65	0.50	0.07	0.106	0.095	0.04	0.003	2%
19	11.90	0.64	0.55	0.216			0.9	11.65	12.15	0.50	0.09	0.216	0.194	0.05	0.009	6%
20	12.40	0.58	0.55	-0.068			0.9	12.15	12.85	0.70	0.03	-0.068	-0.061	0.02	-0.001	-1%
21	13.30	0.55	0.48	-0.054			0.9	12.85	13.90	1.05	0.07	-0.054	-0.049	0.07	-0.004	-2%
RB	14.50	0.00	0.00	0.00	0.00	0.00	1.0	13.90	14.50	0.60	0.02	-0.014	-0.014	0.01	0.000	0%
<b>Total Flow</b>														<b>0.157</b>		

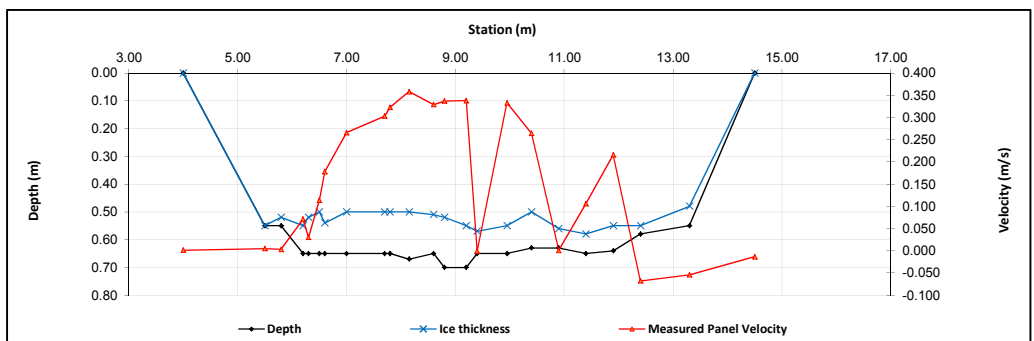
Measurement Details:	
Start Time (MST):	17:30
End Time (MST):	18:05
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Fair
Weather:	Clear, 0°C

Flow characteristics:	
Total Flow:	0.157 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.86 (m <sup>2</sup> )
Wetted Width:	10.50 (m)
Hydraulic Depth:	0.081 (m)
Mean Velocity:	0.184 (m/s)
Froude Number:	0.205

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.388	-
Battery (Main):	13.9	-
Datalogger Clock:	17:00	-
Laptop Clock:	17:01	-
Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S07-03	0.668	276.166		275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04			1.343	274.823	274.826	3/4" Pipe 10 m W of data logger
S07-05			0.958	275.208	275.208	3/4" Pipe 2 m S of data logger
Ice/PT:			4.224	271.942		
Water Level:			4.18	271.986		
Other:					275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
S07-03			0.806	275.498	275.498	3/4" Pipe 8 m W of data logger
S07-04			1.481	274.823	274.826	3/4" Pipe 10 m W of data logger
S07-05	1.096	276.304		275.208	275.208	3/4" Pipe 2 m S of data logger
Ice/PT:			4.362	271.942		
Water Level:			4.322	271.982		
Other:					275.406	

Closing Error	0.000
WL Check	0.004

Average WL	271.984
Transducer Elevation Before	271.596
Transducer Elevation After	-

<b>Field Personnel:</b>	XP, CJ	<b>Trip Date:</b>	26-Mar-13
<b>Data Entry Personnel:</b>	XP	<b>Date:</b>	26-Mar-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: May 7, 2013  
 Site Visit Time (MST): 12:30

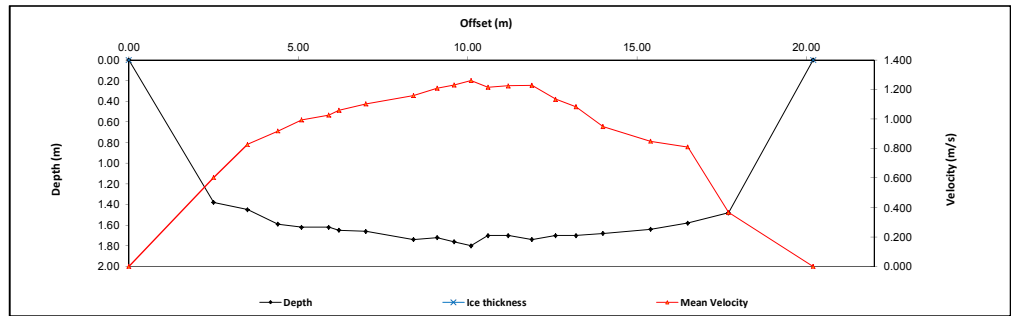


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	1.25	0.00	0.000	0.00	0.000	
1	2.50	1.38				1.10	0.577	0.28	0.631	1.00	1.75	1.38	0.604	2.42	1.459	5%
2	3.50	1.45				1.16	0.791	0.29	0.865	1.00	0.95	1.45	0.828	1.38	1.141	4%
3	4.40	1.59				1.27	0.862	0.32	0.973	1.00	0.80	1.59	0.918	1.27	1.167	4%
4	5.10	1.62				1.30	0.979	0.32	1.010	1.00	0.75	1.62	0.995	1.22	1.208	4%
5	5.90	1.62				1.30	0.947	0.32	1.105	1.00	0.55	1.62	1.026	0.89	0.914	3%
6	6.20	1.65				1.32	1.035	0.33	1.082	1.00	0.55	1.65	1.059	0.91	0.961	4%
7	7.00	1.66				1.33	1.134	0.33	1.070	1.00	1.10	1.66	1.102	1.83	2.012	7%
8	8.40	1.74				1.39	1.236	0.35	1.081	1.00	1.05	1.74	1.159	1.83	2.117	8%
9	9.10	1.72				1.38	1.261	0.34	1.157	1.00	0.60	1.72	1.209	1.03	1.248	5%
10	9.60	1.76				1.41	1.280	0.35	1.180	1.00	0.50	1.76	1.230	0.88	1.082	4%
11	10.10	1.80				1.44	1.306	0.36	1.215	1.00	0.50	1.80	1.261	0.90	1.134	4%
12	10.60	1.70				1.36	1.302	0.34	1.128	1.00	0.55	1.70	1.215	0.93	1.136	4%
13	11.20	1.70				1.36	1.294	0.34	1.156	1.00	0.65	1.70	1.225	1.11	1.354	5%
14	11.90	1.74				1.39	1.302	0.35	1.156	1.00	0.70	1.74	1.229	1.22	1.497	6%
15	12.60	1.70				1.36	1.214	0.34	1.054	1.00	0.65	1.70	1.134	1.11	1.253	5%
16	13.20	1.70				1.36	1.176	0.34	0.990	1.00	0.70	1.70	1.083	1.19	1.289	5%
17	14.00	1.68				1.34	1.047	0.34	0.849	1.00	1.10	1.68	0.848	1.85	1.752	7%
18	15.40	1.64				1.31	0.867	0.33	0.831	1.00	1.25	1.64	0.849	2.05	1.740	6%
19	16.50	1.58				1.26	0.871	0.32	0.749	1.00	1.15	1.58	0.810	1.82	1.472	5%
20	17.70	1.48				1.18	0.292	0.30	0.440	1.00	1.85	1.48	0.366	2.74	1.002	4%
LB	20.20	0.00	0.00		0.00		0.00		0.00	1.00	1.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>26.9</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Adjacent to pressure transducer location.

Meas. Start Time (MST):	12:42
Meas. End Time (MST):	13:35
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 8°C



**Flow characteristics:**

Total Flow:	26.9	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	28.55	(m <sup>2</sup> )
Wetted Width:	20.20	(m)
Hydraulic Depth:	1.41	(m)
Mean Velocity:	0.94	(m/s)
Froude Number:	0.25	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.331	1.345
Water (°C):	5.3	5.7
Datalogger Clock:	12:15	13:53
Laptop Clock:	12:15	13:53
Battery (Main):	14.3	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S07-03			0.613	275.497	275.498	3/4" Pipe 8 m W of data logger	S07-04
S07-04	1.284	276.110		274.826	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05			0.902	275.208	275.208	3/4" Pipe 2 m S of data logger	S07-04
Water Level:			3.183	272.927	Time WL Surveyed: 12:30		S07-05
Other:					275.406	Rebar 2 m SW of data logger	S07-03
Setup #2							S07-04
S07-03			0.598	275.496	275.498	3/4" Pipe 8 m W of data logger	
S07-04			1.269	274.825	274.826	3/4" Pipe 10 m W of data logger	
S07-05	0.886	276.094		275.208	275.208	3/4" Pipe 2 m S of data logger	
Water Level:			3.171	272.923	Time WL Surveyed: 12:32		
Other:					275.406	Rebar 2 m SW of data logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S07-03	0.597	276.094	275.497	Time WL Surveyed: 13:55		
Water Level:			3.158	272.935	Time WL Surveyed: 13:57		
Water Level:			3.148	272.935			
BM:	S07-03	0.586	276.083	275.497			

**WL Survey Summary**

	Before	After
Average WL:	272.925	272.936
Transducer Elevation:	271.594	271.591
Closing Error:	0.001	-
WL Check:	0.004	0.001

**Site Rating Information**

Measured Discharge:	26.9
Expected Discharge:	26.98
Shift from Existing Rating (m <sup>3</sup> /s):	0.08
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, DW	Trip Date:	7-May-13
SM	Date:	7-May-13
CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: June 5, 2013  
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
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22																	
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24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High flow
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Sunny, calm, 20°C

**Flow characteristics:**

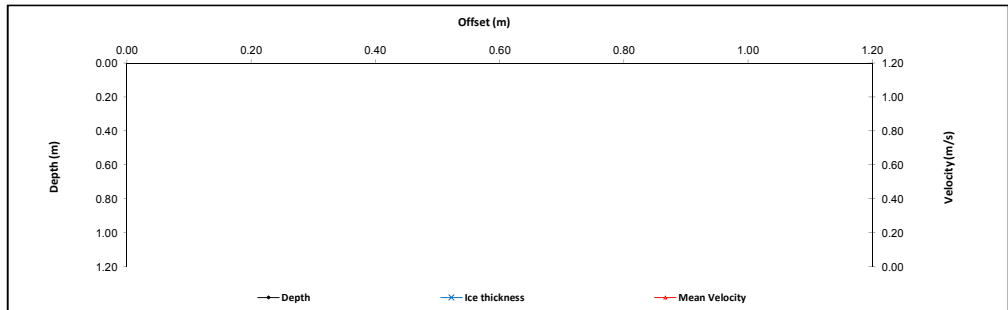
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.797	-
Water (°C):	19.1	-
Datalogger Clock:	09:57	-
Laptop Clock:	09:58	-
Battery (Main):	14.0	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S07-04
S07-03	0.595	276.093		275.498	275.498	3/4" Pipe 8 m W of data logger	S07-03
S07-04			1.266	274.827	274.826	3/4" Pipe 10 m W of data logger	S07-05
S07-05			0.884	275.209	275.208	3/4" Pipe 2 m S of data logger	WL
Ice/PT:							WL
Water Level:		3.780		272.313			S07-05
Other:					Time WL Surveyed: 10:36		S07-03
					275.406	Rebar 2 m SW of data logger	S07-04
<b>Setup #2</b>							
S07-03			0.578	275.498	275.498	3/4" Pipe 8 m W of data logger	
S07-04			1.250	274.826	274.826	3/4" Pipe 10 m W of data logger	
S07-05	0.867	276.076		275.209	275.208	3/4" Pipe 2 m S of data logger	
Ice/PT:							
Water Level:			3.765	272.311			
Other:					Time WL Surveyed: 10:37		
					275.406	Rebar 2 m SW of data logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				275.209			
Water Level:					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
BM:				275.209			

**WL Survey Summary**

	Before	After
Average WL:	272.312	-
Transducer Elevation:	271.515	-
Closing Error:	0.000	-
WL Check:	0.002	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	8.36
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, CJ	Trip Date:	5-Jun-13
<b>Data Entry Personnel:</b>	SM	Date:	5-Jun-13
<b>Data Check Personnel:</b>	CJ	Date:	17-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S7 Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: August 6, 2013  
 Site Visit Time (MST): 09:20

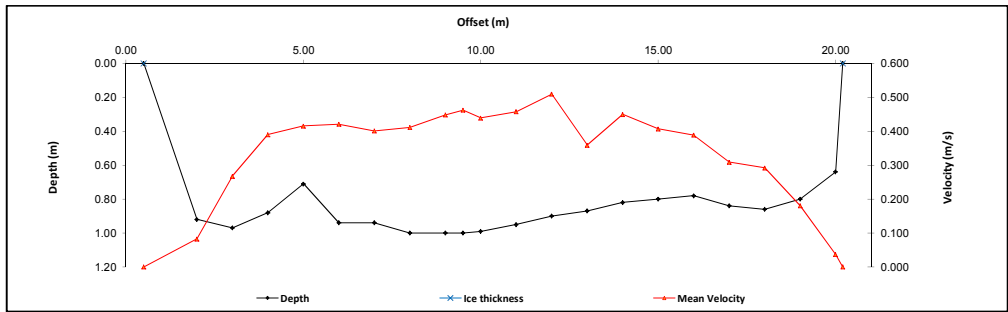


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	2.00	0.92			0.74	0.133	0.18	0.032	1.00	1.25	0.92	0.083	1.15	0.095	2%	
2	3.00	0.97			0.78	0.284	0.19	0.251	1.00	1.00	0.97	0.268	0.97	0.259	4%	
3	4.00	0.88			0.70	0.383	0.18	0.397	1.00	1.00	0.88	0.390	0.88	0.343	6%	
4	5.00	0.71			0.57	0.379	0.14	0.452	1.00	1.00	0.71	0.416	0.71	0.295	5%	
5	6.00	0.94			0.75	0.392	0.19	0.450	1.00	1.00	0.94	0.421	0.94	0.396	7%	
6	7.00	0.94			0.75	0.348	0.19	0.454	1.00	1.00	0.94	0.401	0.94	0.377	6%	
7	8.00	1.00			0.80	0.384	0.20	0.439	1.00	1.00	1.00	0.412	1.00	0.412	7%	
8	9.00	1.00			0.80	0.399	0.20	0.497	1.00	0.75	1.00	0.448	0.75	0.336	6%	
9	9.50	1.00			0.80	0.406	0.20	0.518	1.00	0.50	1.00	0.462	0.50	0.231	4%	
10	10.00	0.99			0.79	0.383	0.20	0.495	1.00	0.75	0.99	0.439	0.74	0.326	5%	
11	11.00	0.95			0.76	0.424	0.19	0.491	1.00	1.00	0.95	0.458	0.95	0.435	7%	
12	12.00	0.90			0.72	0.478	0.18	0.541	1.00	1.00	0.90	0.510	0.90	0.459	8%	
13	13.00	0.87			0.70	0.440	0.17	0.278	1.00	1.00	0.87	0.359	0.87	0.312	5%	
14	14.00	0.82			0.66	0.409	0.16	0.490	1.00	1.00	0.82	0.450	0.82	0.369	6%	
15	15.00	0.80			0.64	0.414	0.16	0.400	1.00	1.00	0.80	0.407	0.80	0.326	5%	
16	16.00	0.78			0.62	0.388	0.16	0.399	1.00	1.00	0.78	0.389	0.78	0.303	5%	
17	17.00	0.84			0.67	0.333	0.17	0.285	1.00	1.00	0.84	0.309	0.84	0.260	4%	
18	18.00	0.86			0.69	0.260	0.17	0.324	1.00	1.00	0.86	0.292	0.86	0.251	4%	
19	19.00	0.80			0.64	0.160	0.16	0.200	1.00	1.00	0.80	0.180	0.80	0.144	2%	
20	20.00	0.64	0.38	0.037	0.00	0.00	0.00	0.00	1.00	0.60	0.64	0.037	0.38	0.014	0%	
RB	20.20	0.00	0.00		0.00	0.00	0.00	0.00	1.00	0.10	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>5.94</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): At PLS

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	11:10
Equipment:	ADV
Method:	Fishcat
River Condition:	Good flow, WL dropping
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 20°C



**Flow characteristics:**

Total Flow:	5.94	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	16.59	(m <sup>2</sup> )
Wetted Width:	19.70	(m)
Hydraulic Depth:	0.84	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.749	0.749
Water (°C):	17.3	17.5
Datalogger Clock:	09:41	-
Laptop Clock:	09:41	-
Battery (Main):	14.1	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ran ADV test, results good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S07-03			0.464	275.499	275.498	3/4" Pipe 8 m W of data logger	S07-04
S07-04	1.137	275.963		274.826	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05			0.752	275.211	275.208	3/4" Pipe 2 m S of data logger	S07-05
Ice/PT:							WL
Water Level:			3.696	272.267	Time WL Surveyed: 10:09		S07-05
Other:					275.406	Rebar 2 m SW of data logger	S07-03
<b>Setup #2</b>							S07-04
S07-03			0.492	275.500	275.498	3/4" Pipe 8 m W of data logger	
S07-04			1.164	274.828	274.826	3/4" Pipe 10 m W of data logger	
S07-05	0.781	275.992		275.211	275.208	3/4" Pipe 2 m S of data logger	
Ice/PT:							
Water Level:			3.721	272.271	Time WL Surveyed: 10:04		
Other:					275.406	Rebar 2 m SW of data logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S07-04	1.138	275.964		274.826			
Water Level:			3.698	272.268	Time WL Surveyed: 11:18		
Water Level:			3.672	272.268	Time WL Surveyed: 11:19		
BM: S07-04	1.114	275.940		274.826			

**WL Survey Summary**

	Before	After
Average WL:	272.269	272.267
Transducer Elevation:	271.520	271.518
Closing Error:	-0.002	-
WL Check:	0.004	-0.002

**Site Rating Information**

Measured Discharge:	5.94
Expected Discharge:	7.41
Shift from Existing Rating (m <sup>3</sup> /s):	1.47
Shift from Existing Rating (%):	25%

**Field Personnel:**

Field Personnel:	TR, JVR	Trip Date:	6-Aug-13
Data Entry Personnel:	JVR	Date:	6-Aug-13
Data Check Personnel:	CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: September 10, 2013  
 Site Visit Time (MST): 15:30



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
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22																	
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24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

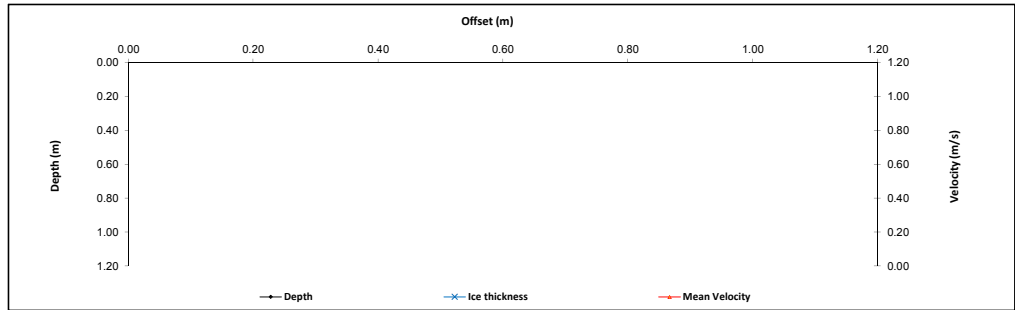
**Logger Details:**

	Before	After
Transducer Reading (m):	0.503	0.662
Water (°C):	16.6	-
Datalogger Clock:	15:37	-
Laptop Clock:	15:37	-
Battery (Main):	14.0	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS has been moved downstream about 2 m during high flows
- Repositioned PLS
- No flow meas. conducted

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S07-04
S07-03			0.479	275.496	275.498	3/4" Pipe 8 m W of data logger	S07-03
S07-04			1.151	274.824	274.826	3/4" Pipe 10 m W of data logger	S07-05
S07-05	0.767	275.975		275.208	275.208	3/4" Pipe 2 m S of data logger	WL
Ice/PT:							WL
Water Level:			3.957	272.018		Time WL Surveyed: 15:55	S07-05
Other:					275.406	Rebar 2 m SW of data logger	S07-03
<b>Setup #2</b>							S07-04
S07-03	0.462	275.958		275.496	275.498	3/4" Pipe 8 m W of data logger	
S07-04			1.134	274.824	274.826	3/4" Pipe 10 m W of data logger	
S07-05			0.752	275.206	275.208	3/4" Pipe 2 m S of data logger	
Ice/PT:							
Water Level:			3.943	272.015		Time WL Surveyed: 15:57	
Other:					275.406	Rebar 2 m SW of data logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				275.208			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				275.208			

**WL Survey Summary**

	Before	After
Average WL:	272.017	-
Transducer Elevation:	271.514	-
Closing Error:	0.002	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	2.91
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	10-Sep-13
<b>Data Entry Personnel:</b>	SM	Date:	10-Sep-13
<b>Data Check Personnel:</b>	XP	Date:	17-Sep-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: October 23, 2013  
 Site Visit Time (MST): 07:30



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

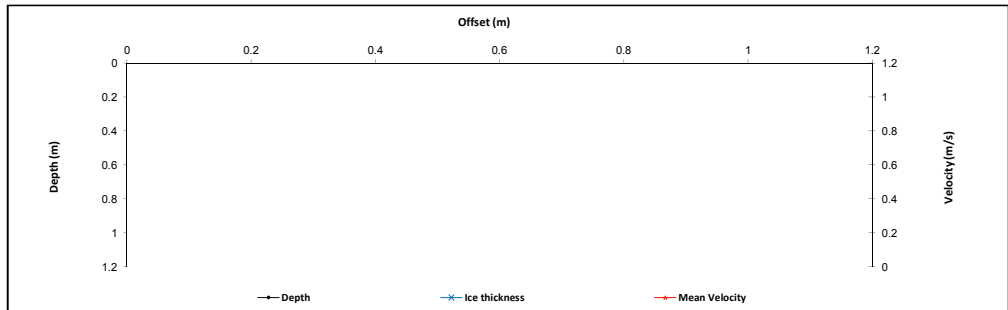
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.912	-
Water (°C):	3.9	-
Datalogger Clock:	07:36	-
Laptop Clock:	07:37	-
Battery (Main):	12.5	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S07-03			0.767	275.496	275.498	3/4" Pipe 8 m W of data logger	S07-04
S07-04	1.437	276.263		274.826	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05			1.053	275.210	275.208	3/4" Pipe 2 m S of data logger	S07-05
Ice/PT:							WL
Water Level:		3.990		272.273		Time WL Surveyed: 7:43	S07-05
Other:					275.406	Rebar 2 m SW of data logger	S07-03
<b>Setup #2</b>							
S07-03			0.724	275.498	275.498	3/4" Pipe 8 m W of data logger	S07-04
S07-04			1.400	274.822	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05	1.012	276.222		275.210	275.208	3/4" Pipe 2 m S of data logger	S07-05
Ice/PT:							WL
Water Level:		3.952		272.270		Time WL Surveyed: 7:47	(must close survey loop on survey starting point)
Other:					275.406	Rebar 2 m SW of data logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				275.210		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				275.210		Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	272.272	-
Transducer Elevation:	271.360	-
Closing Error:	0.004	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	7.47
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, DW	Trip Date:	23-Oct-13
<b>Data Entry Personnel:</b>	TR	Date:	23-Oct-13
<b>Data Check Personnel:</b>	CJ	Date:	24-Oct-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: December 1, 2013  
 Site Visit Time (MST): 13:35



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Flow Measurement Conducted																
															<b>Total Flow</b>	<b>0%</b>

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

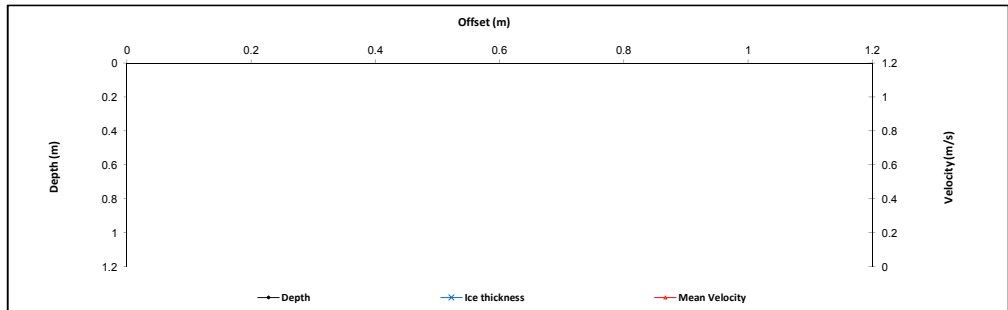
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.653	-
Water (°C):	0.2	-
Datalogger Clock:	13:44	-
Laptop Clock:	13:44	-
Battery (Main):	12.4	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S07-03			0.329	275.499	275.498	3/4" Pipe 8 m W of data logger	S07-04
S07-04	1.002	275.828		274.826	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05			0.617	275.211	275.208	3/4" Pipe 2 m S of data logger	S07-05
Ice/PT:			3.788	272.040			Ice
Water Level:			3.811	272.017			WL
Other:					Time WL Surveyed: 13:50		WL
					275.406	Rebar 2 m SW of data logger	Ice
<b>Setup #2</b>							
S07-03			0.311	275.499	275.498	3/4" Pipe 8 m W of data logger	S07-05
S07-04			0.984	274.826	274.826	3/4" Pipe 10 m W of data logger	S07-03
S07-05	0.599	275.810		275.211	275.208	3/4" Pipe 2 m S of data logger	S07-04
Ice/PT:			3.769	272.041			Ice
Water Level:			3.795	272.015			WL
Other:					Time WL Surveyed: 13:53		WL
					275.406	Rebar 2 m SW of data logger	Ice
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				275.211			
Water Level:					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
BM:				275.211			

**WL Survey Summary**

	Before	After
Average WL:	272.015	-
Transducer Elevation:	271.363	-
Closing Error:	0.000	-
WL Check:	0.002	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	1-Dec-13
<b>Data Entry Personnel:</b>	SM	Date:	1-Dec-13
<b>Data Check Personnel:</b>	DW	Date:	28-Mar-14
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

February 6, 2013



Measured Data						Calculated Data										
Bank/ Mnt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	3.60	0.00	0.00	0.000	0.000	0.000	1.0	3.60	4.00	0.40	0.10	0.000	0.000	0.04	0.000	0%
1	4.40	0.69	0.31	0.000			1.0	4.00	4.65	0.65	0.38	0.000	0.000	0.25	0.000	0%
2	4.90	0.61	0.34	0.000			1.0	4.65	5.08	0.43	0.27	0.000	0.000	0.11	0.000	0%
3	5.25	0.60	0.29	0.002			0.9	5.08	5.33	0.25	0.31	0.002	0.002	0.08	0.000	0%
4	5.40	0.59	0.27	0.043			0.9	5.33	5.55	0.23	0.32	0.043	0.039	0.07	0.003	2%
5	5.70	0.68	0.27	0.007			0.9	5.55	5.90	0.35	0.41	0.007	0.006	0.14	0.001	1%
6	6.10	0.67	0.29	0.121			0.9	5.90	6.15	0.25	0.38	0.121	0.109	0.10	0.010	9%
7	6.20	0.62	0.32	0.090			0.9	6.15	6.35	0.20	0.30	0.090	0.081	0.06	0.005	4%
8	6.50	0.68	0.24	0.037			0.9	6.35	6.68	0.33	0.44	0.037	0.033	0.14	0.005	4%
9	6.85	0.61	0.34	0.001			0.9	6.68	7.08	0.40	0.27	0.001	0.001	0.11	0.000	0%
10	7.30	0.69	0.32	0.001			0.9	7.08	7.60	0.53	0.37	0.001	0.001	0.19	0.000	0%
11	7.90	0.75	0.54	0.078			0.9	7.60	8.10	0.50	0.21	0.078	0.070	0.11	0.007	6%
12	8.30	0.79	0.58	0.102			0.9	8.10	8.40	0.30	0.21	0.102	0.092	0.06	0.006	5%
13	8.50	0.83	0.23	0.144			0.9	8.40	8.55	0.15	0.60	0.144	0.130	0.09	0.012	10%
14	8.60	0.90	0.60	0.078			0.9	8.55	8.70	0.15	0.30	0.078	0.070	0.04	0.003	3%
15	8.80	0.90	0.55	0.106			0.9	8.70	8.90	0.20	0.35	0.106	0.095	0.07	0.007	6%
16	9.00	0.92	0.51	0.134			0.9	8.90	9.03	0.13	0.41	0.134	0.121	0.05	0.006	5%
17	9.05	0.94	0.53	0.153			0.9	9.03	9.13	0.10	0.41	0.153	0.138	0.04	0.006	5%
18	9.20	1.07	0.45	0.075			0.9	9.13	9.35	0.23	0.62	0.075	0.068	0.14	0.009	8%
19	9.50	1.00	0.43	0.100			0.9	9.35	9.55	0.20	0.57	0.100	0.090	0.11	0.010	9%
20	9.60	1.02	0.42	0.091			0.9	9.55	10.05	0.50	0.60	0.091	0.082	0.30	0.025	21%
LB	10.50	0.00	0.00	0.00	0.00	0.00	1.0	10.05	10.50	0.45	0.15	0.023	0.023	0.07	0.002	1%
<b>Total Flow</b>															<b>0.116</b>	

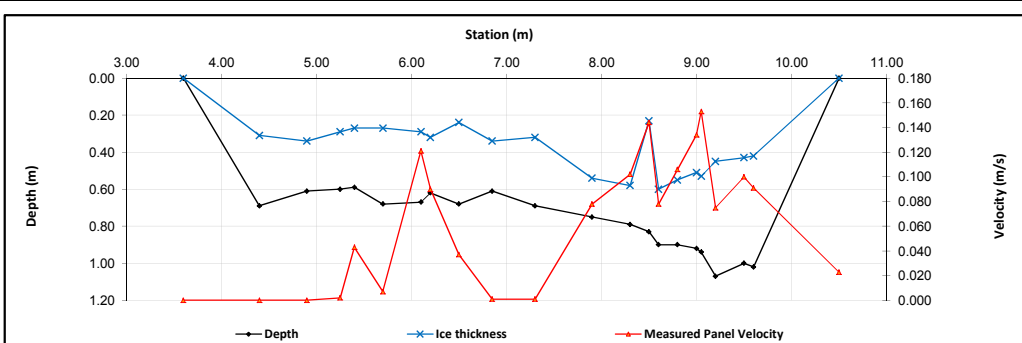
Measurement Details:	
Start Time (MST):	14:20
End Time (MST):	15:25
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, open leads
Quality/Error (see reverse):	Poor
Weather:	Partial cloud, -15°C

Flow characteristics:		
Total Flow:	0.116	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.38	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.345	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
	0.915	-
Water (°C):	0.4	-
Battery (Main):	14.6	-
Datalogger Clock:	14:24	-
Laptop Clock:	14:23	-
Enclosure Dessiccant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessiccant:	Good	

Datalogger / Station Notes:	

General Notes:	
- Open leads US and DS, ice conditions poor	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S09-03			0.9	330.229	330.231	3/4" Pipe 15 m E of logger
S09-04			0.838	330.291	330.293	3/4" Pipe 6 m E of logger
S09-05	0.494	331.129		330.635	330.635	3/4" Pipe 10 m E of logger
Ice/PT:			1.612	329.517		
Water Level:			1.589	329.540		
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
S09-03			0.79	330.231	330.231	3/4" Pipe 15 m E of logger
S09-04	0.73	331.021		330.291	330.293	3/4" Pipe 6 m E of logger
S09-05			0.386	330.635	330.635	3/4" Pipe 10 m E of logger
Ice/PT:			1.502	329.519		
Water Level:			1.478	329.543		
Other:					329.796	

Closing Error	0.000
WL Check	0.003

Average WL	329.542
Transducer Elevation Before	328.6265
Transducer Elevation After	-

Field Personnel:	TR, CJ	Trip Date:	6-Feb-13
Data Entry Personnel:	TR	Date:	6-Feb-13
Data Check Personnel:	CJ	Date:	12-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

February 25, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
No Flow Measurement Conducted																
<b>Total Flow</b>																

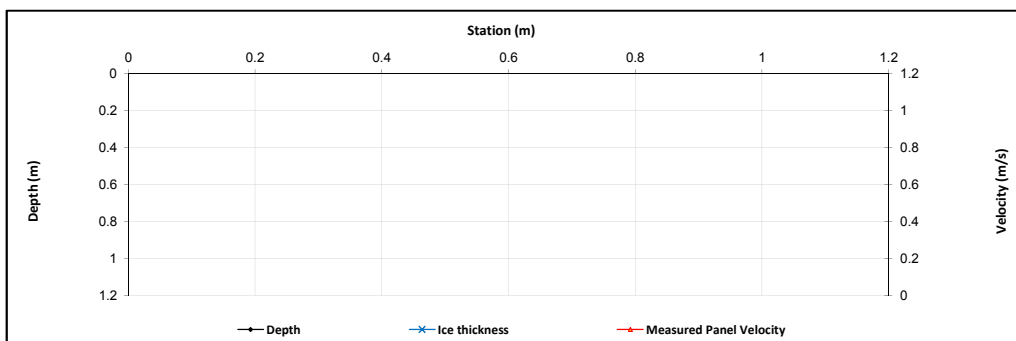
Measurement Details:	
Start Time (MST):	16:35
End Time (MST):	16:50
Equipment:	-
Method:	-
River Condition:	Open patches
Quality/Error (see reverse):	-
Weather:	Clear, -2°C, calm

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measuremt Quality:	-
Cross Section Area:	- (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
	Before	After
Transducer Reading (m):	0.892	-
Water (°C):	0.8	-
Battery (Main):	14.4	-
Datalogger Clock:	16:43	-
Laptop Clock:	16:42	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- No flow measurement, due to open water and degraded ice conditions.	
- Flowing water observed US of road and out of culvert	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S09-03					330.231	3/4" Pipe 15 m E of logger
S09-04					330.293	3/4" Pipe 6 m E of logger
S09-05					330.635	3/4" Pipe 10 m E of logger
Ice/PT:						
Water Level:						
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
S09-03					330.231	3/4" Pipe 15 m E of logger
S09-04					330.293	3/4" Pipe 6 m E of logger
S09-05					330.635	3/4" Pipe 10 m E of logger
Ice/PT:						
Water Level:						
Other:					329.796	

Closing Error	-	Average WL	-
WL Check	-	Transducer Elevation Before	-
		Transducer Elevation After	-

Field Personnel:		TR, SM	Trip Date:	25-Feb-13
Data Entry Personnel:	TR		Date:	25-Feb-13
Data Check Personnel:	CJ		Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

March 29, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
No Flow Measurement Conducted																
<b>Total Flow</b>																

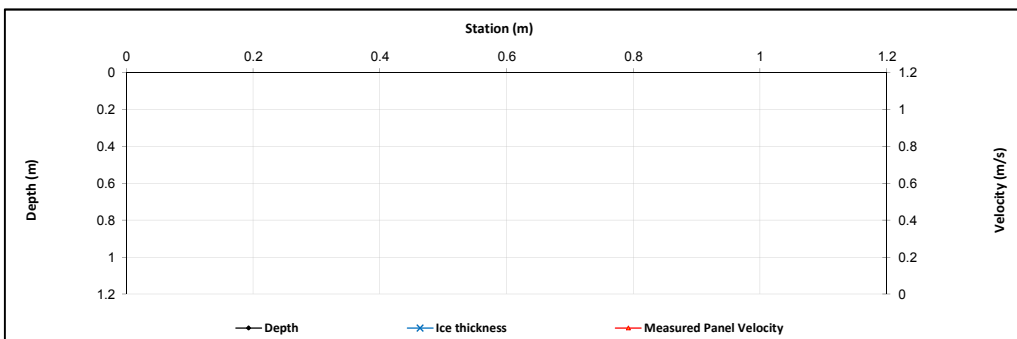
Measurement Details:	
Start Time (MST):	17:10
End Time (MST):	17:38
Equipment:	-
Method:	-
River Condition:	Half open
Quality/Error (see reverse):	-
Weather:	Clear, calm, 5°C

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measuremt Quality:	-
Cross Section Area:	- (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
	Before	After
Transducer Reading (m):	0.008	-
Water (°C):	1.3	-
Battery (Main):	14.2	-
Datalogger Clock:	4:22	-
Laptop Clock:	4:22	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- BM descriptions have been updated	
- S09-03 is only 10 m E. of logger	
- S09-04 and S09-05 are NE of logger	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S09-03	1.064	331.295		330.231	330.231	3/4" Pipe 10 m E of logger
S09-04			1.004	330.291	330.293	3/4" Pipe 6 m NE of logger
S09-05			0.659	330.636	330.635	3/4" Pipe 10 m NE of logger
Ice/PT:						
Water Level:						
			1.78	329.515		
Other:						
					329.796	Nail in birch tree
<b>Setup #2</b>						
S09-03			1.051	330.232	330.231	3/4" Pipe 10 m E of logger
S09-04	0.992	331.283		330.291	330.293	3/4" Pipe 6 m NE of logger
S09-05			0.647	330.636	330.635	3/4" Pipe 10 m NE of logger
Ice/PT:						
Water Level:						
			1.772	329.511		
Other:						
					329.796	

Closing Error	-0.001
WL Check	0.004

Average WL	329.513
Transducer Elevation Before	329.5046
Transducer Elevation After	-

Field Personnel:		Trip Date:	29-Mar-13
Data Entry Personnel:	CJ, XP	Date:	29-Mar-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S9 Kearl Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: May 2, 2013  
 Site Visit Time (MST): 13:38

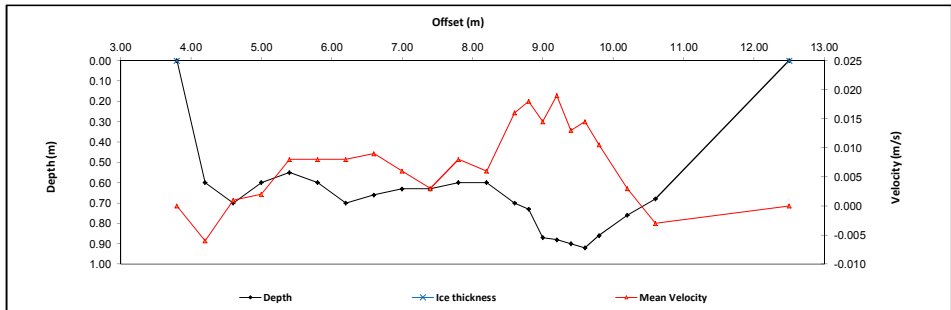


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	4.20	0.60		0.36	-0.006					1.00	0.40	0.60	-0.006	0.24	-0.01	-5%
2	4.60	0.70		0.42	0.001					1.00	0.40	0.70	0.001	0.28	0.000	1%
3	5.00	0.60		0.36	0.002					1.00	0.40	0.60	0.002	0.24	0.000	2%
4	5.40	0.55		0.33	0.008					1.00	0.40	0.55	0.008	0.22	0.002	6%
5	5.80	0.60		0.36	0.008					1.00	0.40	0.60	0.008	0.24	0.002	6%
6	6.20	0.70		0.42	0.008					1.00	0.40	0.70	0.008	0.28	0.002	7%
7	6.60	0.66		0.40	0.009					1.00	0.40	0.66	0.009	0.26	0.002	8%
8	7.00	0.63		0.38	0.006					1.00	0.40	0.63	0.006	0.25	0.002	5%
9	7.40	0.63		0.38	0.003					1.00	0.40	0.63	0.003	0.25	0.001	2%
10	7.80	0.60		0.36	0.008					1.00	0.40	0.60	0.008	0.24	0.002	6%
11	8.20	0.60		0.36	0.006					1.00	0.40	0.60	0.006	0.24	0.001	5%
12	8.60	0.70		0.42	0.016					1.00	0.30	0.70	0.016	0.21	0.003	11%
13	8.80	0.73		0.44	0.018					1.00	0.20	0.73	0.018	0.15	0.003	8%
14	9.00	0.87				0.70	0.008	0.17	0.021	1.00	0.20	0.87	0.015	0.17	0.003	8%
15	9.20	0.88				0.70	0.013	0.18	0.025	1.00	0.20	0.88	0.019	0.18	0.003	11%
16	9.40	0.90				0.72	0.008	0.18	0.018	1.00	0.20	0.90	0.013	0.18	0.002	7%
17	9.60	0.92				0.74	0.007	0.18	0.022	1.00	0.20	0.92	0.015	0.18	0.003	8%
18	9.80	0.86				0.69	0.004	0.17	0.017	1.00	0.30	0.86	0.011	0.26	0.003	9%
19	10.20	0.76				0.61	-0.001	0.15	0.007	1.00	0.40	0.76	0.003	0.30	0.001	3%
20	10.60	0.68		0.41	-0.003					1.00	1.15	0.68	-0.003	0.78	-0.002	-7%
LB	12.50	0.00	0.00		0.00		0.00		0.00	1.00	0.95	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.031</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Right at station

Meas. Start Time (MST):	13:58
Meas. End Time (MST):	14:30
Equipment:	ADC
Method:	Wading
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Cloudy, breezy, 9°C



**Flow characteristics:**

Total Flow:	0.031	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	5.16	(m <sup>2</sup> )
Wetted Width:	8.70	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.50	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.877	0.880
Water (°C):	3.3	3.5
Datalogger Clock:	13:38	14:40
Laptop Clock:	13:37	14:39
Battery (Main):	13.9	13.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- River flooded, vegetation along banks
- Beavers are starting a dam 20 m DS of station
- Culverts filled w/ beaver debris, removed after visit

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM5
S09-03			0.923	330.232	330.231	3/4" Pipe 10 m E of logger	BM4
S09-04	0.862	331.155		330.293	330.293	3/4" Pipe 6 m NE of logger	BM3
S09-05			0.517	330.638	330.635	3/4" Pipe 10 m NE of logger	WL
Ice/PT:							WL
Water Level:			1.648	329.507		Time WL Surveyed: 13:50	BM3
Other:					329.796	Nail in birch tree	BM4
<b>Setup #2</b>							BM5
S09-03	0.912	331.144		330.232	330.231	3/4" Pipe 10 m E of logger	
S09-04			0.852	330.292	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.507	330.637	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:							
Water Level:			1.638	329.506		Time WL Surveyed: 13:51	
Other:					329.796	Nail in birch tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S09-04	0.852	331.145	330.293		Time WL Surveyed: 14:37	
Water Level:			1.635	329.510		Time WL Surveyed: 14:38	
Water Level:			1.622	329.508			
BM	S09-04	0.837	331.130	330.293			

**WL Survey Summary**

	Before	After
Average WL:	329.507	329.509
Transducer Elevation:	328.630	328.629
Closing Error:	0.001	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	0.0314
Expected Discharge:	0.21
Shift from Existing Rating (m <sup>3</sup> /s):	0.18
Shift from Existing Rating (%):	573%

**Field Personnel:**

SM, TR	Trip Date:	2-May-13
TR	Date:	2-May-13
CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: June 11, 2013  
 Site Visit Time (MST): 10:00

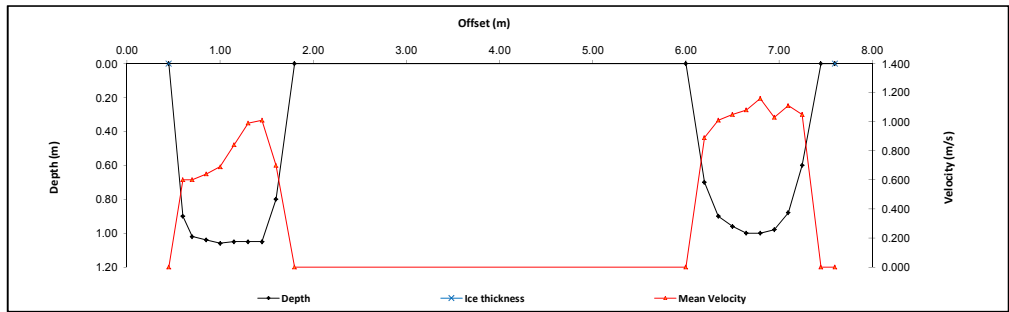


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.45	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.60	0.90			0.600	0.72		0.18		1.00	0.13	0.90	0.600	0.11	0.067	3%
2	0.70	1.02			0.600	0.82		0.20		1.00	0.13	1.02	0.600	0.13	0.077	4%
3	0.85	1.04			0.640	0.83		0.21		1.00	0.15	1.04	0.640	0.16	0.100	5%
4	1.00	1.06			0.690	0.85		0.21		1.00	0.15	1.06	0.690	0.16	0.110	5%
5	1.15	1.05			0.840	0.84		0.21		1.00	0.15	1.05	0.840	0.16	0.132	6%
6	1.30	1.05			0.990	0.84		0.21		1.00	0.15	1.05	0.990	0.16	0.156	8%
7	1.45	1.05			1.010	0.84		0.21		1.00	0.15	1.05	1.010	0.16	0.159	8%
8	1.60	0.80			0.700	0.64		0.16		1.00	0.18	0.80	0.700	0.14	0.098	5%
9	1.80	0.00		0.00	0.000					1.00	2.20	0.00	0.000	0.00	0.000	0%
10	6.00	0.00		0.00	0.000					1.00	2.20	0.00	0.000	0.00	0.000	0%
11	6.20	0.70		0.42	0.890					1.00	0.18	0.70	0.890	0.12	0.109	5%
12	6.35	0.90			1.010	0.72		0.18		1.00	0.15	0.90	1.010	0.14	0.136	7%
13	6.50	0.96			1.050	0.77		0.19		1.00	0.15	0.96	1.050	0.14	0.151	7%
14	6.65	1.00			1.080	0.80		0.20		1.00	0.15	1.00	1.080	0.15	0.162	8%
15	6.80	1.00			1.160	0.80		0.20		1.00	0.15	1.00	1.160	0.15	0.174	9%
16	6.95	0.98			1.030	0.78		0.20		1.00	0.15	0.98	1.030	0.15	0.151	7%
17	7.10	0.88			1.110	0.70		0.18		1.00	0.18	0.88	1.110	0.13	0.147	7%
18	7.25	0.60		0.36	1.050					1.00	0.18	0.60	1.050	0.11	0.110	5%
19	7.45	0.00		0.00	0.000					1.00	0.18	0.00	0.000	0.00	0.000	0%
LB	7.60	0.00	0.00		0.00		0.00			1.00	0.07	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.04</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	10:35
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High level
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 10°C



**Flow characteristics:**

Total Flow:	2.04	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.25	(m <sup>2</sup> )
Wetted Width:	7.15	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.91	(m/s)
Froude Number:	0.52	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.120	-
Water (°C):	11.5	-
Datalogger Clock:	10:04	-
Laptop Clock:	10:04	-
Battery (Main):	14.0	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Banks are very flooded
- Flow measurement conducted on flow coming out of culverts, - The flow is confined at this location.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S09-03			1.028	330.230	330.231	3/4" Pipe 10 m E of logger	BM5
S09-04			0.967	330.291	330.293	3/4" Pipe 6 m NE of logger	BM3
S09-05	0.623	331.258		330.635	330.635	3/4" Pipe 10 m NE of logger	WL
Ice/PT:							WL
Water Level:			1.512	329.746	Time WL Surveyed:	10:10	BM3
Other:						Nail in birch tree	BM4
<b>Setup #2</b>							
S09-03	1.014	331.244		330.230	330.231	3/4" Pipe 10 m E of logger	BM5
S09-04			0.955	330.289	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.612	330.632	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:							
Water Level:			1.500	329.744	Time WL Surveyed:	10:12	
Other:						Nail in birch tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				330.635			
Water Level:					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
BM:				330.635			

**WL Survey Summary**

	Before	After
Average WL:	329.745	-
Transducer Elevation:	328.625	-
Closing Error:	0.003	-
WL Check:	0.002	-

**Site Rating Information**

Measured Discharge:	2.04
Expected Discharge:	0.71
Shift from Existing Rating (m <sup>3</sup> /s):	-1.33
Shift from Existing Rating (%):	-65%

**Field Personnel:**

SG, CJ	Trip Date:	11-Jun-13
CJ	Date:	11-Jun-13
CJ	Date:	18-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S9 Kearl Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: August 18, 2013  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	1.80	0.36		0.22	0.001					1.00	1.05	0.36	0.001	0.38	0.000	0%
2	2.30	0.66		0.40	0.008					1.00	0.50	0.66	0.008	0.33	0.003	1%
3	2.80	0.68		0.41	0.087					1.00	0.40	0.68	0.087	0.27	0.024	8%
4	3.10	1.16				0.93	0.000	0.23	0.109	1.00	0.20	1.16	0.055	0.23	0.013	4%
5	3.20	1.19				0.95	0.081	0.24	0.128	1.00	0.10	1.19	0.105	0.12	0.012	4%
6	3.30	1.20				0.96	0.085	0.24	0.124	1.00	0.10	1.20	0.105	0.12	0.013	4%
7	3.40	1.21				0.97	0.089	0.24	0.112	1.00	0.10	1.21	0.101	0.12	0.012	4%
8	3.50	1.21				0.97	0.095	0.24	0.109	1.00	0.10	1.21	0.102	0.12	0.012	4%
9	3.60	1.21				0.97	0.079	0.24	0.116	1.00	0.10	1.21	0.098	0.12	0.012	4%
10	3.70	1.24				0.99	0.094	0.25	0.108	1.00	0.10	1.24	0.101	0.12	0.013	4%
11	3.80	1.24				0.99	0.096	0.25	0.142	1.00	0.10	1.24	0.119	0.12	0.015	5%
12	3.90	1.25				1.00	0.091	0.25	0.127	1.00	0.10	1.25	0.109	0.13	0.014	5%
13	4.00	1.25				1.00	0.095	0.25	0.144	1.00	0.10	1.25	0.120	0.13	0.015	5%
14	4.10	1.24				0.99	0.111	0.25	0.125	1.00	0.10	1.24	0.118	0.12	0.015	5%
15	4.20	1.22				0.98	0.117	0.24	0.126	1.00	0.10	1.22	0.122	0.12	0.015	5%
16	4.30	1.22				0.98	0.102	0.24	0.132	1.00	0.10	1.22	0.117	0.12	0.014	5%
17	4.40	1.20				0.96	0.091	0.24	0.121	1.00	0.10	1.20	0.106	0.12	0.013	4%
18	4.50	1.18				0.94	0.098	0.24	0.114	1.00	0.20	1.18	0.106	0.24	0.025	8%
19	4.80	1.14				0.91	0.089	0.23	0.097	1.00	0.30	1.14	0.093	0.34	0.032	11%
20	5.10	0.99				0.79	0.052	0.20	0.075	1.00	0.48	0.99	0.064	0.47	0.030	10%
21	5.75	0.75	0.45	0.001						1.00	2.05	0.75	0.001	1.54	0.002	1%
LB	9.20	0.00	0.00		0.00		0.00		0.00	1.00	1.73	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.301</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:38
Equipment:	ADV
Method:	Wading
River Condition:	flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 20°C

**Flow characteristics:**

Total Flow:	0.301	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.39	(m <sup>2</sup> )
Wetted Width:	9.00	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.02	

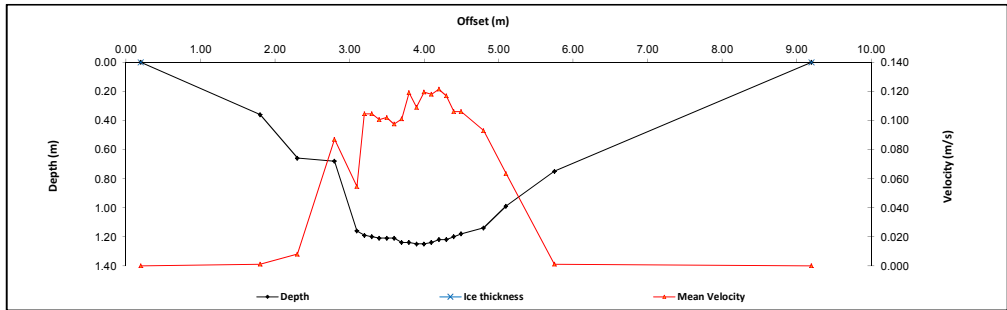
**Logger Details:**

	Before	After
Transducer Reading (m):	1.362	1.361
Water (°C):	18.4	18.8
Datalogger Clock:	09:36	10:47
Laptop Clock:	09:35	10:47
Battery (Main):	13.5	13.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Floating vegetation along banks, except from 2.8 m to 5.4 m
- Banks flooded, no flow
- Culverts clear, small beaver dam 10 m DS



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S09-03			1.335	330.232	330.231	3/4" Pipe 10 m E of logger	S09-03
S09-04			1.274	330.293	330.293	3/4" Pipe 6 m NE of logger	S09-05
S09-05	0.932	331.567		330.635	330.635	3/4" Pipe 10 m NE of logger	WL
Ice/PT:							WL
Water Level:			1.966	329.601	Time WL Surveyed:	9:44	S09-05
Other:						Nail in birch tree	S09-04
<b>Setup #2</b>							S09-03
S09-03			1.248	330.231	330.231	3/4" Pipe 10 m E of logger	
S09-04	1.186	331.479		330.293	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.845	330.634	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:							
Water Level:			1.875	329.604	Time WL Surveyed:	9:46	
Other:						Nail in birch tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S09-04	1.187	331.480		330.293		
Water Level:			1.882	329.598	Time WL Surveyed:	10:43	
Water Level:			1.813	329.601	Time WL Surveyed:	10:44	
BM:	S09-04	1.121	331.414		330.293		

**WL Survey Summary**

	Before	After
Average WL:	329.603	329.600
Transducer Elevation:	328.241	328.239
Closing Error:	0.001	-
WL Check:	0.003	-0.003

**Site Rating Information**

Measured Discharge:	0.301
Expected Discharge:	0.35
Shift from Existing Rating (m <sup>3</sup> /s):	0.05
Shift from Existing Rating (%):	17%

**Field Personnel:**

TR, DW	Trip Date:	18-Aug-13
TR	Date:	18-Aug-13
CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: September 19, 2013  
 Site Visit Time (MST): 10:30

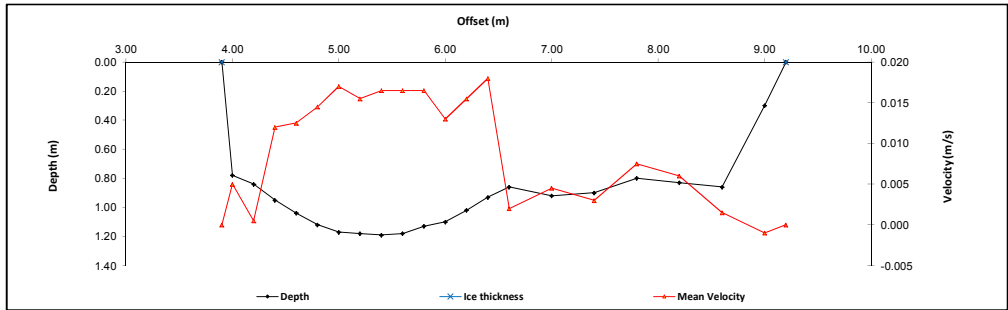


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	4.00	0.78			0.62	0.003	0.16	0.007	1.00	0.15	0.78	0.005	0.12	0.001	1%	
2	4.20	0.84			0.67	0.002	0.17	-0.001	1.00	0.20	0.84	0.001	0.17	0.000	0%	
3	4.40	0.95			0.76	0.003	0.19	0.021	1.00	0.20	0.95	0.012	0.19	0.002	5%	
4	4.60	1.04			0.83	0.006	0.21	0.019	1.00	0.20	1.04	0.013	0.21	0.003	6%	
5	4.80	1.12			0.90	0.008	0.22	0.021	1.00	0.20	1.12	0.015	0.22	0.003	7%	
6	5.00	1.17			0.94	0.009	0.23	0.025	1.00	0.20	1.17	0.017	0.23	0.004	9%	
7	5.20	1.18			0.94	0.008	0.24	0.023	1.00	0.20	1.18	0.016	0.24	0.004	8%	
8	5.40	1.19			0.95	0.012	0.24	0.021	1.00	0.20	1.19	0.017	0.24	0.004	9%	
9	5.60	1.18			0.94	0.013	0.24	0.020	1.00	0.20	1.18	0.017	0.24	0.004	9%	
10	5.80	1.13			0.90	0.013	0.23	0.020	1.00	0.20	1.13	0.017	0.23	0.004	8%	
11	6.00	1.10			0.88	0.006	0.22	0.020	1.00	0.20	1.10	0.013	0.22	0.003	6%	
12	6.20	1.02			0.82	0.011	0.20	0.020	1.00	0.20	1.02	0.016	0.20	0.003	7%	
13	6.40	0.93			0.74	0.017	0.19	0.019	1.00	0.20	0.93	0.018	0.19	0.003	7%	
14	6.60	0.86			0.69	0.002	0.17	0.002	1.00	0.30	0.86	0.002	0.26	0.001	1%	
15	7.00	0.92			0.74	0.000	0.18	0.009	1.00	0.40	0.92	0.005	0.37	0.002	4%	
16	7.40	0.90			0.72	0.003	0.18	0.003	1.00	0.40	0.90	0.003	0.36	0.001	2%	
17	7.80	0.90			0.64	0.002	0.16	0.013	1.00	0.40	0.80	0.008	0.32	0.002	5%	
18	8.20	0.83			0.60	0.003	0.17	0.009	1.00	0.40	0.63	0.006	0.33	0.002	4%	
19	8.60	0.86			0.69	0.000	0.17	0.003	1.00	0.40	0.86	0.002	0.34	0.001	1%	
20	9.00	0.30	0.18	-0.001					1.00	0.30	0.30	-0.001	0.09	0.000	0%	
RB	9.20	0.00	0.00		0.00		0.00		1.00	0.10	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.045</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m DS of PT

Meas. Start Time (MST):	11:05
Meas. End Time (MST):	11:50
Equipment:	ADV
Method:	Wading
River Condition:	Possible backwater
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, breezy, +8°C



**Flow characteristics:**

Total Flow:	0.045	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.76	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.90	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.90	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.315	1.315
Water (°C):	9.7	9.7
Datalogger Clock:	10:34	11:58
Laptop Clock:	10:34	11:58
Battery (Main):	14.2	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Station area still flooded. Possibly beaver activity somewhere DS. Flow measurement graded as "Good" because of this.

**General Notes:**

- Station area still flooded. Possibly beaver activity somewhere DS. Flow measurement graded as "Good" because of this.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S09-03			1.246	330.232	330.231	3/4" Pipe 10 m E of logger	S09-03
S09-04			1.186	330.292	330.293	3/4" Pipe 6 m NE of logger	S09-04
S09-05	0.843	331.478		330.635	330.635	3/4" Pipe 10 m NE of logger	S09-05
Ice/PT:							WL
Water Level:			1.924	329.554	Time WL Surveyed:	10:54	S09-05
Other:					329.796	Nail in birch tree	S09-04
<b>Setup #2</b>							S09-03
S09-03			1.235	330.231	330.231	3/4" Pipe 10 m E of logger	
S09-04	1.174	331.466		330.292	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.832	330.634	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:							
Water Level:			1.911	329.555	Time WL Surveyed:	10:57	(must close survey loop on survey starting point)
Other:					329.796	Nail in birch tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S09-04	1.174	331.466		330.292	Time WL Surveyed:	11:53	
Water Level:			1.909	329.557	Time WL Surveyed:	11:55	
Water Level:			1.899	329.557	Time WL Surveyed:	11:55	
BM: S09-04	1.164	331.456		330.292			

**WL Survey Summary**

	Before	After
Average WL:	329.555	329.557
Transducer Elevation:	328.240	328.242
Closing Error:	0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	0.0454
Expected Discharge:	0.27
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	504%

**Field Personnel:**

SM, CJ	Trip Date:	19-Sep-13
CJ	Date:	19-Sep-13
CJ	Date:	25-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: October 27, 2013  
 Site Visit Time (MST): 10:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	6.40	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	6.60	0.55		0.33	0.020		0.70	0.060	0.17	1.00	0.30	0.55	0.020	0.17	0.003	1%
2	7.00	0.87					0.82	0.050	0.20	1.00	0.40	0.87	0.056	0.35	0.019	6%
3	7.40	1.02					0.93	0.005	0.23	1.00	0.40	1.02	0.055	0.41	0.022	7%
4	7.80	1.16					0.99	0.088	0.25	1.00	0.40	1.16	0.023	0.46	0.011	3%
5	8.20	1.24					0.98	0.079	0.24	1.00	0.40	1.24	0.084	0.50	0.041	13%
6	8.60	1.22					0.97	0.081	0.24	1.00	0.30	1.22	0.083	0.37	0.030	9%
7	8.80	1.21					0.94	0.153	0.24	1.00	0.20	1.21	0.090	0.24	0.022	7%
8	9.00	1.18					0.88	0.004	0.22	1.00	0.30	1.18	0.119	0.35	0.042	13%
9	9.40	1.10					0.67	0.035	0.17	1.00	0.40	1.10	0.029	0.44	0.013	4%
10	9.80	0.84					0.66	0.017	0.17	1.00	0.30	0.84	0.035	0.25	0.009	3%
11	10.00	0.83					0.61	0.027	0.15	1.00	0.20	0.83	0.024	0.17	0.004	1%
12	10.20	0.76								1.00	0.30	0.76	0.036	0.23	0.008	2%
13	10.60	0.74	0.44	0.044						1.00	0.40	0.74	0.044	0.30	0.013	4%
14	11.00	0.72	0.43	0.059						1.00	0.30	0.72	0.059	0.22	0.013	4%
15	11.20	0.70	0.42	0.085						1.00	0.20	0.70	0.085	0.14	0.012	4%
16	11.40	0.72	0.43	0.161						1.00	0.30	0.72	0.161	0.14	0.039	12%
17	11.80	0.64	0.38	0.043						1.00	0.40	0.64	0.043	0.26	0.011	3%
18	12.20	0.70	0.42	0.001						1.00	0.40	0.70	0.001	0.28	0.000	0%
19	12.60	0.88			0.70	-0.114	0.18	0.074		1.00	0.40	0.88	-0.020	0.35	-0.007	-2%
20	13.00	0.70	0.42	0.073						1.00	0.50	0.70	0.073	0.35	0.026	8%
RB	13.60	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.331</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:43
Meas. End Time (MST):	11:29
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -7°C

**Flow characteristics:**

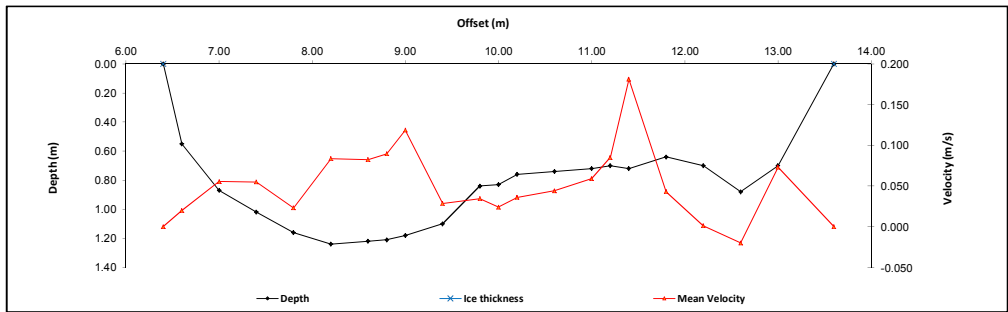
Total Flow:	0.331	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.03	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.84	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.350	1.351
Water (°C):	2.1	2.1
Datalogger Clock:	10:26	11:31
Laptop Clock:	10:26	11:31
Battery (Main):	14.6	14.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S09-03	1.064	331.295		330.231	330.231	3/4" Pipe 10 m E of logger	S09-03
S09-04			1.003	330.292	330.293	3/4" Pipe 6 m NE of logger	S09-04
S09-05			0.662	330.633	330.635	3/4" Pipe 10 m NE of logger	WL
Ice/PT:							WL
Water Level:		1.704		329.591	Time WL Surveyed:	10:38	S09-05
Other:					329.796	Nail in birch tree	S09-04
Setup #2							S09-03
S09-03			1.048	330.232	330.231	3/4" Pipe 10 m E of logger	
S09-04	0.988	331.280		330.292	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.646	330.634	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:							
Water Level:		1.690		329.590	Time WL Surveyed:	10:40	(must close survey loop on survey starting point)
Other:					329.796	Nail in birch tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S09-03	1.048	331.279	330.231		Time WL Surveyed:	11:30
Water Level:			1.690	329.589		Time WL Surveyed:	11:31
Water Level:			1.672	329.591			
BM:	S09-03	1.032	331.263	330.231			

**WL Survey Summary**

	Before	After
Average WL:	329.591	329.590
Transducer Elevation:	328.241	328.239
Closing Error:	-0.001	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	0.331
Expected Discharge:	0.33
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, TR	Trip Date:	27-Oct-13
SM	Date:	27-Oct-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S9 Kears Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: December 2, 2013  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Flow Measurement Conducted																
															<b>Total Flow</b>	<b>0%</b>

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	See Notes
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

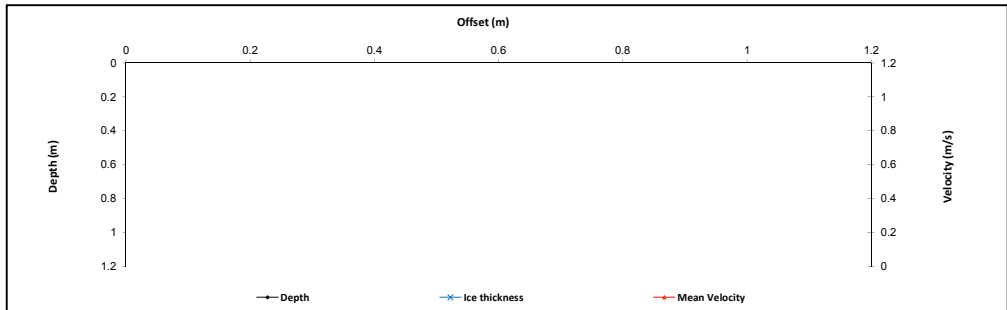
**Logger Details:**

	Before	After
Transducer Reading (m):	12.980	-
Water (°C):	0.6	-
Datalogger Clock:	13:03	-
Laptop Clock:	13:03	-
Battery (Main):	14.6	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement was not conducted due to open water and poor ice conditions.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S09-03			1.026	330.229	330.231	3/4" Pipe 10 m E of logger	S09-03
S09-04			0.967	330.288	330.293	3/4" Pipe 6 m NE of logger	S09-04
S09-05	0.620	331.255		330.635	330.635	3/4" Pipe 10 m NE of logger	WL
Ice/PT:			1.700	329.555			WL
Water Level:			1.715	329.540		Time WL Surveyed: 13:10	S09-05
Other:					329.796	Nail in birch tree	S09-04
<b>Setup #2</b>							S09-03
S09-03			1.010	330.228	330.231	3/4" Pipe 10 m E of logger	
S09-04	0.950	331.238		330.288	330.293	3/4" Pipe 6 m NE of logger	
S09-05			0.605	330.633	330.635	3/4" Pipe 10 m NE of logger	
Ice/PT:			1.683	329.555			
Water Level:			1.701	329.537		Time WL Surveyed: 13:12	
Other:					329.796	Nail in birch tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				330.635			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				330.635			

**WL Survey Summary**

	Before	After
Average WL:	329.539	-
Transducer Elevation:	316.559	-
Closing Error:	0.002	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	2-Dec-13
<b>Data Entry Personnel:</b>	SM	Date:	2-Dec-13
<b>Data Check Personnel:</b>	DW	Date:	28-Mar-14
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek at Canterra Road

UTM Location: 488573 E, 6358554 N

Site Visit Date:

January 10, 2013



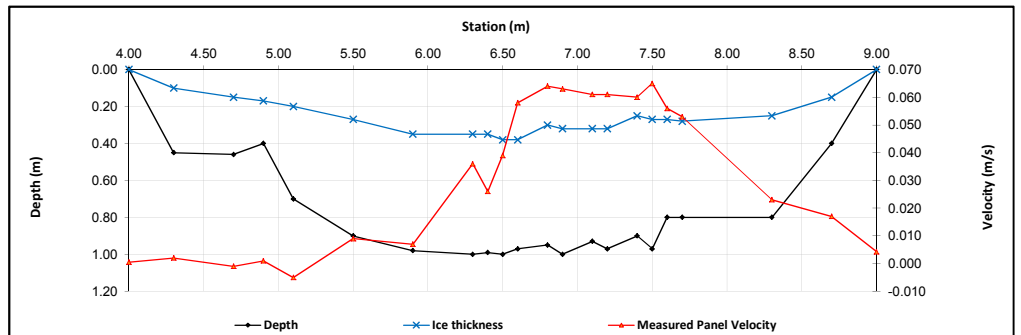
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	4.15	0.15	0.09	0.001	0.000	0.01	0.000	0%
1	4.30	0.45	0.10	0.002			0.9	4.15	4.50	0.35	0.35	0.002	0.002	0.12	0.000	0%
2	4.70	0.46	0.15	-0.001			0.9	4.50	4.80	0.30	0.31	-0.001	-0.001	0.09	0.000	0%
3	4.90	0.40	0.17	0.001			0.9	4.80	5.00	0.20	0.23	0.001	0.001	0.05	0.000	0%
4	5.10	0.70	0.20	-0.005			0.9	5.00	5.30	0.30	0.50	-0.005	-0.005	0.15	-0.001	-1%
5	5.50	0.90	0.27	0.009			0.9	5.30	5.70	0.40	0.63	0.009	0.008	0.25	0.002	3%
6	5.90	0.98	0.35	0.007			0.9	5.70	6.10	0.40	0.63	0.007	0.006	0.25	0.002	2%
7	6.30	1.00	0.35	0.036			0.9	6.10	6.35	0.25	0.65	0.036	0.032	0.16	0.005	8%
8	6.40	0.99	0.35	0.026			0.9	6.35	6.45	0.10	0.64	0.026	0.023	0.06	0.001	2%
9	6.50	1.00	0.38	0.039			0.9	6.45	6.55	0.10	0.62	0.039	0.035	0.06	0.002	3%
10	6.60	0.97	0.38	0.058			0.9	6.55	6.70	0.15	0.59	0.058	0.052	0.09	0.005	7%
11	6.80	0.95	0.30	0.064			0.9	6.70	6.85	0.15	0.65	0.064	0.058	0.10	0.006	8%
12	6.90	1.00	0.32	0.063			0.9	6.85	7.00	0.15	0.68	0.063	0.057	0.10	0.006	9%
13	7.10	0.93	0.32	0.061			0.9	7.00	7.15	0.15	0.61	0.061	0.055	0.09	0.005	8%
14	7.20	0.97	0.32	0.061			0.9	7.15	7.30	0.15	0.65	0.061	0.055	0.10	0.005	8%
15	7.40	0.90	0.25	0.060			0.9	7.30	7.45	0.15	0.65	0.060	0.054	0.10	0.005	8%
16	7.50	0.97	0.27	0.065			0.9	7.45	7.55	0.10	0.70	0.065	0.059	0.07	0.004	6%
17	7.60	0.80	0.27	0.056			0.9	7.55	7.65	0.10	0.53	0.056	0.050	0.05	0.003	4%
18	7.70	0.80	0.28	0.053			0.9	7.65	8.00	0.35	0.52	0.053	0.048	0.18	0.009	13%
19	8.30	0.80	0.25	0.023			0.9	8.00	8.50	0.50	0.55	0.023	0.021	0.28	0.006	9%
20	8.70	0.40	0.15	0.017			0.9	8.50	8.85	0.35	0.25	0.017	0.015	0.09	0.001	2%
LB	9.00	0.00	0.00	0.00	0.00	0.00	1.0	8.85	9.00	0.15	0.06	0.004	0.004	0.01	0.000	0%
<b>Total Flow</b>														<b>0.066</b>		

Measurement Details:	
Start Time (MST):	14:15
End Time (MST):	15:33
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, -17°C

Flow Characteristics:		
Total Flow:	0.066	(m <sup>3</sup> /s)
Perceived Measurement Quality:	41	
Cross Section Area:	2.47	(m <sup>2</sup> )
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.494	(m)
Mean Velocity:	0.027	(m/s)
Froude Number:	0.012	

Logger Details:		
Transducer Reading (m):	Before	After
	0.465	-
Water (°C):	0.0	-
Battery (Main):	13.8	12.98
Datalogger Clock:	14:23	14:27
Laptop Clock:	14:23	14:27
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
-	Replaced battery



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S10A-01			0.978	100.235	100.236	3/4" Pipe NW of logger
S10A-02			1.212	100.001	100.000	3/4" Pipe W of logger
S10A-03	1.077	101.213		100.136	100.136	3/4" Pipe N of logger
Ice/PT:			2.325	98.888		
Water Level:			2.367	98.846		
Other:						
<b>Setup #2</b>						
S10A-01	0.968	101.203		100.235	100.236	3/4" Pipe NW of logger
S10A-02			1.203	100.000	100.000	3/4" Pipe W of logger
S10A-03			1.068	100.135	100.136	3/4" Pipe N of logger
Ice/PT:			2.317	98.886		
Water Level:			2.353	98.850		
Other:						

Closing Error	0.001
WL Check	0.004

Average WL	98.848
Transducer Elevation Before	98.383
Transducer Elevation After	-

General Notes:	

Field Personnel:	TR and DW	Trip Date:	10-Jan-13
Data Entry Personnel:	TR	Date:	10-Jan-13
Data Check Personnel:	CJ	Date:	25-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek at Canterra Road

UTM Location: 488573 E, 6358554 N

Site Visit Date:

February 24, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	3.80	0.00	0.00	0.000	0.000	0.000	0.9	3.80	3.98	0.18	0.11	0.001	0.000	0.02	0.000	0%
1	4.15	0.60	0.15	0.002			0.9	3.98	4.25	0.28	0.45	0.002	0.002	0.12	0.000	1%
2	4.35	0.81	0.20	0.036			0.9	4.25	4.43	0.18	0.61	0.036	0.032	0.11	0.003	8%
3	4.50	0.82	0.17	0.044			0.9	4.43	4.55	0.13	0.65	0.044	0.040	0.08	0.003	8%
4	4.60	0.85	0.22	0.031			0.9	4.55	4.68	0.13	0.63	0.031	0.028	0.08	0.002	5%
5	4.75	0.87	0.24	0.051			0.9	4.68	4.80	0.13	0.63	0.051	0.046	0.08	0.004	9%
6	4.85	0.89	0.24	0.042			0.9	4.80	4.93	0.13	0.65	0.042	0.038	0.08	0.003	8%
7	5.00	0.89	0.24	0.054			0.9	4.93	5.08	0.15	0.65	0.054	0.049	0.10	0.005	12%
8	5.15	0.82	0.25	0.062			0.9	5.08	5.20	0.13	0.57	0.062	0.056	0.07	0.004	10%
9	5.25	0.90	0.24	0.051			0.9	5.20	5.33	0.13	0.66	0.051	0.046	0.08	0.004	9%
10	5.40	0.90	0.25	0.055			0.9	5.33	5.43	0.10	0.65	0.055	0.050	0.07	0.003	8%
11	5.45	0.89	0.25	-0.001			0.9	5.43	5.53	0.10	0.64	-0.001	-0.001	0.06	0.000	0%
12	5.60	0.89	0.25	0.034			0.9	5.53	5.70	0.17	0.64	0.034	0.031	0.11	0.003	8%
13	5.80	0.89	0.25	0.013			0.9	5.70	5.95	0.25	0.64	0.013	0.012	0.16	0.002	5%
14	6.10	0.86	0.25	0.018			0.9	5.95	6.25	0.30	0.61	0.018	0.016	0.18	0.003	7%
15	6.40	0.80	0.24	0.014			0.9	6.25	6.63	0.38	0.56	0.014	0.013	0.21	0.003	6%
16	6.85	0.70	0.22	-0.001			0.9	6.63	6.98	0.35	0.48	-0.001	-0.001	0.17	0.000	0%
17	7.10	0.68	0.21	-0.002			0.9	6.98	7.23	0.25	0.47	-0.002	-0.002	0.12	0.000	-1%
18	7.35	0.61	0.17	-0.002			0.9	7.23	7.50	0.28	0.44	-0.002	-0.002	0.12	0.000	-1%
19	7.65	0.61	0.17	-0.001			0.9	7.50	7.83	0.33	0.44	-0.001	-0.001	0.14	0.000	0%
20	8.00	0.60	0.13	-0.006			0.9	7.83	8.15	0.33	0.47	-0.006	-0.005	0.15	-0.001	-2%
LB	8.30	0.00	0.00	0.00	0.00	0.00	1.0	8.15	8.30	0.15	0.12	-0.002	-0.002	0.02	0.000	0%
<b>Total Flow</b>														<b>0.041</b>		

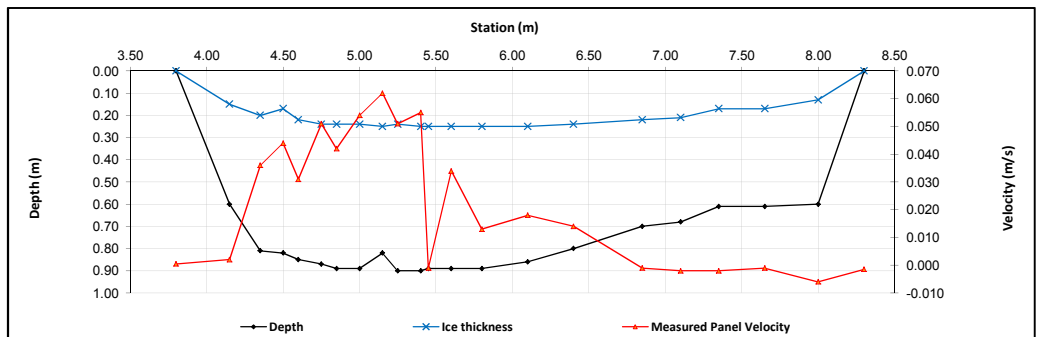
Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	12:25
Equipment:	ADC
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -2°C

Flow characteristics:		
Total Flow:	0.041	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.34	(m <sup>2</sup> )
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.519	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.446	-
Battery (Main):	14.7	-
Datalogger Clock:	11:36	-
Laptop Clock:	11:35	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	17935	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S10A-01	1.256	101.492		100.236	100.236	3/4" Pipe NW of logger
S10A-02			1.494	99.998	100.000	3/4" Pipe W of logger
S10A-03			1.356	100.136	100.136	3/4" Pipe N of logger
Ice/PT:			2.586	98.906		
Water Level:			2.673	98.819		
Other:						
<b>Setup #2</b>						
S10A-01			1.238	100.236	100.236	3/4" Pipe NW of logger
S10A-02	1.476	101.474		99.998	100.000	3/4" Pipe W of logger
S10A-03			1.338	100.136	100.136	3/4" Pipe N of logger
Ice/PT:			2.568	98.906		
Water Level:			2.654	98.820		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	98.820
Transducer Elevation Before	98.3735
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	24-Feb-13
Data Entry Personnel:	SM	Date:	24-Feb-13
Data Check Personnel:	CJ	Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek at Canterra Road

UTM Location: 488573 E, 6358554 N

Site Visit Date:

March 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.15	0.00	0.00	0.000	0.000	0.000	0.9	0.15	0.23	0.08	0.03	0.000	0.000	0.00	0.000	0%
1	0.30	0.30	0.20	0.001			0.9	0.23	0.43	0.20	0.10	0.001	0.001	0.02	0.000	0%
2	0.55	0.45	0.22	-0.003			0.9	0.43	0.70	0.28	0.23	-0.003	-0.003	0.06	0.000	0%
3	0.85	0.55	0.25	-0.010			0.9	0.70	1.00	0.30	0.30	-0.010	-0.009	0.09	-0.001	-2%
4	1.15	0.60	0.25	0.000			1.0	1.00	1.28	0.28	0.35	0.000	0.000	0.10	0.000	0%
5	1.40	0.65	0.26	0.004			0.9	1.28	1.55	0.28	0.39	0.004	0.004	0.11	0.000	1%
6	1.70	0.70	0.25	0.000			1.0	1.55	1.85	0.30	0.45	0.000	0.000	0.14	0.000	0%
7	2.00	0.80	0.27	0.011			0.9	1.85	2.15	0.30	0.53	0.011	0.010	0.16	0.002	4%
8	2.30	0.80	0.26	0.025			0.9	2.15	2.45	0.30	0.54	0.025	0.023	0.16	0.004	9%
9	2.60	0.85	0.27	0.028			0.9	2.45	2.73	0.28	0.58	0.028	0.025	0.16	0.004	10%
10	2.85	0.85	0.25	0.047			0.9	2.73	2.90	0.18	0.60	0.047	0.042	0.11	0.004	11%
11	2.95	0.85	0.25	0.031			0.9	2.90	3.03	0.13	0.60	0.031	0.028	0.08	0.002	5%
12	3.10	0.80	0.24	0.085			0.9	3.03	3.18	0.15	0.56	0.085	0.077	0.08	0.006	15%
13	3.25	0.85	0.25	0.061			0.9	3.18	3.30	0.13	0.60	0.061	0.055	0.08	0.004	10%
14	3.35	0.75	0.20	0.072			0.9	3.30	3.43	0.13	0.55	0.072	0.065	0.07	0.004	11%
15	3.50	0.70	0.20	0.063			0.9	3.43	3.58	0.15	0.50	0.063	0.057	0.08	0.004	10%
16	3.65	0.60	0.20	0.058			0.9	3.58	3.70	0.13	0.40	0.058	0.052	0.05	0.003	6%
17	3.75	0.40	0.17	0.062			0.9	3.70	3.85	0.15	0.23	0.062	0.056	0.03	0.002	5%
18	3.95	0.60	0.17	0.040			0.9	3.85	4.10	0.25	0.43	0.040	0.036	0.11	0.004	9%
19	4.25	0.50	0.15	-0.007			0.9	4.10	4.40	0.30	0.35	-0.007	-0.006	0.11	-0.001	-2%
20	4.55	0.30	0.10	-0.003			0.9	4.40	4.78	0.38	0.20	-0.003	-0.003	0.08	0.000	0%
RB	5.00	0.00	0.00	0.00	0.00	0.00	1.0	4.78	5.00	0.23	0.05	-0.001	-0.001	0.01	0.000	0%
<b>Total Flow</b>														<b>0.042</b>		

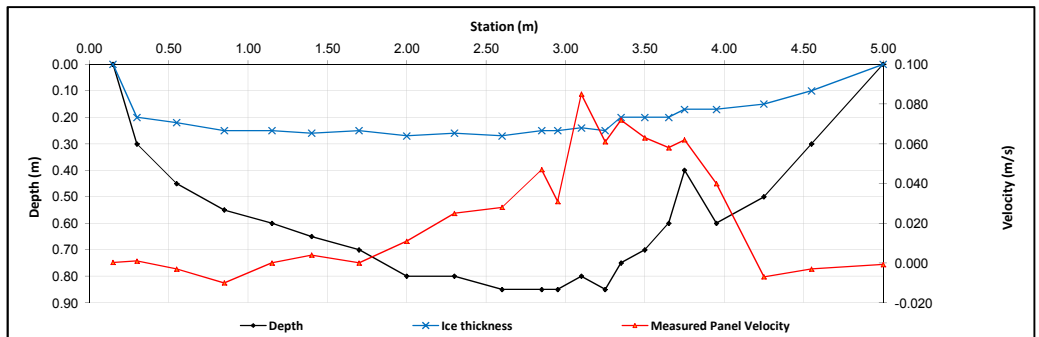
Measurement Details:	
Start Time (MST):	14:55
End Time (MST):	15:55
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	Snowing, 2°C

Flow characteristics:		
Total Flow:	0.042	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.86	(m <sup>2</sup> )
Wetted Width:	4.85	(m)
Hydraulic Depth:	0.384	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.440	-
Battery (Main):	14.5	-
Datalogger Clock:	14:58	-
Laptop Clock:	14:57	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	17935	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S10A-01	1.344	101.58		100.236	100.236	3/4" Pipe NW of logger
S10A-02			1.582	99.998	100.000	3/4" Pipe W of logger
S10A-03			1.445	100.135	100.136	3/4" Pipe N of logger
Ice/PT:			2.676	98.904		
Water Level:			2.757	98.823		
Other:						
<b>Setup #2</b>						
S10A-01			1.332	100.235	100.236	3/4" Pipe NW of logger
S10A-02			1.567	100.000	100.000	3/4" Pipe W of logger
S10A-03	1.432	101.567		100.135	100.136	3/4" Pipe N of logger
Ice/PT:			2.663	98.904		
Water Level:			2.738	98.829		
Other:						

Closing Error	0.001
WL Check	0.006

Average WL	98.826
Transducer Elevation Before	98.386
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	10-Mar-13
Data Entry Personnel:	SM	Date:	10-Mar-13
Data Check Personnel:	CJ	Date:	22-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek at Canterra Road

UTM Location: 488573 E, 6358554 N

Site Visit Date:

March 30, 2013



Flow Measurement:							Measured Data								Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow					
RB	0.00	0.00	0.00	0.000	0.000	0.000	0.9	0.00	0.28	0.28	0.00	0.004	0.004	0.00	0.000	0%					
1	0.55	0.50	0.49	0.017			0.9	0.28	0.64	0.36	0.01	0.017	0.015	0.00	0.000	0%					
2	0.72	0.50	0.49	-0.121			0.9	0.64	0.84	0.20	0.01	-0.121	-0.109	0.00	0.000	-1%					
3	0.95	0.30	0.25	-0.216			0.9	0.84	1.03	0.19	0.05	-0.216	-0.194	0.01	-0.002	-10%					
4	1.10	0.30	0.26	-0.092			0.9	1.03	1.23	0.20	0.04	-0.092	-0.083	0.01	-0.001	-4%					
5	1.35	0.60	0.30	-0.001			0.9	1.23	1.43	0.20	0.30	-0.001	-0.001	0.06	0.000	0%					
6	1.50	0.60	0.28	-0.004			0.9	1.43	1.62	0.19	0.32	-0.004	-0.004	0.06	0.000	-1%					
7	1.73	0.60	0.30	-0.002			0.9	1.62	1.82	0.21	0.30	-0.002	-0.002	0.06	0.000	-1%					
8	1.91	0.56	0.28	0.004			0.9	1.82	2.01	0.19	0.28	0.004	0.004	0.05	0.000	1%					
9	2.10	0.59	0.25	0.021			0.9	2.01	2.19	0.19	0.34	0.021	0.019	0.06	0.001	6%					
10	2.28	0.60	0.25	0.024			0.9	2.19	2.37	0.18	0.35	0.024	0.022	0.06	0.001	7%					
11	2.45	0.57	0.25	0.026			0.9	2.37	2.55	0.19	0.32	0.026	0.023	0.06	0.001	7%					
12	2.65	0.55	0.22	0.037			0.9	2.55	2.74	0.19	0.33	0.037	0.033	0.06	0.002	11%					
13	2.82	0.52	0.20	0.018			0.9	2.74	2.90	0.17	0.32	0.018	0.016	0.05	0.001	5%					
14	2.98	0.52	0.20	0.015			0.9	2.90	3.07	0.17	0.32	0.015	0.014	0.05	0.001	4%					
15	3.15	0.49	0.20	0.096			0.9	3.07	3.24	0.18	0.29	0.096	0.086	0.05	0.004	24%					
16	3.33	0.50	0.20	0.062			0.9	3.24	3.46	0.22	0.30	0.062	0.056	0.06	0.004	19%					
17	3.58	0.48	0.18	0.089			0.9	3.46	3.66	0.20	0.30	0.089	0.080	0.06	0.005	26%					
18	3.73	0.35	0.15	0.030			0.9	3.66	3.87	0.21	0.20	0.030	0.027	0.04	0.001	6%					
LB	4.00	0.00	0.00	0.00	0.00	0.00	1.0	3.87	4.00	0.14	0.05	0.008	0.008	0.01	0.000	0%					
<b>Total Flow</b>														<b>0.019</b>							

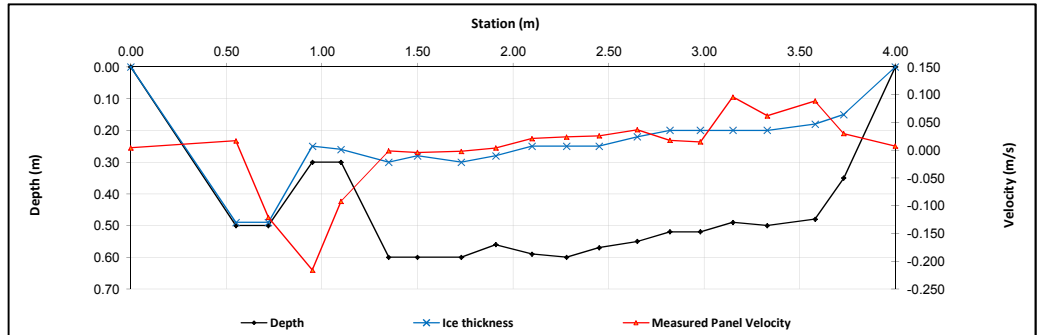
Measurement Details:	
Start Time (MST):	14:20
End Time (MST):	15:07
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Sunny 2°C

Flow characteristics:		
Total Flow:	0.019	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.83	(m <sup>2</sup> )
Wetted Width:	4.00	(m)
Hydraulic Depth:	0.208	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.431	-
Battery (Main):	0.0	-
Datalogger Clock:	14.5	-
Laptop Clock:	15:18	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

Datalogger / Station Notes:	
-	24 hr. file has only 3 records

General Notes:	
-	Almost frozen to depth
-	Also rocks



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S10A-01	1.402	101.638		100.236	100.236	3/4" Pipe NW of logger
S10A-02			1.638	100.000	100.000	3/4" Pipe W of logger
S10A-03			1.502	100.136	100.136	3/4" Pipe N of logger
Ice/PT:			2.703	98.935		
Water Level:			2.822	98.816		
Other:						
<b>Setup #2</b>						
S10A-01			1.348	100.240	100.236	3/4" Pipe NW of logger
S10A-02			1.588	100.000	100.000	3/4" Pipe W of logger
S10A-03	1.452	101.588		100.136	100.136	3/4" Pipe N of logger
Ice/PT:			2.653	98.935		
Water Level:			2.77	98.818		
Other:						

Closing Error	-0.004
WL Check	0.002

Average WL	98.817
Transducer Elevation Before	98.386
Transducer Elevation After	-

Field Personnel:	CJ, XP	Trip Date:	30-Mar-13
Data Entry Personnel:	XP	Date:	30-Mar-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: May 12, 2013  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.60	0.30		0.18	0.092					1.00	0.50	0.30	0.092	0.15	0.014	0%
2	3.00	0.50		0.30	0.275					1.00	0.40	0.50	0.275	0.20	0.055	1%
3	3.40	1.48				1.18	0.463	0.30	0.401	1.00	0.40	1.48	0.432	0.59	0.256	5%
4	3.80	1.50				1.20	0.535	0.30	0.550	1.00	0.40	1.50	0.543	0.60	0.326	6%
5	4.20	1.58				1.26	0.593	0.32	0.639	1.00	0.40	1.58	0.616	0.63	0.389	8%
6	4.60	1.64				1.31	0.626	0.33	0.700	1.00	0.40	1.64	0.663	0.66	0.435	9%
7	5.00	1.70				1.36	0.735	0.34	0.698	1.00	0.40	1.70	0.717	0.68	0.487	10%
8	5.40	1.74				1.39	0.685	0.35	0.742	1.00	0.40	1.74	0.714	0.70	0.497	10%
9	5.80	1.75				1.40	0.723	0.35	0.678	1.00	0.40	1.75	0.701	0.70	0.490	10%
10	6.20	1.70				1.36	0.671	0.34	0.656	1.00	0.40	1.70	0.664	0.68	0.451	9%
11	6.60	1.68				1.34	0.580	0.34	0.671	1.00	0.40	1.68	0.626	0.67	0.420	8%
12	7.00	1.65				1.32	0.485	0.33	0.452	1.00	0.30	1.65	0.469	0.50	0.232	5%
13	7.20	1.48				1.18	0.463	0.30	0.580	1.00	0.20	1.48	0.522	0.30	0.154	3%
14	7.40	1.60				1.28	0.516	0.32	0.200	1.00	0.20	1.60	0.358	0.32	0.115	2%
15	7.60	1.66				1.33	0.000	0.33	0.451	1.00	0.20	1.66	0.226	0.33	0.075	1%
16	7.80	1.18				0.94	0.463	0.24	0.528	1.00	0.30	1.18	0.496	0.35	0.175	3%
17	8.20	1.30				1.04	0.401	0.26	0.359	1.00	0.40	1.30	0.380	0.52	0.198	4%
18	8.60	1.22				0.98	0.352	0.24	0.263	1.00	0.50	1.22	0.308	0.61	0.198	4%
19	9.20	1.00				0.80		0.20		1.00	0.45	1.00	0.198	0.45	0.089	2%
20	9.50	0.90				0.107	0.72	0.18		1.00	0.25	0.90	0.107	0.23	0.024	0%
LB	9.70	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>5.07</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): Adjacent to pressure transducer

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	15:02
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, 29°C

**Flow characteristics:**

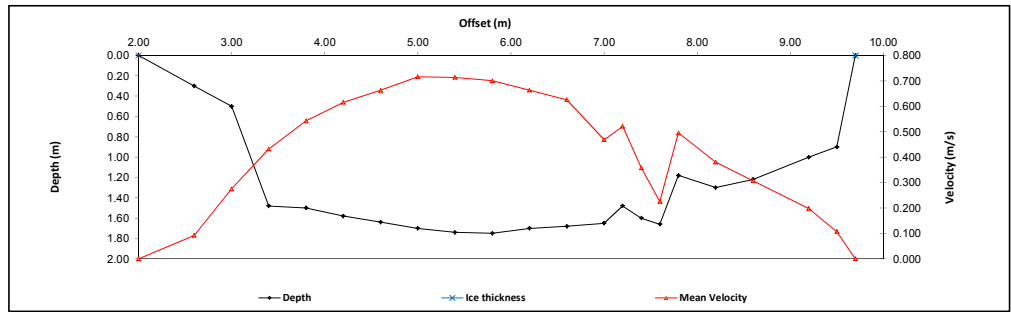
Total Flow:	5.07	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.86	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	1.28	(m)
Mean Velocity:	0.51	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.401	1.374
Water (°C):	10.5	11.8
Datalogger Clock:	12:14	15:21
Laptop Clock:	12:14	15:21
Battery (Main):	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S10A-01			1.167	100.238	100.236	3/4" Pipe NW of logger	S10A-02
S10A-02	1.405	101.405		100.000	100.000	3/4" Pipe W of logger	S10A-01
S10A-03			1.267	100.138	100.136	3/4" Pipe N of logger	S10A-03
Ice/PT:							WL
Water Level:			1.606	99.799		Time WL Surveyed: 13:17	S10A-03
Other:							S10A-01
<b>Setup #2</b>							
S10A-01			1.155	100.237	100.236	3/4" Pipe NW of logger	S10A-02
S10A-02			1.393	99.999	100.000	3/4" Pipe W of logger	S10A-01
S10A-03	1.254	101.392		100.138	100.136	3/4" Pipe N of logger	S10A-03
Ice/PT:							
Water Level:			1.597	99.795		Time WL Surveyed: 13:19	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S10A-03	1.254	101.392	100.138			
Water Level:			1.594	99.798		Time WL Surveyed: 15:18	
Water Level:			1.582	99.794		Time WL Surveyed: 15:19	
BM:	S10A-03	1.238	101.376	100.138			

**WL Survey Summary**

	Before	After
Average WL:	99.797	99.796
Transducer Elevation:	98.396	98.422
Flowing Error:	0.001	-
WL Check:	0.004	0.004

**Site Rating Information**

Measured Discharge:	5.07
Expected Discharge:	5.23
Shift from Existing Rating (m <sup>3</sup> /s):	0.16
Shift from Existing Rating (%):	3%

**Field Personnel:**

SM, DW	Trip Date:	12-May-13
SM, DW	Date:	12-May-13
CJ	Date:	12-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: June 15, 2013  
 Site Visit Time (MST): 12:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.80	0.41		0.25	0.040					1.00	0.40	0.41	0.040	0.16	0.007	0%
2	3.20	0.71		0.43	0.030					1.00	0.40	0.71	0.030	0.28	0.009	0%
3	3.60	1.07				0.86	0.370	0.21	0.260	1.00	0.40	1.07	0.315	0.43	0.135	2%
4	4.00	2.07				1.66	0.140	0.41	0.430	1.00	0.40	2.07	0.285	0.83	0.236	3%
5	4.40	2.05				1.64	0.290	0.41	0.440	1.00	0.40	2.05	0.365	0.82	0.299	4%
6	4.80	2.10				1.68	0.520	0.42	0.410	1.00	0.40	2.10	0.465	0.84	0.391	5%
7	5.20	2.05				1.64	0.500	0.41	0.450	1.00	0.40	2.05	0.475	0.82	0.390	5%
8	5.60	2.05				1.64	0.960	0.41	0.710	1.00	0.40	2.05	0.835	0.82	0.685	8%
9	6.00	2.05				1.64	0.940	0.41	0.650	1.00	0.40	2.05	0.795	0.82	0.652	8%
10	6.40	2.15				1.72	1.120	0.43	0.870	1.00	0.30	2.15	0.995	0.65	0.642	8%
11	6.60	2.05				1.64	0.940	0.41	0.820	1.00	0.20	2.05	0.880	0.41	0.361	4%
12	6.80	2.05				1.64	0.960	0.41	0.830	1.00	0.30	2.05	0.895	0.62	0.550	7%
13	7.20	2.05				1.64	0.850	0.41	0.910	1.00	0.40	2.05	0.880	0.82	0.722	9%
14	7.60	2.05				1.64	0.710	0.41	0.940	1.00	0.40	2.05	0.825	0.82	0.676	8%
15	8.00	2.05				1.64	0.680	0.41	0.780	1.00	0.40	2.05	0.730	0.82	0.599	7%
16	8.40	2.10				1.68	0.650	0.42	0.820	1.00	0.40	2.10	0.735	0.84	0.617	7%
17	8.80	2.02				1.62	0.560	0.40	0.550	1.00	0.40	2.02	0.555	0.81	0.448	5%
18	9.20	1.96				1.58	0.510	0.40	0.580	1.00	0.40	1.96	0.545	0.79	0.432	5%
19	9.60	1.85				1.48	0.350	0.37	0.550	1.00	0.40	1.85	0.450	0.74	0.333	4%
20	10.00	0.76				0.61	0.310	0.15	0.320	1.00	0.30	0.76	0.315	0.23	0.072	1%
LB	10.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>8.25</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 50 m downstream of station  
 Some out of bank flow present at station

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:45
Equipment:	Marsh McBirney
Method:	Fishcat
River Condition:	High, Bank full
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast

**Flow characteristics:**

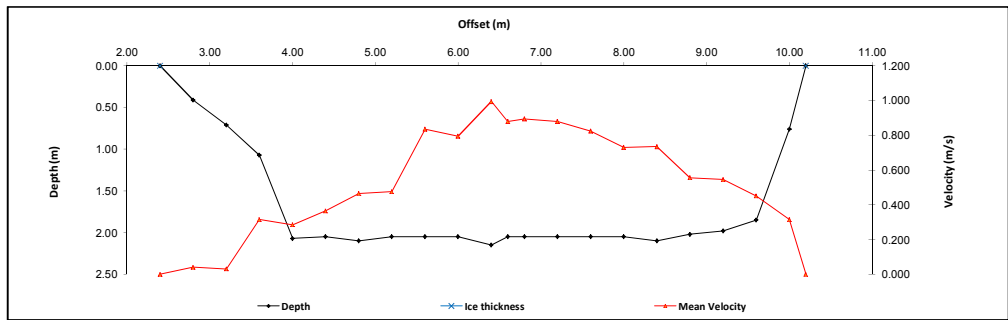
Total Flow:	8.25	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.36	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	1.71	(m)
Mean Velocity:	0.62	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.541	1.526
Water (°C):	14.8	14.9
Datalogger Clock:	12:37	14:00
Laptop Clock:	12:37	14:01
Battery (Main):	14.0	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Good	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S10A-01	1.438	101.674		100.236	100.236	3/4" Pipe NW of logger	S10A-01
S10A-02			1.673	100.001	100.000	3/4" Pipe W of logger	S10A-02
S10A-03			1.542	100.132	100.136	3/4" Pipe N of logger	S10A-03
Ice/PT:							WL
Water Level:			1.606	100.068		Time WL Surveyed: 12:41	S10A-02
Other:							S10A-03
Setup #2							S10A-01
S10A-01			1.374	100.237	100.236	3/4" Pipe NW of logger	
S10A-02	1.610	101.611		100.001	100.000	3/4" Pipe W of logger	
S10A-03			1.477	100.134	100.136	3/4" Pipe N of logger	
Ice/PT:							
Water Level:			1.541	100.070		Time WL Surveyed: 12:42	(must close survey loop on survey starting point)
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S10A-01	1.372	101.808		100.236		Time WL Surveyed: 13:54	
Water Level:			1.548	100.060		Time WL Surveyed: 13:56	
Water Level:			1.512	100.064			
BM: S10A-01	1.340	101.576		100.236			

**WL Survey Summary**

	Before	After
Average WL:	100.069	100.062
Transducer Elevation:	98.528	98.536
Closing Error:	-0.001	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	8.25
Expected Discharge:	8.29
Shift from Existing Rating (m <sup>3</sup> /s):	0.04
Shift from Existing Rating (%):	0%

**Field Personnel:**

Field Personnel:	TR, SG	Trip Date:	15-Jun-13
Data Entry Personnel:	TR	Date:	15-Jun-13
Data Check Personnel:	CJ	Date:	18-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 13:20

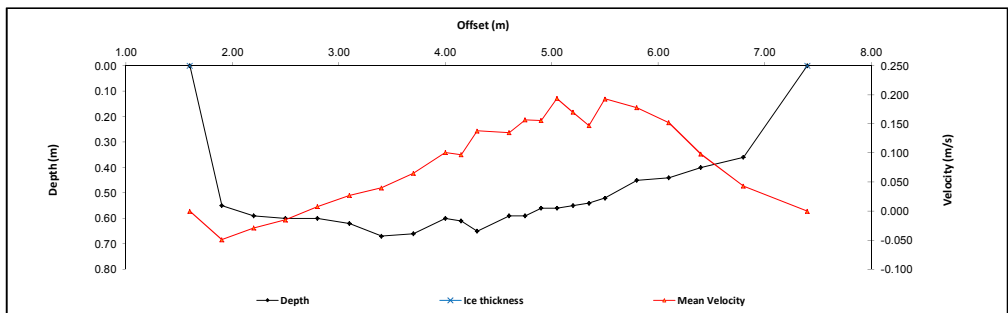


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.60	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.90	0.55		0.33	-0.049					1.00	0.30	0.55	-0.049	0.17	-0.008	-4%
2	2.20	0.59		0.35	-0.029					1.00	0.30	0.59	-0.029	0.18	-0.005	-2%
3	2.50	0.60		0.36	-0.015					1.00	0.30	0.60	-0.015	0.18	-0.003	-1%
4	2.80	0.60		0.36	0.008					1.00	0.30	0.60	0.008	0.18	0.001	1%
5	3.10	0.62		0.37	0.027					1.00	0.30	0.62	0.027	0.19	0.005	2%
6	3.40	0.67		0.40	0.040					1.00	0.30	0.67	0.040	0.20	0.008	4%
7	3.70	0.66		0.40	0.065					1.00	0.30	0.66	0.065	0.20	0.013	6%
8	4.00	0.60		0.36	0.101					1.00	0.23	0.60	0.101	0.14	0.014	6%
9	4.15	0.61		0.37	0.097					1.00	0.15	0.61	0.097	0.09	0.009	4%
10	4.30	0.65		0.39	0.138					1.00	0.23	0.65	0.138	0.15	0.020	9%
11	4.60	0.59		0.35	0.135					1.00	0.23	0.59	0.135	0.13	0.018	8%
12	4.75	0.59		0.35	0.157					1.00	0.15	0.59	0.157	0.09	0.014	6%
13	4.90	0.56		0.34	0.156					1.00	0.15	0.56	0.156	0.08	0.013	6%
14	5.05	0.56		0.34	0.194					1.00	0.15	0.56	0.194	0.08	0.016	7%
15	5.20	0.55		0.33	0.170					1.00	0.15	0.55	0.170	0.08	0.014	6%
16	5.35	0.54		0.32	0.147					1.00	0.15	0.54	0.147	0.08	0.012	5%
17	5.50	0.52		0.31	0.193					1.00	0.23	0.52	0.193	0.12	0.023	10%
18	5.80	0.45		0.27	0.178					1.00	0.30	0.45	0.178	0.14	0.024	10%
19	6.10	0.44		0.26	0.152					1.00	0.30	0.44	0.152	0.13	0.020	9%
20	6.40	0.40		0.24	0.098					1.00	0.35	0.40	0.098	0.14	0.014	6%
21	6.80	0.36		0.22	0.043					1.00	0.50	0.36	0.043	0.18	0.008	3%
LB	7.40	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.229</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across FROM STATION

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:05
Equipment:	ADV
Method:	Wading
River Condition:	Good, moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, 24°C



**Flow characteristics:**

Total Flow:	0.229	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.92	(m <sup>2</sup> )
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.405	0.497
Water (°C):	17.4	17.5
Datalogger Clock:	13:28	14:12
Laptop Clock:	13:28	14:12
Battery (Main):	13.8	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- RB 1.0 m undercut
- PLS was moved to deeper water

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S10A-01			1.087	100.235	100.236	3/4" Pipe NW of logger	S10A-03
S10A-02			1.323	99.999	100.000	3/4" Pipe W of logger	S10A-02
S10A-03	1.186	101.322		100.136	100.136	3/4" Pipe N of logger	WL
Ice/PT:							WL
Water Level:			2.404	98.918		Time WL Surveyed: 13:35	S10A-02
Other:							S10A-01
<b>Setup #2</b>							S10A-03
S10A-01			1.076	100.236	100.236	3/4" Pipe NW of logger	
S10A-02	1.313	101.312		99.999	100.000	3/4" Pipe W of logger	
S10A-03			1.175	100.137	100.136	3/4" Pipe N of logger	
Ice/PT:							
Water Level:			2.395	98.917		Time WL Surveyed: 13:37	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S10A-03	1.175	101.311		100.136			
Water Level:			2.394	98.917		Time WL Surveyed: 14:08	
Water Level:			2.380	98.919		Time WL Surveyed: 14:10	
BM: S10A-03	1.163	101.299		100.136			

**WL Survey Summary**

	Before	After
Average WL:	98.918	98.918
Transducer Elevation:	98.513	98.421
Closing Error:	-0.001	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	0.229
Expected Discharge:	0.15
Shift from Existing Rating (m <sup>3</sup> /s):	-0.08
Shift from Existing Rating (%):	-33%

**Field Personnel:**

TR, SM	Trip Date:	11-Aug-13
TR	Date:	11-Aug-13
CJ	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: September 13, 2013  
 Site Visit Time (MST): 10:22

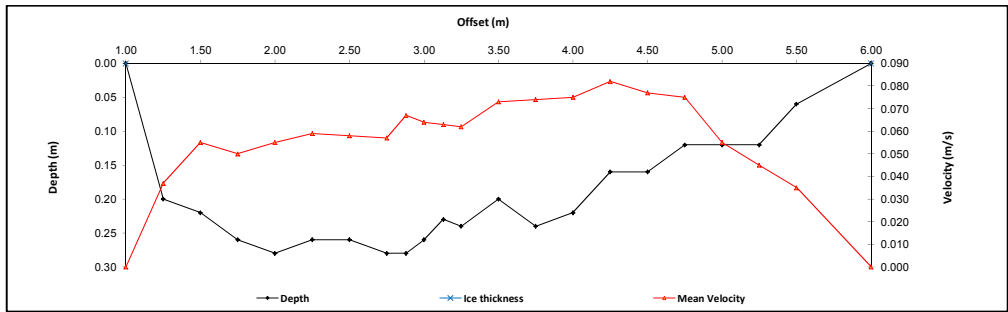


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	1.25	0.20		0.12	0.037					1.00	0.25	0.20	0.037	0.05	0.002	3%
2	1.50	0.22		0.13	0.055					1.00	0.25	0.22	0.055	0.06	0.003	5%
3	1.75	0.26		0.16	0.050					1.00	0.25	0.26	0.050	0.07	0.003	6%
4	2.00	0.28		0.17	0.055					1.00	0.25	0.28	0.055	0.07	0.004	7%
5	2.25	0.26		0.16	0.059					1.00	0.25	0.26	0.059	0.07	0.004	7%
6	2.50	0.26		0.16	0.058					1.00	0.25	0.26	0.058	0.07	0.004	7%
7	2.75	0.28		0.17	0.057					1.00	0.19	0.28	0.057	0.05	0.003	5%
8	2.88	0.28		0.17	0.067					1.00	0.13	0.28	0.067	0.04	0.002	4%
9	3.00	0.26		0.16	0.064					1.00	0.13	0.26	0.064	0.03	0.002	4%
10	3.13	0.23		0.14	0.063					1.00	0.13	0.23	0.063	0.03	0.002	3%
11	3.25	0.24		0.14	0.062					1.00	0.19	0.24	0.062	0.04	0.003	5%
12	3.50	0.20		0.12	0.073					1.00	0.25	0.20	0.073	0.05	0.004	6%
13	3.75	0.24		0.14	0.074					1.00	0.25	0.24	0.074	0.06	0.004	8%
14	4.00	0.22		0.13	0.075					1.00	0.25	0.22	0.075	0.06	0.004	7%
15	4.25	0.16		0.10	0.082					1.00	0.25	0.16	0.082	0.04	0.003	6%
16	4.50	0.16		0.10	0.077					1.00	0.25	0.16	0.077	0.04	0.003	5%
17	4.75	0.12		0.07	0.075					1.00	0.25	0.12	0.075	0.03	0.002	4%
18	5.00	0.12		0.07	0.055					1.00	0.25	0.12	0.055	0.03	0.002	3%
19	5.25	0.12		0.07	0.045					1.00	0.25	0.12	0.045	0.03	0.001	2%
20	5.50	0.06		0.04	0.035					1.00	0.38	0.06	0.035	0.02	0.001	1%
LB	6.00	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.056</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:43
Meas. End Time (MST):	11:07
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 16°C



**Flow characteristics:**

Total Flow:	0.056	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.92	(m <sup>2</sup> )
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.418	0.548
Water (°C):	13.9	14.1
Datalogger Clock:	10:26	11:18
Laptop Clock:	10:26	11:18
Battery (Main):	14.1	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT repositioned

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S10A-01			1.038	100.235	100.236	3/4" Pipe NW of logger	S10A-03
S10A-02			1.275	99.998	100.000	3/4" Pipe W of logger	S10A-02
S10A-03	1.137	101.273		100.136	100.136	3/4" Pipe N of logger	WL
Ice/PT:							WL
Water Level:			2.432	98.841		Time WL Surveyed: 10:35	S10A-01
Other:							S10A-02
<b>Setup #2</b>							
S10A-01	1.027	101.262		100.235	100.236	3/4" Pipe NW of logger	S10A-03
S10A-02			1.264	99.998	100.000	3/4" Pipe W of logger	
S10A-03			1.126	100.136	100.136	3/4" Pipe N of logger	
Ice/PT:							
Water Level:			2.418	98.844		Time WL Surveyed: 10:37	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S10A-03	1.126	101.262		100.136		
Water Level:			2.416	98.846		Time WL Surveyed: 11:10	
Water Level:			2.406	98.843		Time WL Surveyed: 11:11	
BM:	S10A-03	1.113	101.249		100.136		

**WL Survey Summary**

	Before	After
Average WL:	98.843	98.845
Transducer Elevation:	98.425	98.297
Closing Error:	0.000	-
WL Check:	0.003	0.003

**Site Rating Information**

Measured Discharge:	0.0562
Expected Discharge:	0.05
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	-3%

**Field Personnel:**

Field Personnel:	DW, CJ	Trip Date:	13-Sep-13
Data Entry Personnel:	CJ	Date:	13-Sep-13
Data Check Personnel:	CJ	Date:	25-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: October 18, 2013  
 Site Visit Time (MST): 09:55

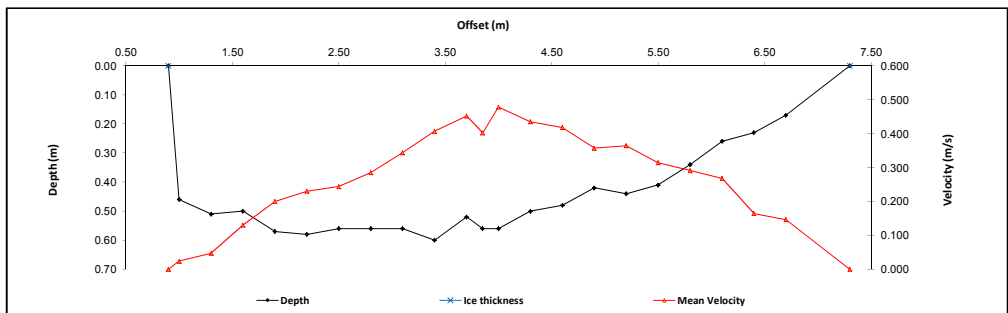


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.00	0.46		0.28	0.024					1.00	0.20	0.46	0.024	0.09	0.002	0%
2	1.30	0.51		0.31	0.047					1.00	0.30	0.51	0.047	0.15	0.007	1%
3	1.60	0.50		0.30	0.130					1.00	0.30	0.50	0.130	0.15	0.020	2%
4	1.90	0.57		0.34	0.200					1.00	0.30	0.57	0.200	0.17	0.034	4%
5	2.20	0.58		0.35	0.230					1.00	0.30	0.58	0.230	0.17	0.040	5%
6	2.50	0.56		0.34	0.244					1.00	0.30	0.56	0.244	0.17	0.041	5%
7	2.80	0.56		0.34	0.285					1.00	0.30	0.56	0.285	0.17	0.048	6%
8	3.10	0.56		0.34	0.344					1.00	0.30	0.56	0.344	0.17	0.058	7%
9	3.40	0.60		0.36	0.407					1.00	0.30	0.60	0.407	0.18	0.073	9%
10	3.70	0.52		0.31	0.452					1.00	0.23	0.52	0.452	0.12	0.053	7%
11	3.85	0.56		0.34	0.402					1.00	0.15	0.56	0.402	0.08	0.034	4%
12	4.00	0.56		0.34	0.478					1.00	0.23	0.56	0.478	0.13	0.060	8%
13	4.30	0.50		0.30	0.435					1.00	0.30	0.50	0.435	0.15	0.065	8%
14	4.60	0.48		0.29	0.418					1.00	0.30	0.48	0.418	0.14	0.060	8%
15	4.90	0.42		0.25	0.357					1.00	0.30	0.42	0.357	0.13	0.045	6%
16	5.20	0.44		0.26	0.364					1.00	0.30	0.44	0.364	0.13	0.048	6%
17	5.50	0.41		0.25	0.314					1.00	0.30	0.41	0.314	0.12	0.039	5%
18	5.80	0.34		0.20	0.291					1.00	0.30	0.34	0.291	0.10	0.030	4%
19	6.10	0.26		0.16	0.268					1.00	0.30	0.26	0.268	0.08	0.021	3%
20	6.40	0.23		0.14	0.164					1.00	0.30	0.23	0.164	0.07	0.011	1%
21	6.70	0.17		0.10	0.146					1.00	0.45	0.17	0.146	0.08	0.011	1%
LB	7.30	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.800</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:18
Meas. End Time (MST):	10:41
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 5°C



**Flow characteristics:**

Total Flow:	0.800	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.75	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.863	0.850
Water (°C):	4.2	4.6
Datalogger Clock:	10:04	10:50
Laptop Clock:	10:03	10:50
Battery (Main):	13.4	14.2
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was moved

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S10A-01			1.044	100.236	100.236	3/4" Pipe NW of logger	S10A-02
S10A-02	1.280	101.280		100.000	100.000	3/4" Pipe W of logger	S10A-03
S10A-03			1.144	100.136	100.136	3/4" Pipe N of logger	WL
Ice/PT:							WL
Water Level:			2.123	99.157		Time WL Surveyed: 10:12	S10A-03
Other:							S10A-01
<b>Setup #2</b>							S10A-02
S10A-01			1.031	100.235	100.236	3/4" Pipe NW of logger	
S10A-02			1.266	100.000	100.000	3/4" Pipe W of logger	
S10A-03	1.130	101.266		100.136	100.136	3/4" Pipe N of logger	
Ice/PT:							
Water Level:			2.107	99.159		Time WL Surveyed: 10:14	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S10A-03	1.131	101.267		100.136			
Water Level:			2.109	99.158		Time WL Surveyed: 10:53	
Water Level:			2.093	99.157		Time WL Surveyed: 10:55	
BM: S10A-03	1.114	101.250		100.136			

**WL Survey Summary**

	Before	After
Average WL:	99.158	99.158
Transducer Elevation:	98.295	98.308
Closing Error:	0.000	-
WL Check:	0.002	0.001

**Site Rating Information**

Measured Discharge:	0.8
Expected Discharge:	0.82
Shift from Existing Rating (m <sup>3</sup> /s):	0.02
Shift from Existing Rating (%):	2%

**Field Personnel:**

SM, DW	Trip Date:	18-Oct-13
SM	Date:	18-Oct-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: December 12, 2013  
 Site Visit Time (MST): 14:00

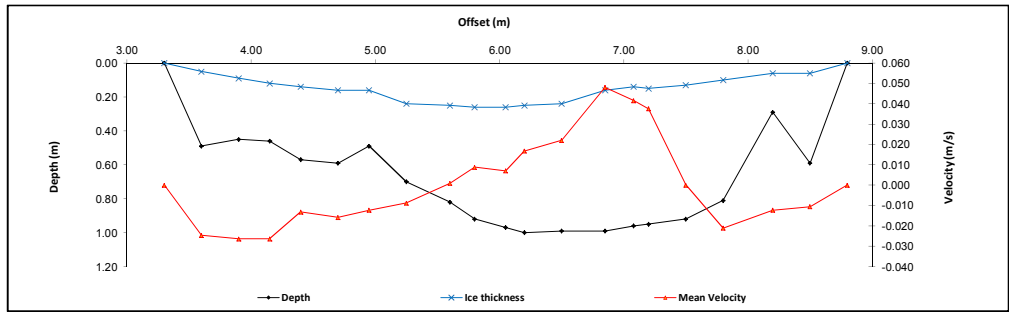


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	3.60	0.49	0.05	0.27	-0.028					0.88	0.30	0.44	-0.025	0.13	-0.003	-26%
2	3.90	0.45	0.09	0.27	-0.030					0.88	0.28	0.36	-0.026	0.10	-0.003	-21%
3	4.15	0.46	0.12	0.29	-0.030					0.88	0.25	0.34	-0.026	0.09	-0.002	-18%
4	4.40	0.57	0.14	0.36	-0.015					0.88	0.28	0.43	-0.013	0.12	-0.002	-12%
5	4.70	0.59	0.16	0.38	-0.018					0.88	0.27	0.43	-0.016	0.12	-0.002	-15%
6	4.95	0.49	0.16	0.33	-0.014					0.88	0.27	0.33	-0.012	0.09	-0.001	-9%
7	5.25	0.70	0.24	0.47	-0.010					0.88	0.33	0.46	-0.009	0.15	-0.001	-11%
8	5.60	0.82	0.25	0.54	0.001					0.88	0.27	0.57	0.001	0.16	0.000	1%
9	5.80	0.92	0.26	0.59	0.010					0.88	0.23	0.66	0.009	0.15	0.001	10%
10	6.05	0.97	0.26	0.62	0.008					0.88	0.20	0.71	0.007	0.14	0.001	8%
11	6.20	1.00	0.25	0.63	0.019					0.88	0.23	0.75	0.017	0.17	0.003	23%
12	6.50	0.99	0.24	0.62	0.025					0.88	0.33	0.75	0.022	0.24	0.005	43%
13	6.85	0.99	0.16			0.82	0.006	0.33	0.090	1.00	0.29	0.83	0.048	0.24	0.012	92%
14	7.08	0.96	0.14			0.80	0.006	0.30	0.077	1.00	0.18	0.82	0.042	0.14	0.006	48%
15	7.20	0.95	0.15			0.79	-0.001	0.31	0.076	1.00	0.21	0.80	0.038	0.17	0.006	50%
16	7.50	0.92	0.13			0.76	-0.005	0.29	0.005	1.00	0.30	0.79	0.000	0.24	0.000	0%
17	7.80	0.81	0.10	0.46	-0.024					1.00	0.35	0.71	-0.021	0.25	-0.005	-42%
18	8.20	0.29	0.06	0.18	-0.014					0.88	0.35	0.23	-0.012	0.08	-0.001	-5%
19	8.50	0.59	0.06	0.33	-0.012					0.88	0.30	0.53	-0.011	0.16	-0.002	-13%
LB	8.80	0.00	0.00		0.00		0.00		0.00	0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.013</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	ADV
Method:	Ice
River Condition:	See notes
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	-



**Flow characteristics:**

Total Flow:	0.013	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.93	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.90	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.509	-
Water (°C):	0.0	-
Datalogger Clock:	14:08	-
Laptop Clock:	14:07	-
Battery (Main):	13.6	-
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- 24 hr data is only outputting data on days when it is manually downloaded

**General Notes:**

- Channelled flow and ice is frozen to depth in some areas resulting in a very poor flow measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S10A-01			1.145	100.237	100.236	3/4" Pipe NW of logger	S10A-02
S10A-02	1.382	101.382		100.000	100.000	3/4" Pipe W of logger	S10A-03
S10A-03			1.245	100.137	100.136	3/4" Pipe N of logger	Ice
Ice/PT:			2.536	98.846			WL
Water Level:			2.572	98.810		Time WL Surveyed:	WL
Other:							Ice
<b>Setup #2</b>							
S10A-01			1.113	100.238	100.236	3/4" Pipe NW of logger	S10A-03
S10A-02			1.349	100.002	100.000	3/4" Pipe W of logger	S10A-02
S10A-03	1.214	101.351		100.137	100.136	3/4" Pipe N of logger	
Ice/PT:			2.504	98.847			
Water Level:			2.537	98.814		Time WL Surveyed:	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.137		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.137		Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.812	-
Transducer Elevation:	98.303	-
Closing Error:	-0.002	-
WL Check:	0.004	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Data Entry Personnel:	DB, TR	Trip Date:	12-Dec-13
Data Check Personnel:	DW	Date:	28-Mar-14
Entered Digitally in the Field:	CJ	Date:	28-Mar-14
	No		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

January 7, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.70	0.00	0.00	0.000	0.000	0.000	1.0	4.70	4.83	0.13	0.07	0.000	0.000	0.01	0.000	0%
1	4.95	0.30	0.01	0.000			1.0	4.83	5.10	0.27	0.29	0.000	0.000	0.08	0.000	0%
2	5.25	0.29	0.18	0.266			0.9	5.10	5.38	0.28	0.11	0.266	0.239	0.03	0.007	2%
3	5.50	0.38	0.19	0.112			0.9	5.38	5.65	0.28	0.19	0.112	0.101	0.05	0.005	2%
4	5.80	0.37	0.15	0.249			0.9	5.65	5.95	0.30	0.22	0.249	0.224	0.07	0.015	4%
5	6.10	0.23	0.05	0.363			0.9	5.95	6.28	0.33	0.18	0.363	0.327	0.06	0.019	5%
6	6.45	0.18		0.324			0.9	6.28	6.58	0.30	0.18	0.324	0.292	0.05	0.016	4%
7	6.70	0.18		0.686			0.9	6.58	6.80	0.23	0.18	0.686	0.617	0.04	0.025	7%
8	6.90	0.20		0.766			0.9	6.80	6.95	0.15	0.20	0.766	0.689	0.03	0.021	6%
9	7.00	0.19		0.778			0.9	6.95	7.15	0.20	0.19	0.778	0.700	0.04	0.027	8%
10	7.30	0.20	0.01	0.588			0.9	7.15	7.45	0.30	0.19	0.588	0.529	0.06	0.030	9%
11	7.60	0.20		0.570			0.9	7.45	7.75	0.30	0.20	0.570	0.513	0.06	0.031	9%
12	7.90	0.32		0.362			0.9	7.75	7.95	0.20	0.32	0.362	0.326	0.06	0.021	6%
13	8.00	0.22		0.504			0.9	7.95	8.08	0.12	0.22	0.504	0.454	0.03	0.012	4%
14	8.15	0.33		0.474			0.9	8.08	8.28	0.20	0.33	0.474	0.427	0.07	0.028	8%
15	8.40	0.30		0.376			0.9	8.28	8.58	0.30	0.30	0.376	0.338	0.09	0.030	9%
16	8.75	0.20	0.05	0.172			0.9	8.58	8.88	0.30	0.15	0.172	0.155	0.05	0.007	2%
17	9.00	0.37	0.25	0.483			0.9	8.88	9.15	0.28	0.12	0.483	0.435	0.03	0.014	4%
18	9.30	0.43	0.25	0.514			0.9	9.15	9.45	0.30	0.18	0.514	0.463	0.05	0.025	7%
19	9.60	0.42	0.27	0.433			0.9	9.45	9.75	0.30	0.15	0.433	0.390	0.05	0.018	5%
20	9.90	0.27	0.28	0.189			0.9	9.75	9.95	0.20	-0.01	0.189	0.170	0.00	0.000	0%
RB	10.00	0.00	0.00	0.00	0.00	0.00	1.0	9.95	10.00	0.05	0.00	0.047	0.047	0.00	0.000	0%
<b>Total Flow</b>															<b>0.351</b>	

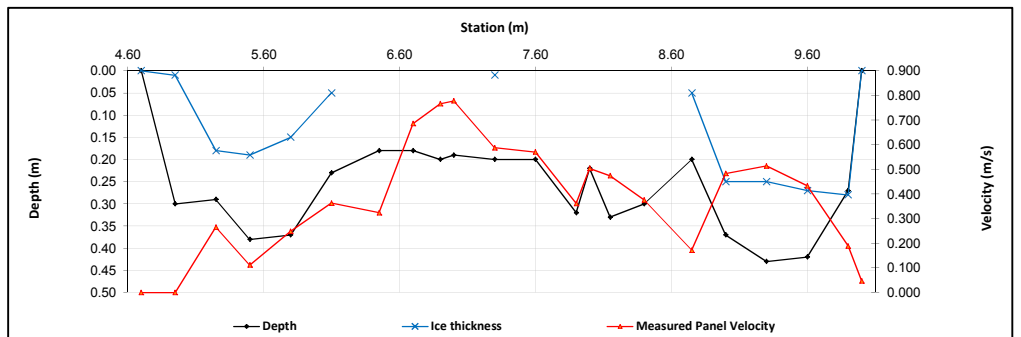
Measurement Details:	
Start Time (MST):	8:30
End Time (MST):	9:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -7°C

Flow characteristics:		
Total Flow:	0.351	(m <sup>3</sup> /s)
Perceived Measurement Quality:	0.351	
Cross Section Area:	1.00	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.188	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
	0.416	-
Water (°C):	0.0	-
Battery (Main):	12.2	12.88
Datalogger Clock:	8:36	-
Laptop Clock:	8:36	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
-	Replaced batteries

General Notes:	
-	Cross flow apparent in channel
-	Ice was above water level in parts of the channel



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S11-01			1.033	242.065	242.081	ASCN Pin
S11-04			0.766	242.332	242.244	3/4" Pipe near ASCN
S11-05	0.886	243.098		242.212	242.212	3/4" Pipe 20 m E of ASCN
Ice/PT:			1.745	241.353		
Water Level:			2.117	240.981		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
S11-01	1.016	243.081		242.065	242.081	ASCN Pin
S11-04			0.749	242.332	242.244	3/4" Pipe near ASCN
S11-05			0.869	242.212	242.212	3/4" Pipe 20 m E of ASCN
Ice/PT:			1.728	241.353		
Water Level:			2.104	240.977		
Other:						Rebar with Orange Flagging

Closing Error	0.000
WL Check	0.004

Average WL	240.979
Transducer Elevation Before	240.583
Transducer Elevation After	-

Field Personnel:	SM, DW, JG	Trip Date:	7-Jan-13
Data Entry Personnel:	SM	Date:	7-Jan-13
Data Check Personnel:	TR	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

February 8, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	6.00	0.00	0.00	0.000	0.000	0.000	0.9	6.00	6.25	0.25	0.04	0.001	0.001	0.01	0.000	0%
1	6.50	0.37	0.23	0.003			0.9	6.25	6.60	0.35	0.14	0.003	0.003	0.05	0.000	0%
2	6.70	0.36	0.21	0.003			0.9	6.60	6.85	0.25	0.15	0.003	0.003	0.04	0.000	0%
3	7.00	0.37	0.24	0.304			0.9	6.85	7.18	0.33	0.13	0.304	0.274	0.04	0.012	4%
4	7.35	0.38	0.21	0.390			0.9	7.18	7.50	0.33	0.17	0.390	0.351	0.06	0.019	7%
5	7.65	0.38		0.393			0.9	7.50	7.70	0.20	0.38	0.393	0.354	0.08	0.027	10%
6	7.75	0.38		0.321			0.9	7.70	7.85	0.15	0.38	0.321	0.289	0.06	0.016	6%
7	7.95	0.32		0.305			0.9	7.85	8.10	0.25	0.32	0.305	0.275	0.08	0.022	8%
8	8.25	0.30		0.363			0.9	8.10	8.38	0.28	0.30	0.363	0.327	0.08	0.027	10%
9	8.50	0.27		0.417			0.9	8.38	8.60	0.23	0.27	0.417	0.375	0.06	0.023	9%
10	8.70	0.26		0.432			0.9	8.60	8.78	0.17	0.26	0.432	0.389	0.05	0.018	7%
11	8.85	0.20		0.475			0.9	8.78	8.93	0.15	0.20	0.475	0.428	0.03	0.013	5%
12	9.00	0.26		0.482			0.9	8.93	9.05	0.13	0.26	0.482	0.434	0.03	0.014	5%
13	9.10	0.27		0.490			0.9	9.05	9.20	0.15	0.27	0.490	0.441	0.04	0.018	7%
14	9.30	0.25		0.442			0.9	9.20	9.40	0.20	0.25	0.442	0.398	0.05	0.020	7%
15	9.50	0.19		0.402			0.9	9.40	9.60	0.20	0.19	0.402	0.362	0.04	0.014	5%
16	9.70	0.21		0.386			0.9	9.60	9.75	0.15	0.21	0.386	0.347	0.03	0.011	4%
17	9.80	0.17		0.273			0.9	9.75	9.90	0.15	0.17	0.273	0.246	0.03	0.006	2%
18	10.00	0.20		0.232			0.9	9.90	10.10	0.20	0.20	0.232	0.209	0.04	0.008	3%
19	10.20	0.18		0.003			0.9	10.10	10.40	0.30	0.18	0.003	0.003	0.05	0.000	0%
LB	10.60	0.00	0.00	0.00	0.00	0.00	1.0	10.40	10.60	0.20	0.05	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>															<b>0.268</b>	

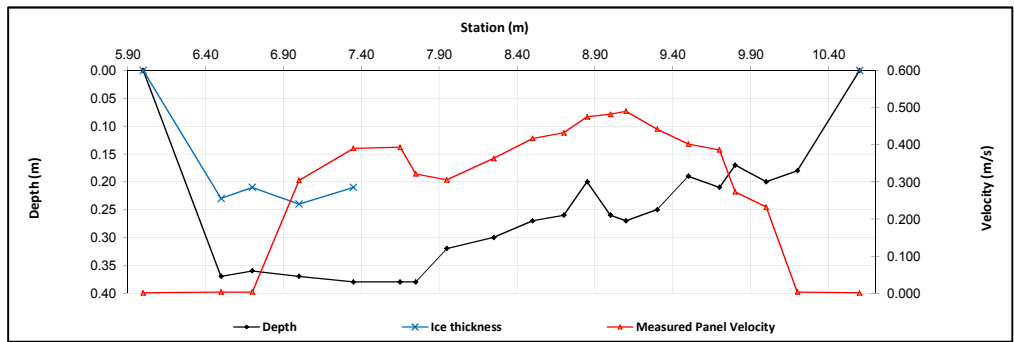
Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	10:03
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -8°C

Flow characteristics:		
Total Flow:	0.268	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.95	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.206	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	0.257	-
Water (°C):	0.1	-
Battery (Main):	12.5	-
Datalogger Clock:	9:08	-
Laptop Clock:	9:08	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Water level below bottom of ice

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S11-01			1.252	242.119	242.081	ASCM Pin
S11-04			1.116	242.255	242.244	3/4" Pipe near ASCM
S11-05	1.159	243.371		242.212	242.212	3/4" Pipe 20 m E of ASCM
Ice/PT:			1.947	241.424		
Water Level:			2.512	240.859		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
S11-01			1.240	242.118	242.081	ASCM Pin
S11-04	1.103	243.358		242.255	242.244	3/4" Pipe near ASCM
S11-05			1.145	242.213	242.212	3/4" Pipe 20 m E of ASCM
Ice/PT:			1.934	241.424		
Water Level:			2.501	240.857		
Other:						Rebar with Orange Flagging

Closing Error	-0.001	Average WL	240.858
WL Check	0.002	Transducer Elevation Before	240.601
		Transducer Elevation After	-

Field Personnel:	SM, TR, JG, HH	Trip Date:	8-Feb-13
Data Entry Personnel:	SM	Date:	8-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

March 4, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.60	0.00	0.00	0.000	0.000	0.000	0.9	4.60	4.75	0.15	0.06	0.049	0.044	0.01	0.000	0%
1	4.90	0.22		0.196			0.9	4.75	5.00	0.25	0.22	0.196	0.176	0.06	0.010	4%
2	5.10	0.37		0.245			0.9	5.00	5.15	0.15	0.37	0.245	0.221	0.06	0.012	5%
3	5.20	0.38		0.337			0.9	5.15	5.28	0.13	0.38	0.337	0.303	0.05	0.014	5%
4	5.35	0.39		0.371			0.9	5.28	5.40	0.13	0.39	0.371	0.334	0.05	0.016	6%
5	5.45	0.40		0.326			0.9	5.40	5.53	0.13	0.40	0.326	0.293	0.05	0.015	6%
6	5.60	0.38		0.254			0.9	5.53	5.68	0.15	0.38	0.254	0.229	0.06	0.013	5%
7	5.75	0.30		0.173			0.9	5.68	5.83	0.15	0.30	0.173	0.156	0.05	0.007	3%
8	5.90	0.39		0.168			0.9	5.83	6.00	0.18	0.39	0.168	0.151	0.07	0.010	4%
9	6.10	0.38		0.193			0.9	6.00	6.25	0.25	0.38	0.193	0.174	0.10	0.017	6%
10	6.40	0.36		0.222			0.9	6.25	6.55	0.30	0.36	0.222	0.200	0.11	0.022	8%
11	6.70	0.29		0.278			0.9	6.55	6.78	0.23	0.29	0.278	0.250	0.07	0.016	6%
12	6.85	0.29		0.320			0.9	6.78	6.95	0.17	0.29	0.320	0.288	0.05	0.015	6%
13	7.05	0.28		0.354			0.9	6.95	7.13	0.18	0.28	0.354	0.319	0.05	0.016	6%
14	7.20	0.21		0.355			0.9	7.13	7.28	0.15	0.21	0.355	0.320	0.03	0.010	4%
15	7.35	0.28		0.356			0.9	7.28	7.43	0.15	0.28	0.356	0.320	0.04	0.013	5%
16	7.50	0.22		0.324			0.9	7.43	7.55	0.13	0.22	0.324	0.292	0.03	0.008	3%
17	7.60	0.28		0.328			0.9	7.55	7.83	0.28	0.28	0.328	0.295	0.08	0.023	9%
18	8.05	0.19		0.282			0.9	7.83	8.20	0.37	0.19	0.282	0.254	0.07	0.018	7%
19	8.35	0.15		0.124			0.9	8.20	8.50	0.30	0.15	0.124	0.112	0.05	0.005	2%
20	8.65	0.18		0.059			0.9	8.50	8.83	0.32	0.18	0.059	0.053	0.06	0.003	1%
LB	9.00	0.00	0.00	0.00	0.00	0.00	1.0	8.83	9.00	0.18	0.05	0.015	0.015	0.01	0.000	0%
<b>Total Flow</b>														<b>0.263</b>		

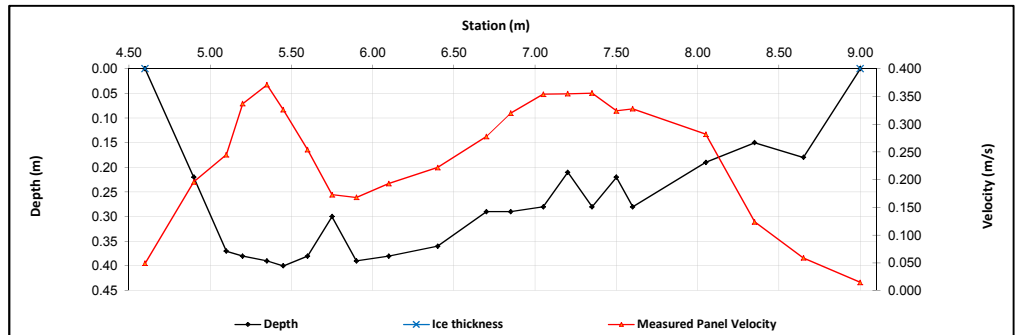
Measurement Details:	
Start Time (MST):	8:10
End Time (MST):	9:01
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -8°C

Flow Characteristics:		
Total Flow:	0.263	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.16	(m <sup>2</sup> )
Wetted Width:	4.40	(m)
Hydraulic Depth:	0.265	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	0.229	-
Water (°C):	0.1	-
Battery (Main):	12.7	13.0
Datalogger Clock:	8:15	-
Laptop Clock:	8:15	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Replaced batteries

General Notes:	
-	Air space between water surface and ice across entire channel



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S11-01			1.372	242.120	242.081	ASCN Pin
S11-04			1.237	242.255	242.244	3/4" Pipe near ASCN
S11-05	1.280	243.492		242.212	242.212	3/4" Pipe 20 m E of ASCN
Ice/PT:			2.127	241.365		
Water Level:			2.672	240.820		
Other:						
<b>Setup #2</b>						
S11-01			1.360	242.121	242.081	ASCN Pin
S11-04				242.255	242.244	3/4" Pipe near ASCN
S11-05	1.226	243.481		242.213	242.212	3/4" Pipe 20 m E of ASCN
Ice/PT:			2.116	241.365		
Water Level:			2.660	240.821		
Other:						

Closing Error	-0.001
WL Check	0.001

Average WL	240.821
Transducer Elevation Before	240.592
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	4-Mar-13
Data Entry Personnel:	SM	Date:	4-Mar-13
Data Check Personnel:	TR	Date:	14-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

April 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB		0.00	0.00	0.000	0.000	0.000	1.0									
1							1.0									
2							1.0									
3							1.0									
4							1.0									
5							1.0									
6							1.0									
7							1.0									
8							1.0									
9							1.0									
10							1.0									
11							1.0									
12							1.0									
13							1.0									
14							1.0									
15							1.0									
16							1.0									
17							1.0									
18							1.0									
19							1.0									
20							1.0									
21							1.0									
22							1.0									
23							1.0									
24							1.0									
25							1.0									
26							1.0									
27							1.0									
28							1.0									
29							1.0									
30							1.0									
LB		0.00	0.00	0.00	0.00	0.00	1.0									
<b>Total Flow</b>																

No Flow Measurement Conducted

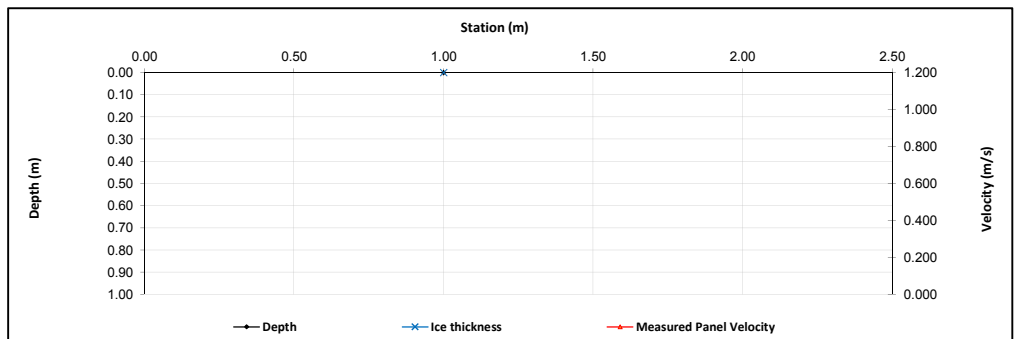
Measurement Details:	
Start Time (MST):	7:00
End Time (MST):	7:25
Equipment:	-
Method:	-
River Condition:	Mostly open
Quality/Error (see reverse):	-
Weather:	Clear, calm, -10°C

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	#VALUE! (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:	Before	After
Transducer Reading (m):	0.170	-
Water (°C):	0.3	-
Battery (Main):	12.8	12.83
Datalogger Clock:	7:02	-
Laptop Clock:	7:02	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:
- Changed batteries

General Notes:
- No flow measurement conducted.
- Open water and ice cover was unstable



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S11-01			1.388	242.126	242.081	ASCN Pin
S11-04			1.268	242.246	242.244	3/4" Pipe near ASCM
S11-05	1.302	243.514		242.212	242.212	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			2.673	240.841		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
S11-01			1.363	242.126	242.081	ASCN Pin
S11-04	1.243	243.489		242.246	242.244	3/4" Pipe near ASCM
S11-05			1.276	242.213	242.212	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			2.653	240.836		
Other:						Rebar with Orange Flagging
Closing Error	-0.001					Average WL 240.839
WL Check	0.005					Transducer Elevation Before 240.668
						Transducer Elevation After -

Field Personnel:	SM, CJ	Trip Date:	1-Apr-13
Data Entry Personnel:	SM	Date:	1-Apr-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: April 29, 2013  
 Site Visit Time (MST): 07:28

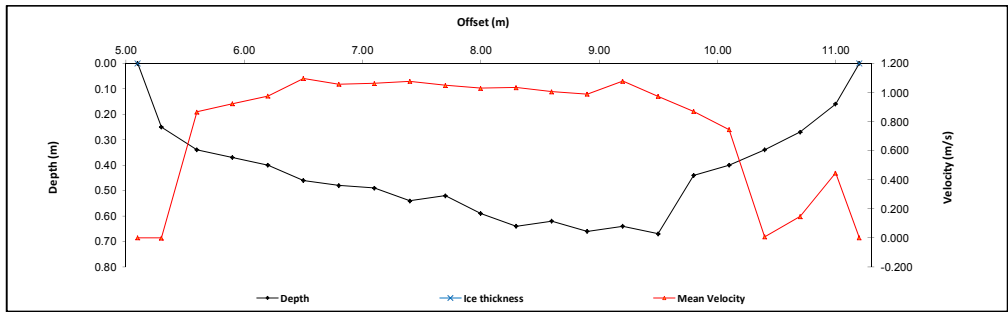


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.10	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	5.30	0.25		0.15	-0.001					1.00	0.25	0.25	-0.001	0.06	0.000	0%
2	5.60	0.34		0.20	0.866					1.00	0.30	0.34	0.866	0.10	0.088	4%
3	5.90	0.37		0.22	0.922					1.00	0.30	0.37	0.922	0.11	0.102	4%
4	6.20	0.40		0.24	0.975					1.00	0.30	0.40	0.975	0.12	0.117	5%
5	6.50	0.46		0.28	1.096					1.00	0.30	0.46	1.096	0.14	0.151	6%
6	6.80	0.48		0.29	1.057					1.00	0.30	0.48	1.057	0.14	0.152	6%
7	7.10	0.49		0.29	1.062					1.00	0.30	0.49	1.062	0.15	0.156	6%
8	7.40	0.54		0.32	1.077					1.00	0.30	0.54	1.077	0.16	0.174	7%
9	7.70	0.52		0.31	1.049					1.00	0.30	0.52	1.049	0.16	0.164	7%
10	8.00	0.59		0.35	1.029					1.00	0.30	0.59	1.029	0.18	0.182	7%
11	8.30	0.64		0.38	1.034					1.00	0.30	0.64	1.034	0.19	0.199	8%
12	8.60	0.62		0.37	1.005					1.00	0.30	0.62	1.005	0.19	0.187	7%
13	8.90	0.66		0.40	0.988					1.00	0.30	0.66	0.988	0.20	0.196	8%
14	9.20	0.64		0.38	1.078					1.00	0.30	0.64	1.078	0.19	0.207	8%
15	9.50	0.67		0.40	0.973					1.00	0.30	0.67	0.973	0.20	0.196	8%
16	9.90	0.44		0.26	0.869					1.00	0.30	0.44	0.869	0.13	0.115	5%
17	10.10	0.40		0.24	0.744					1.00	0.30	0.40	0.744	0.12	0.089	4%
18	10.40	0.34		0.20	0.007					1.00	0.30	0.34	0.007	0.10	0.001	0%
19	10.70	0.27		0.16	0.147					1.00	0.30	0.27	0.147	0.08	0.012	0%
20	11.00	0.16		0.10	0.446					1.00	0.25	0.16	0.446	0.04	0.018	1%
RB	11.20	0.00	0.00		0.00	0.00	0.00			1.00	0.10	0.00	0.000	0.000	0.000	100%
<b>Total Flow</b>														<b>2.51</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from logger

Meas. Start Time (MST):	7:55
Meas. End Time (MST):	8:18
Equipment:	ADV
Method:	Wading
River Condition:	High flow, ice along right bank
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	overcast, calm, -5°C



**Flow characteristics:**

Total Flow:	2.51	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.76	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.91	(m/s)
Froude Number:	0.43	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.510	0.505
Water (°C):	1.4	1.4
Datalogger Clock:	07:32	08:31
Laptop Clock:	07:32	08:31
Battery (Main):	12.6	12.7
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed new modem

**General Notes:**

- Cobbles in channel, ice and vegetation along RB

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S11-01			1.212	242.125	242.081	ASCM Pin	S11-05
S11-04			1.083	242.254	242.244	3/4" Pipe near ASCM	S11-04
S11-05	1.125	243.337		242.212	242.212	3/4" Pipe 20 m E of ASCM	S11-01
Ice/PT:							WL
Water Level:			2.186	241.151		Time WL Surveyed: 7:46	S11-01
Other:						Rebar with Orange Flagging	S11-04
<b>Setup #2</b>							
S11-01	1.200	243.325		242.125	242.081	ASCM Pin	
S11-04			1.070	242.255	242.244	3/4" Pipe near ASCM	
S11-05			1.113	242.212	242.212	3/4" Pipe 20 m E of ASCM	
Ice/PT:							
Water Level:			2.171	241.154		Time WL Surveyed: 7:48	
Other:						Rebar with Orange Flagging	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-04	1.071	243.325	242.254			BM2
Water Level:			2.172	241.153		Time WL Surveyed: 8:22	
Water Level:			2.160	241.151		Time WL Surveyed: 8:23	
BM:	S11-04	1.057	243.311	242.254			

**WL Survey Summary**

	Before	After
Average WL:	241.153	241.152
Transducer Elevation:	240.643	240.647
Closing Error:	0.000	-
WL Check:	0.003	0.002

**Site Rating Information**

Measured Discharge:	2.51
Expected Discharge:	3.11
Shift from Existing Rating (m <sup>3</sup> /s):	0.60
Shift from Existing Rating (%):	24%

**Field Personnel:**

SM & TR	Trip Date:	29-Apr-13
SM	Date:	29-Apr-13
TR	Date:	31-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: June 5, 2013  
 Site Visit Time (MST): 07:20

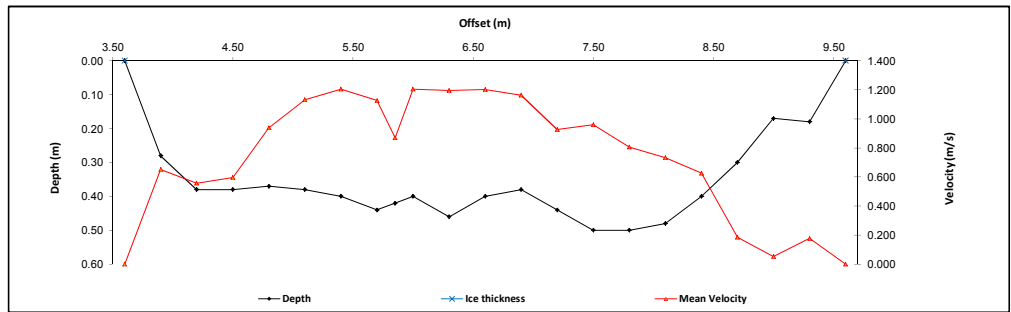


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.60	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.90	0.28		0.17	0.652					1.00	0.30	0.28	0.652	0.08	0.055	3%
2	4.20	0.38		0.23	0.558					1.00	0.30	0.38	0.558	0.11	0.064	3%
3	4.50	0.38		0.23	0.597					1.00	0.30	0.38	0.597	0.11	0.068	4%
4	4.80	0.37		0.22	0.938					1.00	0.30	0.37	0.938	0.11	0.104	6%
5	5.10	0.38		0.23	1.132					1.00	0.30	0.38	1.132	0.11	0.129	7%
6	5.40	0.40		0.24	1.204					1.00	0.30	0.40	1.204	0.12	0.144	8%
7	5.70	0.44		0.26	1.126					1.00	0.23	0.44	1.126	0.10	0.111	6%
8	5.85	0.42		0.25	0.870					1.00	0.15	0.42	0.870	0.06	0.055	3%
9	6.00	0.40		0.24	1.205					1.00	0.23	0.40	1.205	0.09	0.108	6%
10	6.30	0.46		0.28	1.196					1.00	0.30	0.46	1.196	0.14	0.165	9%
11	6.60	0.40		0.24	1.202					1.00	0.30	0.40	1.202	0.12	0.144	8%
12	6.90	0.38		0.23	1.163					1.00	0.30	0.38	1.163	0.11	0.133	7%
13	7.20	0.44		0.26	0.927					1.00	0.30	0.44	0.927	0.13	0.122	7%
14	7.50	0.50		0.30	0.960					1.00	0.30	0.50	0.960	0.15	0.144	8%
15	7.80	0.50		0.30	0.806					1.00	0.30	0.50	0.806	0.15	0.121	6%
16	8.10	0.48		0.29	0.733					1.00	0.30	0.48	0.733	0.14	0.106	5%
17	8.40	0.40		0.24	0.627					1.00	0.30	0.40	0.627	0.12	0.075	4%
18	8.70	0.30		0.18	0.186					1.00	0.30	0.30	0.186	0.09	0.017	1%
19	9.00	0.17		0.10	0.053					1.00	0.30	0.17	0.053	0.05	0.003	0%
20	9.30	0.18		0.11	0.178					1.00	0.30	0.18	0.178	0.05	0.010	1%
RB	9.60	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.88</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:17
Meas. End Time (MST):	8:40
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	1.88	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.17	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.87	(m/s)
Froude Number:	0.46	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.403	0.406
Water (°C):	18.1	18.1
Datalogger Clock:	07:22	08:47
Laptop Clock:	07:22	08:47
Battery (Main):	12.4	12.7
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced batteries

**General Notes:**

- Vegetation in channel along RB

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S11-01			1.299	242.103	242.081	ASCN Pin	S11-01
S11-04			1.146	242.256	242.244	3/4" Pipe near ASCN	S11-04
S11-05	1.190	243.402		242.212	242.212	3/4" Pipe 20 m E of ASCN	WL
Ice/PT:							WL
Water Level:			2.382	241.020		Time WL Surveyed: 8:08	S11-05
Other:						Rebar with Orange Flagging	S11-04
<b>Setup #2</b>							S11-01
S11-01			1.283	242.103	242.081	ASCN Pin	
S11-04	1.130	243.386		242.256	242.244	3/4" Pipe near ASCN	
S11-05			1.175	242.211	242.212	3/4" Pipe 20 m E of ASCN	
Ice/PT:							
Water Level:			2.367	241.019		Time WL Surveyed: 8:10	
Other:						Rebar with Orange Flagging	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-05	1.175	243.387	242.212		Time WL Surveyed: 8:43	
Water Level:			2.350	241.037		Time WL Surveyed: 8:44	
Water Level:			2.335	241.037			
BM:	S11-05	1.160	243.372	242.212			

**WL Survey Summary**

	Before	After
Average WL:	241.020	241.037
Transducer Elevation:	240.617	240.632
Closing Error:	0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	1.88
Expected Discharge:	1.55
Shift from Existing Rating (m <sup>3</sup> /s):	-0.33
Shift from Existing Rating (%):	-17%

**Field Personnel:**

SM, CJ	Trip Date:	5-Jun-13
CJ	Date:	5-Jun-13
TR	Date:	17-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

August 7, 2013

Site Visit Time (MST):

17:02



## Flow Measurement:

Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.20	0.18		0.11	0.048					1.00	0.35	0.18	0.048	0.06	0.003	0%
2	1.60	0.42		0.25	0.283					1.00	0.35	0.42	0.283	0.15	0.042	1%
3	1.90	0.50		0.30	0.441					1.00	0.30	0.50	0.441	0.15	0.066	2%
4	2.20	0.50		0.30	0.822					1.00	0.30	0.50	0.822	0.15	0.123	4%
5	2.50	0.61		0.37	0.923					1.00	0.30	0.61	0.923	0.18	0.169	5%
6	2.80	0.70		0.42	1.138					1.00	0.30	0.70	1.138	0.21	0.239	7%
7	3.10	0.67		0.40	1.211					1.00	0.30	0.67	1.211	0.20	0.243	8%
8	3.40	0.66		0.40	1.178					1.00	0.35	0.66	1.178	0.23	0.272	9%
9	3.80	0.72		0.43	0.774					1.00	0.35	0.72	0.774	0.25	0.195	6%
10	4.10	0.72		0.43	0.688					1.00	0.30	0.72	0.688	0.22	0.149	5%
11	4.40	0.80			0.693	0.64		0.16		1.00	0.30	0.80	0.693	0.24	0.166	5%
12	4.70	0.77			0.800	0.62		0.15		1.00	0.30	0.77	0.800	0.23	0.185	6%
13	5.00	0.77			0.550	0.62		0.15		1.00	0.30	0.77	0.550	0.23	0.127	4%
14	5.30	0.72		0.43	0.851					1.00	0.30	0.72	0.851	0.22	0.184	6%
15	5.60	0.72		0.43	0.693					1.00	0.35	0.72	0.693	0.25	0.175	5%
16	6.00	0.61		0.37	0.790					1.00	0.45	0.61	0.790	0.27	0.217	7%
17	6.50	0.52		0.31	0.638					1.00	0.50	0.52	0.638	0.26	0.166	5%
18	7.00	0.59		0.35	0.487					1.00	0.75	0.59	0.487	0.44	0.215	7%
19	8.00	0.56		0.34	0.317					1.00	1.00	0.56	0.317	0.56	0.178	6%
20	9.00	0.48		0.29	0.139					1.00	1.10	0.48	0.139	0.53	0.073	2%
LB	10.20	0.00	0.00		0.00		0.00		0.00	1.00	0.60	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.19</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
Across from station

Meas. Start Time (MST):	17:40
Meas. End Time (MST):	18:05
Equipment:	ADV
Method:	Wading
River Condition:	fast
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P. cloudy, calm, 19°C

## Flow characteristics:

Total Flow:	3.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.04	(m <sup>2</sup> )
Wetted Width:	9.30	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.63	(m/s)
Froude Number:	0.27	

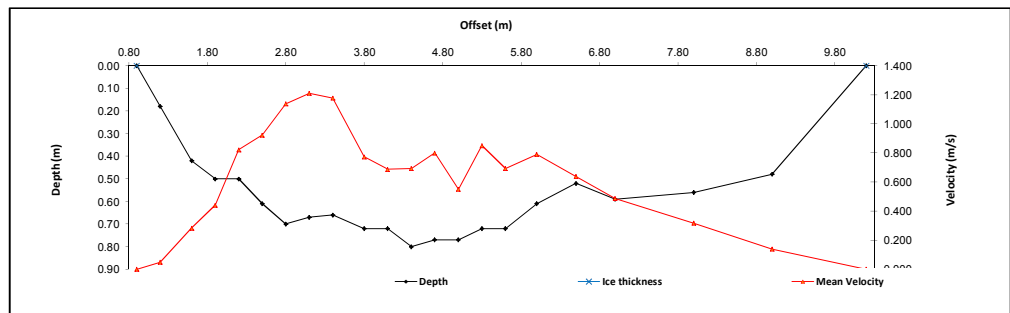
## Logger Details:

	Before	After
Transducer Reading (m):	0.049	0.045
Water (°C):	19.1	19.4
Datalogger Clock:	17:05	18:17
Laptop Clock:	17:05	18:17
Battery (Main):	12.2	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger Station Notes:

- Morphology of channel has changed dramatically

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S11-01
S11-01			1.276	242.100	242.081	ASCN Pin	S11-04
S11-04			1.152	242.224	242.244	3/4" Pipe near ASCN	S11-05
S11-05	1.164	243.376		242.212	242.212	3/4" Pipe 20 m East of ASCN	WL
Ice/PT:							WL
Water Level:			3.132	240.244		Time WL Surveyed: 17:28	S11-05
Other:						Rebar w/ orange flagging	S11-04
<b>Setup #2</b>							S11-01
S11-01			1.241	242.101	242.081	ASCN Pin	
S11-04	1.118	243.342		242.224	242.244	3/4" Pipe near ASCN	
S11-05			1.128	242.214	242.212	3/4" Pipe 20 m East of ASCN	
Ice/PT:							
Water Level:			3.101	240.241		Time WL Surveyed: 17:30	
Other:						Rebar w/ orange flagging	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-01	1.242	243.342		242.100		
Water Level:			3.105	240.237		Time WL Surveyed: 18:09	
Water Level:			3.078	240.235		Time WL Surveyed: 18:11	
BM:	S11-01	1.213	243.313		242.100		

WL Survey Summary	Before	After
Average WL:	240.243	240.236
Transducer Elevation:	240.194	240.191
Closing Error:	-0.002	-
WL Check:	0.003	0.002

## Site Rating Information

Measured Discharge:	3.19
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:	TR & JVR	Trip Date:	7-Aug-13
Data Entry Personnel:	JVR	Date:	7-Aug-13
Data Check Personnel:	TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

September 13, 2013

Site Visit Time (MST):

08:30



## Flow Measurement:

Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.10	0.00	0.00		-0.005		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.30	0.30		0.18	0.046					1.00	0.27	0.30	-0.005	0.08	0.000	0%
2	1.65	0.35		0.21	0.046					1.00	0.35	0.35	0.046	0.12	0.006	5%
3	2.00	0.32		0.19	0.046					1.00	0.35	0.32	0.046	0.11	0.005	5%
4	2.35	0.36		0.22	0.038					1.00	0.35	0.36	0.038	0.13	0.005	5%
5	2.70	0.34		0.20	0.059					1.00	0.35	0.34	0.059	0.12	0.007	7%
6	3.05	0.33		0.20	0.054					1.00	0.35	0.33	0.054	0.12	0.006	6%
7	3.40	0.32		0.19	0.036					1.00	0.35	0.32	0.036	0.11	0.004	4%
8	3.75	0.32		0.19	0.056					1.00	0.35	0.32	0.056	0.11	0.006	6%
9	4.10	0.33		0.20	0.062					1.00	0.35	0.33	0.062	0.12	0.007	7%
10	4.45	0.32		0.19	0.033					1.00	0.35	0.32	0.033	0.11	0.004	4%
11	4.80	0.36		0.22	0.015					1.00	0.35	0.36	0.015	0.13	0.002	2%
12	5.15	0.40		0.24	0.041					1.00	0.35	0.40	0.041	0.14	0.006	6%
13	5.50	0.41		0.25	0.061					1.00	0.35	0.41	0.061	0.14	0.009	8%
14	5.85	0.36		0.22	0.057					1.00	0.35	0.36	0.057	0.13	0.007	7%
15	6.20	0.41		0.25	0.057					1.00	0.35	0.41	0.057	0.14	0.008	8%
16	6.55	0.38		0.23	0.044					1.00	0.35	0.38	0.044	0.13	0.006	6%
17	6.90	0.31		0.19	0.032					1.00	0.35	0.31	0.032	0.11	0.003	3%
18	7.25	0.42		0.25	0.026					1.00	0.35	0.42	0.026	0.15	0.004	4%
19	7.60	0.38		0.23	0.037					1.00	0.35	0.38	0.037	0.13	0.005	5%
20	7.95	0.36		0.22	0.020					1.00	0.35	0.36	0.020	0.13	0.003	2%
21	8.30	0.22		0.13	0.018					1.00	0.32	0.22	0.018	0.07	0.001	1%
RB	8.60	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.103</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
10m DS of new station

Meas. Start Time (MST):	9:40
Meas. End Time (MST):	9:58
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15°C

## Flow characteristics:

Total Flow:	0.103	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.53	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

## Logger Details:

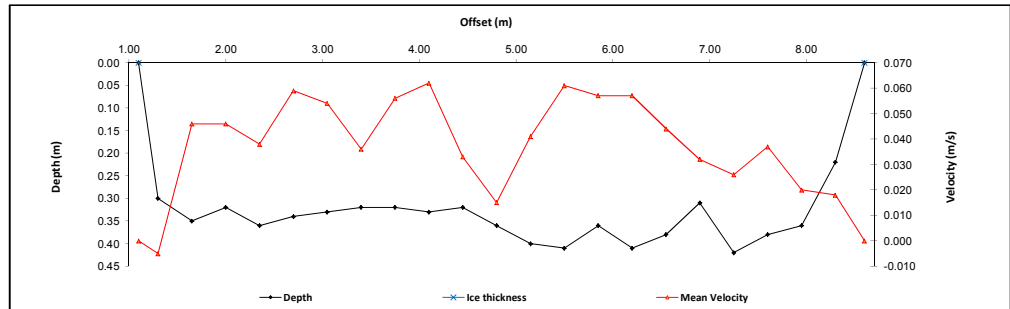
	Before	After
Transducer Reading (m):	-0.024	0.749
Water (°C):	13.3	12.6
Datalogger Clock:	07:46	12:28
Laptop Clock:	07:46	12:28
Battery (Main):	12.6	12.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent. Tube Dessiccant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- BM 4 was damaged so a replacement was installed (BM6)  
Data logger and enclosure were relocated to mast on right bank

## General Notes:

- Reach in front of new station location is a straight run with cobbles



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S11-01			1.272	242.096	242.081	ASCN Pin	S11-05
S11-05	1.156	243.368		242.212	242.212	3/4" Pipe 7 m W of logger	S11-01
S11-06			0.789	242.579	242.579	3/4" Pipe 3 m E of logger	S11-06
Ice/PT:							WL
Water Level:			3.461	239.907		Time WL Surveyed: 9:23	S11-06
Other:							S11-01
<b>Setup #2</b>							S11-05
S11-01			1.252	242.096	242.081	ASCN Pin	
S11-05			1.136	242.212	242.212	3/4" Pipe 7 m W of logger	
S11-06	0.769	243.348		242.579	242.579	3/4" Pipe 3 m E of logger	
Ice/PT:							
Water Level:			3.445	239.903		Time WL Surveyed: 9:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-06	0.769	243.348		242.579		
Water Level:				3.448	239.900	Time WL Surveyed: 10:02	
Water Level:				3.424	239.904	Time WL Surveyed: 10:04	
BM:	S11-06	0.749	243.328		242.579		

## WL Survey Summary

	Before	After
Average WL:	239.905	239.902
Transducer Elevation:	239.929	239.153
Closing Error:	0.000	-
WL Check:	0.004	-0.004

## Site Rating Information

Measured Discharge:	0.103
Expected Discharge:	0.11
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	5%

## Field Personnel:

SM & TR	Trip Date:	22-Sep-13
SM	Date:	22-Sep-13
TR	Date:	18-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record



Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: October 23, 2013  
 Site Visit Time (MST): 14:40

## Flow Measurement:

Measured Data									Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.00	0.53		0.32	0.202					1.00	0.55	0.53	0.202	0.29	0.059	4%
2	3.50	0.50		0.30	0.243					1.00	0.50	0.50	0.243	0.25	0.061	4%
3	4.00	0.52		0.31	0.234					1.00	0.50	0.52	0.234	0.26	0.061	4%
4	4.50	0.54		0.32	0.231					1.00	0.50	0.54	0.231	0.27	0.062	4%
5	5.00	0.46		0.28	0.254					1.00	0.50	0.46	0.254	0.23	0.058	4%
6	5.50	0.45		0.27	0.339					1.00	0.50	0.45	0.339	0.23	0.076	5%
7	6.00	0.48		0.29	0.317					1.00	0.50	0.48	0.317	0.24	0.076	5%
8	6.50	0.55		0.33	0.462					1.00	0.38	0.55	0.462	0.21	0.095	7%
9	6.75	0.64		0.38	0.518					1.00	0.25	0.64	0.518	0.16	0.083	6%
10	7.00	0.54		0.32	0.546					1.00	0.28	0.54	0.546	0.15	0.081	6%
11	7.30	0.46		0.28	0.498					1.00	0.30	0.46	0.498	0.14	0.069	5%
12	7.60	0.50		0.30	0.542					1.00	0.40	0.50	0.542	0.20	0.108	8%
13	8.10	0.50		0.30	0.479					1.00	0.40	0.50	0.479	0.20	0.096	7%
14	8.40	0.35		0.21	0.252					1.00	0.30	0.35	0.252	0.11	0.026	2%
15	8.70	0.45		0.27	0.605					1.00	0.30	0.45	0.605	0.14	0.082	6%
16	9.00	0.50		0.30	0.521					1.00	0.30	0.50	0.521	0.15	0.078	5%
17	9.30	0.50		0.30	0.565					1.00	0.30	0.50	0.565	0.15	0.085	6%
18	9.60	0.50		0.30	0.380					1.00	0.35	0.50	0.380	0.18	0.067	5%
19	10.00	0.50		0.30	0.258					1.00	0.45	0.50	0.258	0.23	0.058	4%
20	10.50	0.44		0.26	0.150					1.00	0.80	0.44	0.150	0.35	0.053	4%
RB	11.60	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.43</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
10m DS of PT

Meas. Start Time (MST):	15:10
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Wading
River Condition:	Good
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 7°C

## Flow characteristics:

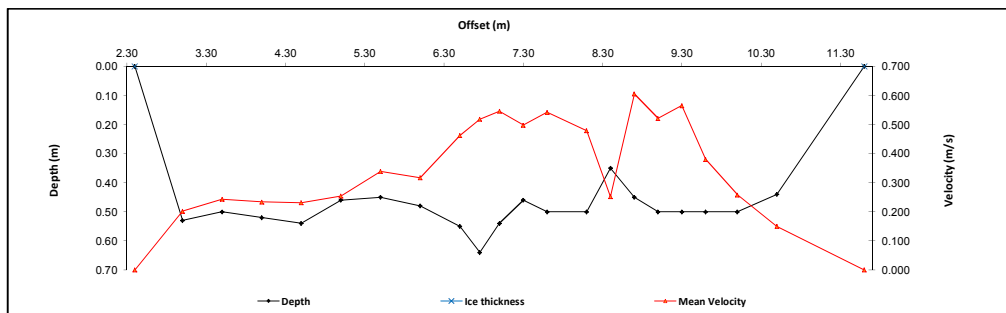
Total Flow:	1.43	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.11	(m <sup>2</sup> )
Wetted Width:	9.20	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.17	

## Logger Details:

	Before	After
Transducer Reading (m):	0.935	0.933
Water (°C):	6.5	6.6
Datalogger Clock:	14:44	15:40
Laptop Clock:	14:44	15:40
Battery (Main):	12.8	13.1
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S11-01			1.305	242.095	242.081	ASCN Pin	S11-01
S11-05	1.188	243.400		242.212	242.212	3/4" Pipe 7 m W of logger	S11-05
S11-06			0.821	242.579	242.579	3/4" Pipe 3 m E of logger	S11-06
Ice/PT:							WL
Water Level:			3.282	240.118		Time WL Surveyed: 15:02	S11-06
Other:							S11-05
<b>Setup #2</b>							S11-01
S11-01			1.288	242.094	242.081	ASCN Pin	
S11-05			1.170	242.212	242.212	3/4" Pipe 7 m W of logger	
S11-06	0.803	243.382		242.579	242.579	3/4" Pipe 3 m E of logger	
Ice/PT:							
Water Level:			3.266	240.116		Time WL Surveyed: 15:04	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-06	0.803	243.382		242.579		
Water Level:			3.266	240.116		Time WL Surveyed: 15:34	
Water Level:			3.235	240.118		Time WL Surveyed: 15:35	
BM:	S11-06	0.774	243.353		242.579		

WL Survey Summary	Before	After
Average WL:	240.117	240.117
Transducer Elevation:	239.182	239.184
Closing Error:	0.000	-
WL Check:	0.002	-0.002

## Site Rating Information

Measured Discharge:	1.43
Expected Discharge:	1.45
Shift from Existing Rating (m <sup>3</sup> /s):	0.02
Shift from Existing Rating (%):	1%

Field Personnel:	TR AND DW	Trip Date:	23-Oct-13
Data Entry Personnel:	TR	Date:	23-Oct-13
Data Check Personnel:	TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N



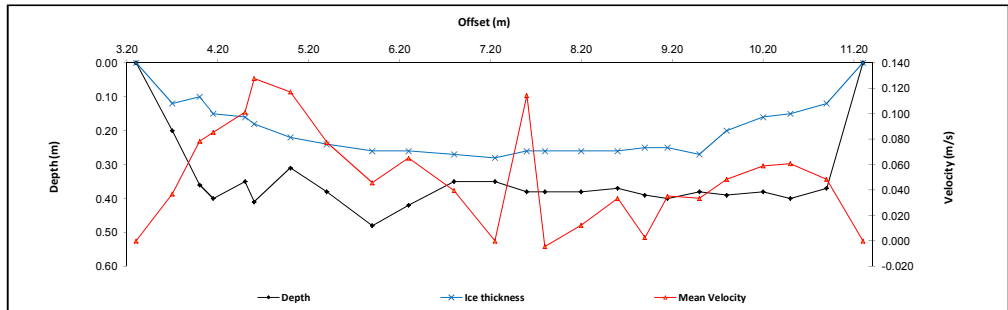
Site Visit Date: December 3, 2013  
 Site Visit Time (MST): 13:00

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	3.70	0.20	0.12	0.16	0.042					0.88	0.35	0.08	0.037	0.03	0.001	2%
2	4.00	0.36	0.10	0.23	0.089					0.88	0.23	0.26	0.078	0.06	0.005	7%
3	4.15	0.40	0.15	0.28	0.097					0.88	0.25	0.25	0.085	0.06	0.005	8%
4	4.50	0.35	0.16	0.26	0.115					0.88	0.23	0.19	0.101	0.04	0.004	6%
5	4.60	0.41	0.18	0.30	0.145					0.88	0.25	0.23	0.128	0.06	0.007	11%
6	5.00	0.31	0.22	0.27	0.133					0.88	0.40	0.09	0.117	0.04	0.004	6%
7	5.40	0.38	0.24	0.31	0.088					0.88	0.45	0.14	0.077	0.06	0.005	7%
8	5.90	0.48	0.26	0.37	0.052					0.88	0.45	0.22	0.046	0.10	0.005	7%
9	6.30	0.42	0.26	0.34	0.074					0.88	0.45	0.16	0.065	0.07	0.005	7%
10	6.80	0.35	0.27	0.31	0.045					0.88	0.48	0.08	0.040	0.04	0.002	2%
11	7.25	0.35	0.28	0.32	0.000					0.88	0.40	0.07	0.000	0.03	0.000	0%
12	7.60	0.38	0.26	0.32	0.130					0.88	0.27	0.12	0.114	0.03	0.004	5%
13	7.80	0.38	0.26	0.32	-0.005					0.88	0.30	0.12	-0.004	0.04	0.000	0%
14	8.20	0.38	0.26	0.32	0.014					0.88	0.40	0.12	0.012	0.05	0.001	1%
15	8.60	0.37	0.26	0.32	0.038					0.88	0.35	0.11	0.033	0.04	0.001	2%
16	8.90	0.39	0.25	0.32	0.003					0.88	0.28	0.14	0.003	0.04	0.000	0%
17	9.15	0.40	0.25	0.33	0.040					0.88	0.30	0.15	0.035	0.04	0.002	2%
18	9.50	0.38	0.27	0.33	0.038					0.88	0.33	0.11	0.033	0.04	0.001	2%
19	9.80	0.39	0.20	0.30	0.055					0.88	0.35	0.19	0.048	0.07	0.003	5%
20	10.20	0.38	0.16	0.27	0.067					0.88	0.35	0.22	0.059	0.08	0.005	7%
21	10.50	0.40	0.15	0.28	0.069					0.88	0.35	0.25	0.061	0.09	0.005	8%
22	10.90	0.37	0.12	0.25	0.055					0.88	0.40	0.25	0.048	0.10	0.005	7%
LB	11.30	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.069</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
4 m US of station

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:17
Equipment:	ADV
Method:	Ice
River Condition:	Frozen overflow on surface
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, -20°C



**Flow characteristics:**

Total Flow:	0.069	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	8.00	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.750	0.752
Water (°C):	-0.1	-0.1
Datalogger Clock:	13:16	14:34
Laptop Clock:	13:16	14:34
Battery (Main):	12.5	12.8
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Large rocks in channel affecting mmt

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S11-01			0.710	242.105	242.081	ASCN Pin	S11-01
S11-05	0.603	242.815		242.212	242.212	3/4" Pipe 7 m W of logger	S11-05
S11-06			0.236	242.579	242.579	3/4" Pipe 3 m E of logger	S11-06
Ice/PT:			2.916	239.899			WL
Water Level:			2.877	239.938		Time WL Surveyed: 13:45	Ice
Other:							Ice
<b>Setup #2</b>							WL
S11-01			0.700	242.103	242.081	ASCN Pin	S11-06
S11-05			0.592	242.211	242.212		S11-05
S11-06	0.224	242.803		242.579	242.579	3/4" Pipe 3 m E of logger	S11-01
Ice/PT:			2.905	239.898			
Water Level:			2.867	239.936		Time WL Surveyed: 13:46	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S11-06	0.225	242.804	242.579			
Water Level:			2.861	239.943		Time WL Surveyed: 14:25	
Water Level:			2.851	239.939		Time WL Surveyed: 14:28	
BM:	S11-06	0.211	242.790	242.579			

**WL Survey Summary**

	Before	After
Average WL:	239.937	239.941
Transducer Elevation:	239.187	239.189
Closing Error:	0.001	-
WL Check:	0.002	0.004

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, CJ, AH	Trip Date:	3-Dec-13	
Data Entry Personnel:	CJ	Date:	3-Dec-13
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: April 29, 2013  
 Site Visit Time (MST): 16:05

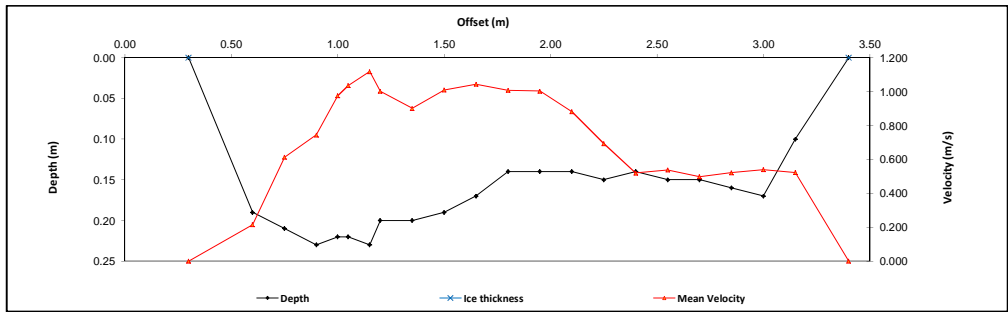


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	0.60	0.19		0.11	0.215					1.00	0.23	0.19	0.215	0.04	0.009	3%
2	0.75	0.21		0.13	0.613					1.00	0.15	0.21	0.613	0.03	0.019	5%
3	0.90	0.23		0.14	0.744					1.00	0.13	0.23	0.744	0.03	0.021	6%
4	1.00	0.22		0.13	0.975					1.00	0.08	0.22	0.975	0.02	0.016	5%
5	1.05	0.22		0.13	1.036					1.00	0.08	0.22	1.036	0.02	0.017	5%
6	1.15	0.23		0.14	1.118					1.00	0.07	0.23	1.118	0.02	0.019	5%
7	1.20	0.20		0.12	1.002					1.00	0.10	0.20	1.002	0.02	0.020	6%
8	1.35	0.20		0.12	0.901					1.00	0.15	0.20	0.901	0.03	0.027	8%
9	1.50	0.19		0.11	1.009					1.00	0.15	0.19	1.009	0.03	0.029	8%
10	1.65	0.17		0.10	1.043					1.00	0.15	0.17	1.043	0.03	0.027	8%
11	1.80	0.14		0.08	1.008					1.00	0.15	0.14	1.008	0.02	0.021	6%
12	1.95	0.14		0.08	1.003					1.00	0.15	0.14	1.003	0.02	0.021	6%
13	2.10	0.14		0.08	0.881					1.00	0.15	0.14	0.881	0.02	0.019	5%
14	2.25	0.15		0.09	0.693					1.00	0.15	0.15	0.693	0.02	0.016	4%
15	2.40	0.14		0.08	0.520					1.00	0.15	0.14	0.520	0.02	0.011	3%
16	2.55	0.15		0.09	0.538					1.00	0.15	0.15	0.538	0.02	0.012	3%
17	2.70	0.15		0.09	0.498					1.00	0.15	0.15	0.498	0.02	0.011	3%
18	2.85	0.16		0.10	0.522					1.00	0.15	0.16	0.522	0.02	0.013	4%
19	3.00	0.17		0.10	0.540					1.00	0.15	0.17	0.540	0.03	0.014	4%
20	3.15	0.10		0.06	0.523					1.00	0.20	0.10	0.523	0.02	0.010	3%
RB	3.40	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.352</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Several meters downstream of pressure transducer.

Meas. Start Time (MST):	16:30
Meas. End Time (MST):	16:55
Equipment:	ADV
Method:	Wading
River Condition:	Medium flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 0°C



**Flow characteristics:**

Total Flow:	0.352	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.48	(m <sup>2</sup> )
Wetted Width:	3.10	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.74	(m/s)
Froude Number:	0.60	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.295	0.296
Water (°C):	1.9	2.0
Datalogger Clock:	16:09	16:57
Laptop Clock:	16:10	16:59
Battery (Main):	12.6	12.9
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	New
Vent Tube Dessicant:	-	New
PT# (if replaced):	298680	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

PLS installed

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S12-01			0.717	98.716	98.699	T-post closest to road	S12-04
S12-04	0.340	99.433		99.093	99.093	3/4" Pipe 10 m Northwest of Station	S12-05
S12-05			0.373	99.060	99.058	3/4" Pipe 8 m North of Station	WL
Ice/PT:							WL
Water Level:			1.842	97.591		Time WL Surveyed: 16:23	S12-05
Other:						T-post 2 m from logger	S12-01
Setup #2							S12-04
S12-01			0.706	98.716	98.699	T-post closest to road	
S12-04			0.327	99.095	99.093	3/4" Pipe 10 m Northwest of Station	
S12-05	0.362	99.422		99.060	99.058	3/4" Pipe 8 m North of Station	
Ice/PT:							
Water Level:			1.830	97.592		Time WL Surveyed: 16:25	(must close survey loop on survey starting point)
Other:						T-post 2 m from logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S12-01	0.705	99.421	98.716			
Water Level:			1.832	97.589		Time WL Surveyed: 16:51	
Water Level:			1.818	97.592		Time WL Surveyed: 16:53	
BM:	S12-01	0.694	99.410	98.716			

**WL Survey Summary**

	Before	After
Average WL:	97.592	97.591
Transducer Elevation:	97.297	97.295
Closing Error:	-0.002	-
WL Check:	0.001	-0.003

**Site Rating Information**

Measured Discharge:	0.352
Expected Discharge:	0.42
Shift from Existing Rating (m <sup>3</sup> /s):	0.07
Shift from Existing Rating (%):	19%

**Field Personnel:**

SM, TR	Trip Date:	29-Apr-13
SM	Date:	29-Apr-13
CJ	Date:	21-May-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: June 20, 2013  
 Site Visit Time (MST): 16:00

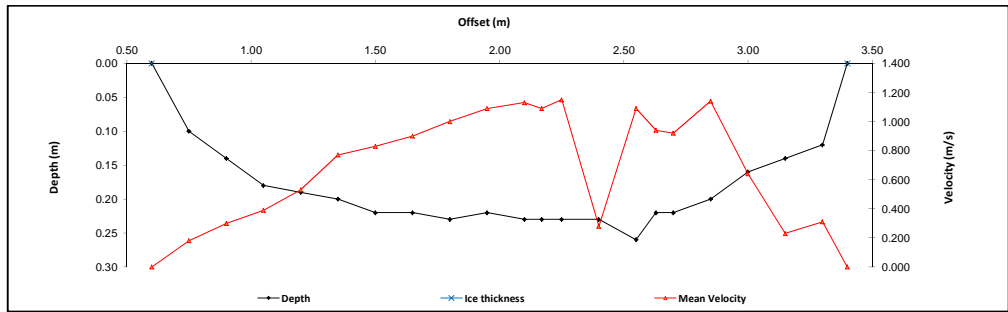


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.75	0.10		0.06	0.180					1.00	0.15	0.10	0.180	0.02	0.003	1%
2	0.90	0.14		0.08	0.300					1.00	0.15	0.14	0.300	0.02	0.006	2%
3	1.05	0.18		0.11	0.390					1.00	0.15	0.18	0.390	0.03	0.011	3%
4	1.20	0.19		0.11	0.530					1.00	0.15	0.19	0.530	0.03	0.015	4%
5	1.35	0.20		0.12	0.770					1.00	0.15	0.20	0.770	0.03	0.023	6%
6	1.50	0.22		0.13	0.830					1.00	0.15	0.22	0.830	0.03	0.027	7%
7	1.65	0.22		0.13	0.900					1.00	0.15	0.22	0.900	0.03	0.030	7%
8	1.80	0.23		0.14	1.000					1.00	0.15	0.23	1.000	0.03	0.035	9%
9	1.95	0.22		0.13	1.090					1.00	0.15	0.22	1.090	0.03	0.036	9%
10	2.10	0.23		0.14	1.130					1.00	0.11	0.23	1.130	0.03	0.029	7%
11	2.17	0.23		0.14	1.090					1.00	0.08	0.23	1.090	0.02	0.019	5%
12	2.25	0.23		0.14	1.150					1.00	0.12	0.23	1.150	0.03	0.030	8%
13	2.40	0.23		0.14	0.280					1.00	0.15	0.23	0.280	0.03	0.010	2%
14	2.55	0.26		0.16	1.090					1.00	0.12	0.26	1.090	0.03	0.033	8%
15	2.63	0.22		0.13	0.940					1.00	0.08	0.22	0.940	0.02	0.016	4%
16	2.70	0.22		0.13	0.920					1.00	0.11	0.22	0.920	0.02	0.022	6%
17	2.85	0.20		0.12	1.140					1.00	0.15	0.20	1.140	0.03	0.034	9%
18	3.00	0.16		0.10	0.640					1.00	0.15	0.16	0.640	0.02	0.015	4%
19	3.15	0.14		0.08	0.230					1.00	0.15	0.14	0.230	0.02	0.005	1%
20	3.30	0.12		0.07	0.310					1.00	0.13	0.12	0.310	0.02	0.005	1%
LB	3.40	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.402</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	16:34
Meas. End Time (MST):	16:46
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, +25°C



**Flow characteristics:**

Total Flow:	0.402	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.52	(m <sup>2</sup> )
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.77	(m/s)
Froude Number:	0.57	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.293	0.293
Water (°C):	19.8	20.0
Datalogger Clock:	16:18	16:56
Laptop Clock:	16:19	16:55
Battery (Main):	13.2	13.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>			0.690	98.714	98.699	T-post closest to road	S12-04
S12-01				99.093	99.093	3/4" Pipe 10 m Northwest of Station	S12-01
S12-04	0.311	99.404		99.057	99.058	3/4" Pipe 8 m North of Station	S12-05
S12-05			0.347	99.057	99.058	3/4" Pipe 8 m North of Station	WL
Ice/PT:							WL
Water Level:			1.824	97.580		Time WL Surveyed: 16:27	S12-05
Other:						T-post 2 m from logger	S12-01
<b>Setup #2</b>							S12-04
S12-01			0.683	98.711	98.699	T-post closest to road	
S12-04			0.303	99.091	99.093	3/4" Pipe 10 m Northwest of Station	
S12-05	0.337	99.394		99.057	99.058	3/4" Pipe 8 m North of Station	
Ice/PT:							
Water Level:			1.813	97.581		Time WL Surveyed: 16:29	(must close survey loop on survey starting point)
Other:						T-post 2 m from logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S12-01	0.683	99.397	98.714		Time WL Surveyed: 16:50	
Water Level:			1.810	97.587		Time WL Surveyed: 16:51	
Water Level:			1.803	97.584			
BM:	S12-01	0.673	99.387	98.714			

**WL Survey Summary**

	Before	After
Average WL:	97.581	97.586
Transducer Elevation:	97.288	97.293
Closing Error:	0.002	-
WL Check:	0.001	0.003

**Site Rating Information**

Measured Discharge:	0.402
Expected Discharge:	0.39
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-2%

**Field Personnel:**

SM, TR	Trip Date:	20-Jun-13
SM, TR	Date:	20-Jun-13
CJ	Date:	21-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



## Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63

UTM Location: 462600 E, 6363400 N

Site Visit Date: August 16, 2013

Site Visit Time (MST): 15:00



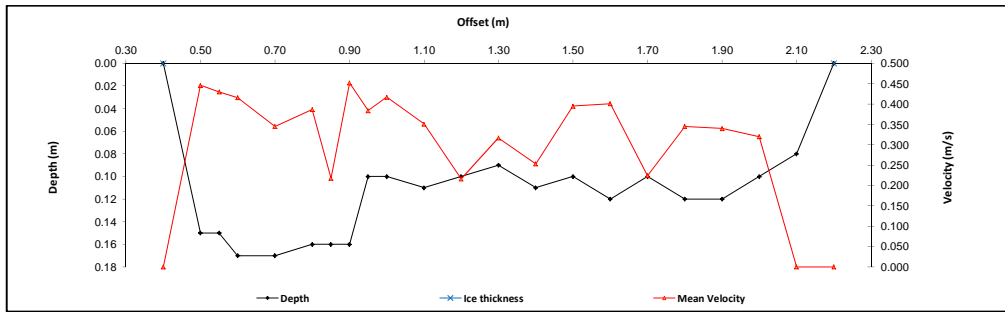
**Flow Measurement:**

Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.40	0.00	0.00	0.00	0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.50	0.15		0.09	0.446				1.00	0.08	0.15	0.446	0.01	0.005	7%	
2	0.55	0.15		0.09	0.430				1.00	0.05	0.15	0.430	0.01	0.003	5%	
3	0.60	0.17		0.10	0.416				1.00	0.08	0.17	0.416	0.01	0.005	8%	
4	0.70	0.17		0.10	0.345				1.00	0.10	0.17	0.345	0.02	0.006	9%	
5	0.80	0.16		0.10	0.387				1.00	0.08	0.16	0.387	0.01	0.005	7%	
6	0.85	0.16		0.10	0.218				1.00	0.05	0.16	0.218	0.01	0.002	3%	
7	0.90	0.16		0.10	0.452				1.00	0.05	0.16	0.452	0.01	0.004	5%	
8	0.95	0.10		0.06	0.384				1.00	0.05	0.10	0.384	0.00	0.002	3%	
9	1.00	0.10		0.06	0.417				1.00	0.08	0.10	0.417	0.01	0.003	5%	
10	1.10	0.11		0.07	0.351				1.00	0.10	0.11	0.351	0.01	0.004	6%	
11	1.20	0.10		0.06	0.216				1.00	0.10	0.10	0.216	0.01	0.002	3%	
12	1.30	0.09		0.05	0.317				1.00	0.10	0.09	0.317	0.01	0.003	4%	
13	1.40	0.11		0.07	0.253				1.00	0.10	0.11	0.253	0.01	0.003	4%	
14	1.50	0.10		0.06	0.395				1.00	0.10	0.10	0.395	0.01	0.004	6%	
15	1.60	0.12		0.07	0.401				1.00	0.10	0.12	0.401	0.01	0.005	7%	
16	1.70	0.10		0.06	0.224				1.00	0.10	0.10	0.224	0.01	0.002	3%	
17	1.80	0.12		0.07	0.345				1.00	0.10	0.12	0.345	0.01	0.004	6%	
18	1.90	0.12		0.07	0.340				1.00	0.10	0.12	0.340	0.01	0.004	6%	
19	2.00	0.10		0.06	0.320				1.00	0.10	0.10	0.320	0.01	0.003	5%	
20	2.10	0.08		0.05	0.000				1.00	0.10	0.08	0.000	0.01	0.000	0%	
LB	2.20	0.00	0.00		0.00				0.00	0.05	0.00	0.000	0.00	0.000		
<b>Total Flow</b>															<b>0.0685</b>	<b>100%</b>

**Flow Measurement Details:**

**Metering Section Location (describe):**

Meas. Start Time (MST):	15:19
Meas. End Time (MST):	15:39
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy +24°C



**Flow characteristics:**

Total Flow:	0.069	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.20	(m²)
Wetted Width:	1.80	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.32	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.070	0.102
Water (°C):	18.2	20.1
Datalogger Clock:	15:05	15:47
Laptop Clock:	15:03	15:45
Battery (Main):	13.2	13.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was moved to deeper water: 0.10 m

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S12-01			0.587	98.715	98.699	T-post closest to road	S12-04
S12-04	0.209	99.302		99.093	99.093	3/4" Pipe 10 m Northwest of Station	S12-05
S12-05			0.244	99.058	99.058	3/4" Pipe 8 m North of Station	WL
Ice/PT:							WL
Water Level:			1.942	97.360		<b>Time WL Surveyed:</b> 15:14	S12-05
Other:						T-post 2 m from logger	S12-01
<b>Setup #2</b>							
S12-01			0.571	98.713	98.699	T-post closest to road	
S12-04			0.192	99.092	99.093	3/4" Pipe 10 m Northwest of Station	
S12-05	0.226	99.284		99.058	99.058	3/4" Pipe 8 m North of Station	
Ice/PT:							
Water Level:			1.926	97.358		<b>Time WL Surveyed:</b> 15:16	(must close survey loop on survey starting point)
Other:						T-post 2 m from logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S12-01	0.571	99.286		98.715		
Water Level:				1.925	97.361		<b>Time WL Surveyed:</b> 15:41
Water Level:				1.911	97.361		<b>Time WL Surveyed:</b> 15:43
BM:	S12-01	0.557	99.272		98.715		

WL Survey Summary	Before	After
Average WL:	97.359	97.361
Transducer Elevation:	97.289	97.259
Closing Error:	0.001	-
WL Check:	0.002	0.000

Site Rating Information	
Measured Discharge:	0.0685
Expected Discharge:	0.05
Shift from Existing Rating (m³/s):	-0.01
Shift from Existing Rating (%):	-20%

Field Personnel:	SM, DW	Trip Date:	16-Aug-13
Data Entry Personnel:	SM	Date:	16-Aug-13
Data Check Personnel:	CJ	Date:	27-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63
UTM Location: 462600 E, 6363400 N

Site Visit Date: September 18, 2013
Site Visit Time (MST): 15:30



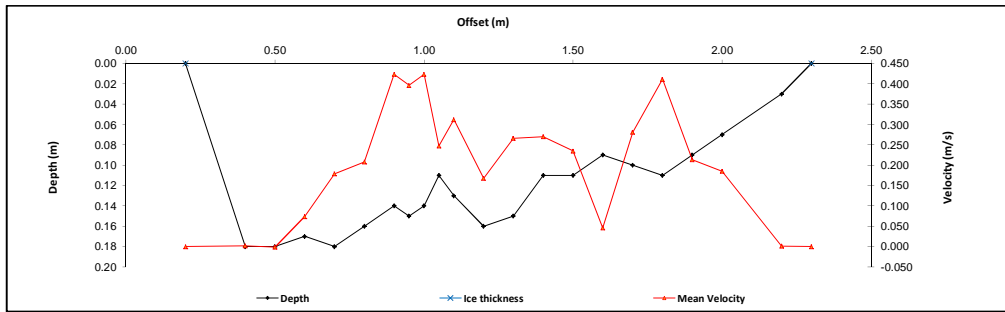
Flow Measurement table with columns for Measured Data (Bank/Offset, Depth from bottom to WS, WS to bottom of ice, Depth of Obs., Velocity @ 0.6, 0.8, 0.2 Depth) and Calculated Data (Velocity Correction Factor, Pannel Width, Effective Pannel Depth, Effective Average Pannel Velocity, Pannel Area, Pannel Discharge, Percent of total flow). Total Flow: 0.0465, 100%.

Flow Measurement Details:

Metering Section Location (describe): 8 m US of PT
Meas. Start Time (MST): 15:58
Meas. End Time (MST): 16:30
Equipment: ADV
Method: Wading
River Condition: Low flow
Channel Edges: Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse): Good
Weather: Cloudy, calm, 10°C

Flow characteristics:

Total Flow: 0.047 (m³/s)
Perceived Measurement Quality: Good
Cross Section Area: 0.24 (m²)
Wetted Width: 2.10 (m)
Hydraulic Depth: 0.12 (m)
Mean Velocity: 0.19 (m/s)
Froude Number: 0.18



Logger Details:

Table with columns Before and After for Transducer Reading (m), Water (°C), Datalogger Clock, Laptop Clock, Battery (Main), Battery Condition, Battery Serial #., Enclosure Dessicant, Vent Tube Dessicant, PT# (# replaced), Logger# (# replaced).

Datalogger / Station Notes:

Moved PT a little to try to find a deeper location

General Notes:

Level Survey table with columns Station, BS + (m), HI (m), FS - (m), Elevation (m), Elevation as given (m), Description, Survey Loop Order. Includes Setup #1 and Setup #2 data.

WL Survey Summary

Table with columns Before and After for Average WL, Transducer Elevation, Closing Error, WL Check.

Site Rating Information

Table for Measured Discharge, Expected Discharge, Shift from Existing Rating (m³/s), Shift from Existing Rating (%).

Field Personnel:

Table for SM, CJ, Trip Date, Date, Entered Digitally in the Field.

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63

UTM Location: 462600 E, 6363400 N

Site Visit Date:

October 31, 2013

Site Visit Time (MST):

12:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.05	0.00			0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.15	0.22		0.13	0.251					1.00	0.10	0.22	0.251	0.02	0.006	5%
2	0.25	0.21		0.13	0.283					1.00	0.10	0.21	0.283	0.02	0.006	6%
3	0.35	0.24		0.14	0.280					1.00	0.10	0.24	0.280	0.02	0.007	6%
4	0.45	0.25		0.15	0.219					1.00	0.10	0.25	0.219	0.03	0.005	5%
5	0.55	0.24		0.14	0.261					1.00	0.10	0.24	0.261	0.02	0.006	6%
6	0.65	0.22		0.13	0.339					1.00	0.10	0.22	0.339	0.02	0.007	7%
7	0.75	0.22		0.13	0.345					1.00	0.10	0.22	0.345	0.02	0.008	7%
8	0.85	0.20		0.12	0.236					1.00	0.10	0.20	0.236	0.02	0.005	4%
9	0.95	0.17		0.10	0.410					1.00	0.10	0.17	0.410	0.02	0.007	7%
10	1.05	0.19		0.11	0.273					1.00	0.10	0.19	0.273	0.02	0.005	5%
11	1.15	0.17		0.10	0.090					1.00	0.10	0.17	0.090	0.02	0.002	1%
12	1.25	0.16		0.10	0.395					1.00	0.10	0.16	0.395	0.02	0.006	6%
13	1.35	0.14		0.08	0.344					1.00	0.10	0.14	0.344	0.01	0.005	5%
14	1.45	0.14		0.08	0.345					1.00	0.10	0.14	0.345	0.01	0.005	5%
15	1.55	0.18		0.11	0.378					1.00	0.10	0.18	0.378	0.02	0.007	6%
16	1.65	0.18		0.11	0.343					1.00	0.10	0.18	0.343	0.02	0.006	6%
17	1.75	0.18		0.11	0.294					1.00	0.10	0.18	0.294	0.02	0.005	5%
18	1.85	0.13		0.08	0.362					1.00	0.10	0.13	0.362	0.01	0.005	4%
19	1.95	0.10		0.06	0.310					1.00	0.10	0.10	0.310	0.01	0.003	3%
20	2.05	0.06		0.04	0.328					1.00	0.10	0.06	0.328	0.01	0.002	2%
21	2.15	0.06		0.04	0.004					1.00	0.16	0.06	0.004	0.01	0.000	0%
LB	2.37	0.00	0.00		0.00		0.00		0.00	1.00	0.11	0.00	0.000	0.00	0.000	
														<b>Total Flow</b>	<b>0.107</b>	<b>100%</b>

### Flow Measurement Details:

Metering Section Location (describe): At the end of the culvert (approx. 30 m upstream of station)

Meas. Start Time (MST):	12:45
Meas. End Time (MST):	13:12
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, +1°C

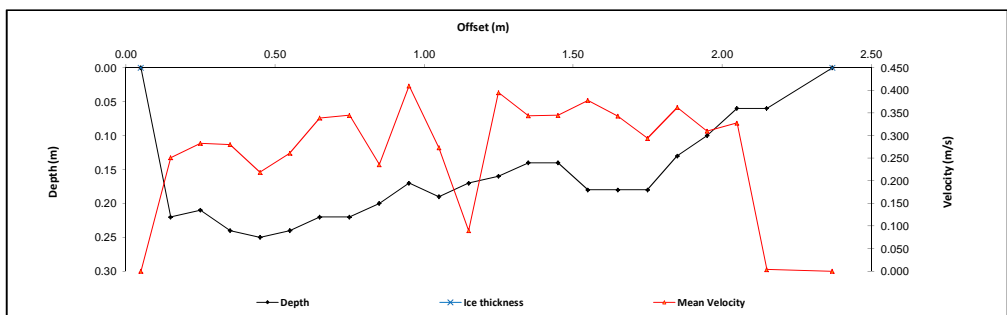
<b>Flow characteristics:</b>	
Total Flow:	0.107 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.37 (m <sup>2</sup> )
Wetted Width:	2.32 (m)
Hydraulic Depth:	0.16 (m)
Mean Velocity:	0.29 (m/s)
Froude Number:	0.23

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
	0.156	0.141
Water (°C):	2.2	2.3
Datalogger Clock:	12:39	13:22
Laptop Clock:	12:37	13:20
Battery (Main):	12.0	12.0
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	298680	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Removed PLS for winter
- Anchor cable and weight left at base of tree marked with pink ribbon

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S12-01			0.617	98.714	98.699	T-post 10.5 m NW of STATION	S12-04
S12-04	0.238	99.331		99.093	99.093	3/4" Pipe 10 m NW of Station	S12-05
S12-05			0.273	99.058	99.058	3/4" Pipe 8 m North of Station	WL
Ice/PT:							WL
Water Level:			1.923	97.408		Time WL Surveyed: 12:43	S12-05
Other:						T-post 15 m NW of STATION	S12-01
<b>Setup #2</b>							
S12-01			0.595	98.713	98.699	T-post 10.5 m NW of STATION	S12-04
S12-04			0.216	99.092	99.093	3/4" Pipe 10 m NW of Station	S12-05
S12-05	0.250	99.308		99.058	99.058	3/4" Pipe 8 m North of Station	WL
Ice/PT:							WL
Water Level:			1.903	97.405		Time WL Surveyed: 12:45	S12-05
Other:						T-post 15 m NW of STATION	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S12-05	0.251	99.309	99.058			
Water Level:			1.900	97.409		Time WL Surveyed: 13:16	
Water Level:			1.886	97.408		Time WL Surveyed: 13:17	
BM:	S12-05	0.236	99.294	99.058			

<b>WL Survey Summary</b>		
Average WL:	Before	After
	97.407	97.409
Transducer Elevation:	97.251	97.268
Closing Error:	0.001	-
WL Check:	0.003	0.001

<b>Site Rating Information</b>	
Measured Discharge:	0.107
Expected Discharge:	0.10
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-8%

<b>Field Personnel:</b>	SM,TR	Trip Date:	31-Oct-13
Data Entry Personnel:	SM	Date:	31-Oct-13
Data Check Personnel:	CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
END



# Hydrometric Measurement / Site Visit Record

Site: S14A - Eils River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

February 4, 2013



Measured Data								Calculated Data								
Bank/ 0.057 Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	3.60	0.00	0.00	0.000	0.000	0.000	0.9	3.60	4.35	0.75	0.09	0.017	0.015	0.07	0.001	0%
1	5.10	0.80	0.45	0.067			0.9	4.35	5.60	1.25	0.35	0.067	0.060	0.44	0.026	2%
2	6.10	1.20	0.50	0.078			0.9	5.60	6.65	1.05	0.70	0.078	0.070	0.74	0.052	4%
3	7.20	1.25	0.50	0.135			0.9	6.65	7.75	1.10	0.75	0.135	0.122	0.83	0.100	8%
4	8.30	1.25	0.55	0.146			0.9	7.75	8.90	1.15	0.70	0.146	0.131	0.81	0.106	9%
5	9.50	1.15	0.55	0.132			0.9	8.90	10.10	1.20	0.60	0.132	0.119	0.72	0.086	7%
6	10.70	1.10	0.60	0.127			0.9	10.10	11.15	1.05	0.50	0.127	0.114	0.53	0.060	5%
7	11.60	1.05	0.65	0.117			0.9	11.15	12.05	0.90	0.40	0.117	0.105	0.36	0.038	3%
8	12.50	1.05	0.65	0.106			0.9	12.05	13.00	0.95	0.40	0.106	0.095	0.38	0.036	3%
9	13.50	1.20	0.50	0.126			0.9	13.00	13.95	0.95	0.70	0.126	0.113	0.66	0.075	6%
10	14.40	1.60	0.65		0.102	0.126	1.0	13.95	14.85	0.90	0.95	0.114	0.114	0.86	0.097	8%
11	15.30	1.50	0.70		0.161	0.133	1.0	14.85	15.70	0.85	0.80	0.147	0.147	0.68	0.100	8%
12	16.10	1.50	0.65		0.088	0.119	1.0	15.70	16.55	0.85	0.85	0.104	0.104	0.72	0.075	6%
13	17.00	1.50	0.55		0.068	0.078	1.0	16.55	17.45	0.90	0.95	0.073	0.073	0.85	0.062	5%
14	17.90	1.45	0.55		0.056	0.062	1.0	17.45	18.55	1.10	0.90	0.059	0.059	0.99	0.058	5%
15	19.20	1.45	0.55		0.057	0.049	1.0	18.55	20.00	1.45	0.90	0.053	0.053	1.31	0.069	6%
16	20.80	1.35	0.45		0.044	0.053	1.0	20.00	21.45	1.45	0.90	0.049	0.049	1.31	0.063	5%
17	22.10	1.30	0.40		0.042	0.048	1.0	21.45	22.70	1.25	0.90	0.045	0.045	1.13	0.051	4%
18	23.30	0.90	0.35	0.045			0.9	22.70	24.45	1.75	0.55	0.045	0.041	0.96	0.039	3%
19	25.60	0.45	0.35	0.034			0.9	24.45	25.90	1.45	0.10	0.034	0.031	0.15	0.004	0%
RB	26.20	0.00	0.00	0.00	0.00	0.00	1.0	25.90	26.20	0.30	0.03	0.009	0.009	0.01	0.000	0%
<b>Total Flow</b>															<b>1.20</b>	

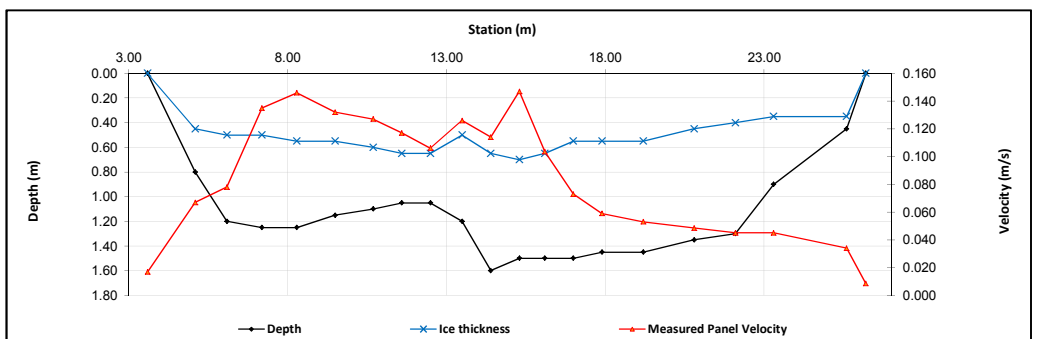
Measurement Details:	
Start Time (MST):	15:45
End Time (MST):	17:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -12°C

Flow characteristics:	
Total Flow:	1.20 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	14.47 (m <sup>2</sup> )
Wetted Width:	22.60 (m)
Hydraulic Depth:	0.640 (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
	Before	After
Transducer Reading (m):	0.938	-
Water (°C):	0.1	-
Battery (Main):	13.3	-
Datalogger Clock:	15:56	-
Laptop Clock:	15:55	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	16569	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S14A-03			1.924	99.997	99.989	Pipe 3 m SW of Station
S14A-04			1.515	100.406	100.407	Pipe 5 m SE of Station
S14A-05	1.243	101.921		100.678	100.678	Pipe 5 m NE of Station
Ice/PT:			3.879	98.042		
Water Level:			3.880	98.041		
Other:						
<b>Setup #2</b>						
S14A-03			1.935	99.996	99.989	Pipe 3 m SW of Station
S14A-04	1.525	101.931		100.406	100.407	Pipe 5 m SE of Station
S14A-05			1.253	100.678	100.678	Pipe 5 m NE of Station
Ice/PT:			3.875	98.056		
Water Level:			3.892	98.039		
Other:						

Closing Error	0.000
WL Check	0.002

Average WL	98.040
Transducer Elevation Before	97.102
Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	4-Feb-13
Data Entry Personnel:	SM	Date:	4-Feb-13
Data Check Personnel:	DL ✓ YES <input type="checkbox"/> NO	Date:	12-Mar-13
Entered Digitally in the Field:			





# Hydrometric Measurement / Site Visit Record

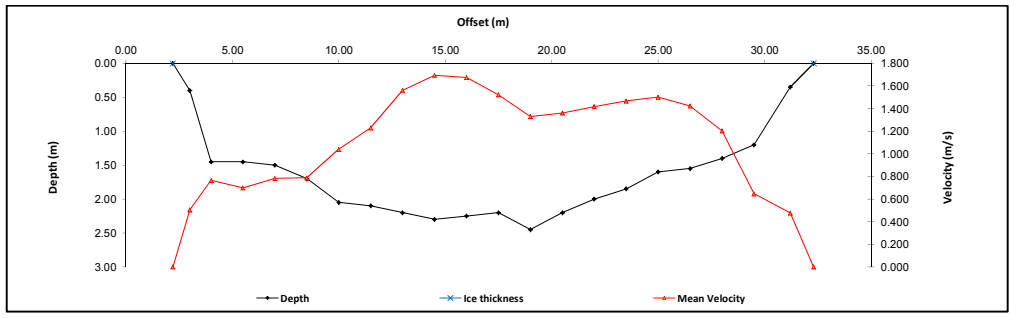
Site: S14A - Ellis River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: May 17, 2013  
 Site Visit Time (MST): 09:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	3.00	0.40		0.24	0.505					1.00	0.90	0.40	0.505	0.36	0.182	0%
2	4.00	1.45				1.16	0.670	0.29	0.862	1.00	1.25	1.45	0.766	1.81	1.388	2%
3	5.50	1.45				1.16	0.672	0.29	0.727	1.00	1.50	1.45	0.700	2.18	1.521	2%
4	7.00	1.50				1.20	0.691	0.30	0.874	1.00	1.50	1.50	0.783	2.25	1.761	3%
5	8.50	1.70				1.36	0.629	0.34	0.947	1.00	1.50	1.70	0.788	2.55	2.009	3%
6	10.00	2.05				1.64	0.880	0.41	1.201	1.00	1.50	2.05	1.041	3.08	3.200	5%
7	11.50	2.10				1.68	1.002	0.42	1.457	1.00	1.50	2.10	1.230	3.15	3.873	6%
8	13.00	2.20				1.76	1.364	0.44	1.760	1.00	1.50	2.20	1.562	3.30	5.155	8%
9	14.50	2.30				1.84	1.516	0.46	1.874	1.00	1.50	2.30	1.695	3.45	5.848	9%
10	16.00	2.25				1.80	1.521	0.45	1.829	1.00	1.50	2.25	1.675	3.38	5.653	9%
11	17.50	2.20				1.76	1.300	0.44	1.746	1.00	1.50	2.20	1.523	3.30	5.026	8%
12	19.00	2.45				1.96	1.003	0.49	1.656	1.00	1.50	2.45	1.330	3.68	4.886	8%
13	20.50	2.20				1.76	1.097	0.44	1.626	1.00	1.50	2.20	1.362	3.30	4.493	7%
14	22.00	2.00				1.60	1.207	0.40	1.629	1.00	1.50	2.00	1.418	3.00	4.254	7%
15	23.50	1.85				1.48	1.243	0.37	1.691	1.00	1.50	1.85	1.467	2.78	4.071	6%
16	25.00	1.60				1.28	1.338	0.32	1.665	1.00	1.50	1.60	1.502	2.40	3.604	6%
17	26.50	1.55				1.24	1.276	0.31	1.571	1.00	1.50	1.55	1.424	2.33	3.310	5%
18	28.00	1.40				1.12	0.965	0.28	1.412	1.00	1.50	1.40	1.204	2.10	2.527	4%
19	29.50	1.20				0.96	0.385	0.24	0.908	1.00	1.60	1.20	0.647	1.92	1.241	2%
20	31.20	0.35		0.21	0.477					1.00	1.40	0.35	0.477	0.49	0.234	0%
LB	32.30	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>64.2</b>	<b>100%</b>	

Flow Measurement Details:	
<b>Metering Section Location (describe):</b>	
Meas. Start Time (MST):	10:30
Meas. End Time (MST):	11:33
Equipment:	ADV
Method:	Boat
River Condition:	high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



Flow characteristics:		
Total Flow:	64.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	50.78	(m <sup>2</sup> )
Wetted Width:	30.10	(m)
Hydraulic Depth:	1.69	(m)
Mean Velocity:	1.26	(m/s)
Froude Number:	0.31	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.074	1.074
Datalogger Clock:	9:6	10:3
Laptop Clock:	09:49	11:48
Battery (Main):	09:48	11:46
Battery Condition:	14.1	14.0
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S14A-03			1.836	100.005	99.989	Pipe 3 m SW of Station	BM5
S14A-04			1.435	100.406	100.407	Pipe 5 m SE of Station	BM3
S14A-05	1.163	101.841		100.678	100.678	Pipe 5 m NE of Station	WL
Ice/PT:							WL
Water Level:			3.020	98.821		Time WL Surveyed: 10:11	BM3
Other:							BM4
<b>Setup #2</b>							
S14A-03			1.826	100.005	99.989	Pipe 3 m SW of Station	BM5
S14A-04	1.425	101.831		100.406	100.407	Pipe 5 m SE of Station	BM3
S14A-05			1.152	100.679	100.678	Pipe 5 m NE of Station	WL
Ice/PT:							WL
Water Level:			3.009	98.822		Time WL Surveyed: 10:13	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S14A-04	1.424	101.830		100.406		
Water Level:			3.008	98.822		Time WL Surveyed: 11:43	
Water Level:			2.999	98.819		Time WL Surveyed: 11:44	
BM:	S14A-04	1.412	101.818		100.406		

WL Survey Summary		
Average WL:	Before	After
Transducer Elevation:	98.822	98.821
Closing Error:	97.748	97.747
WL Check:	-0.001	-
	0.001	0.003

Site Rating Information	
Measured Discharge:	64.2
Expected Discharge:	48.93
Shift from Existing Rating (m <sup>3</sup> /s):	-15.27
Shift from Existing Rating (%):	-24%

Field Personnel:	SM, TR	Trip Date:	17-May-13
Data Entry Personnel:	SM	Date:	17-May-13
Data Check Personnel:	DW	Date:	26-May-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: June 24, 2013  
 Site Visit Time (MST): 14:00



Flow Measurement:										Calculated Data						
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
1	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30	0.00	0.00		0.00						1.00	0.00	0.00	0.000	0.00	0.000	
No Flow Measurement Conducted										<b>Total Flow 0%</b>						

**Flow Measurement Details:**  
**Metering Section Location (describe):**

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

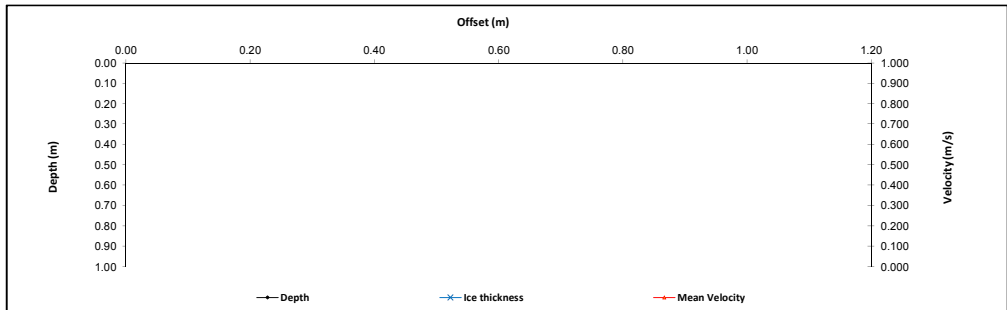
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.834	-
Water (°C):	18.5	-
Datalogger Clock:	14:16	-
Laptop Clock:	14:14	-
Battery (Main):	12.9	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 - Flow measurement was not conducted due to high water level and safety concerns

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM5
S14A-03			1.994	100.006	99.989	Pipe 3 m SW of Station	BM4
S14A-04			1.594	100.406	100.407	Pipe 5 m SE of Station	BM3
S14A-05	1.322	102.000		100.678	100.678	Pipe 5 m NE of Station	WL
Ice/PT:							WL
Water Level:		3.479		98.521		Time WL Surveyed: 14:24	BM3
Other:							BM4
<b>Setup #2</b>							BM5
S14A-03	1.982	101.988		100.006	99.989	Pipe 3 m SW of Station	
S14A-04			1.582	100.406	100.407	Pipe 5 m SE of Station	
S14A-05			1.310	100.678	100.678	Pipe 5 m NE of Station	
Ice/PT:							
Water Level:		3.469		98.519		Time WL Surveyed: 14:25	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.678		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.678			

**WL Survey Summary**

	Before	After
Average WL:	98.520	-
Transducer Elevation:	97.886	-
Closing Error:	0.000	-
WL Check:	0.002	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	26.30
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	24-Jun-13
<b>Data Entry Personnel:</b>	SM	Date:	24-Jun-13
<b>Data Check Personnel:</b>	DW	Date:	26-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

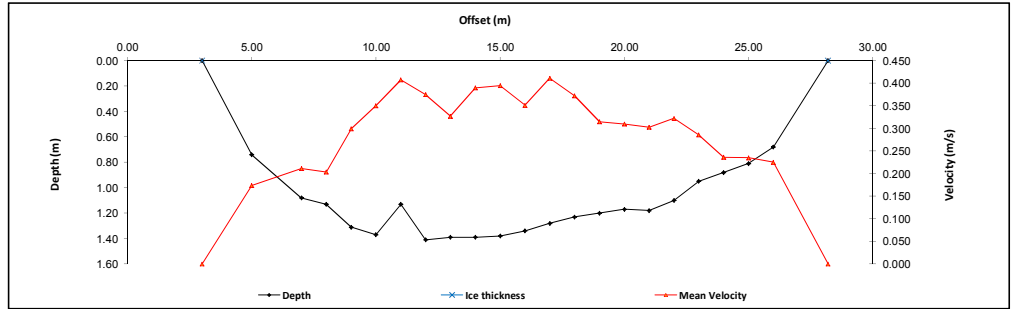


Site Visit Date: August 15, 2013  
 Site Visit Time (MST): 09:25

Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	5.00	0.74		0.44	0.174					1.00	2.00	0.74	0.174	1.48	0.258	3%
2	7.00	1.08			0.86	0.179	0.22	0.244		1.00	1.50	1.08	0.212	1.62	0.343	4%
3	8.00	1.13			0.90	0.180	0.23	0.227		1.00	1.00	1.13	0.204	1.13	0.230	3%
4	9.00	1.31			1.05	0.289	0.26	0.309		1.00	1.00	1.31	0.299	1.31	0.392	5%
5	10.00	1.37			1.10	0.330	0.27	0.370		1.00	1.00	1.37	0.350	1.37	0.480	6%
6	11.00	1.13			0.90	0.405	0.23	0.410		1.00	1.00	1.13	0.408	1.13	0.460	6%
7	12.00	1.41			1.13	0.361	0.28	0.389		1.00	1.00	1.41	0.375	1.41	0.529	7%
8	13.00	1.39			1.11	0.359	0.28	0.295		1.00	1.00	1.39	0.327	1.39	0.455	6%
9	14.00	1.39			1.11	0.350	0.28	0.429		1.00	1.00	1.39	0.390	1.39	0.541	7%
10	15.00	1.38			1.10	0.373	0.28	0.416		1.00	1.00	1.38	0.395	1.38	0.544	7%
11	16.00	1.34			1.07	0.334	0.27	0.388		1.00	1.00	1.34	0.351	1.34	0.470	6%
12	17.00	1.28			1.02	0.369	0.26	0.453		1.00	1.00	1.28	0.411	1.28	0.526	7%
13	18.00	1.23			0.98	0.372	0.25	0.372		1.00	1.00	1.23	0.372	1.23	0.458	6%
14	19.00	1.20			0.96	0.318	0.24	0.311		1.00	1.00	1.20	0.315	1.20	0.377	5%
15	20.00	1.17			0.94	0.301	0.23	0.318		1.00	1.00	1.17	0.310	1.17	0.362	4%
16	21.00	1.18			0.94	0.277	0.24	0.328		1.00	1.00	1.18	0.303	1.18	0.357	4%
17	22.00	1.10			0.98	0.252	0.22	0.392		1.00	1.00	1.10	0.322	1.10	0.354	4%
18	23.00	0.95			0.76	0.244	0.19	0.327		1.00	1.00	0.95	0.266	0.95	0.271	3%
19	24.00	0.88			0.70	0.236	0.18	0.236		1.00	1.00	0.88	0.236	0.88	0.208	3%
20	25.00	0.81			0.65	0.240	0.16	0.230		1.00	1.00	0.81	0.235	0.81	0.190	2%
21	26.00	0.68		0.41	0.225					1.00	1.60	0.68	0.225	1.09	0.245	3%
LB	28.20	0.00	0.00		0.00		0.00			1.00	1.10	0.00	0.000	0.00	0.000	
														<b>Total Flow</b>	<b>8.05</b>	<b>100%</b>

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	10:38
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 23°C



**Flow characteristics:**

Total Flow:	8.05	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	25.84	(m²)
Wetted Width:	25.20	(m)
Hydraulic Depth:	1.03	(m)
Mean Velocity:	0.31	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.459	0.449
Water (°C):	21.0	21.3
Datalogger Clock:	09:34	10:51
Laptop Clock:	09:32	10:50
Battery (Main):	14.1	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							BM5
S14A-03			1.810	100.005	99.989	Pipe 3 m SW of Station	BM4
S14A-04			1.409	100.406	100.407	Pipe 5 m SE of Station	BM3
S14A-05	1.137	101.815		100.678	100.678	Pipe 5 m NE of Station	WL
Ice/PT:							WL
Water Level:			3.735	98.080		Time WL Surveyed: 9:42	BM3
Other:							BM4
Setup #2							BM5
S14A-03	1.796	101.801		100.005	99.989	Pipe 3 m SW of Station	
S14A-04			1.397	100.404	100.407	Pipe 5 m SE of Station	
S14A-05			1.124	100.677	100.678	Pipe 5 m NE of Station	
Ice/PT:							
Water Level:			3.724	98.077		Time WL Surveyed: 9:44	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S14A-04	1.396	101.802		100.406			
Water Level:			3.720	98.082		Time WL Surveyed: 10:46	
Water Level:			3.709	98.079		Time WL Surveyed: 10:48	
BM: S14A-04	1.382	101.788		100.406			

**WL Survey Summary**

	Before	After
Average WL:	98.079	98.081
Transducer Elevation:	97.620	97.632
Closing Error:	0.001	-
WL Check:	0.003	0.003

**Site Rating Information**

Measured Discharge:	8.05
Expected Discharge:	5.71
Shift from Existing Rating (m³/s):	-2.34
Shift from Existing Rating (%):	-29%

**Field Personnel:**

	SM, TR	Trip Date:	15-Aug-13
Data Entry Personnel:	SM	Date:	15-Aug-13
Data Check Personnel:	DW	Date:	22-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: September 11, 2013  
 Site Visit Time (MST): 13:00

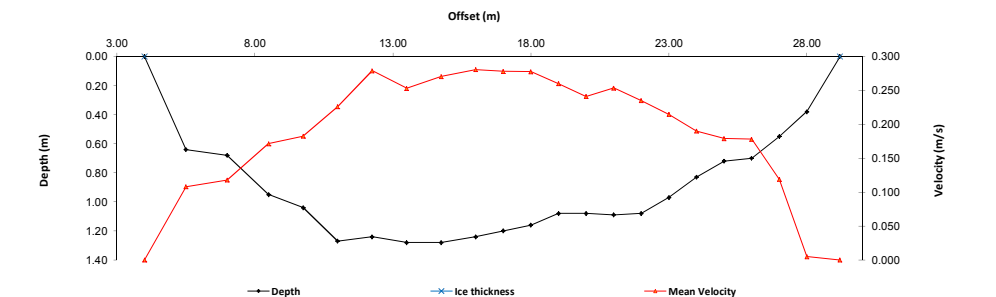


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	5.50	0.64		0.38	0.108					1.00	1.50	0.64	0.108	0.96	0.104	2%
2	7.00	0.68		0.41	0.118					1.00	1.50	0.68	0.118	1.02	0.120	2%
3	8.50	0.95				0.76	0.161	0.19	0.182	1.00	1.38	0.95	0.172	1.31	0.224	4%
4	9.75	1.04				0.83	0.175	0.21	0.190	1.00	1.25	1.04	0.183	1.30	0.237	5%
5	11.00	1.27				1.02	0.204	0.25	0.248	1.00	1.25	1.27	0.226	1.59	0.359	7%
6	12.25	1.24				0.99	0.271	0.25	0.287	1.00	1.25	1.24	0.279	1.55	0.432	8%
7	13.50	1.28				1.02	0.220	0.26	0.286	1.00	1.25	1.28	0.253	1.60	0.405	8%
8	14.75	1.28				1.02	0.252	0.26	0.289	1.00	1.25	1.28	0.271	1.60	0.433	8%
9	16.00	1.24				0.99	0.282	0.25	0.279	1.00	1.13	1.24	0.281	1.40	0.391	8%
10	17.00	1.20				0.96	0.227	0.24	0.329	1.00	1.00	1.20	0.278	1.20	0.334	7%
11	18.00	1.16				0.93	0.264	0.23	0.291	1.00	1.00	1.16	0.278	1.16	0.322	6%
12	19.00	1.08				0.86	0.249	0.22	0.271	1.00	1.00	1.08	0.260	1.08	0.281	5%
13	20.00	1.08				0.86	0.231	0.22	0.251	1.00	1.00	1.08	0.241	1.08	0.260	5%
14	21.00	1.09				0.87	0.229	0.22	0.278	1.00	1.00	1.09	0.254	1.09	0.276	5%
15	22.00	1.08				0.86	0.220	0.22	0.250	1.00	1.00	1.08	0.235	1.08	0.254	5%
16	23.00	0.97				0.78	0.192	0.19	0.237	1.00	1.00	0.97	0.215	0.97	0.208	4%
17	24.00	0.83				0.66	0.172	0.17	0.208	1.00	1.00	0.83	0.190	0.83	0.158	3%
18	25.00	0.72	0.43		0.179					1.00	1.00	0.72	0.179	0.72	0.129	3%
19	26.00	0.70	0.42		0.178					1.00	1.00	0.70	0.178	0.70	0.125	2%
20	27.00	0.55	0.33		0.119					1.00	1.00	0.55	0.119	0.55	0.065	1%
21	28.00	0.38	0.23		0.005					1.00	1.10	0.38	0.005	0.42	0.002	0%
LB	29.20	0.00	0.00		0.00		0.00		0.00	1.00	0.60	0.00	0.000	0.00	0.000	
														<b>Total Flow</b>	<b>5.12</b>	<b>100%</b>

**Flow Measurement Details:**

**Metering Section Location (describe):**

Meas. Start Time (MST): 13:45  
 Meas. End Time (MST): 14:32  
 Equipment: ADV  
 Method: Fishcat  
 River Condition: Moderate flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Clear, calm, 20°C



**Flow characteristics:**

Total Flow: 5.12 (m<sup>3</sup>/s)  
 Perceived Measurement Quality: Excellent  
 Cross Section Area: 23.20 (m<sup>2</sup>)  
 Wetted Width: 25.20 (m)  
 Hydraulic Depth: 0.92 (m)  
 Mean Velocity: 0.22 (m/s)  
 Froude Number: 0.07

**Logger Details:**

	Before	After
Transducer Reading (m):	0.418	0.833
Water (°C):	15.0	15.6
Datalogger Clock:	13:08	14:44
Laptop Clock:	13:08	14:44
Battery (Main):	14.1	14.0
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was not attached to a weight.  
 - PLS was reattached and repositioned in a deeper spot.

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM3
S14A-03			1.831	100.006	99.989	Pipe 3 m SW of Station	BM4
S14A-04			1.432	100.405	100.407	Pipe 5 m SE of Station	BM5
S14A-05	1.159	101.837		100.678	100.678	Pipe 5 m NE of Station	WL
Water Level:			3.889	97.948		Time WL Surveyed: 13:37	BM5
Other:							BM4
<b>Setup #2</b>							BM3
S14A-03			1.821	100.006	99.989	Pipe 3 m SW of Station	
S14A-04	1.422	101.827		100.405	100.407	Pipe 5 m SE of Station	
S14A-05			1.149	100.678	100.678	Pipe 5 m NE of Station	
Water Level:			3.881	97.946		Time WL Surveyed: 13:39	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S14A-04	1.422	101.827	100.405			
Water Level:			3.871	97.956		Time WL Surveyed: 14:37	
Water Level:			3.862	97.952		Time WL Surveyed: 14:40	
BM	S14A-04	1.409	101.814	100.405			

**WL Survey Summary**

	Before	After
Average WL:	97.947	97.954
Transducer Elevation:	97.529	97.121
Closing Error:	0.000	-
WL Check:	0.002	0.004

**Site Rating Information**

Measured Discharge:	5.12
Expected Discharge:	2.47
Shift from Existing Rating (m <sup>3</sup> /s):	-2.65
Shift from Existing Rating (%):	-52%

**Field Personnel:**

SM, CJ	Trip Date:	11-Sep-13	
Data Entry Personnel:	CJ	Date:	11-Sep-13
Data Check Personnel:	DW	Date:	16-Sep-13
Entered Digitally in the Field:	Yes		

START  
 ↓  
 END





# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth

UTM Location: 458395 E, 6353391 N

Site Visit Date:

March 25, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB		0.00	0.00	0.000	0.000	0.000	1.0									
1							1.0									
2							1.0									
3							1.0									
4							1.0									
5							1.0									
6							1.0									
7							1.0									
8							1.0									
9							1.0									
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24							1.0									
25							1.0									
26							1.0									
27							1.0									
28							1.0									
29							1.0									
30							1.0									
LB		0.00	0.00	0.00	0.00	0.00	1.0									

No Flow Measurement Conducted

Total Flow

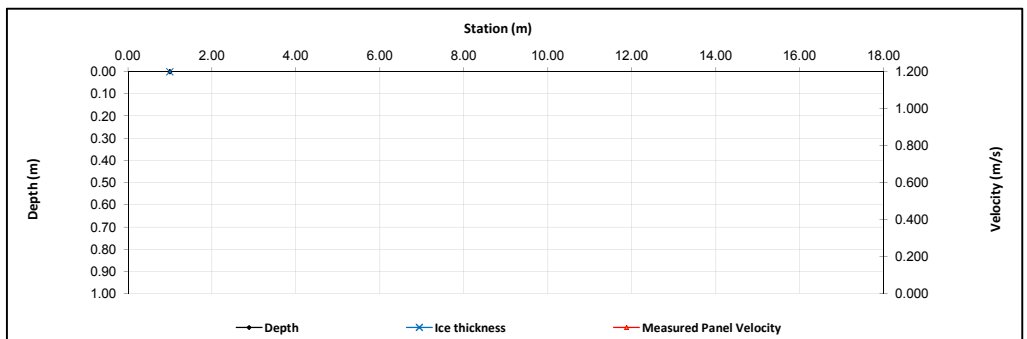
Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	10:15
Equipment:	-
Method:	-
River Condition:	Poor Ice
Quality/Error (see reverse):	-
Weather:	Clear, calm, -10°C

Flow characteristics:		
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Enclosure Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	304018	-
Vent Tube Dessicant:	-	-

**Datalogger / Station Notes:**

- Ice has two defined layers with flow in between.
- Ice conditions are poor and no flow could be conducted.
- PT and battery installed.
- Need to bring longer section of bendable tubing for PT
- Unsure of location of anchor cable



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S15A-03					100.000	3/4" Pipe 3 m S of Station
S15A-04					99.815	3/4" Pipe 2 m E of Station
S15A-05					99.929	3/4" Pipe 3 m NE of Station
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
S15A-03					100.000	3/4" Pipe 3 m S of Station
S15A-04					99.815	3/4" Pipe 2 m E of Station
S15A-05					99.929	3/4" Pipe 3 m NE of Station
Ice/PT:						
Water Level:						
Other:						

Closing Error	-
WL Check	-

Average WL	-
Transducer Elevation Before	-
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	TR AND CJ	Trip Date:	25-Mar-13
Data Entry Personnel:	TR	Date:	25-Mar-13
Data Check Personnel:	DW	Date:	3-Jun-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: April 29, 2013  
 Site Visit Time (MST): 11:00

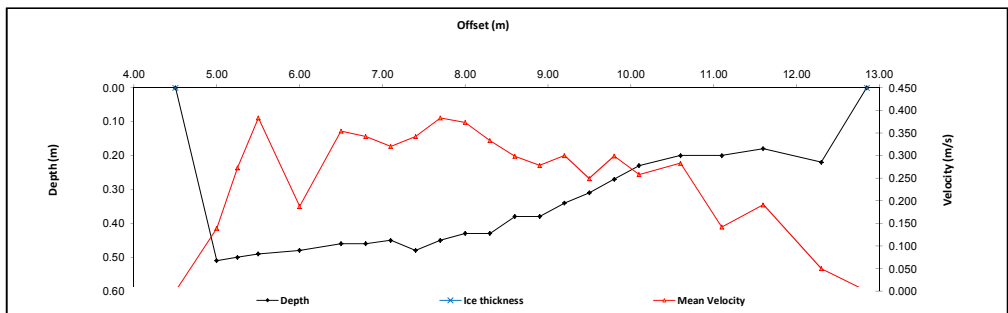


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00	0.000	0.00	0.000	
1	5.00	0.51		0.31	0.139					1.00	0.38	0.51	0.139	0.19	0.027	3%
2	5.25	0.50		0.30	0.273					1.00	0.25	0.50	0.273	0.13	0.034	4%
3	5.50	0.49		0.29	0.383					1.00	0.38	0.49	0.383	0.18	0.070	9%
4	6.00	0.48		0.29	0.188					1.00	0.50	0.48	0.188	0.24	0.045	6%
5	6.50	0.46		0.28	0.354					1.00	0.40	0.46	0.354	0.18	0.065	9%
6	6.80	0.46		0.28	0.342					1.00	0.30	0.46	0.342	0.14	0.047	6%
7	7.10	0.45		0.27	0.320					1.00	0.30	0.45	0.320	0.14	0.043	6%
8	7.40	0.48		0.29	0.342					1.00	0.30	0.48	0.342	0.14	0.049	6%
9	7.70	0.45		0.27	0.383					1.00	0.30	0.45	0.383	0.14	0.052	7%
10	8.00	0.43		0.26	0.373					1.00	0.30	0.43	0.373	0.13	0.048	6%
11	8.30	0.43		0.26	0.333					1.00	0.30	0.43	0.333	0.13	0.043	6%
12	8.60	0.38		0.23	0.298					1.00	0.30	0.38	0.298	0.11	0.034	4%
13	8.90	0.38		0.23	0.278					1.00	0.30	0.38	0.278	0.11	0.032	4%
14	9.20	0.34		0.20	0.300					1.00	0.30	0.34	0.300	0.10	0.031	4%
15	9.50	0.31		0.19	0.249					1.00	0.30	0.31	0.249	0.09	0.023	3%
16	9.90	0.27		0.16	0.299					1.00	0.30	0.27	0.299	0.08	0.024	3%
17	10.10	0.23		0.14	0.258					1.00	0.40	0.23	0.258	0.09	0.024	3%
18	10.60	0.20		0.12	0.283					1.00	0.50	0.20	0.283	0.10	0.028	4%
19	11.10	0.20		0.12	0.142					1.00	0.50	0.20	0.142	0.10	0.014	2%
20	11.60	0.18		0.11	0.191					1.00	0.60	0.18	0.191	0.11	0.021	3%
21	12.30	0.22		0.13	0.050					1.00	0.63	0.22	0.050	0.14	0.007	1%
RB	12.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.27	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.761</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): open channel, no bed ice.

Meas. Start Time (MST):	11:25
Meas. End Time (MST):	11:47
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, -5°C



**Flow characteristics:**

Total Flow:	0.761	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.78	(m <sup>2</sup> )
Wetted Width:	8.35	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.409	0.379
Water (°C):	0.3	0.4
Datalogger Clock:	11:01	12:07
Laptop Clock:	11:01	12:07
Battery (Main):	14.5	14.2
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessoricant:	-	Good
Vent Tube Dessiccant:	-	New
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modem, operational, RSSI -85.

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S15A-05
S15A-03			1.107	100.001	100.000	3/4" Pipe 3 m S of Station	S15A-04
S15A-04			1.295	99.813	99.815	3/4" Pipe 2 m E of Station	S15A-03
S15A-05	1.179	101.108		99.929	99.929	3/4" Pipe 3 m NE of Station	WL
Ice/PT:							WL
Water Level:			4.382	96.726		Time WL Surveyed: 11:17	S15A-03
Other:							S15A-04
<b>Setup #2</b>							S15A-05
S15A-03			1.096	99.999	100.000	3/4" Pipe 3 m S of Station	
S15A-04	1.282	101.095		99.813	99.815	3/4" Pipe 2 m E of Station	
S15A-05			1.166	99.929	99.929	3/4" Pipe 3 m NE of Station	
Ice/PT:							
Water Level:			4.372	96.723		Time WL Surveyed: 11:18	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S15A-04	1.272	101.085		99.813			
Water Level:			4.377	96.708		Time WL Surveyed: 12:02	
Water Level:			4.369	96.706		Time WL Surveyed: 12:03	
BM: S15A-04	1.262	101.075		99.813			

**WL Survey Summary**

	Before	After
Average WL:	96.725	96.707
Transducer Elevation:	96.316	96.328
Closing Error:	0.000	-
WL Check:	0.003	0.002

**Site Rating Information**

Measured Discharge:	0.761
Expected Discharge:	1.13
Shift from Existing Rating (m <sup>3</sup> /s):	0.37
Shift from Existing Rating (%):	49%

**Field Personnel:**

	SM, TR	Trip Date:	29-Apr-13
Data Entry Personnel:	SM	Date:	29-Apr-13
Data Check Personnel:	DW	Date:	28-May-13
Entered Digitally in the Field:	Yes		

START  
END

# Hydrometric Measurement / Site Visit Record



Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

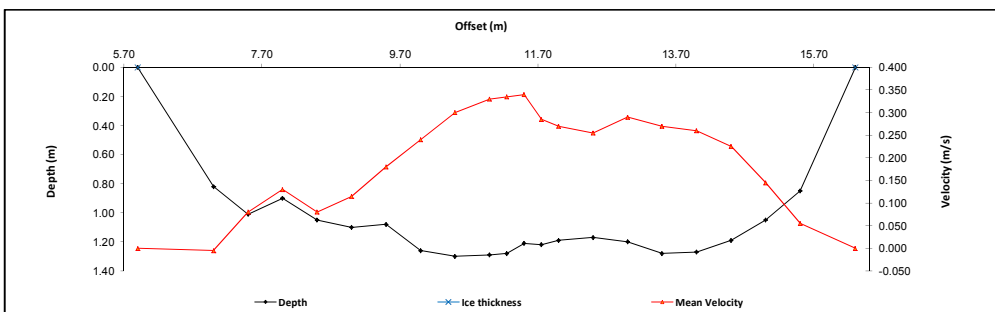
Site Visit Date: June 25, 2013  
 Site Visit Time (MST): 10:50

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.90	0.00	0.00		0.000		0.000		0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	7.00	0.82			0.66	0.000	0.16	-0.010	1.00	0.80	0.82	-0.005	0.66	-0.003	0%	
2	7.50	1.01			0.81	0.060	0.20	0.100	1.00	0.50	1.01	0.080	0.51	0.040	2%	
3	8.00	0.90			0.72	0.110	0.18	0.150	1.00	0.50	0.90	0.130	0.45	0.059	3%	
4	8.50	1.05			0.84	0.050	0.21	0.110	1.00	0.50	1.05	0.080	0.53	0.042	2%	
5	9.00	1.10			0.88	0.120	0.22	0.110	1.00	0.50	1.10	0.115	0.55	0.063	3%	
6	9.50	1.08			0.86	0.190	0.22	0.170	1.00	0.50	1.08	0.180	0.54	0.097	5%	
7	10.00	1.26			1.01	0.240	0.25	0.240	1.00	0.50	1.26	0.240	0.63	0.151	7%	
8	10.50	1.30			1.04	0.310	0.26	0.290	1.00	0.50	1.30	0.300	0.65	0.195	9%	
9	11.00	1.29			1.03	0.300	0.26	0.360	1.00	0.38	1.29	0.330	0.48	0.160	8%	
10	11.25	1.28			1.02	0.280	0.26	0.390	1.00	0.25	1.28	0.335	0.32	0.107	5%	
11	11.50	1.21			0.97	0.320	0.24	0.360	1.00	0.25	1.21	0.340	0.30	0.103	5%	
12	11.75	1.22			0.98	0.260	0.24	0.310	1.00	0.25	1.22	0.285	0.31	0.087	4%	
13	12.00	1.19			0.95	0.260	0.24	0.280	1.00	0.38	1.19	0.270	0.45	0.120	6%	
14	12.50	1.17			0.94	0.230	0.23	0.280	1.00	0.50	1.17	0.255	0.59	0.149	7%	
15	13.00	1.20			0.96	0.230	0.24	0.350	1.00	0.50	1.20	0.290	0.60	0.174	8%	
16	13.50	1.26			1.02	0.300	0.26	0.240	1.00	0.50	1.26	0.270	0.64	0.173	8%	
17	14.00	1.27			1.02	0.280	0.25	0.240	1.00	0.50	1.27	0.260	0.64	0.165	8%	
18	14.50	1.19			0.95	0.250	0.24	0.200	1.00	0.50	1.19	0.225	0.60	0.134	6%	
19	15.00	1.05			0.84	0.160	0.21	0.130	1.00	0.50	1.05	0.145	0.53	0.076	4%	
20	15.50	0.85			0.68	0.030	0.17	0.080	1.00	0.65	0.85	0.055	0.55	0.030	1%	
RB	16.30	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
													<b>Total Flow</b>	<b>2.12</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:36
Meas. End Time (MST):	12:02
Equipment:	Marsh McBirney
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Rain, calm, 15°C



**Flow characteristics:**

Total Flow:	2.12	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.50	(m <sup>2</sup> )
Wetted Width:	10.40	(m)
Hydraulic Depth:	1.01	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.96	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.597	1.615
Water (°C):	11.7	11.7
Datalogger Clock:	11:07	12:16
Laptop Clock:	11:07	12:16
Battery (Main):	13.6	13.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S15A-03			1.138	100.000	100.000	3/4" Pipe 3 m S of Station	S15A-05
S15A-04			1.324	99.814	99.815	3/4" Pipe 2 m E of Station	S15A-04
S15A-05	1.209	101.138		99.929	99.929	3/4" Pipe 3 m NE of Station	S15A-03
Ice/PT:							WL
Water Level:			3.202	97.936		Time WL Surveyed:	S15A-03
Other:							S15A-04
<b>Setup #2</b>							
S15A-03	1.124	101.124		100.000	100.000	3/4" Pipe 3 m S of Station	S15A-05
S15A-04			1.309	99.815	99.815	3/4" Pipe 2 m E of Station	
S15A-05			1.195	99.929	99.929	3/4" Pipe 3 m NE of Station	
Ice/PT:							
Water Level:			3.188	97.936		Time WL Surveyed:	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S15A-04	1.309	101.123	99.814		Time WL Surveyed:	
Water Level:			3.177	97.946		Time WL Surveyed:	12:11
Water Level:			3.166	97.946		Time WL Surveyed:	12:12
BM:	S15A-04	1.298	101.112	99.814			

**WL Survey Summary**

	Before	After
Average WL:	97.936	97.946
Transducer Elevation:	96.339	96.331
Closing Error:	0.000	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	2.12
Expected Discharge:	18.57
Shift from Existing Rating (m <sup>3</sup> /s):	16.45
Shift from Existing Rating (%):	776%

**Datalogger / Station Notes:**

**General Notes:**

- Backflow from Athabasca River
- Access road washed out.

**Field Personnel:**

	SM, TR	Trip Date:	24-Jun-13
Data Entry Personnel:	SM	Date:	24-Jun-13
Data Check Personnel:	DW	Date:	26-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: August 15, 2013  
 Site Visit Time (MST): 11:45

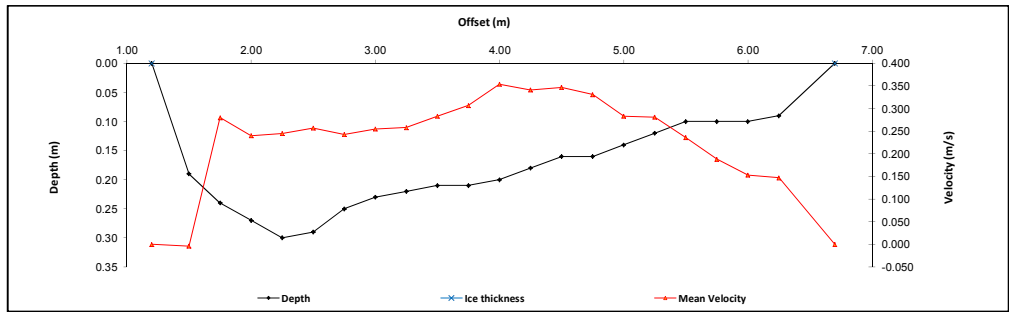


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.50	0.19		0.11	-0.004					1.00	0.28	0.19	-0.004	0.05	0.000	0%
2	1.75	0.24		0.14	0.280					1.00	0.25	0.24	0.280	0.06	0.017	7%
3	2.00	0.27		0.16	0.240					1.00	0.25	0.27	0.240	0.07	0.016	7%
4	2.25	0.30		0.18	0.245					1.00	0.25	0.30	0.245	0.08	0.018	8%
5	2.50	0.29		0.17	0.257					1.00	0.25	0.29	0.257	0.07	0.019	8%
6	2.75	0.25		0.15	0.243					1.00	0.25	0.25	0.243	0.06	0.015	6%
7	3.00	0.23		0.14	0.255					1.00	0.25	0.23	0.255	0.06	0.015	6%
8	3.25	0.22		0.13	0.258					1.00	0.25	0.22	0.258	0.06	0.014	6%
9	3.50	0.21		0.13	0.283					1.00	0.25	0.21	0.283	0.05	0.015	6%
10	3.75	0.21		0.13	0.307					1.00	0.25	0.21	0.307	0.05	0.016	7%
11	4.00	0.20		0.12	0.354					1.00	0.25	0.20	0.354	0.05	0.018	7%
12	4.25	0.18		0.11	0.341					1.00	0.25	0.18	0.341	0.05	0.015	6%
13	4.50	0.16		0.10	0.347					1.00	0.25	0.16	0.347	0.04	0.014	6%
14	4.75	0.16		0.10	0.331					1.00	0.25	0.16	0.331	0.04	0.013	5%
15	5.00	0.14		0.08	0.283					1.00	0.25	0.14	0.283	0.04	0.010	4%
16	5.25	0.12		0.07	0.281					1.00	0.25	0.12	0.281	0.03	0.008	3%
17	5.50	0.10		0.06	0.236					1.00	0.25	0.10	0.236	0.03	0.006	2%
18	5.75	0.10		0.06	0.188					1.00	0.25	0.10	0.188	0.03	0.005	2%
19	6.00	0.10		0.06	0.153					1.00	0.25	0.10	0.153	0.03	0.004	2%
20	6.25	0.09		0.05	0.147					1.00	0.35	0.09	0.147	0.03	0.005	2%
RB	6.70	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.242</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:13
Meas. End Time (MST):	12:29
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	clear, calm, 25°C



**Flow characteristics:**

Total Flow:	0.242	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.95	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.19	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.261	0.258
Water (°C):	16.7	16.7
Datalogger Clock:	11:59	12:37
Laptop Clock:	11:59	12:37
Battery (Main):	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent. Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S15A-03				100.000	100.000	3/4" Pipe 3 m S of Station	S15A-03
S15A-04	0.941	100.941		99.817	99.815	3/4" Pipe 2 m E of Station	S15A-04
S15A-05			1.124	99.933	99.929	3/4" Pipe 3 m NE of Station	S15A-05
Ice/PT:							WL
Water Level:			4.345	96.596		Time WL Surveyed: 12:05	S15A-05
Other:							S15A-04
<b>Setup #2</b>							S15A-03
S15A-03			0.927	100.003	100.000	3/4" Pipe 3 m S of Station	
S15A-04			1.112	99.818	99.815	3/4" Pipe 2 m E of Station	
S15A-05	0.997	100.930		99.933	99.929	3/4" Pipe 3 m NE of Station	
Ice/PT:							
Water Level:			4.330	96.600		Time WL Surveyed: 12:07	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S15A-04	1.112	100.929	99.817			
Water Level:			4.328	96.601		Time WL Surveyed: 12:32	
Water Level:			4.315	96.601		Time WL Surveyed: 12:34	
BM:	S15A-04	1.099	100.916	99.817			

**WL Survey Summary**

	Before	After
Average WL:	96.598	96.601
Transducer Elevation:	96.337	96.343
Closing Error:	-0.003	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	0.242
Expected Discharge:	0.67
Shift from Existing Rating (m <sup>3</sup> /s):	0.43
Shift from Existing Rating (%):	178%

**Field Personnel:**

SM, TR	Trip Date:	15-Aug-13
SM	Date:	15-Aug-13
DW	Date:	22-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: September 11, 2013  
 Site Visit Time (MST): 08:45

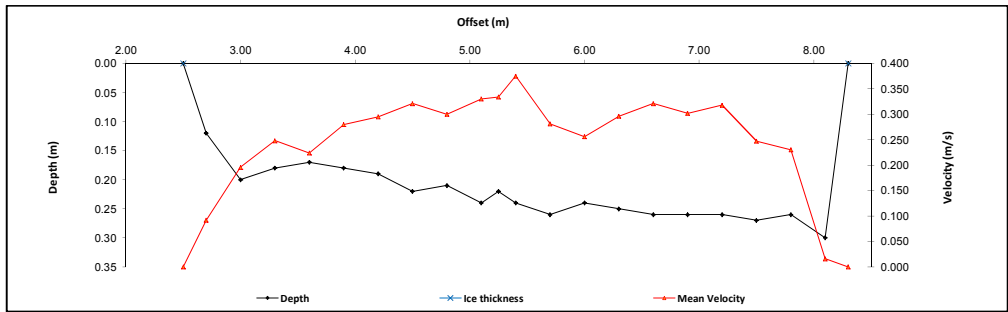


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.50	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.70	0.12		0.07	0.092					1.00	0.25	0.12	0.092	0.03	0.003	1%
2	3.00	0.20		0.12	0.196					1.00	0.30	0.20	0.196	0.06	0.012	4%
3	3.30	0.18		0.11	0.248					1.00	0.30	0.18	0.248	0.05	0.013	4%
4	3.60	0.17		0.10	0.224					1.00	0.30	0.17	0.224	0.05	0.011	3%
5	3.90	0.18		0.11	0.280					1.00	0.30	0.18	0.280	0.05	0.015	5%
6	4.20	0.19		0.11	0.295					1.00	0.30	0.19	0.295	0.06	0.017	5%
7	4.50	0.22		0.13	0.321					1.00	0.30	0.22	0.321	0.07	0.021	6%
8	4.80	0.21		0.13	0.300					1.00	0.30	0.21	0.300	0.06	0.019	6%
9	5.10	0.24		0.14	0.330					1.00	0.23	0.24	0.330	0.05	0.018	5%
10	5.25	0.22		0.13	0.334					1.00	0.15	0.22	0.334	0.03	0.011	3%
11	5.40	0.24		0.14	0.375					1.00	0.23	0.24	0.375	0.05	0.020	6%
12	5.70	0.26		0.16	0.281					1.00	0.30	0.26	0.281	0.08	0.022	7%
13	6.00	0.24		0.14	0.256					1.00	0.30	0.24	0.256	0.07	0.018	5%
14	6.30	0.25		0.15	0.296					1.00	0.30	0.25	0.296	0.07	0.022	7%
15	6.60	0.26		0.16	0.321					1.00	0.30	0.26	0.321	0.08	0.025	7%
16	6.90	0.26		0.16	0.302					1.00	0.30	0.26	0.302	0.08	0.024	7%
17	7.20	0.26		0.16	0.318					1.00	0.30	0.26	0.318	0.08	0.025	7%
18	7.50	0.27		0.16	0.247					1.00	0.30	0.27	0.247	0.08	0.020	6%
19	7.80	0.26		0.16	0.230					1.00	0.30	0.26	0.230	0.08	0.018	5%
20	8.10	0.30		0.18	0.016					1.00	0.25	0.30	0.016	0.08	0.001	0%
LB	8.30	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.336</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:15
Meas. End Time (MST):	9:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15°C



**Flow characteristics:**

Total Flow:	0.336	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.27	(m <sup>2</sup> )
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.311	0.309
Water (°C):	11.9	11.8
Datalogger Clock:	08:54	09:46
Laptop Clock:	08:54	09:46
Battery (Main):	13.5	14.4
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Updated BM plates.

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S15A-03		101.100		100.000	100.000	3/4" Pipe 3 m S of Station	S15A-03
S15A-04	1.100		1.284	99.816	99.815	3/4" Pipe 2 m E of Station	S15A-04
S15A-05			1.169	99.931	99.929	3/4" Pipe 3 m NE of Station	S15A-05
Ice/PT:							WL
Water Level:			4.457	96.643		Time WL Surveyed:	9:06
Other:							
Setup #2							
S15A-03			1.087	100.001	100.000	3/4" Pipe 3 m S of Station	S15A-03
S15A-04			1.273	99.815	99.815	3/4" Pipe 2 m E of Station	S15A-04
S15A-05	1.157	101.088		99.931	99.929	3/4" Pipe 3 m NE of Station	S15A-05
Ice/PT:							
Water Level:			4.445	96.643		Time WL Surveyed:	9:08
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S15A-03	1.087	101.087	100.000		Time WL Surveyed:	9:43
Water Level:			4.447	96.640		Time WL Surveyed:	9:45
Water Level:			4.435	96.639		Time WL Surveyed:	
BM:	S15A-03	1.074	101.074	100.000			

**WL Survey Summary**

	Before	After
Average WL:	96.643	96.640
Transducer Elevation:	96.332	96.331
Closing Error:	-0.001	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	0.336
Expected Discharge:	0.82
Shift from Existing Rating (m <sup>3</sup> /s):	0.48
Shift from Existing Rating (%):	143%

**Field Personnel:**

SM, CJ	Trip Date:	11-Sep-13
SM	Date:	11-Sep-13
DW, XP	Date:	16-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: October 31, 2013  
 Site Visit Time (MST): 08:40

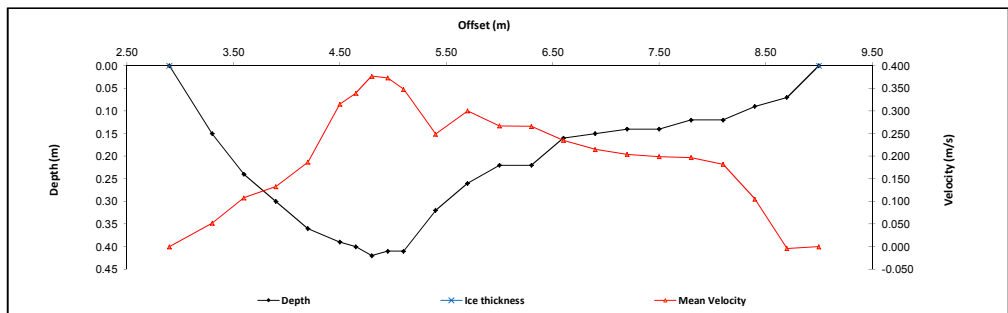


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	3.30	0.15		0.09	0.052					1.00	0.35	0.15	0.052	0.05	0.003	1%
2	3.60	0.24		0.14	0.108					1.00	0.30	0.24	0.108	0.07	0.008	3%
3	3.90	0.30		0.18	0.133					1.00	0.30	0.30	0.133	0.09	0.012	4%
4	4.20	0.36		0.22	0.187					1.00	0.30	0.36	0.187	0.11	0.020	7%
5	4.50	0.39		0.23	0.315					1.00	0.22	0.39	0.315	0.09	0.028	9%
6	4.65	0.40		0.24	0.339					1.00	0.15	0.40	0.339	0.06	0.020	7%
7	4.80	0.42		0.25	0.377					1.00	0.15	0.42	0.377	0.06	0.024	8%
8	4.95	0.41		0.25	0.373					1.00	0.15	0.41	0.373	0.06	0.023	7%
9	5.10	0.41		0.25	0.348					1.00	0.23	0.41	0.348	0.09	0.032	10%
10	5.40	0.32		0.19	0.249					1.00	0.30	0.32	0.249	0.10	0.024	8%
11	5.70	0.26		0.16	0.300					1.00	0.30	0.26	0.300	0.08	0.023	8%
12	6.00	0.22		0.13	0.267					1.00	0.30	0.22	0.267	0.07	0.018	6%
13	6.30	0.22		0.13	0.266					1.00	0.30	0.22	0.266	0.07	0.018	6%
14	6.60	0.16		0.10	0.235					1.00	0.30	0.16	0.235	0.05	0.011	4%
15	6.90	0.15		0.09	0.215					1.00	0.30	0.15	0.215	0.04	0.010	3%
16	7.20	0.14		0.08	0.204					1.00	0.30	0.14	0.204	0.04	0.009	3%
17	7.50	0.14		0.08	0.199					1.00	0.30	0.14	0.199	0.04	0.008	3%
18	7.80	0.12		0.07	0.197					1.00	0.30	0.12	0.197	0.04	0.007	2%
19	8.10	0.12		0.07	0.182					1.00	0.30	0.12	0.182	0.04	0.007	2%
20	8.40	0.09		0.05	0.105					1.00	0.30	0.09	0.105	0.03	0.003	1%
21	8.70	0.07		0.04	-0.004					1.00	0.30	0.07	-0.004	0.02	0.000	0%
RB	9.00	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.306</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:03
Meas. End Time (MST):	9:24
Equipment:	ADV
Method:	Wading
River Condition:	Low flow, no ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -3°C



**Flow characteristics:**

Total Flow:	0.306	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.29	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.21	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.229	0.242
Water (°C):	2.9	2.9
Datalogger Clock:	08:45	09:33
Laptop Clock:	08:45	09:33
Battery (Main):	12.7	12.8
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	304018	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Removed PLS for winter
- ADV test result: good
- PLS weight was left at base of logger mast.

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S15A-03	1.131	101.131		100.000	100.000	3/4" Pipe 3 m S of Station	S15A-03
S15A-04			1.315	99.816	99.815	3/4" Pipe 2 m E of Station	S15A-04
S15A-05			1.200	99.931	99.929	3/4" Pipe 3 m NE of Station	S15A-05
Ice/PT:							WL
Water Level:			4.560	96.571		Time WL Surveyed: 8:56	WL
Other:							S15A-05
<b>Setup #2</b>							S15A-04
S15A-03			1.117	100.001	100.000	3/4" Pipe 3 m S of Station	S15A-03
S15A-04	1.302	101.118		99.816	99.815	3/4" Pipe 2 m E of Station	
S15A-05			1.185	99.933	99.929	3/4" Pipe 3 m NE of Station	
Ice/PT:							
Water Level:			4.548	96.570		Time WL Surveyed: 8:58	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S15A-04	1.302	101.118		99.816			
Water Level:			4.541	96.577		Time WL Surveyed: 9:26	
Water Level:			4.525	96.576		Time WL Surveyed: 9:28	
BM: S15A-04	1.285	101.101		99.816			

**WL Survey Summary**

	Before	After
Average WL:	96.571	96.577
Transducer Elevation:	96.342	96.335
Closing Error:	-0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.306
Expected Discharge:	0.59
Shift from Existing Rating (m <sup>3</sup> /s):	0.29
Shift from Existing Rating (%):	93%

**Field Personnel:**

SM, TR	Trip Date:	31-Oct-13
SM	Date:	31-Oct-13
DW	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

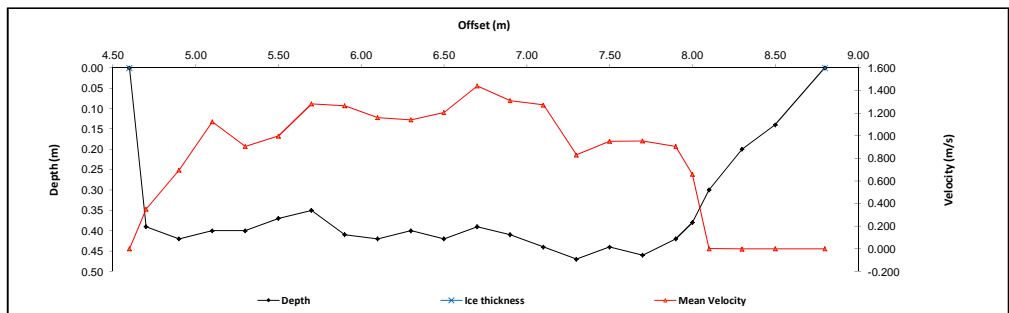
Site Visit Date: May 5, 2013  
 Site Visit Time (MST): 08:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.60	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	4.70	0.39		0.23	0.351					1.00	0.15	0.39	0.351	0.06	0.021	1%
2	4.90	0.42		0.25	0.696					1.00	0.20	0.42	0.696	0.08	0.058	4%
3	5.10	0.40		0.24	1.124					1.00	0.20	0.40	1.124	0.08	0.090	6%
4	5.30	0.40		0.24	0.906					1.00	0.20	0.40	0.906	0.08	0.072	5%
5	5.50	0.37		0.22	0.997					1.00	0.20	0.37	0.997	0.07	0.074	5%
6	5.70	0.35		0.21	1.281					1.00	0.20	0.35	1.281	0.07	0.090	6%
7	5.90	0.41		0.25	1.264					1.00	0.20	0.41	1.264	0.08	0.104	7%
8	6.10	0.42		0.25	1.160					1.00	0.20	0.42	1.160	0.08	0.097	7%
9	6.30	0.40		0.24	1.141					1.00	0.20	0.40	1.141	0.08	0.091	6%
10	6.50	0.42		0.25	1.205					1.00	0.20	0.42	1.205	0.08	0.101	7%
11	6.70	0.39		0.23	1.441					1.00	0.20	0.39	1.441	0.08	0.112	8%
12	6.90	0.41		0.25	1.310					1.00	0.20	0.41	1.310	0.08	0.107	7%
13	7.10	0.44		0.26	1.272					1.00	0.20	0.44	1.272	0.09	0.112	8%
14	7.30	0.47		0.28	0.831					1.00	0.20	0.47	0.831	0.09	0.078	5%
15	7.50	0.44		0.26	0.951					1.00	0.20	0.44	0.951	0.09	0.084	6%
16	7.70	0.46		0.28	0.953					1.00	0.20	0.46	0.953	0.09	0.088	6%
17	7.90	0.42		0.25	0.905					1.00	0.15	0.42	0.905	0.06	0.057	4%
18	8.00	0.38		0.23	0.660					1.00	0.10	0.38	0.660	0.04	0.025	2%
19	8.10	0.30		0.18	0.001					1.00	0.15	0.30	0.001	0.04	0.000	0%
20	8.30	0.20		0.12	-0.002					1.00	0.20	0.20	-0.002	0.04	0.000	0%
21	8.50	0.14		0.08	0.000					1.00	0.25	0.14	0.000	0.04	0.000	0%
LB	8.80	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>1.46</b>	<b>100%</b>		

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	8:24
Meas. End Time (MST):	8:45
Equipment:	ADV
Method:	Wading
River Condition:	High flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 12°C



**Flow characteristics:**

Total Flow:	1.46	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.52	(m <sup>2</sup> )
Wetted Width:	0.20	(m)
Hydraulic Depth:	7.60	(m)
Mean Velocity:	0.96	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.901	0.900
Water (°C):	2.4	2.6
Datalogger Clock:	07:59	08:54
Laptop Clock:	07:58	08:53
Battery (Main):	14.5	14.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- There was vegetation along the left bank where the flow measurement was conducted.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S16A-05
Bench Mark 5:			0.788	99.978	99.976	3/4" pipe 10 m N of logger	S16A-06
Bench Mark 6:			1.202	99.564	99.567	3/4" pipe 12 m E of logger	S16A-07
Bench Mark 7:	0.372	100.766		100.394	100.394	3/4" pipe 8 m N of logger	WL
Ice/PT:							WL
Water Level:			2.230	98.536		Time WL Surveyed: 8:14	S16A-07
Other:							S16A-06
<b>Setup #2</b>							S16A-05
Bench Mark 5:	0.774	100.752		99.978	99.976	3/4" pipe 10 m N of logger	
Bench Mark 6:			1.187	99.565	99.567	3/4" pipe 12 m E of logger	
Bench Mark 7:			0.356	100.396	100.394	3/4" pipe 8 m N of logger	
Ice/PT:							
Water Level:			2.215	98.537		Time WL Surveyed: 8:16	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S16A-05	0.774	100.752		99.978			
Water Level:			2.212	98.540		Time WL Surveyed: 8:50	
Water Level:			2.199	98.537		Time WL Surveyed: 8:51	
BM: S16A-05	0.758	100.736		99.978			

**WL Survey Summary**

	Before	After
Average WL:	98.537	98.539
Transducer Elevation:	97.636	97.639
Closing Error:	-0.002	-
WL Check:	0.001	0.003

**Site Rating Information**

Measured Discharge:	1.46
Expected Discharge:	2.28
Shift from Existing Rating (m <sup>3</sup> /s):	0.82
Shift from Existing Rating (%):	56%

**Field Personnel:**

SM, TR	Trip Date:	5-May-13
SM	Date:	5-May-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: June 13, 2013  
 Site Visit Time (MST): 13:30

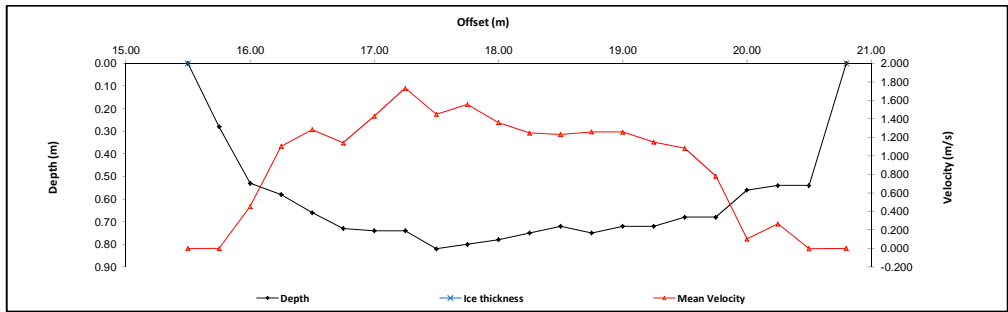


Flow Measurement:										Measured Data					Calculated Data				
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS of ice (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)			
RB	15.50	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000				
1	15.75	0.28		0.17	-0.001					1.00	0.25	0.28	-0.001	0.07	0.000	0%			
2	16.00	0.53		0.32	0.454					1.00	0.25	0.53	0.454	0.13	0.060	2%			
3	16.25	0.58		0.35	1.104					1.00	0.25	0.58	1.104	0.15	0.160	4%			
4	16.50	0.66		0.40	1.284					1.00	0.25	0.66	1.284	0.17	0.212	6%			
5	16.75	0.73		0.44	1.140					1.00	0.25	0.73	1.140	0.18	0.208	6%			
6	17.00	0.74		0.44	1.429					1.00	0.25	0.74	1.429	0.19	0.264	7%			
7	17.25	0.74		0.44	1.732					1.00	0.25	0.74	1.732	0.19	0.320	9%			
8	17.50	0.82			1.449	0.66		0.16		1.00	0.25	0.82	1.449	0.21	0.297	8%			
9	17.75	0.80			1.557	0.64		0.16		1.00	0.25	0.80	1.557	0.20	0.311	9%			
10	18.00	0.78			1.360	0.62		0.16		1.00	0.25	0.78	1.360	0.20	0.265	7%			
11	18.25	0.75		0.45	1.248					1.00	0.25	0.75	1.248	0.19	0.234	7%			
12	18.50	0.72		0.43	1.232					1.00	0.25	0.72	1.232	0.18	0.222	6%			
13	18.75	0.75		0.45	1.260					1.00	0.25	0.75	1.260	0.19	0.236	7%			
14	19.00	0.72		0.43	1.258					1.00	0.25	0.72	1.258	0.18	0.226	6%			
15	19.25	0.72		0.43	1.148					1.00	0.25	0.72	1.148	0.18	0.207	6%			
16	19.50	0.68		0.41	1.082					1.00	0.25	0.68	1.082	0.17	0.184	5%			
17	19.75	0.68		0.41	0.780					1.00	0.25	0.68	0.780	0.17	0.133	4%			
18	20.00	0.56		0.34	0.103					1.00	0.25	0.56	0.103	0.14	0.014	0%			
19	20.25	0.54		0.32	0.266					1.00	0.25	0.54	0.266	0.14	0.036	1%			
20	20.50	0.54		0.32	-0.002					1.00	0.27	0.54	-0.002	0.15	0.000	0%			
LB	20.80	0.00	0.00		0.00			0.00		1.00	0.15	0.00	0.000	0.00	0.000				
<b>Total Flow</b>														<b>3.59</b>	<b>100%</b>				

**Flow Measurement Details:**

Metering Section Location (describe): At crossing

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:13
Equipment:	ADV
Method:	Wading
River Condition:	High Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly Sunny, Light breeze, 15°C



**Flow characteristics:**

Total Flow:	3.59	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.34	(m <sup>2</sup> )
Wetted Width:	0.15	(m)
Hydraulic Depth:	22.29	(m)
Mean Velocity:	1.07	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.136	1.126
Water (°C):	14.8	15.0
Datalogger Clock:	13:32	-
Laptop Clock:	13:31	-
Battery (Main):	14.2	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ran ADV Test, all good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S16A-05				99.976	99.976	3/4" pipe 10 m N of logger	S16A-05
S16A-06	1.025	101.001		99.560	99.567	3/4" pipe 12 m E of logger	S16A-06
S16A-07			1.441	100.392	100.394	3/4" pipe 8 m N of logger	S16A-07
Ice/PT:							WL
Water Level:			2.223	98.778		Time WL Surveyed: 13:36	S16A-07
Other:							S16A-06
<b>Setup #2</b>							S16A-05
S16A-05			0.996	99.973	99.976	3/4" pipe 10 m N of logger	
S16A-06	1.409	100.969		99.560	99.567	3/4" pipe 12 m E of logger	
S16A-07			0.578	100.391	100.394	3/4" pipe 8 m N of logger	
Ice/PT:							
Water Level:			2.189	98.780		Time WL Surveyed: 13:38	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S16A-07	0.577	100.969	2.196	100.392		
Water Level:				98.773		Time WL Surveyed: 14:18	
Water Level:				98.769		Time WL Surveyed: 14:19	
BM:	S16A-07	0.485	100.877	2.108	100.392		

**WL Survey Summary**

	Before	After
Average WL:	98.779	98.771
Transducer Elevation:	97.643	97.645
Closing Error:	0.003	-
WL Check:	0.002	0.004

**Site Rating Information**

Measured Discharge:	3.59
Expected Discharge:	8.24
Shift from Existing Rating (m <sup>3</sup> /s):	4.65
Shift from Existing Rating (%):	130%

**Field Personnel:**

Field Personnel:	TR, SG	Trip Date:	13-Jun-13
Data Entry Personnel:	TR	Date:	13-Jun-13
Data Check Personnel:	DW	Date:	25-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N



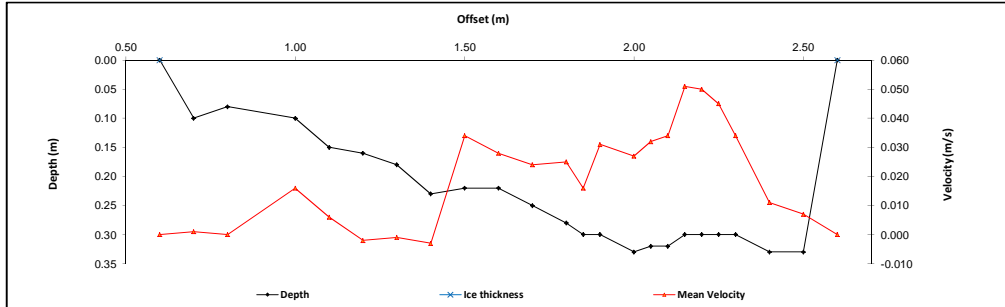
Site Visit Date: September 12, 2013  
 Site Visit Time (MST): 15:10

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.60	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.70	0.10		0.06	0.001					1.00	0.10	0.10	0.001	0.01	0.000	0%
2	0.80	0.08		0.05	0.000					1.00	0.15	0.08	0.000	0.01	0.000	0%
3	1.00	0.10		0.06	0.016					1.00	0.15	0.10	0.016	0.02	0.000	3%
4	1.10	0.15		0.09	0.006					1.00	0.10	0.15	0.006	0.02	0.000	1%
5	1.20	0.16		0.10	-0.002					1.00	0.10	0.16	-0.002	0.02	0.000	0%
6	1.30	0.18		0.11	-0.001					1.00	0.10	0.18	-0.001	0.02	0.000	0%
7	1.40	0.23		0.14	-0.003					1.00	0.10	0.23	-0.003	0.02	0.000	-1%
8	1.50	0.22		0.13	0.034					1.00	0.10	0.22	0.034	0.02	0.001	8%
9	1.60	0.22		0.13	0.028					1.00	0.10	0.22	0.028	0.02	0.001	7%
10	1.70	0.25		0.15	0.024					1.00	0.10	0.25	0.024	0.03	0.001	7%
11	1.80	0.28		0.17	0.025					1.00	0.08	0.28	0.025	0.02	0.001	6%
12	1.85	0.30		0.18	0.016					1.00	0.05	0.30	0.016	0.01	0.000	3%
13	1.90	0.30		0.18	0.031					1.00	0.08	0.30	0.031	0.02	0.001	8%
14	2.00	0.33		0.20	0.027					1.00	0.08	0.33	0.027	0.02	0.001	7%
15	2.05	0.32		0.19	0.032					1.00	0.05	0.32	0.032	0.02	0.001	6%
16	2.10	0.32		0.19	0.034					1.00	0.05	0.32	0.034	0.02	0.001	6%
17	2.15	0.30		0.18	0.051					1.00	0.05	0.30	0.051	0.01	0.001	9%
18	2.20	0.30		0.18	0.050					1.00	0.05	0.30	0.050	0.02	0.001	8%
19	2.25	0.30		0.18	0.045					1.00	0.05	0.30	0.045	0.01	0.001	8%
20	2.30	0.30		0.18	0.034					1.00	0.07	0.30	0.034	0.02	0.001	9%
21	2.40	0.33		0.20	0.011					1.00	0.10	0.33	0.011	0.03	0.000	4%
22	2.50	0.33		0.20	0.007					1.00	0.10	0.33	0.007	0.03	0.000	3%
LB	2.60	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.009</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:40
Meas. End Time (MST):	16:07
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 25°C



**Flow characteristics:**

Total Flow:	0.009	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.43	(m <sup>2</sup> )
Wetted Width:	0.10	(m)
Hydraulic Depth:	4.27	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.518	0.524
Water (°C):	13.7	14.2
Datalogger Clock:	15:14	16:16
Laptop Clock:	15:15	16:17
Battery (Main):	14.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Needs BM plates

**General Notes:**

- Needs BM plates

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S16A-06
S16A-05			0.893	99.979	99.976	3/4" pipe 2.5 m N of logger	S16A-05
S16A-06	1.305	100.872		99.567	99.567	3/4" pipe 4 m E of logger	S16A-07
S16A-07			0.476	100.396	100.394	3/4" pipe 2 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.707	98.165			S16A-07
Other:							S16A-05
<b>Setup #2</b>							S16A-06
S16A-05			0.877	99.981	99.976	3/4" pipe 2.5 m N of logger	
S16A-06			1.291	99.567	99.567	3/4" pipe 4 m E of logger	
S16A-07	0.462	100.858		100.396	100.394	3/4" pipe 2 m NW of logger	
Ice/PT:							
Water Level:			2.690	98.168			
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S16A-06	1.292	100.859		99.567		
Water Level:				98.171			S16A-06
Water Level:				2.670			S16A-05
Water Level:				98.170			S16A-06
BM:	S16A-06	1.273	100.840		99.567		

**WL Survey Summary**

	Before	After
Average WL:	98.167	98.171
Transducer Elevation:	97.649	97.647
Closing Error:	0.000	-
WL Check:	0.003	0.001

**Site Rating Information**

Measured Discharge:	0.00892
Expected Discharge:	0.04
Shift from Existing Rating (m <sup>3</sup> /s):	0.03
Shift from Existing Rating (%):	369%

**Field Personnel:**

SM, CJ	Trip Date:	12-Sep-13
SM	Data Entry Personnel:	12-Sep-13
DW	Data Check Personnel:	16-Sep-13
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

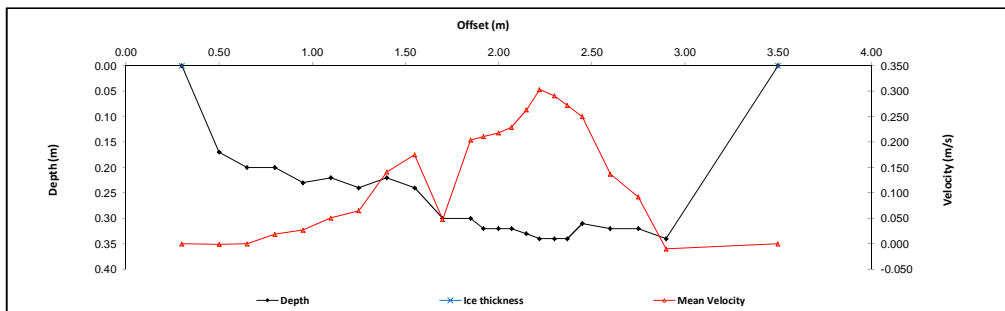
Site Visit Date: November 1, 2013  
 Site Visit Time (MST): 08:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.50	0.17		0.10	-0.001					1.00	0.18	0.17	-0.001	0.03	0.000	0%
2	0.65	0.20		0.12	0.000					1.00	0.15	0.20	0.000	0.03	0.000	0%
3	0.80	0.20		0.12	0.019					1.00	0.15	0.20	0.019	0.03	0.001	1%
4	0.95	0.23		0.14	0.027					1.00	0.15	0.23	0.027	0.03	0.001	1%
5	1.10	0.22		0.13	0.051					1.00	0.15	0.22	0.051	0.03	0.002	2%
6	1.25	0.24		0.14	0.065					1.00	0.15	0.24	0.065	0.04	0.002	3%
7	1.40	0.22		0.13	0.141					1.00	0.15	0.22	0.141	0.03	0.005	5%
8	1.55	0.24		0.14	0.175					1.00	0.15	0.24	0.175	0.04	0.006	7%
9	1.70	0.30		0.18	0.048					1.00	0.15	0.30	0.048	0.05	0.002	2%
10	1.85	0.30		0.18	0.204					1.00	0.11	0.30	0.204	0.03	0.007	8%
11	1.92	0.32		0.19	0.211					1.00	0.08	0.32	0.211	0.02	0.005	6%
12	2.00	0.32		0.19	0.218					1.00	0.08	0.32	0.218	0.02	0.005	6%
13	2.07	0.32		0.19	0.229					1.00	0.07	0.32	0.229	0.02	0.005	6%
14	2.15	0.33		0.20	0.263					1.00	0.08	0.33	0.263	0.02	0.007	7%
15	2.22	0.34		0.20	0.303					1.00	0.07	0.34	0.303	0.03	0.008	9%
16	2.30	0.34		0.20	0.291					1.00	0.08	0.34	0.291	0.03	0.007	8%
17	2.37	0.34		0.20	0.272					1.00	0.08	0.34	0.272	0.03	0.007	8%
18	2.45	0.31		0.19	0.250					1.00	0.12	0.31	0.250	0.04	0.009	10%
19	2.60	0.32		0.19	0.137					1.00	0.15	0.32	0.137	0.05	0.007	7%
20	2.75	0.32		0.19	0.092					1.00	0.15	0.32	0.092	0.05	0.004	5%
21	2.90	0.34		0.20	-0.010					1.00	0.38	0.34	-0.010	0.13	-0.001	-1%
LB	3.50	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.088</b>	<b>100%</b>		

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	8:22
Meas. End Time (MST):	8:42
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 2°C



**Flow characteristics:**

Total Flow:	0.088	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.77	(m <sup>2</sup> )
Wetted Width:	0.30	(m)
Hydraulic Depth:	2.58	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.606	0.606
Water (°C):	0.7	0.6
Datalogger Clock:	08:07	08:44
Laptop Clock:	08:07	08:44
Battery (Main):	12.7	12.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	304020	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Removed PLS for winter
- Anchor and weight left at base of old logger tree

**General Notes:**

- Updated BM descriptions and site description

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S16A-06
S16A-05			0.661	99.979	99.976	3/4" pipe 2.5 m N of logger	S16A-05
S16A-06			1.075	99.565	99.567	3/4" pipe 4 m E of logger	S16A-07
S16A-07	0.246	100.640		100.394	100.394	3/4" pipe 2 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.390	98.250		Time WL Surveyed: 8:12	S16A-07
Other:							S16A-05
<b>Setup #2</b>							S16A-06
S16A-05			0.642	99.978	99.976	3/4" pipe 2.5 m N of logger	
S16A-06	1.055	100.620		99.565	99.567	3/4" pipe 4 m E of logger	
S16A-07			0.225	100.395	100.394	3/4" pipe 2 m NW of logger	
Ice/PT:							
Water Level:			2.370	98.250		Time WL Surveyed: 8:14	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S16A-07	0.226	100.620		100.394		
Water Level:			2.371	98.249		Time WL Surveyed: 8:46	
Water Level:			2.353	98.250		Time WL Surveyed: 8:48	
BM:	S16A-07	0.209	100.603		100.394		

**WL Survey Summary**

	Before	After
Average WL:	98.250	98.250
Transducer Elevation:	97.644	97.644
Closing Error:	-0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.0884
Expected Discharge:	0.17
Shift from Existing Rating (m <sup>3</sup> /s):	0.08
Shift from Existing Rating (%):	92%

**Field Personnel:**

SM, TR	Trip Date:	1-Nov-13
SM	Date:	1-Nov-13
DW	Date:	5-Nov-13
Entered Digitally in the Field:	No	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: April 29, 2013  
 Site Visit Time (MST): 12:55

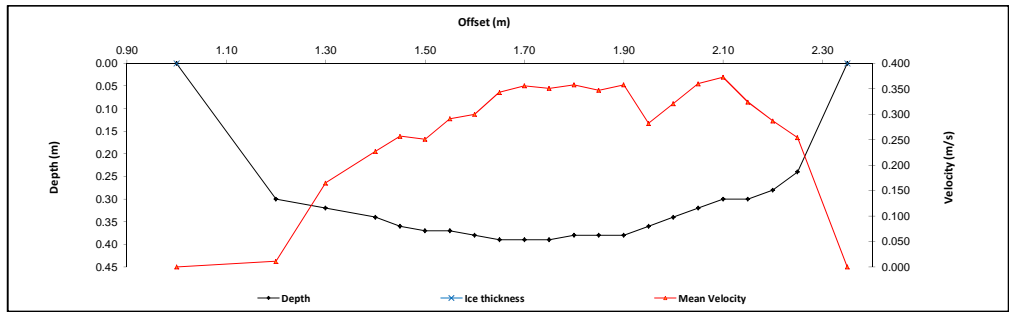


Flow Measurement										Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)			
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000				
1	1.20	0.30		0.18	0.011					1.00	0.15	0.30	0.011	0.05	0.000	0%			
2	1.30	0.32		0.19	0.165					1.00	0.10	0.32	0.165	0.03	0.005	5%			
3	1.40	0.34		0.20	0.227					1.00	0.07	0.34	0.227	0.03	0.006	5%			
4	1.45	0.36		0.22	0.257					1.00	0.05	0.36	0.257	0.02	0.005	4%			
5	1.50	0.37		0.22	0.251					1.00	0.05	0.37	0.251	0.02	0.005	4%			
6	1.55	0.37		0.22	0.291					1.00	0.05	0.37	0.291	0.02	0.005	5%			
7	1.60	0.38		0.23	0.300					1.00	0.05	0.38	0.300	0.02	0.006	5%			
8	1.65	0.39		0.23	0.343					1.00	0.05	0.39	0.343	0.02	0.007	6%			
9	1.70	0.39		0.23	0.356					1.00	0.05	0.39	0.356	0.02	0.007	6%			
10	1.75	0.39		0.23	0.351					1.00	0.05	0.39	0.351	0.02	0.007	6%			
11	1.80	0.38		0.23	0.358					1.00	0.05	0.38	0.358	0.02	0.007	6%			
12	1.85	0.38		0.23	0.347					1.00	0.05	0.38	0.347	0.02	0.007	6%			
13	1.90	0.38		0.23	0.358					1.00	0.05	0.38	0.358	0.02	0.007	6%			
14	1.95	0.36		0.22	0.282					1.00	0.05	0.36	0.282	0.02	0.005	5%			
15	2.00	0.34		0.20	0.321					1.00	0.05	0.34	0.321	0.02	0.005	5%			
16	2.05	0.32		0.19	0.360					1.00	0.05	0.32	0.360	0.02	0.006	5%			
17	2.10	0.30		0.18	0.373					1.00	0.05	0.30	0.373	0.01	0.006	5%			
18	2.15	0.30		0.18	0.324					1.00	0.05	0.30	0.324	0.01	0.005	4%			
19	2.20	0.28		0.17	0.287					1.00	0.05	0.28	0.287	0.01	0.004	4%			
20	2.25	0.24		0.14	0.254					1.00	0.07	0.24	0.254	0.02	0.005	4%			
RB	2.35	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000				
<b>Total Flow</b>														<b>0.108</b>	<b>100%</b>				

**Flow Measurement Details:**

Metering Section Location (describe):  
 - 0.2 m above PT

Meas. Start Time (MST):	13:26
Meas. End Time (MST):	13:49
Equipment:	ADV
Method:	Wading
River Condition:	Open good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 0°C



**Flow characteristics:**

Total Flow:	0.108	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.41	(m <sup>2</sup> )
Wetted Width:	1.35	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.343	0.341
Water (°C):	0.0	0.4
Datalogger Clock:	12:56	13:57
Laptop Clock:	12:57	13:58
Battery (Main):	12.9	12.8
Battery Condition:		New
Battery Serial #:	-	-
Enclosure Dessicant:		New
Vent Tube Dessicant:		New
PT# (if replaced):	298679	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modem operational.
- RSSI -56
- Note: logger is operating with program dated Dec 2011.
- Tested tipping bucket 0.2 mm

**General Notes:**

- Beaver dam is active on other side of road

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S19-04			0.906	103.335	103.334	3/4" Pipe 5 m N of Station	S19-06
S19-05	0.642	104.241		103.599	103.599	3/4" Pipe 3 m S of Station	S19-05
S19-06			0.709	103.532	103.530	3/4" Pipe 3 m SE of Station	S19-04
Ice/PT:							WL
Water Level:			2.836	101.405			WL
Other:						Time WL Surveyed: 13:17	S19-04
<b>Setup #2</b>							S19-05
S19-04			0.894	103.335	103.334	3/4" Pipe 5 m N of Station	S19-06
S19-05			0.628	103.601	103.599	3/4" Pipe 3 m S of Station	
S19-06	0.697	104.229		103.532	103.530	3/4" Pipe 3 m SE of Station	
Ice/PT:							
Water Level:			2.822	101.407			
Other:						Time WL Surveyed: 13:19	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S19-04	0.893	104.228	103.335			
Water Level:			2.830	101.398		Time WL Surveyed: 13:53	
Water Level:			2.813	101.402		Time WL Surveyed: 13:55	
BM:	S19-04	0.880	104.215	103.335			

**WL Survey Summary**

	Before	After
Average WL:	101.406	101.400
Transducer Elevation:	101.063	101.059
Closing Error:	-0.002	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	0.108
Expected Discharge:	0.07
Shift from Existing Rating (m <sup>3</sup> /s):	-0.03
Shift from Existing Rating (%):	-32%

**Field Personnel:**

SM, TR	Trip Date:	29-Apr-13
TR	Date:	29-Apr-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: June 24, 2013  
 Site Visit Time (MST): 13:00

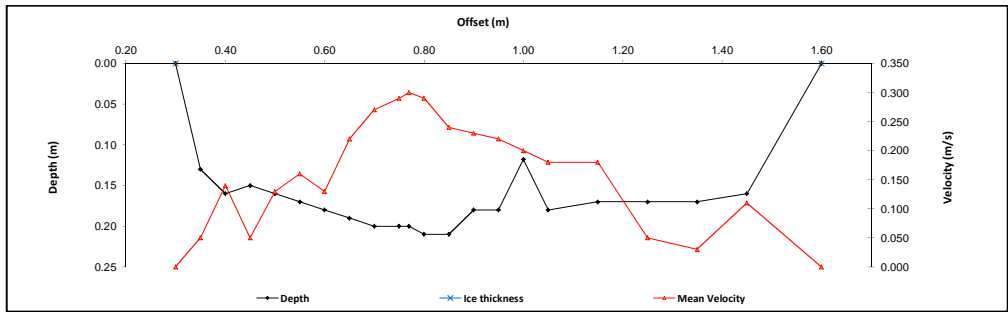


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.30	0.00	0.00		0.000				0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.35	0.13		0.08	0.050					1.00	0.05	0.13	0.050	0.01	0.000	1%
2	0.40	0.16		0.10	0.140					1.00	0.05	0.16	0.140	0.01	0.001	3%
3	0.45	0.15		0.09	0.050					1.00	0.05	0.15	0.050	0.01	0.000	1%
4	0.50	0.16		0.10	0.130					1.00	0.05	0.16	0.130	0.01	0.001	3%
5	0.55	0.17		0.10	0.160					1.00	0.05	0.17	0.160	0.01	0.001	4%
6	0.60	0.18		0.11	0.130					1.00	0.05	0.18	0.130	0.01	0.001	4%
7	0.65	0.19		0.11	0.220					1.00	0.05	0.19	0.220	0.01	0.002	6%
8	0.70	0.20		0.12	0.270					1.00	0.05	0.20	0.270	0.01	0.003	8%
9	0.75	0.20		0.12	0.290					1.00	0.04	0.20	0.290	0.01	0.002	6%
10	0.77	0.20		0.12	0.300					1.00	0.03	0.20	0.300	0.01	0.002	5%
11	0.80	0.21		0.13	0.290					1.00	0.04	0.21	0.290	0.01	0.002	7%
12	0.85	0.21		0.13	0.240					1.00	0.05	0.21	0.240	0.01	0.003	8%
13	0.90	0.18		0.11	0.230					1.00	0.05	0.18	0.230	0.01	0.002	6%
14	0.95	0.18		0.11	0.220					1.00	0.05	0.18	0.220	0.01	0.002	6%
15	1.00	0.12		0.07	0.200					1.00	0.05	0.12	0.200	0.01	0.001	4%
16	1.05	0.18		0.11	0.180					1.00	0.08	0.18	0.180	0.01	0.002	7%
17	1.15	0.17		0.10	0.180					1.00	0.10	0.17	0.180	0.02	0.003	9%
18	1.25	0.17		0.10	0.050					1.00	0.10	0.17	0.050	0.02	0.001	3%
19	1.35	0.17		0.10	0.030					1.00	0.10	0.17	0.030	0.02	0.001	2%
20	1.45	0.16		0.10	0.110					1.00	0.13	0.16	0.110	0.02	0.002	7%
LB	1.60	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.033</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
 - 1 m US of PT

Meas. Start Time (MST):	13:15
Meas. End Time (MST):	13:28
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Low
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Rain



**Flow characteristics:**

Total Flow:	0.033	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.21	(m <sup>2</sup> )
Wetted Width:	1.30	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.194	0.199
Water (°C):	15.6	15.6
Datalogger Clock:	12:59	13:38
Laptop Clock:	12:57	13:37
Battery (Main):	12.9	12.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S19-04			1.040	103.334	103.334	3/4" Pipe 5 m N of Station	S19-06
S19-05	0.775	104.374		103.599	103.599	3/4" Pipe 3 m SE of Station	S19-04
S19-06			0.844	103.530	103.530	3/4" Pipe 3 m S of Station	WL
Ice/PT:							WL
Water Level:			3.165	101.209		Time WL Surveyed: 13:06	S19-04
Other:							S19-05
<b>Setup #2</b>							S19-06
S19-04	1.025	104.359		103.334	103.334	3/4" Pipe 5 m N of Station	
S19-05			0.760	103.599	103.599	3/4" Pipe 3 m SE of Station	
S19-06			0.828	103.531	103.530	3/4" Pipe 3 m S of Station	
Ice/PT:							
Water Level:			3.150	101.209		Time WL Surveyed: 13:08	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S19-06	0.828	104.358		103.530		
Water Level:				3.150	101.208	Time WL Surveyed: 13:30	
Water Level:				3.140	101.206	Time WL Surveyed: 13:32	
BM:	S19-06	0.818	104.348		103.530		

**WL Survey Summary**

	Before	After
Average WL:	101.209	101.208
Transducer Elevation:	101.015	101.009
Closing Error:	0.000	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	0.0329
Expected Discharge:	0.03
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-22%

**Field Personnel:**

SM, TR	Trip Date:	24-Jun-13
SM	Date:	24-Jun-13
DW	Date:	23-Jul-13
Entered Digitally in the Field:	Yes	

START  
 ↓  
 END

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N



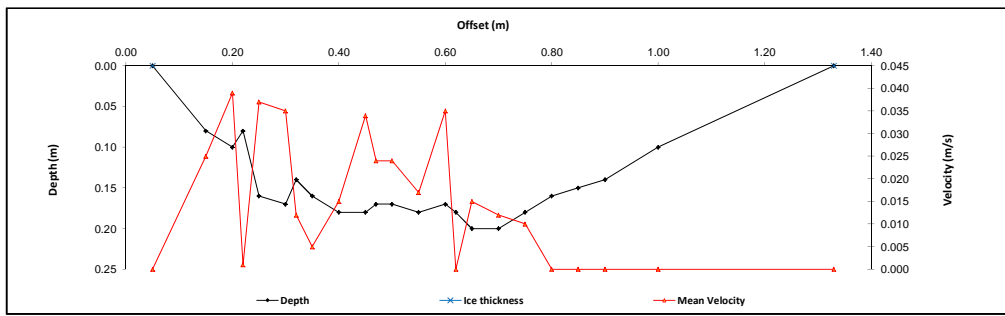
Site Visit Date: August 15, 2013  
 Site Visit Time (MST): 12:55

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.05	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.15	0.08		0.05	0.025					1.00	0.08	0.08	0.025	0.01	0.000	7%
2	0.20	0.10		0.06	0.039					1.00	0.04	0.10	0.039	0.00	0.000	6%
3	0.22	0.08		0.05	0.001					1.00	0.03	0.08	0.001	0.00	0.000	0%
4	0.25	0.16		0.10	0.037					1.00	0.04	0.16	0.037	0.01	0.000	11%
5	0.30	0.17		0.10	0.035					1.00	0.04	0.17	0.035	0.01	0.000	10%
6	0.32	0.14		0.08	0.012					1.00	0.03	0.14	0.012	0.00	0.000	2%
7	0.35	0.16		0.10	0.005					1.00	0.04	0.16	0.005	0.01	0.000	2%
8	0.40	0.18		0.11	0.015					1.00	0.05	0.18	0.015	0.01	0.000	6%
9	0.45	0.18		0.11	0.034					1.00	0.03	0.18	0.034	0.01	0.000	10%
10	0.47	0.17		0.10	0.024					1.00	0.03	0.17	0.024	0.00	0.000	5%
11	0.50	0.17		0.10	0.024					1.00	0.04	0.17	0.024	0.01	0.000	8%
12	0.55	0.18		0.11	0.017					1.00	0.05	0.18	0.017	0.01	0.000	7%
13	0.60	0.17		0.10	0.035					1.00	0.04	0.17	0.035	0.01	0.000	10%
14	0.62	0.18		0.11	0.000					1.00	0.03	0.18	0.000	0.00	0.000	0%
15	0.65	0.20		0.12	0.015					1.00	0.04	0.20	0.015	0.01	0.000	6%
16	0.70	0.20		0.12	0.012					1.00	0.05	0.20	0.012	0.01	0.000	9%
17	0.75	0.18		0.11	0.010					1.00	0.05	0.18	0.010	0.01	0.000	4%
18	0.80	0.16		0.10	0.000					1.00	0.05	0.16	0.000	0.01	0.000	0%
19	0.85	0.15		0.09	0.000					1.00	0.05	0.15	0.000	0.01	0.000	0%
20	0.90	0.14		0.08	0.000					1.00	0.08	0.14	0.000	0.01	0.000	0%
21	1.00	0.10		0.06	0.000					1.00	0.22	0.10	0.000	0.02	0.000	0%
LB	1.33	0.00	0.00		0.00		0.00		0.00	1.00	0.17	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.002</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - Upstream of debris that is blocking the channel

Meas. Start Time (MST):	13:16
Meas. End Time (MST):	13:45
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 26°C



**Flow characteristics:**

Total Flow:	0.002	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.15	(m <sup>2</sup> )
Wetted Width:	1.28	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.049	0.053
Water (°C):	17.5	19.9
Datalogger Clock:	13:02	13:52
Laptop Clock:	13:04	13:51
Battery (Main):	13.7	14.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS moved before flow meas.
- Tested tipping bucket: 0.2 mm

**General Notes:**

- Debris is blocking the channel upstream

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S19-04			1.103	103.335	103.334	3/4" Pipe 5 m N of Station	S19-04
S19-05	0.839	104.438		103.599	103.599	3/4" Pipe 3 m S of Station	S19-05
S19-06			0.907	103.531	103.530	3/4" Pipe 3 m SE of Station	S19-06
Ice/PT:							WL
Water Level:			3.377	101.061		Time WL Surveyed: 13:09	S19-06
Other:							S19-05
<b>Setup #2</b>							S19-04
S19-04	1.087	104.422		103.335	103.334	3/4" Pipe 5 m N of Station	
S19-05			0.824	103.598	103.599	3/4" Pipe 3 m S of Station	
S19-06			0.893	103.529	103.530	3/4" Pipe 3 m SE of Station	
Ice/PT:							
Water Level:			3.357	101.065		Time WL Surveyed: 13:11	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S19-06	0.893	104.424		103.531		
Water Level:			3.356	101.068		Time WL Surveyed: 13:48	
Water Level:			3.346	101.068		Time WL Surveyed: 13:50	
BM:	S19-06	0.883	104.414		103.531		

**WL Survey Summary**

	Before	After
Average WL:	101.063	101.068
Transducer Elevation:	101.014	101.015
Closing Error:	0.001	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	0.00211
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	15-Aug-13
SM	Date:	15-Aug-13
DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: September 11, 2013  
 Site Visit Time (MST): 10:15

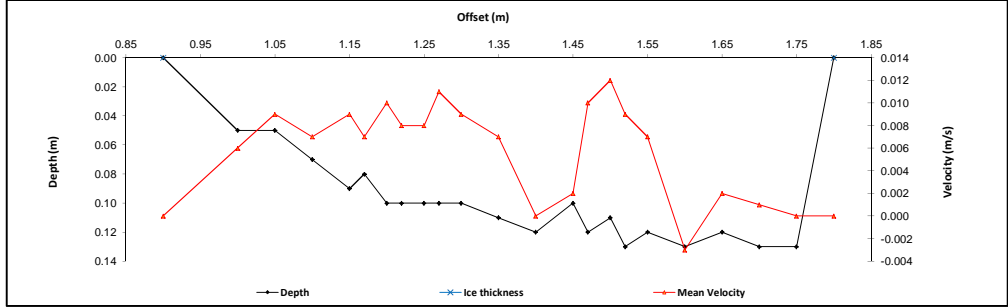


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.00	0.05		0.03	0.006					1.00	0.08	0.05	0.006	0.00	0.000	5%
2	1.05	0.05		0.03	0.009					1.00	0.05	0.05	0.009	0.00	0.000	5%
3	1.10	0.07		0.04	0.007					1.00	0.05	0.07	0.007	0.00	0.000	6%
4	1.15	0.09		0.05	0.009					1.00	0.03	0.09	0.009	0.00	0.000	7%
5	1.17	0.08		0.05	0.007					1.00	0.03	0.08	0.007	0.00	0.000	3%
6	1.20	0.10		0.06	0.010					1.00	0.02	0.10	0.010	0.00	0.000	6%
7	1.22	0.10		0.06	0.008					1.00	0.02	0.10	0.008	0.00	0.000	5%
8	1.25	0.10		0.06	0.008					1.00	0.03	0.10	0.008	0.00	0.000	5%
9	1.27	0.10		0.06	0.011					1.00	0.03	0.10	0.011	0.00	0.000	7%
10	1.30	0.10		0.06	0.009					1.00	0.04	0.10	0.009	0.00	0.000	9%
11	1.35	0.11		0.07	0.007					1.00	0.05	0.11	0.007	0.01	0.000	9%
12	1.40	0.12		0.07	0.000					1.00	0.05	0.12	0.000	0.01	0.000	0%
13	1.45	0.10		0.06	0.002					1.00	0.04	0.10	0.002	0.00	0.000	2%
14	1.47	0.12		0.07	0.010					1.00	0.02	0.12	0.010	0.00	0.000	7%
15	1.50	0.11		0.07	0.012					1.00	0.03	0.11	0.012	0.00	0.000	8%
16	1.52	0.13		0.08	0.009					1.00	0.03	0.13	0.009	0.00	0.000	7%
17	1.55	0.12		0.07	0.007					1.00	0.04	0.12	0.007	0.00	0.000	8%
18	1.60	0.13		0.08	-0.003					1.00	0.05	0.13	-0.003	0.01	0.000	-5%
19	1.65	0.12		0.07	0.002					1.00	0.05	0.12	0.002	0.01	0.000	3%
20	1.70	0.13		0.08	0.001					1.00	0.05	0.13	0.001	0.01	0.000	2%
21	1.75	0.13		0.08	0.000					1.00	0.05	0.13	0.000	0.01	0.000	0%
LB	1.80	0.00	0.00		0.00		0.00		0.00	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.000</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - Flow measurement conducted 30 m downstream of PLS marked with pink ribbon

Meas. Start Time (MST):	11:20
Meas. End Time (MST):	11:52
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15°C



**Flow characteristics:**

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.08	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.09	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.020	0.069
Water (°C):	10.9	12.0
Datalogger Clock:	10:22	12:01
Laptop Clock:	10:21	12:00
Battery (Main):	15.3	14.7
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS to deeper water.
- Tested precise gauge 0.2 mm

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S19-04			1.210	103.335	103.334	3/4" Pipe 5 m N of Station	S19-04
S19-05	0.946	104.545		103.599	103.599	3/4" Pipe 3 m S of Station	S19-05
S19-06			1.013	103.532	103.530	3/4" Pipe 3 m SE of Station	S19-06
Ice/PT:							WL
Water Level:			3.479	101.066		Time WL Surveyed: 10:41	S19-06
Other:							S19-05
<b>Setup #2</b>							S19-04
S19-04			1.193	103.336	103.334	3/4" Pipe 5 m N of Station	
S19-05			0.928	103.601	103.599	3/4" Pipe 3 m S of Station	
S19-06	0.997	104.529		103.532	103.530	3/4" Pipe 3 m SE of Station	
Ice/PT:							
Water Level:			3.462	101.067		Time WL Surveyed: 10:43	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S19-05	0.927	104.526		103.599		
Water Level:			3.463	101.063		Time WL Surveyed: 11:56	
Water Level:			3.442	101.065		Time WL Surveyed: 11:58	
BM:	S19-05	0.908	104.507		103.599		

**WL Survey Summary**

	Before	After
Average WL:	101.067	101.064
Transducer Elevation:	101.047	100.995
Closing Error:	-0.002	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	0.000411
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, CJ	Trip Date:	11-Sep-13
SM	Date:	11-Sep-13
DW	Date:	16-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: October 31, 2013  
 Site Visit Time (MST): 10:10

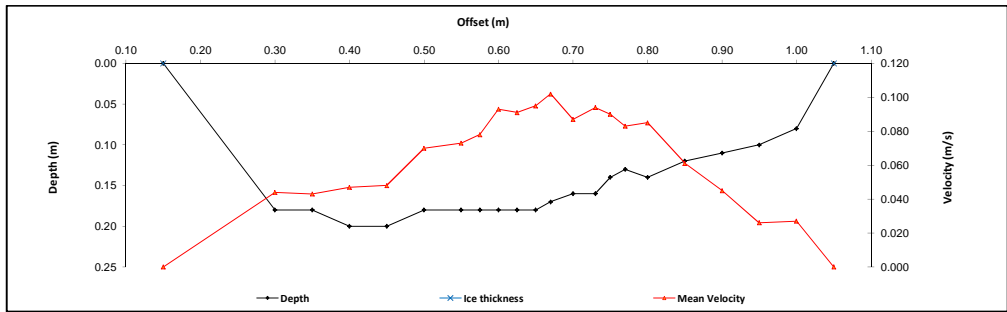


Flow Measurement:																
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.15	0.00	0.00		0.000				0.000	1.00	0.07	0.00	0.000	0.00	0.000	
1	0.30	0.18		0.11	0.044					1.00	0.10	0.18	0.044	0.02	0.001	10%
2	0.35	0.18		0.11	0.043					1.00	0.05	0.18	0.043	0.01	0.000	5%
3	0.40	0.20		0.12	0.047					1.00	0.05	0.20	0.047	0.01	0.000	6%
4	0.45	0.20		0.12	0.048					1.00	0.05	0.20	0.048	0.01	0.000	6%
5	0.50	0.18		0.11	0.070					1.00	0.05	0.18	0.070	0.01	0.001	8%
6	0.55	0.18		0.11	0.073					1.00	0.04	0.18	0.073	0.01	0.000	6%
7	0.58	0.18		0.11	0.078					1.00	0.02	0.18	0.078	0.00	0.000	4%
8	0.60	0.18		0.11	0.093					1.00	0.03	0.18	0.093	0.00	0.000	5%
9	0.63	0.18		0.11	0.091					1.00	0.02	0.18	0.091	0.00	0.000	5%
10	0.65	0.18		0.11	0.095					1.00	0.02	0.18	0.095	0.00	0.000	5%
11	0.67	0.17		0.10	0.102					1.00	0.03	0.17	0.102	0.00	0.000	5%
12	0.70	0.16		0.10	0.087					1.00	0.03	0.16	0.087	0.00	0.000	5%
13	0.73	0.16		0.10	0.094					1.00	0.03	0.16	0.094	0.00	0.000	5%
14	0.75	0.14		0.08	0.090					1.00	0.02	0.14	0.090	0.00	0.000	3%
15	0.77	0.13		0.08	0.083					1.00	0.03	0.13	0.083	0.00	0.000	3%
16	0.80	0.14		0.08	0.085					1.00	0.04	0.14	0.085	0.01	0.000	6%
17	0.85	0.12		0.07	0.061					1.00	0.05	0.12	0.061	0.01	0.000	5%
18	0.90	0.11		0.07	0.045					1.00	0.05	0.11	0.045	0.01	0.000	3%
19	0.95	0.10		0.06	0.026					1.00	0.05	0.10	0.026	0.00	0.000	2%
20	1.00	0.08		0.05	0.027					1.00	0.05	0.08	0.027	0.00	0.000	1%
RB	1.05	0.00	0.00		0.00		0.00		0.00	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.008</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - Flow meas conducted 15 m downstream of PLS

Meas. Start Time (MST):	10:33
Meas. End Time (MST):	10:54
Equipment:	ADV
Method:	Wading
River Condition:	Low flow no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -1°C



**Flow characteristics:**

Total Flow:	0.008	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.099	0.101
Water (°C):	2.1	2.1
Datalogger Clock:	10:16	11:03
Laptop Clock:	10:15	11:02
Battery (Main):	14.2	14.7
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (# replaced):	298679	-
Logger# (# replaced):	-	-

**Datalogger / Station Notes:**

- Removed PLS for winter

**General Notes:**

- Anchor cable and weight location marked with pink flagging.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>			1.003	103.333	103.334	3/4" Pipe 5 m N of Station	S19-05
S19-04				103.599	103.599	3/4" Pipe 3 m S of Station	S19-04
S19-05	0.737	104.336		103.529	103.530	3/4" Pipe 3 m SE of Station	S19-06
S19-06			0.807	103.529	103.530	3/4" Pipe 3 m SE of Station	WL
Ice/PT:							WL
Water Level:			3.225	101.111		Time WL Surveyed: 10:23	S19-06
Other:							S19-04
<b>Setup #2</b>							S19-05
S19-04			0.987	103.334	103.334	3/4" Pipe 5 m N of Station	
S19-05			0.722	103.599	103.599	3/4" Pipe 3 m S of Station	
S19-06	0.792	104.321		103.529	103.530	3/4" Pipe 3 m SE of Station	
Ice/PT:							
Water Level:			3.211	101.110		Time WL Surveyed: 10:25	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S19-05	0.722	104.321	103.599		Time WL Surveyed: 10:58	
Water Level:			3.207	101.114		Time WL Surveyed: 11:00	
Water Level:			3.190	101.115			
BM:	S19-05	0.706	104.305	103.599			

**WL Survey Summary**

	Before	After
Average WL:	101.111	101.115
Transducer Elevation:	101.012	101.014
Closing Error:	0.000	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	0.00789
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	31-Oct-13
SM, TR	Date:	31-Oct-13
DW	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S20A - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date:

February 3, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.40	0.00	0.00	0.000	0.000	0.000	0.9	0.40	0.58	0.18	0.06	0.005	0.004	0.01	0.000	0%
1	0.75	0.50	0.25	0.018			0.9	0.58	0.95	0.38	0.25	0.018	0.016	0.09	0.002	7%
2	1.15	0.50	0.25	0.006			0.9	0.95	1.38	0.43	0.25	0.006	0.005	0.11	0.001	3%
3	1.60	0.60	0.25	0.021			0.9	1.38	1.68	0.30	0.35	0.021	0.019	0.11	0.002	9%
4	1.75	0.60	0.25	0.013			0.9	1.68	1.85	0.18	0.35	0.013	0.012	0.06	0.001	3%
5	1.95	0.60	0.25	0.017			0.9	1.85	2.03	0.18	0.35	0.017	0.015	0.06	0.001	4%
6	2.10	0.65	0.25	0.011			0.9	2.03	2.23	0.20	0.40	0.011	0.010	0.08	0.001	4%
7	2.35	0.60	0.25	0.015			0.9	2.23	2.40	0.18	0.35	0.015	0.014	0.06	0.001	4%
8	2.45	0.60	0.30	0.003			0.9	2.40	2.55	0.15	0.30	0.003	0.003	0.04	0.000	1%
9	2.65	0.60	0.30	0.022			0.9	2.55	2.75	0.20	0.30	0.022	0.020	0.06	0.001	6%
10	2.85	0.60	0.30	0.014			0.9	2.75	2.98	0.23	0.30	0.014	0.013	0.07	0.001	4%
11	3.10	0.50	0.30	-0.001			0.9	2.98	3.28	0.30	0.20	-0.001	-0.001	0.06	0.000	0%
12	3.45	0.50	0.35	0.002			0.9	3.28	3.63	0.35	0.15	0.002	0.002	0.05	0.000	0%
13	3.80	0.50	0.35	-0.064			0.9	3.63	3.98	0.35	0.15	-0.064	-0.058	0.05	-0.003	-14%
14	4.15	0.35	0.30	-0.001			0.9	3.98	4.35	0.38	0.05	-0.001	-0.001	0.02	0.000	0%
15	4.55	0.35	0.25	0.002			0.9	4.35	4.73	0.38	0.10	0.002	0.002	0.04	0.000	0%
16	4.90	0.30	0.20	-0.001			0.9	4.73	5.08	0.35	0.10	-0.001	-0.001	0.04	0.000	0%
17	5.25	0.30	0.05	0.057			0.9	5.08	5.43	0.35	0.25	0.057	0.051	0.09	0.004	21%
18	5.60	0.35	0.10	0.021			0.9	5.43	5.75	0.33	0.25	0.021	0.019	0.08	0.002	7%
19	5.90	0.30	0.05	0.081			0.9	5.75	6.20	0.45	0.25	0.081	0.073	0.11	0.008	39%
LB	6.50	0.00	0.00	0.00	0.00	0.00	1.0	6.20	6.50	0.30	0.06	0.020	0.020	0.02	0.000	2%
<b>Total Flow</b>														<b>0.021</b>		

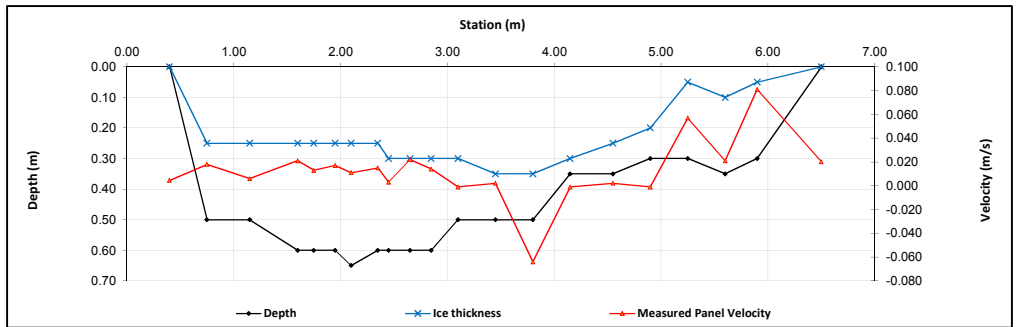
Measurement Details:	
Start Time (MST):	9:40
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Overcast, calm, -17°C

Flow characteristics:		
Total Flow:	0.0212	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.31	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.214	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Enclosure Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	-

Datalogger / Station Notes:	

General Notes:	
Winter flow test at new station S20A-01 S20A-02 S20A-03	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S20A-01						3/4" Pipe 2 m NE of logger
S20A-02	0.924	331.826		330.902	330.902	3/4" Pipe 2 m NW of logger
S20A-03			1.102	330.724		3/4" Pipe 4 m W of logger
Ice/PT:			2.846	328.980		
Water Level:			3.092	328.734		
Other:						
<b>Setup #2</b>						
S20A-01					0.000	3/4" Pipe 2 m NE of logger
S20A-02			0.924	330.892	330.902	3/4" Pipe 2 m NW of logger
S20A-03	1.092	331.816		330.724		3/4" Pipe 4 m W of logger
Ice/PT:			2.836	328.980		
Water Level:			3.083	328.733		
Other:						

Closing Error	0.010
WL Check	0.001

Average WL	328.734
Transducer Elevation Before	-
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	3-Feb-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	3-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	12-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S20A - Muskeg River Upland  
 UTM Location: 491780 E, 6354787 N

Site Visit Date: May 2, 2013  
 Site Visit Time (MST): 09:45

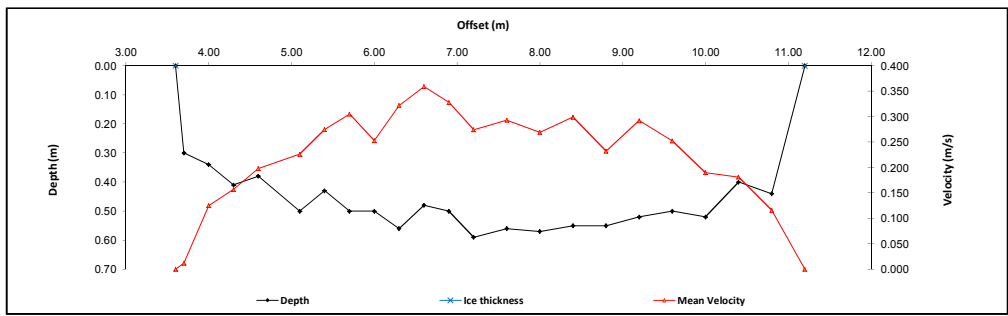


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	3.70	0.30		0.18	0.012					1.00	0.20	0.30	0.012	0.06	0.001	0%
2	4.00	0.34		0.20	0.125					1.00	0.30	0.34	0.125	0.10	0.013	1%
3	4.30	0.41		0.25	0.157					1.00	0.30	0.41	0.157	0.12	0.019	2%
4	4.60	0.38		0.23	0.198					1.00	0.40	0.38	0.198	0.15	0.030	3%
5	5.10	0.50		0.30	0.226					1.00	0.40	0.50	0.226	0.20	0.045	5%
6	5.40	0.43		0.26	0.275					1.00	0.30	0.43	0.275	0.13	0.035	4%
7	5.70	0.50		0.30	0.305					1.00	0.30	0.50	0.305	0.15	0.046	5%
8	6.00	0.50		0.30	0.253					1.00	0.30	0.50	0.253	0.15	0.038	4%
9	6.30	0.56		0.34	0.322					1.00	0.30	0.56	0.322	0.17	0.054	6%
10	6.60	0.48		0.29	0.359					1.00	0.30	0.48	0.359	0.14	0.052	6%
11	6.90	0.50		0.30	0.328					1.00	0.30	0.50	0.328	0.15	0.049	6%
12	7.20	0.59		0.35	0.274					1.00	0.35	0.59	0.274	0.21	0.057	6%
13	7.60	0.56		0.34	0.293					1.00	0.40	0.56	0.293	0.22	0.066	7%
14	8.00	0.57		0.34	0.269					1.00	0.40	0.57	0.269	0.23	0.061	7%
15	8.40	0.55		0.33	0.299					1.00	0.40	0.55	0.299	0.22	0.066	7%
16	8.80	0.55		0.33	0.232					1.00	0.40	0.55	0.232	0.22	0.051	6%
17	9.20	0.52		0.31	0.292					1.00	0.40	0.52	0.292	0.21	0.061	7%
18	9.60	0.50		0.30	0.252					1.00	0.40	0.50	0.252	0.20	0.050	6%
19	10.00	0.52		0.31	0.190					1.00	0.40	0.52	0.190	0.21	0.040	4%
20	10.40	0.40		0.24	0.181					1.00	0.40	0.40	0.181	0.16	0.029	3%
21	10.80	0.44		0.26	0.116					1.00	0.40	0.44	0.116	0.18	0.020	2%
LB	11.20	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.883</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Adjacent to pressure transducer

Meas. Start Time (MST):	11:13
Meas. End Time (MST):	11:35
Equipment:	ADV
Method:	Wading
River Condition:	High flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, Windy, +10°C



**Flow characteristics:**

Total Flow:	0.883	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.58	(m <sup>2</sup> )
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.794	0.807
Water (°C):	3.5	2.5
Datalogger Clock:	10:56	11:46
Laptop Clock:	10:56	11:46
Battery (Main):	13.3	14.3
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessoricant:		New
Vent Tube Dessoricant:		New
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

MODEM ph. #: 6043533864  
 RSSI: -97

**General Notes:**

- Relocated all equipment from S20 to S20A

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S20A-01			0.905	330.905		Pipe 2 m NE	S20A-02
S20A-02	0.908	331.810		330.902	330.902	Pipe 2 m NW	S20A-03
S20A-03			0.990	330.820		Pipe 4 m W	WL
Ice/PT:							WL
Water Level:			2.637	329.173		Time WL Surveyed: 11:04	S20A-03
Other:							S20A-01
<b>Setup #2</b>							S20A-02
S20A-01			0.887	330.907	0.000	Pipe 2 m NE	
S20A-02			0.892	330.902	330.902	Pipe 2 m NW	
S20A-03	0.974	331.794		330.820			
Ice/PT:							
Water Level:			2.623	329.171		Time WL Surveyed: 11:07	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S20A-01	0.876	331.781	330.905			
Water Level:			2.604	329.177		Time WL Surveyed: 11:41	
Water Level:			2.594	329.175		Time WL Surveyed: 11:43	
BM:	S20A-01	0.864	331.769	330.905			

**WL Survey Summary**

	Before	After
Average WL:	329.172	329.176
Transducer Elevation:	328.378	328.369
Closing Error:	0.000	-
WL Check:	0.002	0.002

**Site Rating Information**

Measured Discharge:	0.883
Expected Discharge:	0.87
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-1%

**Field Personnel:**

SM, TR	Trip Date:	2-May-13
SM	Date:	2-May-13
CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
 ↓  
 END

# Hydrometric Measurement / Site Visit Record

Site: S20A - Muskeg River Upland  
 UTM Location: 491780 E, 6354787 N

Site Visit Date: June 11, 2013  
 Site Visit Time (MST): 12:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	1.50	0.00	0.000	0.00	0.000	
1	3.00	0.82			0.830	0.66		0.16		1.00	3.00	0.82	0.830	2.46	2.042	17%
2	6.00	0.84			0.015	0.67		0.17		1.00	2.50	0.84	0.015	2.10	0.032	0%
3	8.00	1.10			0.460	0.88		0.22		1.00	1.50	1.10	0.460	1.65	0.759	6%
4	9.00	2.00			0.580	1.60		0.40		1.00	1.75	2.00	0.580	3.50	2.030	17%
5	11.50	1.80			1.100	1.44		0.36		1.00	2.00	1.80	1.100	3.60	3.960	32%
6	13.00	1.35			0.053	1.08		0.27		1.00	1.75	1.35	0.053	2.36	0.125	1%
7	15.00	0.60		0.36	0.019					1.00	2.75	0.60	0.019	1.65	0.032	0%
8	18.50	1.20			0.910	0.96		0.24		1.00	3.00	1.20	0.910	3.60	3.276	27%
LB	21.00	0.00	0.00		0.00		0.00		0.00	1.00	1.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>12.3</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	1:20
Meas. End Time (MST):	1:30
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High, flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Cloudy, 10°C

**Flow characteristics:**

Total Flow:	12.300	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	20.92	(m <sup>2</sup> )
Wetted Width:	21.00	(m)
Hydraulic Depth:	1.00	(m)
Mean Velocity:	0.59	(m/s)
Froude Number:	0.19	

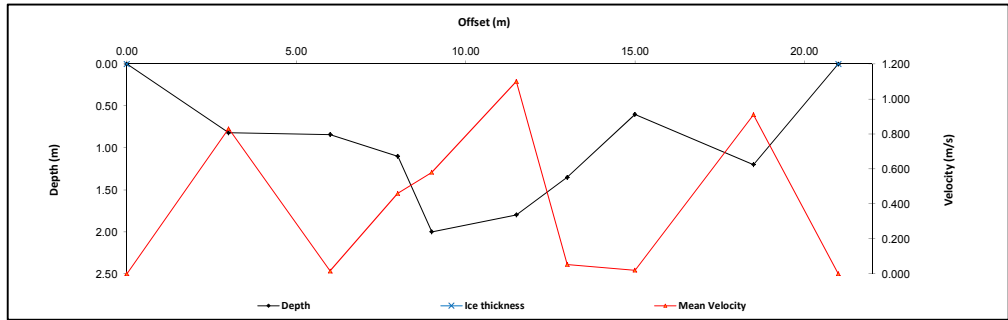
**Logger Details:**

	Before	After
Transducer Reading (m):	3.013	-
Water (°C):	8.9	-
Datalogger Clock:	12:54	-
Laptop Clock:	12:54	-
Battery (Main):	14.3	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Banks are very flooded, BMs are under water
- Surface water near RB is flowing approx. 1m/s
- Conducted several velocity measurements from each bank but could not measure the centre of the channel due to safety concerns



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM1
S20A-01			2.599	330.907		Pipe 2 m NE	BM2
S20A-02	2.604	333.506	2.604	330.902	330.902	Pipe 2 m NW	WL
S20A-03						Pipe 4 m W	WL
Ice/PT:							BM2
Water Level:			2.519	330.987		Time WL Surveyed: 13:04	BM1
Other:							
<b>Setup #2</b>							
S20A-01	2.586	333.493		330.907		Pipe 2 m NE	
S20A-02			2.590	330.903	330.902	Pipe 2 m NW	
S20A-03							
Ice/PT:							
Water Level:			2.505	330.988		Time WL Surveyed: 13:06	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S20A-01	2.586	333.493	330.907			
Water Level:			2.512	330.981		Time WL Surveyed: 13:34	
Water Level:			2.502	330.982		Time WL Surveyed: 13:34	
BM	S20A-01	2.577	333.484	330.907			

**WL Survey Summary**

	Before	After
Average WL:	330.988	330.982
Transducer Elevation:	327.975	-
Closing Error:	-0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SG, CJ	Trip Date:	11-Jun-13	
Data Entry Personnel:	CJ	Date:	11-Jun-13
Data Check Personnel:	CJ	Date:	18-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: August 18, 2013  
 Site Visit Time (MST): 12:19

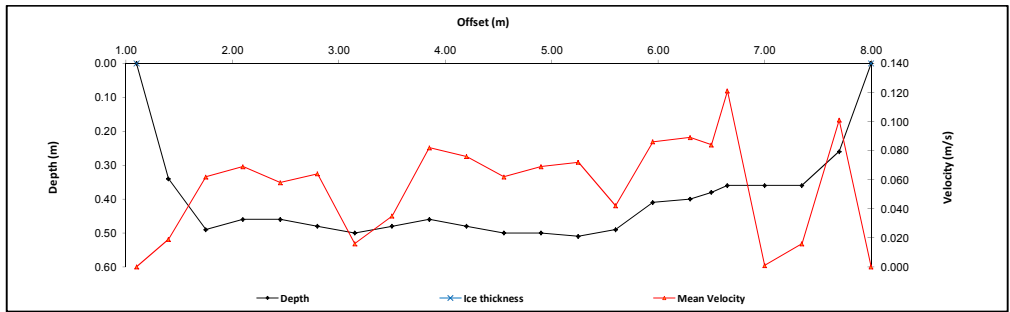


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.10	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.40	0.34		0.20	0.019					1.00	0.33	0.34	0.019	0.11	0.002	1%
2	1.75	0.49		0.29	0.062					1.00	0.35	0.49	0.062	0.17	0.011	6%
3	2.10	0.46		0.28	0.069					1.00	0.35	0.46	0.069	0.16	0.011	6%
4	2.45	0.46		0.28	0.058					1.00	0.35	0.46	0.058	0.16	0.009	5%
5	2.80	0.48		0.29	0.064					1.00	0.35	0.48	0.064	0.17	0.011	6%
6	3.15	0.50		0.30	0.016					1.00	0.35	0.50	0.016	0.18	0.003	2%
7	3.50	0.48		0.29	0.035					1.00	0.35	0.48	0.035	0.17	0.006	3%
8	3.85	0.46		0.28	0.082					1.00	0.35	0.46	0.082	0.16	0.013	8%
9	4.20	0.48		0.29	0.076					1.00	0.35	0.48	0.076	0.17	0.013	7%
10	4.55	0.50		0.30	0.062					1.00	0.35	0.50	0.062	0.18	0.011	6%
11	4.90	0.50		0.30	0.069					1.00	0.35	0.50	0.069	0.18	0.012	7%
12	5.25	0.51		0.31	0.072					1.00	0.35	0.51	0.072	0.18	0.013	8%
13	5.60	0.49		0.29	0.042					1.00	0.35	0.49	0.042	0.17	0.007	4%
14	5.95	0.41		0.25	0.086					1.00	0.35	0.41	0.086	0.14	0.012	7%
15	6.30	0.40		0.24	0.089					1.00	0.28	0.40	0.089	0.11	0.010	6%
16	6.50	0.36		0.23	0.064					1.00	0.18	0.36	0.064	0.07	0.006	3%
17	6.65	0.36		0.22	0.121					1.00	0.25	0.36	0.121	0.09	0.011	6%
18	7.00	0.36		0.22	0.001					1.00	0.35	0.36	0.001	0.13	0.000	0%
19	7.35	0.36		0.22	0.016					1.00	0.35	0.36	0.016	0.13	0.002	1%
20	7.70	0.26		0.16	0.101					1.00	0.32	0.26	0.101	0.08	0.009	5%
RB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.171</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5.0 m Ds of bridge

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:05
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, +25°C



**Flow Characteristics:**

Total Flow:	0.171	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.89	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.898	0.883
Water (°C):	18.7	20.0
Datalogger Clock:	12:21	13:11
Laptop Clock:	12:20	13:12
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT was moved to free it of debris

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S20A-01			0.792	330.906	330.905	3/4" Pipe 2 m NE of logger	S20A-02
S20A-02	0.796	331.698		330.902	330.902	3/4" Pipe 2 m NW of logger	S20A-01
S20A-03			0.878	330.820	330.820	3/4" Pipe 4 m W of logger	WL
Ice/PT:							WL
Water Level:			2.683	329.015		Time WL Surveyed:	12:31
Other:							S20A-01
<b>Setup #2</b>							
S20A-01	0.731	331.637		330.906	330.905	3/4" Pipe 2 m NE of logger	S20A-03
S20A-02			0.735	330.902	330.902	3/4" Pipe 2 m NW of logger	S20A-02
S20A-03			0.818	330.819	330.820		
Ice/PT:							
Water Level:			2.623	329.014		Time WL Surveyed:	12:34
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S20A-01	0.731	331.637		330.906		
Water Level:				2.622	329.015	Time WL Surveyed:	13:07
Water Level:				2.553	329.016	Time WL Surveyed:	13:08
BM:	S20A-01	0.663	331.569		330.906		

**WL Survey Summary**

	Before	After
Average WL:	329.015	329.016
Transducer Elevation:	328.117	328.333
Closing Error:	0.000	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	0.171
Expected Discharge:	0.17
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	-1%

**Field Personnel:**

TR, DW	Trip Date:	18-Aug-13
DW	Date:	18-Aug-13
CJ	Date:	27-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: September 19, 2013  
 Site Visit Time (MST): 14:00

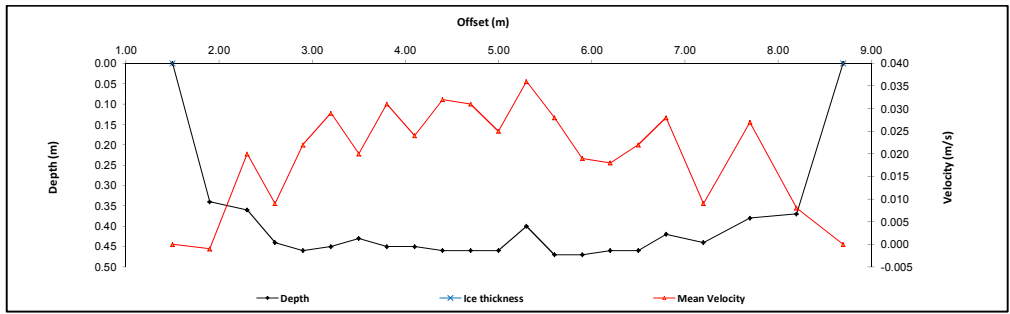


Flow Measurement:																	
Measured Data									Calculated Data								
Bank/	Offset	Depth	WS to	Depth of Obs.	Velocity	Depth	Velocity	Depth	Velocity	Velocity	Pannel	Effective	Effective Average	Pannel Area	Pannel Discharge	Percent of	
Mmt #	(m)	bottom	bottom of ice	@ 0.6 Depth	@ 0.6 Depth	of Obs.	@ 0.8 Depth	@ 0.8 Depth	@ 0.2 Depth	@ 0.2 Depth	Correction	Width	Pannel Depth	Pannel Velocity	(m²)	(m³/s)	total flow
		to WS			(m/s)		(m)	(m/s)	(m)	(m/s)	(m)	(m)	(m)	(m/s)		(m³/s)	(%)
RB	1.50	0.00	0.00		0.000						1.00	0.20	0.00	0.000	0.00	0.000	
1	1.90	0.34		0.20	-0.001						1.00	0.40	0.34	-0.001	0.14	0.000	0%
2	2.30	0.36		0.22	0.020						1.00	0.35	0.36	0.020	0.13	0.003	4%
3	2.60	0.44		0.26	0.009						1.00	0.30	0.44	0.009	0.13	0.001	2%
4	2.90	0.46		0.28	0.022						1.00	0.30	0.46	0.022	0.14	0.003	5%
5	3.20	0.45		0.27	0.029						1.00	0.30	0.45	0.029	0.14	0.004	6%
6	3.50	0.43		0.26	0.020						1.00	0.30	0.43	0.020	0.13	0.003	4%
7	3.80	0.45		0.27	0.031						1.00	0.30	0.45	0.031	0.14	0.004	7%
8	4.10	0.45		0.27	0.024						1.00	0.30	0.45	0.024	0.14	0.003	5%
9	4.40	0.46		0.28	0.032						1.00	0.30	0.46	0.032	0.14	0.004	7%
10	4.70	0.46		0.28	0.031						1.00	0.30	0.46	0.031	0.14	0.004	7%
11	5.00	0.46		0.28	0.025						1.00	0.30	0.46	0.025	0.14	0.003	6%
12	5.30	0.40		0.24	0.036						1.00	0.30	0.40	0.036	0.12	0.004	7%
13	5.60	0.47		0.28	0.028						1.00	0.30	0.47	0.028	0.14	0.004	6%
14	5.90	0.47		0.28	0.019						1.00	0.30	0.47	0.019	0.14	0.003	4%
15	6.20	0.46		0.28	0.018						1.00	0.30	0.46	0.018	0.14	0.002	4%
16	6.50	0.46		0.28	0.022						1.00	0.30	0.46	0.022	0.14	0.003	5%
17	6.80	0.42		0.25	0.028						1.00	0.35	0.42	0.028	0.15	0.004	7%
18	7.20	0.44		0.26	0.009						1.00	0.45	0.44	0.009	0.20	0.002	3%
19	7.70	0.38		0.23	0.027						1.00	0.50	0.38	0.027	0.19	0.005	8%
20	8.20	0.37		0.22	0.008						1.00	0.50	0.37	0.008	0.19	0.001	2%
LB	8.70	0.00	0.00		0.000		0.00		0.000		1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.0616</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:26
Meas. End Time (MST):	14:48
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, +15°C



**Flow characteristics:**

Total Flow:	0.062	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.88	(m²)
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.631	0.632
Water (°C):	10.9	11.1
Datalogger Clock:	14:10	14:57
Laptop Clock:	14:09	14:56
Battery (Main):	14.5	14.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S20A-01	0.945	331.850		330.905	330.905	3/4" Pipe 2 m NE of logger	S20A-01
S20A-02			0.949	330.901	330.902	3/4" Pipe 2 m NW of logger	S20A-02
S20A-03			1.032	330.818	330.820	3/4" Pipe 4 m W of logger	WL
Ice/PT:							WL
Water Level:			2.890	328.960		Time WL Surveyed:	S20A-03
Other:							S20A-02
<b>Setup #2</b>							
S20A-01			0.927	330.904	330.905	3/4" Pipe 2 m NE of logger	S20A-01
S20A-02			0.932	330.899	330.902	3/4" Pipe 2 m NW of logger	
S20A-03	1.013	331.831		330.818	330.820		
Ice/PT:							
Water Level:			2.872	328.959		Time WL Surveyed:	(must close survey loop on survey starting point)
Other:							

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

BM:	S20A-01	0.927	331.832		330.905		
Water Level:			2.869	328.963		Time WL Surveyed:	14:53
Water Level:			2.853	328.965		Time WL Surveyed:	14:55
BM:	S20A-01	0.913	331.818		330.905		

**WL Survey Summary**

	Before	After
Average WL:	328.960	328.964
Transducer Elevation:	328.329	328.332
Closing Error:	0.001	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	0.0616
Expected Discharge:	0.06
Shift from Existing Rating (m³/s):	0.00
Shift from Existing Rating (%):	-5%

**Field Personnel:**

	SM, CJ	Trip Date:	19-Sep-13
Data Entry Personnel:	SM	Date:	19-Sep-13
Data Check Personnel:	CJ	Date:	26-Sep-13
Entered Digitally in the Field:	Yes		

START  
 ↓  
 END

## Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
UTM Location: 492230 E, 6354940 N

Site Visit Date: October 27, 2013  
Site Visit Time (MST): 12:45



### Flow Measurement:

Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	Measured Data				Calculated Data									
			WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20	0.00	0.000	0.00	0.000		
1	2.30	0.47		0.28	0.112				1.00	0.35	0.47	0.112	0.16	0.018	4%	
2	2.60	0.50		0.30	0.111				1.00	0.30	0.50	0.111	0.15	0.017	3%	
3	2.90	0.52		0.31	0.119				1.00	0.30	0.52	0.119	0.16	0.019	4%	
4	3.20	0.56		0.34	0.144				1.00	0.30	0.56	0.144	0.17	0.024	5%	
5	3.50	0.59		0.35	0.156				1.00	0.30	0.59	0.156	0.18	0.028	6%	
6	3.80	0.57		0.34	0.180				1.00	0.30	0.57	0.180	0.17	0.031	6%	
7	4.10	0.60		0.36	0.188				1.00	0.30	0.60	0.188	0.18	0.034	7%	
8	4.40	0.58		0.35	0.206				1.00	0.30	0.58	0.206	0.17	0.036	7%	
9	4.70	0.60		0.36	0.181				1.00	0.30	0.60	0.181	0.18	0.033	7%	
10	5.00	0.62		0.37	0.136				1.00	0.30	0.62	0.136	0.19	0.025	5%	
11	5.30	0.60		0.36	0.160				1.00	0.30	0.60	0.160	0.18	0.029	6%	
12	5.60	0.58		0.35	0.177				1.00	0.30	0.58	0.177	0.17	0.031	6%	
13	5.90	0.62		0.37	0.141				1.00	0.30	0.62	0.141	0.19	0.026	5%	
14	6.20	0.61		0.37	0.146				1.00	0.30	0.61	0.146	0.18	0.027	5%	
15	6.50	0.58		0.35	0.126				1.00	0.30	0.58	0.126	0.17	0.022	4%	
16	6.80	0.60		0.36	0.093				1.00	0.30	0.60	0.093	0.18	0.017	3%	
17	7.10	0.60		0.36	0.094				1.00	0.35	0.60	0.094	0.21	0.020	4%	
18	7.50	0.57		0.34	0.030				1.00	0.45	0.57	0.030	0.26	0.008	2%	
19	8.00	0.52		0.31	0.091				1.00	0.50	0.52	0.091	0.26	0.024	5%	
20	8.50	0.52		0.31	0.104				1.00	0.50	0.52	0.104	0.26	0.027	5%	
LB	9.00	0.00	0.00		0.00		0.00		1.00	0.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>												<b>0.493</b>	<b>100%</b>			

### Flow Measurement Details:

Metering Section Location (describe):  
10 m downstream of PT

Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, -5°C

### Flow characteristics:

Total Flow:	0.493	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.77	(m <sup>2</sup> )
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.96	

### Logger Details:

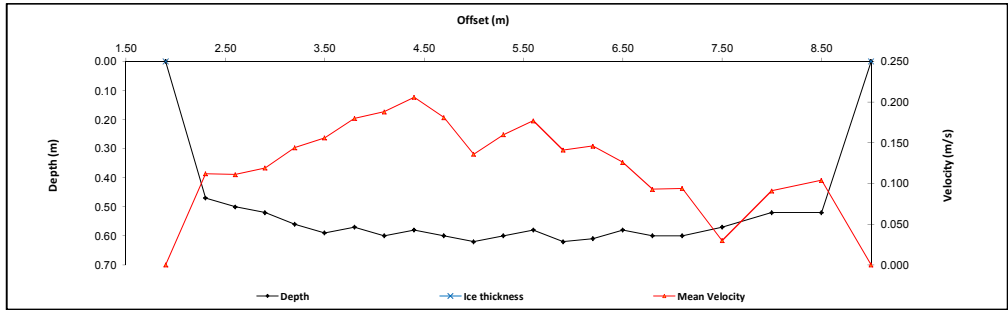
	Before	After
Transducer Reading (m):	0.769	0.768
Water (°C):	1.5	1.5
Datalogger Clock:	12:59	13:55
Laptop Clock:	13:00	13:56
Battery (Main):	14.9	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

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### General Notes:

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Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S20A-01	0.857	331.762		330.905	330.905	3/4" Pipe 2 m NE of logger	S20A-01
S20A-02			0.861	330.901	330.902	3/4" Pipe 2 m NW of logger	S20A-02
S20A-03			0.943	330.819	330.820	3/4" Pipe 4 m W of logger	WL
Ice/PT:							WL
Water Level:		2.666		329.096		Time WL Surveyed: 13:17	S20A-03
Other:							S20A-02
Setup #2							S20A-01
S20A-01			0.845	330.905	330.905	3/4" Pipe 2 m NE of logger	
S20A-02			0.849	330.901	330.902	3/4" Pipe 2 m NW of logger	
S20A-03	0.931	331.750		330.819	330.820		
Ice/PT:							
Water Level:			2.651	329.099		Time WL Surveyed: 13:19	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S20A-01	0.845	331.750	330.905		Time WL Surveyed: 13:51	
Water Level:			2.651	329.099		Time WL Surveyed: 13:52	
Water Level:			2.643	329.097			
BM:	S20A-01	0.835	331.740	330.905			

WL Survey Summary	Before	After
Average WL:	329.098	329.098
Transducer Elevation:	328.329	328.330
Closing Error:	0.000	-
WL Check:	0.003	0.002

Site Rating Information	
Measured Discharge:	0.493
Expected Discharge:	0.46
Shift from Existing Rating (m <sup>3</sup> /s):	-0.03
Shift from Existing Rating (%):	-6%

Field Personnel:		Trip Date:	27-Oct-13
Data Entry Personnel:	SM	Date:	27-Oct-13
Data Check Personnel:	CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek Near The Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

January 16, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	5.40	0.00	0.00	0.000	0.000	0.000	0.9	5.40	5.58	0.18	0.04	0.013	0.012	0.01	0.000	0%
1	5.75	0.28	0.14	0.052			0.9	5.58	5.90	0.33	0.14	0.052	0.047	0.05	0.002	1%
2	6.05	0.26	0.15	0.001			0.9	5.90	6.23	0.32	0.11	0.001	0.001	0.04	0.000	0%
3	6.40	0.38	0.15	0.001			0.9	6.23	6.58	0.35	0.23	0.001	0.001	0.08	0.000	0%
4	6.75	0.38	0.17	0.133			0.9	6.58	6.90	0.33	0.21	0.133	0.120	0.07	0.008	4%
5	7.05	0.58	0.22	0.002			0.9	6.90	7.18	0.27	0.36	0.002	0.002	0.10	0.000	0%
6	7.30	0.66	0.26	0.096			0.9	7.18	7.38	0.20	0.40	0.096	0.086	0.08	0.007	4%
7	7.45	0.68	0.28	0.226			0.9	7.38	7.50	0.13	0.40	0.226	0.203	0.05	0.010	5%
8	7.55	0.60	0.25	0.255			0.9	7.50	7.73	0.23	0.35	0.255	0.230	0.08	0.018	9%
9	7.90	0.67	0.30	0.184			0.9	7.73	8.03	0.30	0.37	0.184	0.166	0.11	0.018	9%
10	8.15	0.70	0.31	0.179			0.9	8.03	8.23	0.20	0.39	0.179	0.161	0.08	0.013	6%
11	8.30	0.70	0.33	0.221			0.9	8.23	8.38	0.15	0.37	0.221	0.199	0.06	0.011	6%
12	8.45	0.75	0.33	0.173			0.9	8.38	8.60	0.23	0.42	0.173	0.156	0.09	0.015	8%
13	8.75	0.57	0.34	0.162			0.9	8.60	8.93	0.33	0.23	0.162	0.146	0.07	0.011	6%
14	9.10	0.85	0.34	0.101			0.9	8.93	9.23	0.30	0.51	0.101	0.091	0.15	0.014	7%
15	9.35	0.88	0.34	0.087			0.9	9.23	9.48	0.25	0.54	0.087	0.078	0.14	0.011	5%
16	9.60	0.83	0.35	0.105			0.9	9.48	9.75	0.28	0.48	0.105	0.095	0.13	0.012	6%
17	9.90	0.82	0.36	0.079			0.9	9.75	10.03	0.28	0.46	0.079	0.071	0.13	0.009	5%
18	10.15	0.81	0.35	0.118			0.9	10.03	10.30	0.28	0.46	0.118	0.106	0.13	0.013	7%
19	10.45	0.80	0.27	0.096			0.9	10.30	10.55	0.25	0.53	0.096	0.086	0.13	0.011	6%
20	10.65	0.86	0.25	0.088			0.9	10.55	10.78	0.23	0.61	0.088	0.079	0.14	0.011	6%
RB	10.90	0.00	0.00	0.00	0.00	0.00	1.0	10.78	10.90	0.13	0.15	0.022	0.022	0.02	0.000	0%
<b>Total Flow</b>															<b>0.196</b>	

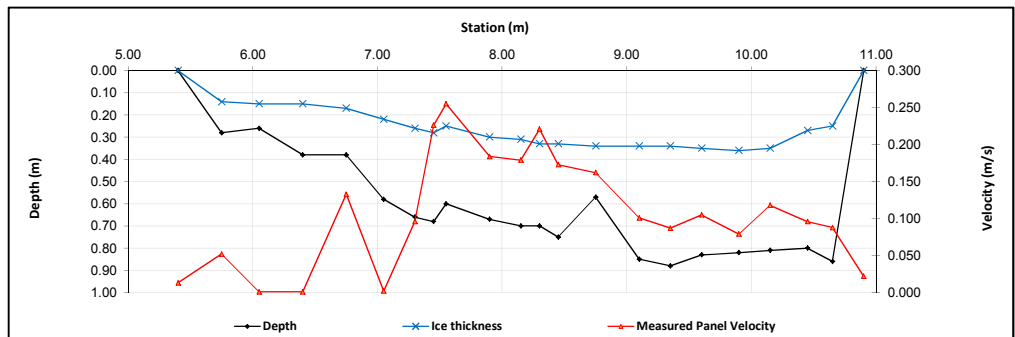
Measurement Details:	
Start Time (MST):	9:53
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -16°C

Flow characteristics:		
Total Flow:	0.196	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.92	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.349	(m)
Mean Velocity:	0.102	(m/s)
Froude Number:	0.055	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.4	-
Battery (Main):	12.6	13.06
Datalogger Clock:	9:54	-
Laptop Clock:	9:54	-
Enclosure Dessicant:	Good	
Logger# (if Δ):	18166	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S22-03			1.583	305.594	305.596	Pipe 3 m W of Logger
S22-04			1.492	305.685	305.689	Pipe 5 m SW of Logger
S22-05	1.099	307.177		306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.755	303.422		
Water Level:			3.808	303.369		
Other:						
<b>Setup #2</b>						
S22-03	1.569	307.163		305.594	305.596	Pipe 3 m W of Logger
S22-04			1.475	305.688	305.689	Pipe 5 m SW of Logger
S22-05			1.083	306.080	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.743	303.420		
Water Level:			3.798	303.365		
Other:						

Closing Error	-0.002
WL Check	0.004

Average WL	303.367
Transducer Elevation Before	302.401
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	16-Jan-13
Data Entry Personnel:	DW	Date:	16-Jan-13
Data Check Personnel:	CJ	Date:	24-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek Near The Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

February 3, 2013



Flow Measurement:							Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow				
RB	4.50	0.00	0.00	0.000	0.000	0.000	0.9	4.50	4.65	0.15	0.14	0.024	0.021	0.02	0.000	0%				
1	4.80	0.75	0.20	0.095			0.9	4.65	4.90	0.25	0.55	0.095	0.086	0.14	0.012	7%				
2	5.00	0.75	0.25	0.076			0.9	4.90	5.05	0.15	0.50	0.076	0.068	0.07	0.005	3%				
3	5.10	0.75	0.25	0.090			0.9	5.05	5.25	0.20	0.50	0.090	0.081	0.10	0.008	5%				
4	5.40	0.75	0.25	0.233			0.9	5.25	5.53	0.28	0.50	0.233	0.210	0.14	0.029	18%				
5	5.65	0.70	0.27	0.056			0.9	5.53	5.78	0.25	0.43	0.056	0.050	0.11	0.005	3%				
6	5.90	0.70	0.25	0.066			0.9	5.78	6.05	0.28	0.45	0.066	0.059	0.12	0.007	5%				
7	6.20	0.75	0.78	0.065			0.9	6.05	6.33	0.27	-0.03	0.065	0.059	-0.01	0.000	0%				
8	6.45	0.75	0.28	0.110			0.9	6.33	6.53	0.20	0.47	0.110	0.099	0.09	0.009	6%				
9	6.60	0.70	0.30	0.127			0.9	6.53	6.68	0.15	0.40	0.127	0.114	0.06	0.007	4%				
10	6.75	0.72	0.30	0.154			0.9	6.68	6.83	0.15	0.42	0.154	0.139	0.06	0.009	6%				
11	6.90	0.70	0.32	0.173			0.9	6.83	7.03	0.20	0.38	0.173	0.156	0.08	0.012	8%				
12	7.15	0.70	0.30	0.182			0.9	7.03	7.23	0.20	0.40	0.182	0.164	0.08	0.013	8%				
13	7.30	0.70	0.30	0.204			0.9	7.23	7.35	0.13	0.40	0.204	0.184	0.05	0.009	6%				
14	7.40	0.70	0.30	0.186			0.9	7.35	7.58	0.23	0.40	0.186	0.167	0.09	0.015	10%				
15	7.75	0.55	0.30	0.161			0.9	7.58	7.90	0.33	0.25	0.161	0.145	0.08	0.012	7%				
16	8.05	0.60	0.35	0.108			0.9	7.90	8.23	0.33	0.25	0.108	0.097	0.08	0.008	5%				
17	8.40	0.52	0.25	0.028			0.9	8.23	8.58	0.35	0.27	0.028	0.025	0.09	0.002	2%				
18	8.75	0.30	0.15	-0.062			0.9	8.58	9.28	0.70	0.15	-0.062	-0.056	0.11	-0.006	-4%				
LB	9.80	0.00	0.00	0.00	0.00	0.00	1.0	9.28	9.80	0.53	0.04	-0.016	-0.016	0.02	0.000	0%				
<b>Total Flow</b>														<b>0.157</b>						

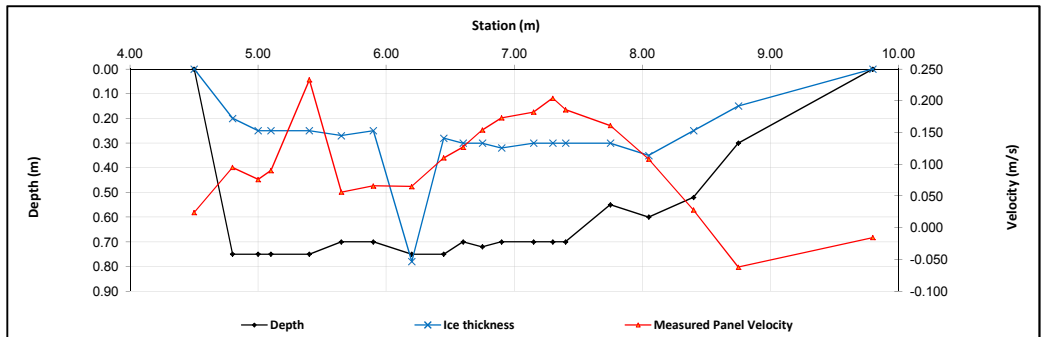
Measurement Details:	
Start Time (MST):	11:35
End Time (MST):	13:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Fair
Weather:	Partial cloud, calm, -15°C

Flow characteristics:		
Total Flow:	0.157	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.59	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.300	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
	Before	After
Transducer Reading (m):	0.949	-
Water (°C):	0.4	-
Battery (Main):	15.2	-
Datalogger Clock:	11:53	-
Laptop Clock:	11:53	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S22-03	1.484	307.08		305.596	305.596	Pipe 3 m W of Logger
S22-04			1.389	305.691	305.689	Pipe 5 m SW of Logger
S22-05			1.006	306.074	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.698	303.382		
Water Level:			3.728	303.352		
Other:						
<b>Setup #2</b>						
S22-03			1.471	305.596	305.596	Pipe 3 m W of Logger
S22-04	1.376	307.067		305.691	305.689	Pipe 5 m SW of Logger
S22-05			0.986	306.081	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.684	303.383		
Water Level:			3.715	303.352		
Other:						

Closing Error	0.000	Average WL	303.352
WL Check	0.000	Transducer Elevation Before	302.403
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	3-Feb-13
Data Entry Personnel:	CJ	Date:	3-Feb-13
Data Check Personnel:	CJ	Date:	
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek Near The Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date:

February 27, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.30	0.00	0.00	0.000	0.000	0.000	0.9	4.30	4.60	0.30	-0.06	0.043	0.037	-0.02	-0.001	-1%
1	4.90	0.55	0.80	0.170			0.9	4.60	5.05	0.45	-0.25	0.170	0.150	-0.11	-0.017	-13%
2	5.20	0.52	0.13	0.106			0.9	5.05	5.25	0.20	0.39	0.106	0.093	0.08	0.007	6%
3	5.30	0.53	0.13	0.079			0.9	5.25	5.38	0.13	0.40	0.079	0.070	0.05	0.003	3%
4	5.45	0.53	0.12	0.174			0.9	5.38	5.60	0.23	0.41	0.174	0.153	0.09	0.014	11%
5	5.75	0.46	0.12	0.132			0.9	5.60	5.85	0.25	0.34	0.132	0.116	0.09	0.010	8%
6	5.95	0.58	0.24	0.127			0.9	5.85	6.08	0.23	0.34	0.127	0.112	0.08	0.009	7%
7	6.20	0.69	0.24	0.119			0.9	6.08	6.38	0.30	0.45	0.119	0.105	0.14	0.014	11%
8	6.55	0.68	0.21	0.106			0.9	6.38	6.68	0.30	0.47	0.106	0.093	0.14	0.013	10%
9	6.80	0.67	0.20	-0.014			0.9	6.68	6.95	0.27	0.47	-0.014	-0.012	0.13	-0.002	-1%
10	7.10	0.61	0.16	0.160			0.9	6.95	7.15	0.20	0.45	0.160	0.141	0.09	0.013	10%
11	7.20	0.67	0.16	0.191			0.9	7.15	7.28	0.13	0.51	0.191	0.168	0.06	0.011	8%
12	7.35	0.60	0.22	0.209			0.9	7.28	7.40	0.13	0.38	0.209	0.184	0.05	0.009	7%
13	7.45	0.61	0.16	0.198			0.9	7.40	7.58	0.18	0.45	0.198	0.174	0.08	0.014	11%
14	7.70	0.63	0.22	0.248			0.9	7.58	7.75	0.18	0.41	0.248	0.218	0.07	0.016	12%
15	7.80	0.38	0.23	0.215			0.9	7.75	7.83	0.07	0.15	0.215	0.189	0.01	0.002	2%
16	7.85	0.38	0.24	0.216			0.9	7.83	7.90	0.08	0.14	0.216	0.190	0.01	0.002	2%
17	7.95	0.35	0.21	0.134			0.9	7.90	8.10	0.20	0.14	0.134	0.118	0.03	0.003	3%
18	8.25	0.37	0.15	0.105			0.9	8.10	8.43	0.33	0.22	0.105	0.092	0.07	0.007	5%
19	8.60	0.38	0.09	-0.001			0.9	8.43	8.75	0.32	0.29	-0.001	-0.001	0.09	0.000	0%
20	8.90	0.40	0.08	0.002			0.9	8.75	9.00	0.25	0.32	0.002	0.002	0.08	0.000	0%
21	9.10	0.29	0.10	0.002			0.9	9.00	9.30	0.30	0.19	0.002	0.002	0.06	0.000	0%
LB	9.50	0.00	0.00	0.00	0.00	0.00	1.0	9.30	9.50	0.20	0.05	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>														<b>0.127</b>		

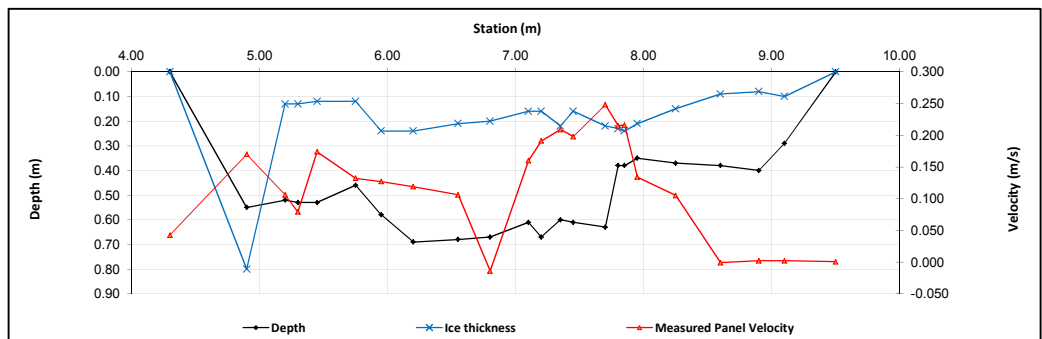
Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	10:46
Equipment:	ADV
Method:	Ice
River Condition:	Open areas
Quality/Error (see reverse):	Good
Weather:	Light cloud, -10°C

Flow characteristics:	
Total Flow:	0.127 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.37 (m <sup>2</sup> )
Wetted Width:	5.20 (m)
Hydraulic Depth:	0.263 (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
	Before	After
Transducer Reading (m):	0.942	-
Water (°C):	0.4	-
Battery (Main):	15.1	-
Datalogger Clock:	9:49	-
Laptop Clock:	9:49	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	18166	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

**General Notes:**  
 - Some open areas that have recently frozen over



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S22-03			0.882	305.595	305.596	Pipe 3 m W of Logger
S22-04			0.788	305.689	305.689	Pipe 5 m SW of Logger
S22-05	0.399	306.477		306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.099	303.378		
Water Level:			3.138	303.339		
Other:						
<b>Setup #2</b>						
S22-03			0.868	305.595	305.596	Pipe 3 m W of Logger
S22-04	0.774	306.463		305.689	305.689	Pipe 5 m SW of Logger
S22-05			0.385	306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.086	303.377		
Water Level:			3.122	303.341		
Other:						

Closing Error	0.000	Average WL	303.340
WL Check	0.002	Transducer Elevation Before	302.398
		Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	Trip Date:	27-Feb-13
<b>Data Entry Personnel:</b>	DW	Date:	27-Feb-13
<b>Data Check Personnel:</b>	CJ	Date:	5-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek Near The Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

March 26, 2013



<b>Flow Measurement:</b>																
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.40	0.00	0.00	0.000	0.000	0.000	0.9	4.40	4.65	0.25	0.10	0.000	0.000	0.02	0.000	0%
1	4.90	0.38		-0.001			0.9	4.65	4.94	0.29	0.38	-0.001	-0.001	0.11	0.000	0%
2	4.97	0.22		0.227			0.9	4.94	5.11	0.17	0.22	0.204	0.204	0.04	0.008	6%
3	5.25	0.40		0.001			0.9	5.11	5.35	0.24	0.40	0.001	0.001	0.10	0.000	0%
4	5.45	0.36	0.05	0.018			0.9	5.35	5.60	0.25	0.31	0.018	0.016	0.08	0.001	1%
5	5.75	0.43	0.10	-0.001			0.9	5.60	5.83	0.23	0.33	-0.001	-0.001	0.07	0.000	0%
6	5.90	0.40	0.10	0.054			0.9	5.83	5.95	0.13	0.30	0.054	0.049	0.04	0.002	1%
7	6.00	0.43	0.10	0.001			0.9	5.95	6.08	0.13	0.33	0.001	0.001	0.04	0.000	0%
8	6.15	0.43	0.10	0.190			0.9	6.08	6.23	0.15	0.33	0.190	0.171	0.05	0.008	6%
9	6.30	0.23	0.20	0.181			0.9	6.23	6.40	0.18	0.30	0.181	0.163	0.01	0.001	1%
10	6.50	0.35	0.20	0.178			0.9	6.40	6.60	0.20	0.15	0.178	0.160	0.03	0.005	4%
11	6.70	0.44	0.20	0.205			0.9	6.60	6.79	0.19	0.24	0.205	0.185	0.05	0.008	6%
12	6.88	0.45	0.20	0.184			0.9	6.79	6.94	0.15	0.25	0.184	0.166	0.04	0.006	5%
13	7.00	0.53	0.20	0.152			0.9	6.94	7.06	0.12	0.33	0.152	0.137	0.04	0.005	4%
14	7.12	0.53	0.06	0.124			0.9	7.06	7.21	0.15	0.47	0.124	0.112	0.07	0.008	6%
15	7.30	0.37	0.02	0.118			0.9	7.21	7.38	0.17	0.35	0.118	0.106	0.06	0.006	4%
16	7.45	0.50	0.02	0.103			0.9	7.38	7.49	0.11	0.48	0.103	0.093	0.05	0.005	4%
17	7.52	0.51	0.02	0.102			0.9	7.49	7.60	0.12	0.49	0.102	0.092	0.06	0.005	4%
18	7.68	0.49	0.02	0.122			0.9	7.60	7.76	0.16	0.47	0.122	0.110	0.08	0.008	6%
19	7.84	0.53	0.02	0.162			0.9	7.76	7.90	0.14	0.51	0.162	0.146	0.07	0.010	8%
20	7.96	0.55	0.02	0.174			0.9	7.90	8.13	0.23	0.55	0.174	0.157	0.13	0.020	14%
21	8.30	0.47		0.051			0.9	8.13	8.39	0.26	0.47	0.051	0.046	0.12	0.006	4%
22	8.48	0.41		0.078			0.9	8.39	8.54	0.15	0.41	0.078	0.070	0.06	0.004	3%
23	8.60	0.35		0.114			0.9	8.54	9.05	0.51	0.35	0.114	0.103	0.18	0.018	13%
LB	9.50	0.00	0.00	0.00	0.00	0.00	1.0	9.05	9.50	0.45	0.09	0.029	0.029	0.04	0.001	1%

Total Flow 0.137

<b>Measurement Details:</b>	
Start Time (MST):	8:30
End Time (MST):	10:57
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -15°C

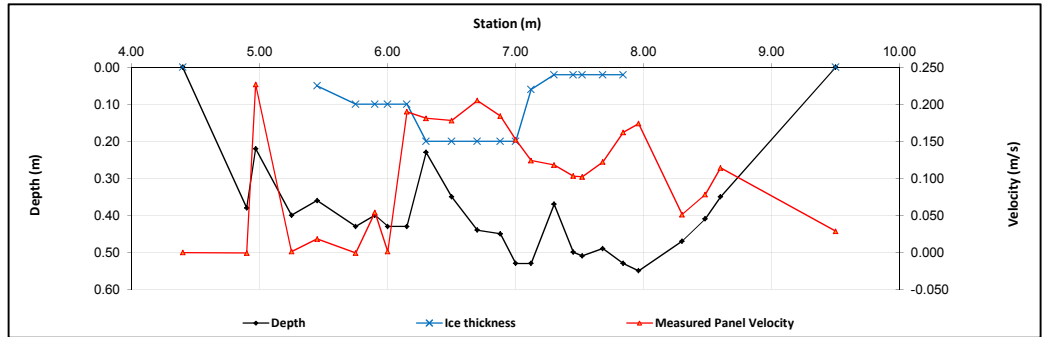
<b>Flow characteristics:</b>		
Total Flow:	0.137	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	1.62	(m <sup>2</sup> )
Wetted Width:	5.10	(m)
Hydraulic Depth:	0.317	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.928	-
Water (°C):	0.4	-
Battery (Main):	15.2	-
Datalogger Clock:	8:36	-
Laptop Clock:	8:36	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

**General Notes:**

- Ice is separated from water by air layer for measurements #1 to 3, 20 to 23, therefore ice thickness has no affect on flow for these measurements.
- A rock is in front of hole at measurement #5, affecting measurement
- Ice is very thin and poor



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S22-03	1.366	306.962		305.596	305.596	Pipe 3 m W of Logger
S22-04			1.269	305.693	305.689	Pipe 5 m SW of Logger
S22-05			0.88	306.082	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.483	303.479		
Water Level:			3.627	303.335		
Other:						
<b>Setup #2</b>						
S22-03			1.379	305.597	305.596	Pipe 3 m W of Logger
S22-04	1.283	306.976		305.693	305.689	Pipe 5 m SW of Logger
S22-05			0.893	306.083	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.486	303.490		
Water Level:			3.639	303.337		
Other:						

Closing Error	-0.001
WL Check	0.002

Average WL	303.336
Transducer Elevation Before	302.408
Transducer Elevation After	-

<b>Field Personnel:</b>			
Data Entry Personnel:	CJ, XP	Trip Date:	26-Mar-13
Data Check Personnel:	CJ	Date:	26-Mar-13
		Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: May 2, 2013  
 Site Visit Time (MST): 12:30

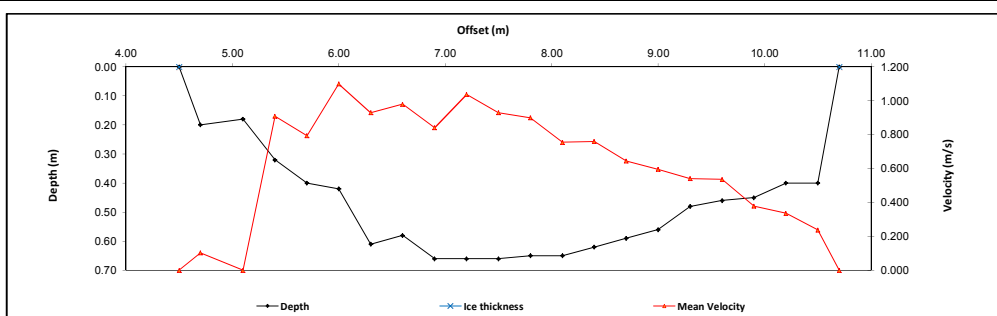


Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.50	0.00	0.00		0.000					1.00	0.10	0.00	0.000	0.00	0.000	
1	4.70	0.20		0.12	0.103					1.00	0.30	0.20	0.103	0.06	0.006	0%
2	5.10	0.18		0.11	0.353					1.00	0.35	0.18	0.18	0.06		
3	5.40	0.32		0.19	0.909					1.00	0.30	0.32	0.909	0.10	0.087	4%
4	5.70	0.40		0.24	0.794					1.00	0.30	0.40	0.794	0.12	0.095	4%
5	6.00	0.42		0.25	1.099					1.00	0.30	0.42	1.099	0.13	0.138	6%
6	6.30	0.61		0.37	0.929					1.00	0.30	0.61	0.929	0.18	0.170	8%
7	6.60	0.58		0.35	0.979					1.00	0.30	0.58	0.979	0.17	0.170	8%
8	6.90	0.66		0.40	0.841					1.00	0.30	0.66	0.841	0.20	0.167	8%
9	7.20	0.66		0.40	1.037					1.00	0.30	0.66	1.037	0.20	0.205	9%
10	7.50	0.66		0.40	0.929					1.00	0.30	0.66	0.929	0.20	0.184	8%
11	7.80	0.65		0.39	0.899					1.00	0.30	0.65	0.899	0.20	0.175	8%
12	8.10	0.65		0.39	0.755					1.00	0.30	0.65	0.755	0.20	0.147	7%
13	8.40	0.62		0.37	0.760					1.00	0.30	0.62	0.760	0.19	0.141	7%
14	8.70	0.59		0.35	0.644					1.00	0.30	0.59	0.644	0.18	0.114	5%
15	9.00	0.56		0.34	0.596					1.00	0.30	0.56	0.596	0.17	0.100	5%
16	9.30	0.48		0.29	0.541					1.00	0.30	0.48	0.541	0.14	0.078	4%
17	9.60	0.46		0.28	0.536					1.00	0.30	0.46	0.536	0.14	0.074	3%
18	9.90	0.45		0.27	0.378					1.00	0.30	0.45	0.378	0.14	0.051	2%
19	10.20	0.40		0.24	0.336					1.00	0.30	0.40	0.336	0.12	0.040	2%
20	10.50	0.40		0.24	0.238					1.00	0.25	0.40	0.238	0.10	0.024	1%
LB	10.70	0.00	0.00		0.00	0.00				1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.17</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST): 12:46  
 Meas. End Time (MST): 13:06  
 Equipment: ADV  
 Method: Fishcat  
 River Condition: High flow, ice along banks  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Partial cloud, calm, +10°C



**Flow characteristics:**

Total Flow:	2.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.97	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.73	(m/s)
Froude Number:	0.34	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.382	1.395
Water (°C):	1.7	1.9
Datalogger Clock:	12:30	13:15
Laptop Clock:	12:30	13:16
Battery (Main):	14.2	14.15
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S22-03			1.104	305.594	305.596	Pipe 3 m W of Logger	S22-05
S22-04			1.009	305.689	305.689	Pipe 5 m SW of Logger	S22-04
S22-05	0.620	306.698		306.078	306.078	Pipe 1 m SE of Logger	S22-03
Ice/PT:							WL
Water Level:			2.907	303.791		Time WL Surveyed:	12:40
Other:							
Setup #2							
S22-03	1.091	306.685		305.594	305.596	Pipe 3 m W of Logger	S22-04
S22-04			0.997	305.688	305.689	Pipe 5 m SW of Logger	S22-05
S22-05			0.606	306.079	306.078	Pipe 1 m SE of Logger	
Ice/PT:							
Water Level:			2.891	303.794		Time WL Surveyed:	12:42
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S22-04	0.997	306.686		305.689		
Water Level:			2.887	303.795		Time WL Surveyed:	13:11
Water Level:			2.872	303.802		Time WL Surveyed:	13:15
BM:	S22-04	0.985	306.674		305.689		

**WL Survey Summary**

	Before	After
Average WL:	303.793	303.801
Transducer Elevation:	302.411	302.406
Closing Error:	-0.001	-
WL Check:	0.003	-0.003

**Site Rating Information**

Measured Discharge:	2.17
Expected Discharge:	2.24
Shift from Existing Rating (m <sup>3</sup> /s):	0.07
Shift from Existing Rating (%):	3%

**Field Personnel:**

SM, TR	Trip Date:	2-May-13
SM	Date:	2-May-13
CJ	Date:	21-May-13

Entered Digitally in the Field:

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: June 11, 2013  
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000	1.00						
1										1.00						
2										1.00						
3										1.00						
4										1.00						
5										1.00						
LB	0.00	0.00			0.00		0.00		0.00	1.00						
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:30
Meas. End Time (MST):	9:40
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Cloudy, 10°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

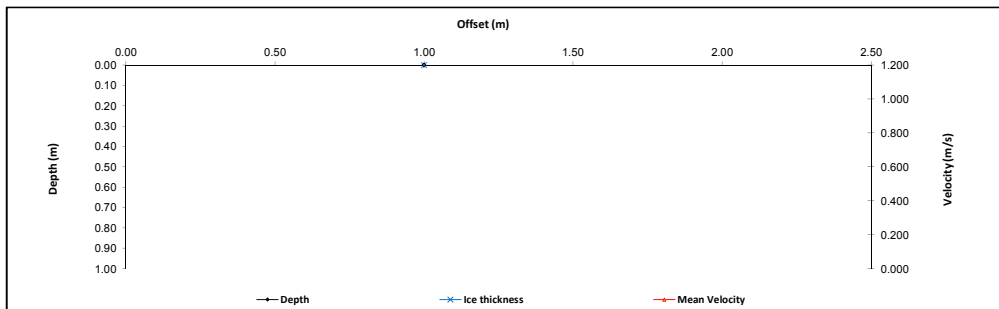
**Logger Details:**

	Before	After
Transducer Reading (m):	3.219	-
Water (°C):	10.1	-
Datalogger Clock:	09:07	-
Laptop Clock:	09:07	-
Battery (Main):	14.1	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- No flow measurement conducted due to extremely high flow and safety concerns



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S22-05
S22-03			2.250	305.594	305.596	Pipe 3 m W of Logger	S22-04
S22-04			2.155	305.689	305.689	Pipe 5 m SW of Logger	S22-03
S22-05	1.766	307.844		306.078	306.078	Pipe 1 m SE of Logger	WL
Ice/PT:							WL
Water Level:			2.238	305.606		Time WL Surveyed: 9:19	S22-03
Other:							S22-04
<b>Setup #2</b>							S22-05
S22-03	2.236	307.830		305.594	305.596	Pipe 3 m W of Logger	
S22-04			2.142	305.688	305.689	Pipe 5 m SW of Logger	
S22-05			1.752	306.078	306.078	Pipe 1 m SE of Logger	
Ice/PT:							
Water Level:			2.227	305.603		Time WL Surveyed: 9:21	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:							
BM:							

**WL Survey Summary**

	Before	After
Average WL:	305.605	-
Transducer Elevation:	302.386	-
Closing Error:	0.000	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	23.46
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SG, CJ	Trip Date:	11-Jun-13
<b>Data Entry Personnel:</b>	CJ	Date:	11-Jun-13
<b>Data Check Personnel:</b>	CJ	Date:	17-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: August 18, 2013  
 Site Visit Time (MST): 08:05



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	1.25	0.23		0.14	-0.059					1.00	0.38	0.23	-0.059	0.09	-0.005	0%
2	1.75	0.23		0.14	0.144					1.00	0.50	0.23	0.144	0.12	0.017	1%
3	2.25	0.25		0.15	0.383					1.00	0.50	0.25	0.383	0.13	0.048	4%
4	2.75	0.33		0.20	0.207					1.00	0.38	0.33	0.207	0.12	0.026	2%
5	3.00	0.30		0.18	0.484					1.00	0.25	0.30	0.484	0.08	0.036	3%
6	3.25	0.33		0.20	0.670					1.00	0.25	0.33	0.670	0.08	0.055	5%
7	3.50	0.30		0.18	0.738					1.00	0.25	0.30	0.738	0.08	0.055	5%
8	3.75	0.34		0.20	0.661					1.00	0.25	0.34	0.661	0.09	0.056	5%
9	4.00	0.37		0.22	0.600					1.00	0.25	0.37	0.600	0.09	0.056	5%
10	4.25	0.40		0.24	0.734					1.00	0.25	0.40	0.734	0.10	0.073	6%
11	4.50	0.46		0.28	0.699					1.00	0.25	0.46	0.699	0.12	0.080	7%
12	4.75	0.50		0.30	0.773					1.00	0.25	0.50	0.773	0.13	0.097	8%
13	5.00	0.52		0.31	0.530					1.00	0.25	0.52	0.530	0.13	0.069	6%
14	5.25	0.42		0.25	1.083					1.00	0.25	0.42	1.083	0.11	0.114	10%
15	5.50	0.40		0.24	1.109					1.00	0.25	0.40	1.109	0.10	0.111	9%
16	5.75	0.36		0.22	0.598					1.00	0.25	0.36	0.598	0.09	0.054	5%
17	6.00	0.30		0.18	1.083					1.00	0.25	0.30	1.083	0.08	0.081	7%
18	6.25	0.25		0.15	0.968					1.00	0.25	0.25	0.968	0.06	0.061	5%
19	6.50	0.25		0.15	0.899					1.00	0.25	0.25	0.899	0.06	0.056	5%
20	6.75	0.20		0.12	0.443					1.00	0.35	0.20	0.443	0.07	0.031	3%
RB	7.20	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.17</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from station

Meas. Start Time (MST):	8:25
Meas. End Time (MST):	8:50
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15°C

**Flow characteristics:**

Total Flow:	1.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.90	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.62	(m/s)
Froude Number:	0.36	

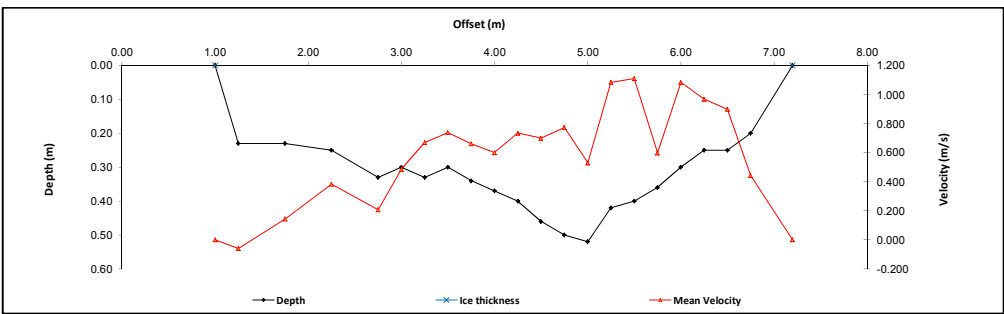
**Logger Details:**

	Before	After
Transducer Reading (m):	1.170	1.170
Water (°C):	17.4	17.3
Datalogger Clock:	08:09	08:58
Laptop Clock:	08:09	08:58
Battery (Main):	14.2	14.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Log jam is present 7 m DS of PLS

**General Notes:**



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							S22-05
S22-03			1.105	305.591	305.595	Pipe 3 m W of Logger	S22-04
S22-04			1.008	305.688	305.686	Pipe 5 m SW of Logger	S22-03
S22-05	0.618	306.696		306.078	306.078	Pipe 1 m SE of Logger	WL
Ice/PT:							WL
Water Level:			3.170	303.526		Time WL Surveyed: 8:21	S22-03
Other:							S22-04
Setup #2							S22-05
S22-03	1.097	306.688		305.591	305.595	Pipe 3 m W of Logger	
S22-04			1.001	305.687	305.686	Pipe 5 m SW of Logger	
S22-05			0.611	306.077	306.078	Pipe 1 m SE of Logger	
Ice/PT:							
Water Level:			3.159	303.529		Time WL Surveyed: 8:23	(must close survey loop on survey starting point)
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S22-03	1.097	306.688	305.591		Time WL Surveyed: 8:54	
Water Level:			3.162	303.526		Time WL Surveyed: 8:55	
Water Level:			3.158	303.525			
BM:	S22-03	1.092	306.683	305.591			

**WL Survey Summary**

	Before	After
Average WL:	303.528	303.526
Transducer Elevation:	302.358	302.356
Closing Error:	0.001	-
WL Check:	0.003	0.001

**Site Rating Information**

Measured Discharge:	1.17
Expected Discharge:	0.96
Shift from Existing Rating (m <sup>3</sup> /s):	-0.21
Shift from Existing Rating (%):	-18%

**Field Personnel:**

TR, DW	Trip Date:	18-Aug-13
TR	Date:	18-Aug-13
CJ	Date:	19-Aug-13
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: September 19, 2013  
 Site Visit Time (MST): 08:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.70	0.38		0.23	0.022					1.00	0.30	0.38	0.022	0.11	0.003	2%
2	2.00	0.36		0.22	0.044					1.00	0.30	0.36	0.044	0.11	0.005	3%
3	2.30	0.32		0.19	0.031					1.00	0.30	0.32	0.031	0.10	0.003	2%
4	2.60	0.33		0.20	0.077					1.00	0.30	0.33	0.077	0.10	0.008	5%
5	2.90	0.35		0.21	0.046					1.00	0.30	0.35	0.046	0.11	0.005	3%
6	3.20	0.32		0.19	0.040					1.00	0.30	0.32	0.040	0.10	0.004	3%
7	3.50	0.33		0.20	0.015					1.00	0.30	0.33	0.015	0.10	0.001	1%
8	3.80	0.35		0.21	0.025					1.00	0.30	0.35	0.025	0.11	0.003	2%
9	4.10	0.40		0.24	0.021					1.00	0.30	0.40	0.021	0.12	0.003	2%
10	4.40	0.42		0.25	0.075					1.00	0.30	0.42	0.075	0.13	0.009	6%
11	4.70	0.45		0.27	0.047					1.00	0.30	0.45	0.047	0.14	0.006	4%
12	5.00	0.46		0.28	0.064					1.00	0.30	0.46	0.064	0.14	0.009	6%
13	5.30	0.44		0.26	0.119					1.00	0.20	0.44	0.119	0.09	0.010	7%
14	5.40	0.42		0.25	0.103					1.00	0.15	0.42	0.103	0.06	0.006	4%
15	5.60	0.45		0.27	0.099					1.00	0.25	0.45	0.099	0.11	0.011	8%
16	5.90	0.43		0.26	0.134					1.00	0.20	0.43	0.134	0.09	0.012	8%
17	6.00	0.42		0.25	0.114					1.00	0.15	0.42	0.114	0.06	0.007	5%
18	6.20	0.40		0.24	0.127					1.00	0.25	0.40	0.127	0.10	0.013	9%
19	6.50	0.32		0.19	0.118					1.00	0.30	0.32	0.118	0.10	0.011	8%
20	6.80	0.26		0.16	0.103					1.00	0.40	0.26	0.103	0.10	0.011	7%
21	7.30	0.22		0.13	0.074					1.00	0.50	0.22	0.074	0.11	0.008	6%
LB	7.80	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.147</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 Approx. 50 m DS of station

Meas. Start Time (MST):	9:30
Meas. End Time (MST):	9:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 3°C

**Flow characteristics:**

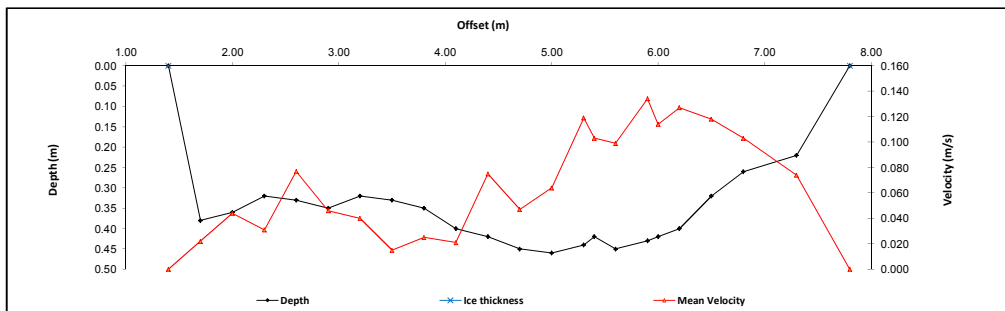
Total Flow:	0.147	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.16	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.909	0.909
Water (°C):	9.6	9.5
Datalogger Clock:	08:52	10:02
Laptop Clock:	08:52	10:02
Battery (Main):	14.7	14.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S22-03			1.277	305.592	305.595	Pipe 3 m W of Logger	S22-05
S22-04			1.183	305.686	305.686	Pipe 5 m SW of Logger	S22-03
S22-05	0.791	306.869		306.078	306.078	Pipe 1 m SE of Logger	WL
Ice/PT:							WL
Water Level:			3.596	303.273		Time WL Surveyed: 9:16	S22-03
Other:							S22-04
<b>Setup #2</b>							
S22-03	1.265	306.857		305.592	305.595	Pipe 3 m W of Logger	
S22-04			1.170	305.687	305.686	Pipe 5 m SW of Logger	
S22-05			0.780	306.077	306.078	Pipe 1 m SE of Logger	
Ice/PT:							
Water Level:			3.582	303.275		Time WL Surveyed: 9:18	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S22-03	1.266	306.858		305.592		
Water Level:			3.583	303.275		Time WL Surveyed: 9:57	
Water Level:			3.571	303.274		Time WL Surveyed: 9:58	
BM:	S22-03	1.253	306.845		305.592		

**WL Survey Summary**

	Before	After
Average WL:	303.274	303.275
Transducer Elevation:	302.365	302.366
Closing Error:	0.001	-
WL Check:	0.002	0.001

**Site Rating Information**

Measured Discharge:	0.147
Expected Discharge:	0.15
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	0%

**Field Personnel:**

	SM, CJ	Trip Date:	19-Sep-13
Data Entry Personnel:	CJ	Date:	19-Sep-13
Data Check Personnel:	DW	Date:	24-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END







# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: January 30, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	3.50	3.00	0.84	0.052	0.052	2.51	0.130	0%
1	6.50	3.85	0.50		0.161	0.254	1.0	3.50	14.35	10.85	3.35	0.208	0.208	36.35	7.542	4%
2	22.20	4.45	0.45		0.242	0.390	1.0	14.35	32.10	17.75	4.00	0.316	0.316	71.00	22.436	12%
3	42.00	3.90	0.45		0.331	0.451	1.0	32.10	46.65	14.55	3.45	0.391	0.391	50.20	19.627	11%
4	51.30	3.30	0.45		0.590	0.252	1.0	46.65	55.40	8.75	2.85	0.421	0.421	24.94	10.499	6%
5	59.50	3.10	0.45		0.449	0.542	1.0	55.40	67.15	11.75	2.65	0.496	0.496	31.14	15.429	8%
6	74.80	3.00	0.45		0.326	0.473	1.0	67.15	81.95	14.80	2.55	0.400	0.400	37.74	15.077	8%
7	89.10	2.80	0.45		0.297	0.439	1.0	81.95	102.40	20.45	2.35	0.368	0.368	48.06	17.685	10%
8	115.70	2.10	0.45		0.348	0.376	1.0	102.40	129.30	26.90	1.65	0.362	0.362	44.39	16.067	9%
9	142.90	2.10	0.45		0.180	0.352	1.0	129.30	156.65	27.35	1.65	0.266	0.266	45.13	12.004	7%
10	170.40	1.70	0.45		0.069	0.333	1.0	156.65	183.60	26.95	1.25	0.201	0.201	33.69	6.771	4%
11	196.80	1.70	0.45		0.164	0.271	1.0	183.60	209.95	26.35	1.25	0.218	0.218	32.94	7.164	4%
12	223.10	1.90	0.45		0.090	0.196	1.0	209.95	235.40	25.45	1.45	0.143	0.143	36.90	5.277	3%
13	247.70	2.20	0.50		0.132	0.237	1.0	235.40	261.85	26.45	1.70	0.185	0.185	44.97	8.296	5%
14	276.00	2.60	0.45		0.060	0.082	1.0	261.85	290.25	28.40	2.15	0.071	0.071	61.06	4.335	2%
15	304.50	2.25	0.45		0.072	0.057	1.0	290.25	312.10	21.85	1.80	0.065	0.065	39.33	2.537	1%
16	319.70	1.90	0.45		0.116	0.177	1.0	312.10	339.05	26.95	1.45	0.147	0.147	39.08	5.725	3%
17	358.40	1.50	0.45		0.208	0.084	1.0	339.05	370.65	31.60	1.05	0.146	0.146	33.18	4.844	3%
18	382.90	0.95	0.45	-0.045			0.9	370.65	396.10	25.45	0.50	-0.041	-0.041	12.73	-0.515	0%
19	409.30	0.90	0.45	0.019			0.9	396.10	420.00	23.90	0.45	0.019	0.017	10.76	0.184	0%
20	430.70	0.80	0.45	0.120			0.9	420.00	433.05	13.05	0.35	0.120	0.108	4.57	0.493	0%
RB	435.40	0.00	0.00	0.00	0.00	0.00	1.0	433.05	435.40	2.35	0.09	0.030	0.030	0.21	0.006	0%
														<b>Total Flow</b>	<b>182</b>	

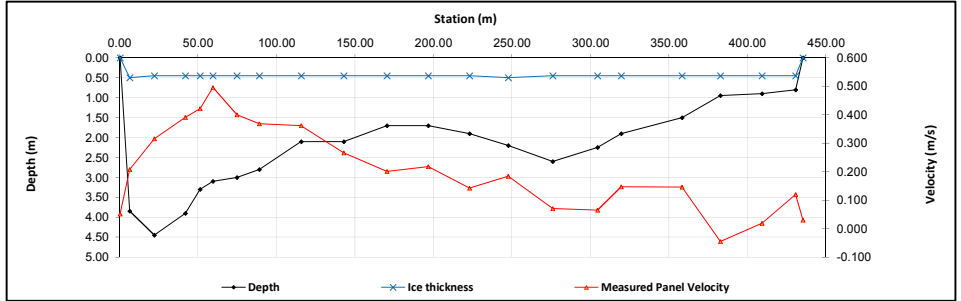
Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	15:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -28°C

Flow characteristics:		
Total Flow:	182	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	740.84	(m <sup>2</sup> )
Wetted Width:	434.90	(m)
Hydraulic Depth:	1.703	(m)
Mean Velocity:	0.246	(m/s)
Froude Number:	0.060	

Logger Details:		
PLS #1 (0-10m) Transducer Reading (m):	0.921	-
PLS #2 (0-4m) Transducer Reading (m):	-	-
Water (°C):	0.1	-
Battery (Main):	15.5	-
Datalogger Clock:	11:53	-
Laptop Clock:	11:53	-
Enclosure Dessicant:		Good
Logger# (if Δ):	16570	-
PT# (if Δ):	-	-
Vent Tube Dessicant:		Good

Datalogger / Station Notes:	

**General Notes:**



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S24-02			0.206	231.362	231.347	T-Post 2 m N of data logger
S24-03	1.187	231.568		230.381	230.381	3/4" Pipe 8 m S of data logger
S24-04			0.732	230.836	230.838	3/4" Pipe 5 m N of data logger
Ice/PT:			5.327	228.241		
Water Level:			5.288	228.280		
Other:						
<b>Setup #2</b>						
S24-02			0.193	231.363	231.347	T-Post 2 m N of data logger
S24-03			1.175	230.381	230.381	3/4" Pipe 8 m S of data logger
S24-04	0.720	231.556		230.836	230.838	3/4" Pipe 5 m N of data logger
Ice/PT:			5.315	228.241		
Water Level:			5.276	228.280		
Other:						

Closing Error	0.000	Average WL	228.280
WL Check	0.000	Transducer Elevation Before	225.359
		Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	30-Jan-13
Data Entry Personnel:	SM	Date:	30-Jan-13
Data Check Personnel:	SM	Date:	13-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		





# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
UTM Location: 466313 E, 6372760 N

Site Visit Date: April 8, 2013



Measured Data							Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow	
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	5.00	5.00	0.63	0.069	0.069	3.13	0.216	0%	
1	10.00	3.00	0.50	0.259	0.295	1.0	5.00	16.50	11.50	2.50	0.277	0.277	28.75	7.964	4%		
2	23.00	4.40	0.55	0.275	0.292	1.0	16.50	28.00	11.50	3.85	0.284	0.284	44.28	12.552	6%		
3	33.00	3.60	0.55	0.376	0.402	1.0	28.00	37.25	9.25	3.05	0.389	0.389	28.21	10.975	5%		
4	41.50	3.90	0.50	0.360	0.385	1.0	37.25	45.75	8.50	3.40	0.373	0.373	28.90	10.765	5%		
5	50.00	3.20	0.55	0.365	0.359	1.0	45.75	54.25	8.50	2.65	0.362	0.362	22.53	8.154	4%		
6	58.50	3.30	0.55	0.499	0.397	1.0	54.25	67.50	13.25	2.75	0.448	0.448	36.44	16.324	8%		
7	76.50	3.20	0.55	0.417	0.368	1.0	67.50	86.25	18.75	2.65	0.393	0.393	49.69	19.502	9%		
8	96.00	3.30	0.60	0.291	0.356	1.0	86.25	111.00	24.75	2.70	0.324	0.324	66.83	21.618	10%		
9	126.00	2.30	0.65	0.315	0.346	1.0	111.00	135.50	24.50	1.65	0.331	0.331	40.43	13.360	6%		
10	145.00	1.90	0.60	0.332	0.383	1.0	135.50	161.00	25.50	1.30	0.358	0.358	33.15	11.851	6%		
11	177.00	1.80	0.65	0.330	0.313	1.0	161.00	189.50	28.50	1.15	0.322	0.322	32.78	10.537	5%		
12	202.00	1.75	0.60	0.260	0.311	1.0	189.50	214.50	25.00	1.15	0.286	0.286	28.75	8.208	4%		
13	227.00	2.00	0.65	0.210	0.299	1.0	214.50	240.00	25.50	1.35	0.255	0.255	34.43	8.761	4%		
14	253.00	2.20	0.60	0.233	0.309	1.0	240.00	264.50	24.50	1.60	0.271	0.271	39.20	10.623	5%		
15	276.00	2.40	0.60	0.263	0.288	1.0	264.50	288.00	23.50	1.80	0.276	0.276	42.30	11.654	6%		
16	300.00	2.50	0.60	0.176	0.230	1.0	288.00	311.50	23.50	1.90	0.203	0.203	44.65	9.064	4%		
17	323.00	2.20	0.65	0.099	0.213	1.0	311.50	335.00	23.50	1.55	0.156	0.156	36.43	5.682	3%		
18	347.00	1.90	0.65	0.127	0.165	1.0	335.00	359.00	24.00	1.25	0.146	0.146	30.00	4.380	2%		
19	371.00	1.60	0.60	0.096	0.098	1.0	359.00	383.50	24.50	1.00	0.097	0.097	24.50	2.377	1%		
20	396.00	1.00	0.65	0.084		0.9	383.50	406.50	23.00	0.35	0.084	0.084	8.05	0.609	0%		
21	417.00	1.00	0.65	0.076		0.9	406.50	425.50	19.00	0.35	0.076	0.076	6.65	0.455	0%		
22	434.00	0.85	0.65	0.138		0.9	425.50	439.00	13.50	0.20	0.138	0.138	2.70	0.335	0%		
RB	444.00	0.00	0.00	0.00	0.00	1.0	439.00	444.00	5.00	0.05	0.035	0.035	0.25	0.009	0%		
<b>Total Flow</b>															<b>206</b>		

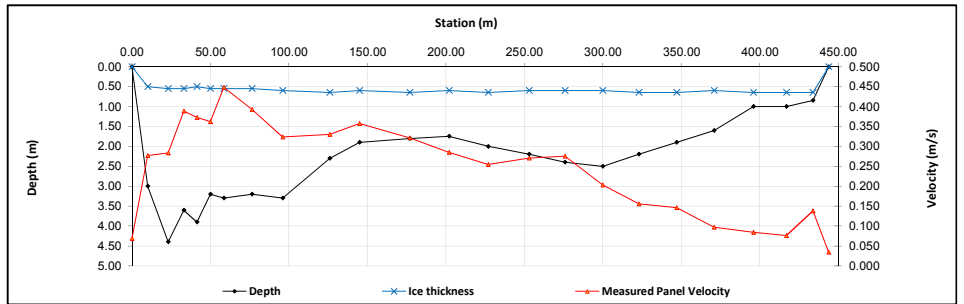
<b>Measurement Details:</b>	
Start Time (MST):	7:50
End Time (MST):	10:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -12°C

<b>Flow characteristics:</b>	
Total Flow:	206 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	712.99 (m <sup>2</sup> )
Wetted Width:	444.00 (m)
Hydraulic Depth:	1.606 (m)
Mean Velocity:	0.289 (m/s)
Froude Number:	0.073

<b>Logger Details:</b>	
PLS #1 (0-4m) Transducer Reading (m):	1.047
PLS #2 (0-10m) Transducer Reading (m):	-
1. Water (°C):	0.1
2. Water (°C):	-
Battery (Main):	14.5
Datalogger Clock:	10:20
Laptop Clock:	10:20
Enclosure Dessicant:	Good
Logger# (if Δ):	-
PT# (if Δ):	-
Vent Tube Dessicant:	Good

<b>Datalogger / Station Notes:</b>	

<b>General Notes:</b>	



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
S24-02			0.311	231.365	231.347	T-Post 2 m N of data logger
S24-03			1.293	230.383	230.381	3/4" Pipe 8 m S of data logger
S24-04	0.838	231.676		230.838	230.838	3/4" Pipe 5 m N of data logger
Ice/PT:			5.283	226.393		
Water Level:			5.305	226.371		
Other:					231.081	Nail in birch tree
Setup #2						
S24-02			0.301	231.365	231.347	T-Post 2 m N of data logger
S24-03			1.283	230.383	230.381	3/4" Pipe 8 m S of data logger
S24-04			0.827	230.839	230.838	3/4" Pipe 5 m N of data logger
Ice/PT:			5.272	226.394		
Water Level:			5.295	226.371		
Other:						

Closing Error	-0.001
WL Check	0.000

Average WL	226.371
Transducer Elevation Before	225.324
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, BL	Trip Date:	8-Apr-13
<b>Data Entry Personnel:</b>	SM	Date:	8-Apr-13
<b>Data Check Personnel:</b>	SM	Date:	16-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S24 Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N



Site Visit Date: June 12, 2013  
 Site Visit Time (MST): 10:25

Flow Measurement:																	
Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correcion Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	6.50	0.00	0.000	0.00	0.000		
1	13.00	6.37				5.10	1.110	1.27	1.400	1.00	12.50	6.37	1.255	79.63	99.929	4%	
2	25.00	7.10				5.68	1.120	1.42	1.470	1.00	13.50	7.10	1.295	95.85	124.126	4%	
3	40.00	7.57				6.06	1.190	1.51	1.090	1.00	15.00	7.57	1.140	113.55	129.447	5%	
4	55.00	8.02				6.42	1.050	1.60	1.020	1.00	15.00	8.02	1.035	120.30	124.511	4%	
5	70.00	6.93				5.54	0.970	1.39	1.370	1.00	13.50	6.93	1.170	93.56	109.459	4%	
6	82.00	7.10				5.68	1.090	1.42	1.410	1.00	11.00	7.10	1.250	78.10	97.625	4%	
7	92.00	6.47				5.18	1.130	1.29	1.460	1.00	15.00	6.47	1.295	97.05	125.680	5%	
8	112.00	6.30				5.04	1.040	1.26	1.500	1.00	19.00	6.30	1.270	119.70	152.019	5%	
9	130.00	5.67				4.54	1.070	1.13	1.370	1.00	18.50	5.67	1.220	104.90	127.972	5%	
10	149.00	5.84				4.67	0.750	1.17	1.530	1.00	23.50	5.84	1.140	137.24	156.454	6%	
11	177.00	5.10				4.08	0.710	1.02	1.370	1.00	38.50	5.10	1.040	196.35	204.204	7%	
12	226.00	4.69				3.75	1.090	0.94	1.310	1.00	44.50	4.69	1.200	208.71	250.446	9%	
13	266.00	5.02				4.02	1.170	1.00	1.450	1.00	43.00	5.02	1.310	215.86	282.777	10%	
14	312.00	5.16				4.13	1.060	1.03	1.570	1.00	44.50	5.16	1.315	229.62	301.950	11%	
15	355.00	5.73				4.58	0.820	1.15	1.370	1.00	49.00	5.73	1.095	280.77	307.443	11%	
16	410.00	4.19				3.35	0.730	0.84	1.070	1.00	47.00	4.19	0.900	196.93	177.237	6%	
RB	449.00	0.00	0.00		0.00					1.00	19.50	0.00	0.000	0.00	0.000		
														<b>Total Flow</b>	<b>2770</b>	<b>100%</b>	

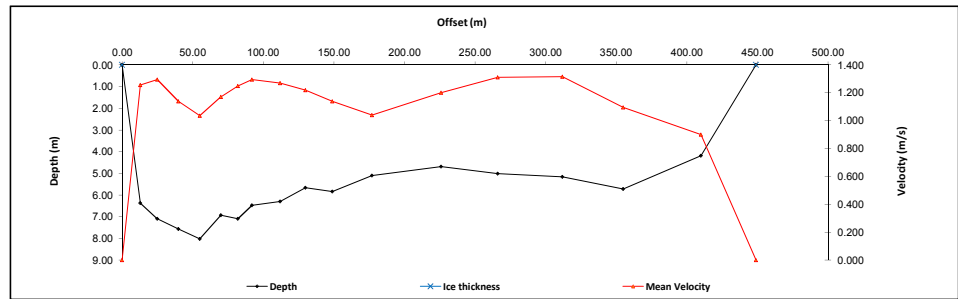
Flow Measurement Details:	
Metering Section Location (describe):	
Meas. Start Time (MST):	11:00
Meas. End Time (MST):	13:30
Equipment:	ADC
Method:	Boat
River Condition:	good
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Rain

Flow characteristics:	
Total Flow:	2770 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2368.10 (m <sup>2</sup> )
Wetted Width:	449.00 (m)
Hydraulic Depth:	5.27 (m)
Mean Velocity:	1.17 (m/s)
Froude Number:	0.16

Logger Details:		
	Before	After
PLS #1 (0-4m) Transducer Reading (m):	2.912	2.931
PLS #2 (0-10m) Transducer Reading (m):	-	-
PLS #1 Water Temp. (°C):	12.5	12.7
PLS #2 Water Temp. (°C):	-	-
Datalogger Clock:	10:31	13:57
Laptop Clock:	10:31	13:57
Battery (Main):	14.3	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:		
New modem needs to be installed		

**General Notes:**  
 - Lots of large floating debris on RB, less than normal verticals conducted, consider measurement an underestimate



Level Survey:							Survey Loop Order	
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description		
<b>Setup #1</b>								
S24-04	0.822	231.660		230.838	230.838	3/4" Pipe 5 m N of data logger		S24-4
S24-05			0.596	231.064	231.065	3/4" Pipe 1.5 m S of data logger		S24-5
S24-06			0.936	230.724	230.725	3/4" Pipe 3 m N of data logger		S24-6
Ice/PT:								WL
Water Level:		1.753		229.907		Time WL Surveyed:	10:40	S24-6
Other:					231.081	Nail in birch tree		S24-5
<b>Setup #2</b>								S24-4
S24-04		0.802		230.837	230.838	3/4" Pipe 5 m N of data logger		
S24-05		0.577		231.062	231.065	3/4" Pipe 1.5 m S of data logger		
S24-06	0.915	231.639		230.724	230.725	3/4" Pipe 3 m N of data logger		
Ice/PT:								
Water Level:		1.734		229.905		Time WL Surveyed:	10:41	(must close survey loop on survey starting point)
Other:					231.081	Nail in birch tree		
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
BM:	S24-04	0.803	231.641		230.838			
Water Level:				1.715	229.926	Time WL Surveyed:	-	
Water Level:				1.706	229.925	Time WL Surveyed:	-	
BM:	S24-04	0.793	231.631		230.838			

WL Survey Summary		
	Before	After
Average WL:	229.906	229.926
Transducer Elevation:	228.994	228.995
Closing Error:	0.001	-
WL Check:	0.002	0.001

Site Rating Information	
Measured Discharge:	2770
Expected Discharge:	2858.13
Shift from Existing Rating (m <sup>3</sup> /s):	88.13
Shift from Existing Rating (%):	3%

Field Personnel:		Trip Date:	
Data Entry Personnel:	SG, CJ	Date:	12-Jun-13
Data Check Personnel:	CJ	Date:	12-Jun-13
Entered Digitally in the Field:	SM	Date:	8-Jul-13
	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N



Site Visit Date: August 19, 2013  
 Site Visit Time (MST): 10:15

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	10.50	0.00	0.000	0.00	0.000	
1	21.00	3.32			2.66	0.370	0.66	0.410	1.00	22.00	3.32	0.390	73.04	28.486	3%	
2	44.00	4.21			3.37	0.340	0.84	0.490	1.00	19.50	4.21	0.415	82.10	34.069	3%	
3	60.00	4.27			3.42	0.620	0.85	0.900	1.00	21.00	4.27	0.760	89.67	68.149	7%	
4	86.00	2.99			2.39	0.740	0.60	0.970	1.00	26.50	2.99	0.855	79.24	67.746	7%	
5	113.00	2.73			2.18	0.670	0.55	0.950	1.00	23.50	2.73	0.810	64.16	51.966	5%	
6	133.00	2.83			2.26	0.630	0.57	0.970	1.00	19.50	2.83	0.800	55.19	44.148	4%	
7	152.00	2.99			2.39	0.660	0.60	0.980	1.00	20.00	2.99	0.820	59.80	49.036	5%	
8	173.00	3.12			2.50	0.680	0.62	0.980	1.00	20.50	3.12	0.830	63.96	53.087	5%	
9	193.00	3.50			2.80	0.650	0.70	0.970	1.00	19.50	3.50	0.810	68.25	55.283	6%	
10	212.00	3.90			2.68	0.910	0.72	1.060	1.00	23.50	3.60	0.935	84.90	79.101	9%	
11	240.00	3.55			2.84	0.720	0.71	0.980	1.00	23.50	3.55	0.850	83.43	70.911	7%	
12	259.00	3.56			2.85	0.660	0.71	0.860	1.00	17.50	3.56	0.760	62.30	47.348	5%	
13	275.00	2.98			2.38	0.580	0.60	0.740	1.00	15.50	2.98	0.660	46.19	30.485	3%	
14	290.00	3.05			2.44	0.740	0.61	1.090	1.00	20.00	3.05	0.915	61.00	55.815	6%	
15	315.00	2.89			2.31	0.810	0.58	0.890	1.00	22.50	2.89	0.850	65.03	55.271	6%	
16	335.00	2.88			2.30	0.730	0.58	0.880	1.00	17.50	2.88	0.805	50.40	40.572	4%	
17	350.00	2.95			2.36	0.780	0.59	0.940	1.00	17.50	2.95	0.860	51.63	44.398	4%	
18	370.00	3.04			2.43	0.640	0.61	0.790	1.00	21.00	3.04	0.715	63.84	45.646	5%	
19	392.00	2.72			2.18	0.470	0.54	0.580	1.00	26.00	2.72	0.525	70.72	37.128	4%	
20	422.00	2.93			2.34	0.260	0.59	0.340	1.00	26.50	2.93	0.300	77.65	23.294	2%	
21	445.00	2.20			1.76	0.150	0.44	0.110	1.00	19.00	2.20	0.130	41.80	5.434	1%	
RB	460.00	0.00	0.00		0.00				1.00	7.50	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>987</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	11:50
Meas. End Time (MST):	14:00
Equipment:	ADC
Method:	Boat
River Condition:	Moderate/high
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Windy, sunny, 20°C

**Flow characteristics:**

Total Flow:	987	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1393.96	(m <sup>2</sup> )
Wetted Width:	460.00	(m)
Hydraulic Depth:	3.03	(m)
Mean Velocity:	0.71	(m/s)
Froude Number:	0.13	

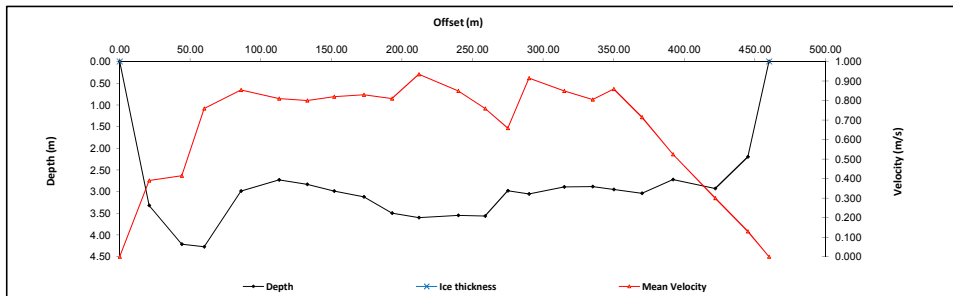
**Logger Details:**

	Before	After
Transducer #1 (0.4m) Reading (m):	0.326	1.791
Transducer #2 (0.1m) Reading (m):	-	-
Water Temperature #1 (°C):	20.2	20.9
Water Temperature #2 (°C):	-	-
Datalogger Clock:	10:21	14:23
Laptop Clock:	10:21	14:23
Battery (Main):	13.6	13.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Replaced
PTA (if replaced):	-	-
Loggers (if replaced):	-	-

**Datalogger / Station Notes:**

- New modem was installed.
- Moved PLS sensor to deeper water. 1.787 m
- Water level survey - water level fluctuating about 5 cm.

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S24-04	0.963	231.801		230.838	230.838	3/4" Pipe 5 m N of logger	S24-4
S24-05			0.738	231.065	231.065	3/4" Pipe 1.5 m South of logger	S24-5
S24-06			1.075	230.726	230.725	3/4" Pipe 3m North of logger	WL
Ice/PT:							WL
Water Level:			4.475	227.326		Time WL Surveyed: 11:16	S24-5
Other:							S24-6
<b>Setup #2</b>							S24-4
S24-04			0.948	230.840	230.838	3/4" Pipe 5 m N of logger	
S24-05	0.723	231.788		231.065	231.065	3/4" Pipe 1.5 m South of logger	
S24-06			1.062	230.726	230.725	3/4" Pipe 3m North of logger	
Ice/PT:							
Water Level:			4.462	227.326		Time WL Surveyed: 11:18	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S24-06	1.108	231.834		230.726			
Water Level:			4.508	227.326		Time WL Surveyed: 14:18	
Water Level:			4.496	227.326		Time WL Surveyed: 14:20	
BM: S24-06	1.096	231.822		230.726			

WL Survey Summary	Before	After
Average WL:	227.326	227.326
Transducer Elevation:	227.000	225.535
Closing Error:	-0.002	-
WL Check:	0.000	0.000

Site Rating Information	
Measured Discharge:	987
Expected Discharge:	945.31
Shift from Existing Rating (m <sup>3</sup> /s):	-41.69
Shift from Existing Rating (%):	-4%

Field Personnel:	SM, DW	Trip Date:	19-Aug-13
Data Entry Personnel:	SM	Date:	19-Aug-13
Data Check Personnel:	SM	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

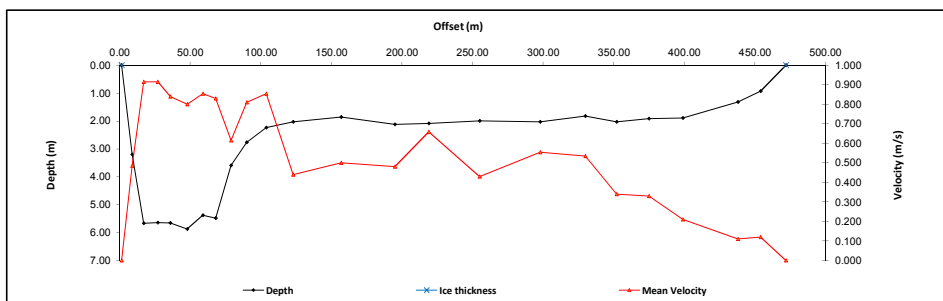
UTM Location: 466313 E, 6372760 N

Site Visit Date: September 14, 2013  
Site Visit Time (MST): 16:20



		Measured Data							Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	150	0.00	0.00		0.000		0.000		0.000	1.00	3.75	0.00	0.000	0.00	0.000	
1	9.00	3.20			2.56	0.350	0.64	0.620	0.620	1.00	7.75	3.20	0.485	24.80	12.028	2%
2	17.00	5.67			4.54	0.810	1.13	1.020	1.020	1.00	9.00	5.67	0.915	51.03	46.692	7%
3	27.00	5.65			4.52	0.850	1.13	0.980	0.980	1.00	9.50	5.65	0.915	53.68	49.113	7%
4	36.00	5.66			4.53	0.690	1.13	0.990	0.990	1.00	10.50	5.66	0.840	59.43	49.921	7%
5	48.00	5.87			4.70	0.660	1.17	0.940	0.940	1.00	11.50	5.87	0.800	67.51	54.004	8%
6	59.00	5.38			4.30	0.790	1.08	0.920	0.920	1.00	10.00	5.38	0.855	53.80	45.999	7%
7	68.00	5.48			4.38	0.740	1.10	0.920	0.920	1.00	10.00	5.48	0.830	54.80	45.484	7%
8	79.00	3.59			2.87	0.510	0.72	0.720	0.720	1.00	11.00	3.59	0.615	39.49	24.286	4%
9	90.00	2.76			2.21	0.700	0.55	0.920	0.920	1.00	12.50	2.76	0.810	34.50	27.945	4%
10	104.00	2.24			1.79	0.760	0.45	0.950	0.950	1.00	16.50	2.24	0.855	36.96	31.601	5%
11	123.00	2.03			1.62	0.380	0.41	0.500	0.500	1.00	26.50	2.03	0.440	53.80	23.670	4%
12	157.00	1.86			1.49	0.340	0.37	0.660	0.660	1.00	36.00	1.86	0.500	66.96	33.480	5%
13	195.00	2.12			1.70	0.320	0.42	0.640	0.640	1.00	31.00	2.12	0.480	65.72	31.546	5%
14	219.00	2.09			1.67	0.460	0.42	0.860	0.860	1.00	30.00	2.09	0.660	62.70	41.382	6%
15	255.00	1.99			1.59	0.320	0.40	0.540	0.540	1.00	39.50	1.99	0.430	78.61	33.800	5%
16	298.00	2.03			1.62	0.320	0.41	0.790	0.790	1.00	37.50	2.03	0.555	76.13	42.249	6%
17	330.00	1.82			1.46	0.440	0.36	0.630	0.630	1.00	27.00	1.82	0.535	49.14	26.290	4%
18	352.00	2.03			1.62	0.170	0.41	0.510	0.510	1.00	22.50	2.03	0.340	45.68	15.530	2%
19	375.00	1.91			1.53	0.280	0.38	0.380	0.380	1.00	23.50	1.91	0.330	44.89	14.812	2%
20	399.00	1.89			1.51	0.190	0.38	0.230	0.230	1.00	31.50	1.89	0.210	59.54	12.502	2%
21	438.00	1.32			1.06	0.100	0.26	0.120	0.120	1.00	27.50	1.32	0.110	36.30	3.993	1%
22	454.00	0.92			0.74	0.110	0.18	0.130	0.130	1.00	17.00	0.92	0.120	15.64	1.877	0%
RB	472.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	1.00	9.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>668</b>	<b>100%</b>

<b>Flow Measurement Details:</b>	
Metering Section Location (describe):	
Meas. Start Time (MST):	16:20
Meas. End Time (MST):	17:40
Equipment:	ADC
Method:	Boat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 17°C



<b>Flow characteristics:</b>	
Total Flow:	668 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	1131.07 (m <sup>2</sup> )
Wetted Width:	470.50 (m)
Hydraulic Depth:	2.40 (m)
Mean Velocity:	0.59 (m/s)
Froude Number:	0.12

<b>Logger Details:</b>		
Transducer #1 (0-4m) Reading (m):	-	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	-	-
Water Temperature #2 (°C):	-	-
Ice/PT:	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Battery (Main):	-	-
Battery Condition:	-	-
Battery Serial #:	-	-
Enclosure Desiccant:	-	-
Ven Tube Desiccant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

No monitoring station download, or water level survey conducted.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>					230.838	3/4" Pipe 5 m N of logger	
S24-04					231.055	3/4" Pipe 1.5 m South of logger	
S24-05					230.725	3/4" Pipe 3 m North of logger	
S24-06							
Water Level:					Time WL Surveyed:		
Other:							
<b>Setup #2</b>					230.838	3/4" Pipe 5 m N of logger	
S24-04					231.055	3/4" Pipe 1.5 m South of logger	
S24-05					230.725	3/4" Pipe 3 m North of logger	
S24-06							
Water Level:					Time WL Surveyed:		
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
BM:							

<b>WL Survey Summary</b>		<b>Site Rating Information</b>	
Average WL:	-	Measured Discharge:	668
Transducer Elevation:	-	Expected Discharge:	-
Closing Error:	-	Shift from Existing Rating (m/s):	-
WL Check:	-	Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, CB, JP	<b>Trip Date:</b>	14-Sep-13
<b>Data Entry Personnel:</b>	JP	<b>Date:</b>	14-Sep-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	24-Oct-13
<b>Entered Digitally in the Field:</b>	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: May 5, 2013  
 Site Visit Time (MST): 09:30

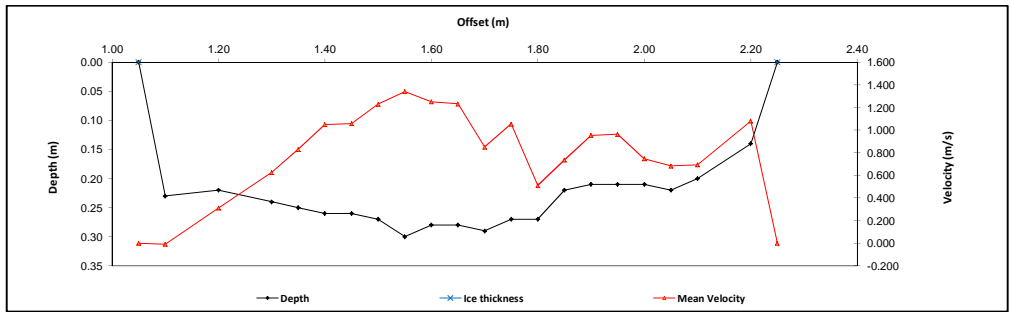


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.05	0.00	0.00		0.000		0.000		0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	1.10	0.23		0.14	-0.009					1.00	0.07	0.23	-0.009	0.02	0.000	0%
2	1.20	0.22		0.13	0.310					1.00	0.10	0.22	0.310	0.02	0.007	3%
3	1.30	0.24		0.14	0.626					1.00	0.08	0.24	0.626	0.02	0.011	5%
4	1.35	0.25		0.15	0.830					1.00	0.05	0.25	0.830	0.01	0.010	5%
5	1.40	0.26		0.16	1.050					1.00	0.05	0.26	1.050	0.01	0.014	6%
6	1.45	0.26		0.16	1.058					1.00	0.05	0.26	1.058	0.01	0.014	6%
7	1.50	0.27		0.16	1.229					1.00	0.05	0.27	1.229	0.01	0.017	7%
8	1.55	0.30		0.18	1.340					1.00	0.05	0.30	1.340	0.02	0.020	9%
9	1.60	0.28		0.17	1.250					1.00	0.05	0.28	1.250	0.01	0.017	8%
10	1.65	0.28		0.17	1.232					1.00	0.05	0.28	1.232	0.01	0.017	8%
11	1.70	0.29		0.17	0.850					1.00	0.05	0.29	0.850	0.01	0.012	5%
12	1.75	0.27		0.16	1.053					1.00	0.05	0.27	1.053	0.01	0.014	6%
13	1.80	0.27		0.16	0.510					1.00	0.05	0.27	0.510	0.01	0.007	3%
14	1.85	0.22		0.13	0.737					1.00	0.05	0.22	0.737	0.01	0.008	4%
15	1.90	0.21		0.13	0.953					1.00	0.05	0.21	0.953	0.01	0.010	4%
16	1.95	0.21		0.13	0.963					1.00	0.05	0.21	0.963	0.01	0.010	4%
17	2.00	0.21		0.13	0.746					1.00	0.05	0.21	0.746	0.01	0.008	3%
18	2.05	0.22		0.13	0.683					1.00	0.05	0.22	0.683	0.01	0.008	3%
19	2.10	0.20		0.12	0.693					1.00	0.08	0.20	0.693	0.02	0.010	5%
20	2.20	0.14		0.08	1.081					1.00	0.07	0.14	1.081	0.01	0.011	5%
RB	2.25	0.00	0.00		0.00		0.00		0.00	1.00	0.02	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.226</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Adjacent to pressure transducer

Meas. Start Time (MST):	10:12
Meas. End Time (MST):	10:31
Equipment:	ADV
Method:	Wading
River Condition:	High flow, partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, +20°C



**Flow characteristics:**

Total Flow:	0.226	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.27	(m <sup>2</sup> )
Wetted Width:	1.20	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.83	(m/s)
Froude Number:	0.56	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.515	0.490
Water (°C):	1.2	1.5
Datalogger Clock:	9:58	10:33
Laptop Clock:	09:58	10:33
Battery (Main):	13.8	14.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	New
Vent Tube Dessicant:	-	New
PT# (if replaced):	-	-
Logger# (if replaced):	284726	-
	20960	-

**Datalogger / Station Notes:**

- Relay operational, RSSI : -100

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S25-01				100.000	100.000	T-Post in PVC 2 m N of data logger	S25-01
S25-03	1.163	101.163		100.159	100.121	3/4" Pipe 2 m E of data logger	S25-04
S25-04			1.004	100.258	100.261	3/4" Pipe 4 m E of data logger	WL
Water Level:			2.157	99.006		Time WL Surveyed: 10:04	S25-03
<b>Setup #2</b>							
S25-01			1.144	100.000	100.000	T-Post in PVC 2 m N of data logger	S25-04
S25-03	0.985	101.144		100.159	100.121	3/4" Pipe 2 m E of data logger	S25-01
S25-04			0.886	100.258	100.261	3/4" Pipe 4 m E of data logger	
Water Level:			2.137	99.007		Time WL Surveyed: 10:09	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S25-03	0.984	101.143		100.159		
Water Level:			2.131	99.012		Time WL Surveyed: 10:36	
Water Level:			2.116	99.011		Time WL Surveyed: 10:37	
BM:	S25-03	0.968	101.127		100.159		

**WL Survey Summary**

	Before	After
Average WL:	99.007	99.012
Transducer Elevation:	98.492	98.522
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.226
Expected Discharge:	0.22
Shift from Existing Rating (m <sup>3</sup> /s):	-0.01
Shift from Existing Rating (%):	-3%

**Field Personnel:**

SM, TR	Trip Date:	5-May-13
SM	Date:	5-May-13
CJ	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: June 12, 2013  
 Site Visit Time (MST): 08:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000	1.00						
1										1.00						
2										1.00						
3										1.00						
4										1.00						
5										1.00						
6										1.00						
7										1.00						
8										1.00						
9										1.00						
10										1.00						
11										1.00						
12										1.00						
13										1.00						
14										1.00						
LB	0.00	0.00			0.00		0.00		0.00	1.00						
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:18
Meas. End Time (MST):	9:35
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Overcast, 10C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

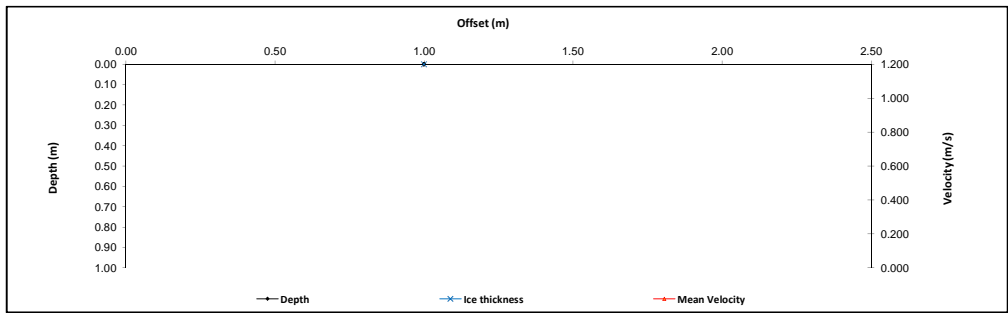
**Logger Details:**

	Before	After
Transducer Reading (m):	0.687	0.665
Water (°C):	9.1	4.2
Datalogger Clock:	09:00	09:50
Laptop Clock:	09:00	09:50
Battery (Main):	13.4	13.5
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- High flow but within banks. No backwater from Athabasca



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S25-01
S25-01	0.979	100.979		100.000	100.000	T-Post in PVC 2 m N of data logger	S25-04
S25-03			0.845	100.134	100.121	3/4" Pipe 2 m E of data logger	S25-03
S25-04			0.720	100.259	100.261	3/4" Pipe 4 m E of data logger	WL
Ice/PT:							WL
Water Level:			1.959	99.020		Time WL Surveyed: 9:07	S25-03
Other:							S25-04
<b>Setup #2</b>							S25-01
S25-01			0.964	99.998	100.000	T-Post in PVC 2 m N of data logger	
S25-03	0.828	100.962		100.134	100.121	3/4" Pipe 2 m E of data logger	
S25-04			0.707	100.255	100.261	3/4" Pipe 4 m E of data logger	
Ice/PT:							
Water Level:			1.946	99.016		Time WL Surveyed: 9:10	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S25-04	0.705	100.964		100.259			
Water Level:			1.943	99.021		Time WL Surveyed: 9:41	
Water Level:			1.931	99.020		Time WL Surveyed: 9:42	
BM: S25-04	0.692	100.951		100.259			

**WL Survey Summary**

	Before	After
Average WL:	99.018	99.021
Transducer Elevation:	98.331	98.356
Closing Error:	0.002	-
WL Check:	0.004	0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SG, CJ	Trip Date:	12-Jun-13
Data Entry Personnel: CJ	Date:	12-Jun-13
Data Check Personnel: CJ	Date:	19-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: August 19, 2013  
 Site Visit Time (MST): 14:50

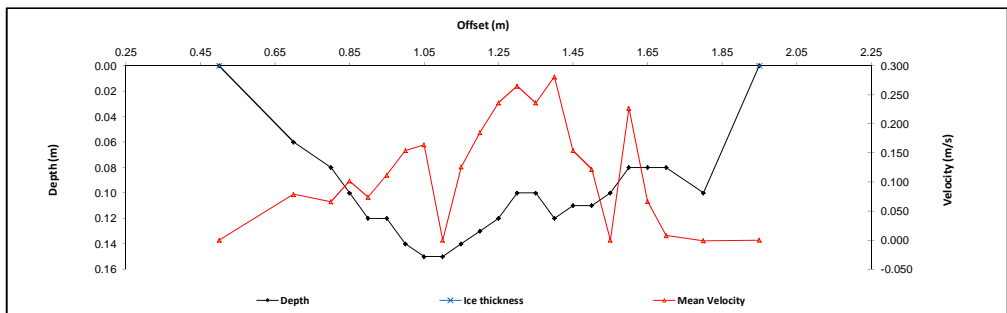


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.70	0.06		0.04	0.079					1.00	0.15	0.06	0.079	0.01	0.001	5%
2	0.80	0.08		0.05	0.066					1.00	0.08	0.08	0.066	0.01	0.000	3%
3	0.85	0.10		0.06	0.102					1.00	0.05	0.10	0.102	0.01	0.001	3%
4	0.90	0.12		0.07	0.074					1.00	0.05	0.12	0.074	0.01	0.000	3%
5	0.95	0.12		0.07	0.112					1.00	0.05	0.12	0.112	0.01	0.001	4%
6	1.00	0.14		0.08	0.154					1.00	0.05	0.14	0.154	0.01	0.001	7%
7	1.05	0.15		0.09	0.164					1.00	0.05	0.15	0.164	0.01	0.001	8%
8	1.10	0.15		0.09	0.000					1.00	0.05	0.15	0.000	0.01	0.000	0%
9	1.15	0.14		0.08	0.126					1.00	0.05	0.14	0.126	0.01	0.001	6%
10	1.20	0.13		0.08	0.185					1.00	0.05	0.13	0.185	0.01	0.001	8%
11	1.25	0.12		0.07	0.236					1.00	0.05	0.12	0.236	0.01	0.001	9%
12	1.30	0.10		0.06	0.265					1.00	0.05	0.10	0.265	0.01	0.001	9%
13	1.35	0.10		0.06	0.236					1.00	0.05	0.10	0.236	0.00	0.001	8%
14	1.40	0.12		0.07	0.281					1.00	0.05	0.12	0.281	0.01	0.002	11%
15	1.45	0.11		0.07	0.154					1.00	0.05	0.11	0.154	0.01	0.001	5%
16	1.50	0.11		0.07	0.122					1.00	0.05	0.11	0.122	0.01	0.001	4%
17	1.55	0.10		0.06	0.000					1.00	0.05	0.10	0.000	0.01	0.000	0%
18	1.60	0.08		0.05	0.227					1.00	0.05	0.08	0.227	0.00	0.001	6%
19	1.65	0.08		0.05	0.067					1.00	0.05	0.08	0.067	0.00	0.000	2%
20	1.70	0.08		0.05	0.008					1.00	0.08	0.08	0.008	0.01	0.000	0%
21	1.80	0.10		0.06	-0.001					1.00	0.13	0.10	-0.001	0.01	0.000	0%
LB	1.95	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.016</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:12
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, windy, +22°C



**Flow characteristics:**

Total Flow:	0.016	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	1.45	(m)
Hydraulic Depth:	0.09	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:		

**Logger Details:**

	Before	After
Transducer Reading (m):	0.163	0.200
Water (°C):	19.6	19.6
Datalogger Clock:	14:54	15:45
Laptop Clock:	14:54	15:45
Battery (Main):	13.9	13.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS to deeper water

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S25-01	1.148	101.148		100.000	100.000	T-Post in PVC 2 m N of data logger	S25-01
S25-03			1.017	100.131	100.121	3/4" Pipe 2 m E of data logger	S25-03
S25-04			0.890	100.258	100.261	3/4" Pipe 4 m E of data logger	S25-04
Ice/PT:							WL
Water Level:			2.343	98.805		Time WL Surveyed: 15:04	WL
Other:							S25-04
<b>Setup #2</b>							S25-03
S25-01			1.134	100.000	100.000	T-Post in PVC 2 m N of data logger	S25-01
S25-03			1.004	100.130	100.121	3/4" Pipe 2 m E of data logger	
S25-04	0.876	101.134		100.258	100.261	3/4" Pipe 4 m E of data logger	
Ice/PT:							
Water Level:			2.329	98.805		Time WL Surveyed: 15:06	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S25-03	1.004	101.135	100.131			
Water Level:			2.330	98.805		Time WL Surveyed: 15:42	
Water Level:			2.317	98.806		Time WL Surveyed: 15:44	
BM:	S25-03	0.992	101.123	100.131			

**WL Survey Summary**

	Before	After
Average WL:	98.805	98.806
Transducer Elevation:	98.642	98.606
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.0155
Expected Discharge:	0.02
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	3%

**Field Personnel:**

SM, DW	Trip Date:	19-Aug-13
SM	Date:	19-Aug-13
CJ	Date:	27-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: September 23, 2013  
 Site Visit Time (MST): 13:00

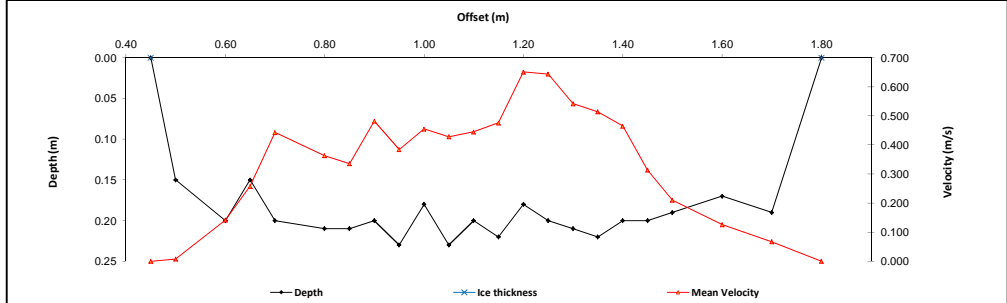


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.45	0.00	0.00		0.000		0.000		0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.50	0.15		0.09	0.008					1.00	0.08	0.15	0.008	0.01	0.000	0%
2	0.60	0.20		0.12	0.142					1.00	0.08	0.20	0.142	0.02	0.002	2%
3	0.65	0.15		0.09	0.258					1.00	0.05	0.15	0.258	0.01	0.002	2%
4	0.70	0.20		0.12	0.443					1.00	0.08	0.20	0.443	0.02	0.007	8%
5	0.80	0.21		0.13	0.363					1.00	0.08	0.21	0.363	0.02	0.006	7%
6	0.85	0.21		0.13	0.336					1.00	0.05	0.21	0.336	0.01	0.004	4%
7	0.90	0.20		0.12	0.482					1.00	0.05	0.20	0.482	0.01	0.005	6%
8	0.95	0.23		0.14	0.384					1.00	0.05	0.23	0.384	0.01	0.004	5%
9	1.00	0.18		0.11	0.455					1.00	0.05	0.18	0.455	0.01	0.004	5%
10	1.05	0.23		0.14	0.428					1.00	0.05	0.23	0.428	0.01	0.005	6%
11	1.10	0.20		0.12	0.445					1.00	0.05	0.20	0.445	0.01	0.004	5%
12	1.15	0.22		0.13	0.476					1.00	0.05	0.22	0.476	0.01	0.005	6%
13	1.20	0.18		0.11	0.651					1.00	0.05	0.18	0.651	0.01	0.006	7%
14	1.25	0.20		0.12	0.644					1.00	0.05	0.20	0.644	0.01	0.006	8%
15	1.30	0.21		0.13	0.542					1.00	0.05	0.21	0.542	0.01	0.006	7%
16	1.35	0.22		0.13	0.514					1.00	0.05	0.22	0.514	0.01	0.006	7%
17	1.40	0.20		0.12	0.465					1.00	0.05	0.20	0.465	0.01	0.005	5%
18	1.45	0.20		0.12	0.314					1.00	0.05	0.20	0.314	0.01	0.003	4%
19	1.50	0.19		0.11	0.210					1.00	0.08	0.19	0.210	0.01	0.003	3%
20	1.60	0.17		0.10	0.126					1.00	0.10	0.17	0.126	0.02	0.002	2%
21	1.70	0.19		0.11	0.067					1.00	0.10	0.19	0.067	0.02	0.001	1%
LB	1.80	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.086</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Adjacent to station

Meas. Start Time (MST):	13:20
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, +15°C



**Flow characteristics:**

Total Flow:	0.086	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.25	(m <sup>2</sup> )
Wetted Width:	1.35	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.26	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.303	0.301
Water (°C):	10.4	10.5
Datalogger Clock:	13:05	13:46
Laptop Clock:	13:05	13:46
Battery (Main):	13.3	13.3
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modem RSSI -91
- Radio communications operational

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S25-01			1.132	100.003	100.000	T-Post in PVC 2 m N of data logger	S25-04
S25-03			1.003	100.132	100.121	3/4" Pipe 2 m E of data logger	S25-01
S25-04	0.874	101.135		100.261	100.261	3/4" Pipe 4 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.228	98.907		Time WL Surveyed: 13:14	S25-01
Other:							S25-03
<b>Setup #2</b>							S25-04
S25-01	1.099	101.102		100.003	100.000	T-Post in PVC 2 m N of data logger	
S25-03			0.971	100.131	100.121	3/4" Pipe 2 m E of data logger	
S25-04			0.840	100.262	100.261	3/4" Pipe 4 m E of data logger	
Ice/PT:							
Water Level:			2.194	98.908		Time WL Surveyed: 13:16	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S25-03	0.970	101.102	100.132			
Water Level:			2.197	98.905		Time WL Surveyed: 13:42	
Water Level:			2.182	98.905		Time WL Surveyed: 13:44	
BM:	S25-03	0.955	101.087	100.132			

**WL Survey Summary**

	Before	After
Average WL:	98.908	98.905
Transducer Elevation:	98.605	98.604
Closing Error:	-0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	0.0858
Expected Discharge:	0.09
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	1%

**Field Personnel:**

SM, TR	Trip Date:	23-Sep-13
SM	Date:	23-Sep-13
CJ	Date:	28-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: November 1, 2013  
 Site Visit Time (MST): 09:20

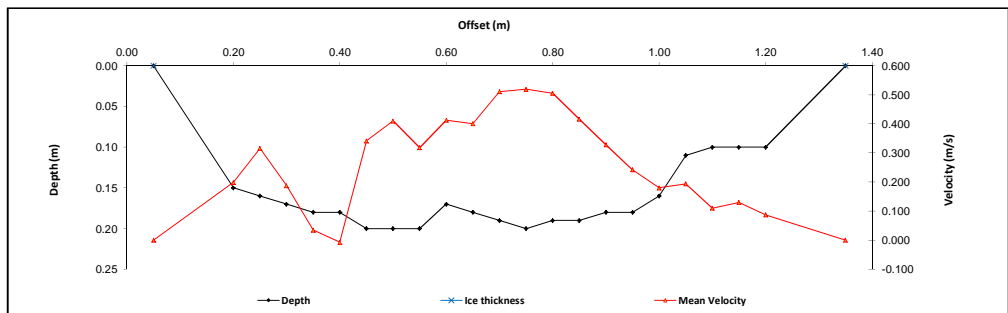


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.05	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.20	0.15		0.09	0.199					1.00	0.10	0.15	0.199	0.02	0.003	6%
2	0.25	0.16		0.10	0.316					1.00	0.05	0.16	0.316	0.01	0.003	5%
3	0.30	0.17		0.10	0.188					1.00	0.05	0.17	0.188	0.01	0.002	3%
4	0.35	0.18		0.11	0.035					1.00	0.05	0.18	0.035	0.01	0.000	1%
5	0.40	0.18		0.11	-0.007					1.00	0.05	0.18	-0.007	0.01	0.000	0%
6	0.45	0.20		0.12	0.342					1.00	0.05	0.20	0.342	0.01	0.003	6%
7	0.50	0.20		0.12	0.410					1.00	0.05	0.20	0.410	0.01	0.004	8%
8	0.55	0.20		0.12	0.318					1.00	0.05	0.20	0.318	0.01	0.003	6%
9	0.60	0.17		0.10	0.413					1.00	0.05	0.17	0.413	0.01	0.004	7%
10	0.65	0.18		0.11	0.401					1.00	0.05	0.18	0.401	0.01	0.004	7%
11	0.70	0.19		0.11	0.511					1.00	0.05	0.19	0.511	0.01	0.005	9%
12	0.75	0.20		0.12	0.519					1.00	0.05	0.20	0.519	0.01	0.005	10%
13	0.80	0.19		0.11	0.505					1.00	0.05	0.19	0.505	0.01	0.005	9%
14	0.85	0.19		0.11	0.416					1.00	0.05	0.19	0.416	0.01	0.004	7%
15	0.90	0.18		0.11	0.328					1.00	0.05	0.18	0.328	0.01	0.003	5%
16	0.95	0.18		0.11	0.242					1.00	0.05	0.18	0.242	0.01	0.002	4%
17	1.00	0.16		0.10	0.180					1.00	0.05	0.16	0.180	0.01	0.001	3%
18	1.05	0.11		0.07	0.194					1.00	0.05	0.11	0.194	0.01	0.001	2%
19	1.10	0.10		0.06	0.110					1.00	0.05	0.10	0.110	0.00	0.001	1%
20	1.15	0.10		0.06	0.130					1.00	0.05	0.10	0.130	0.00	0.001	1%
21	1.20	0.10		0.06	0.087					1.00	0.10	0.10	0.087	0.01	0.001	2%
LB	1.35	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.054</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:41
Meas. End Time (MST):	10:02
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -2°C



**Flow characteristics:**

Total Flow:	0.054	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	1.30	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.24	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.277	0.278
Water (°C):	1.9	1.9
Datalogger Clock:	09:27	10:07
Laptop Clock:	09:27	10:07
Battery (Main):	12.4	12.4
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	284726	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S25-01			1.022	100.002	100.000	T-Post in PVC 2 m N of data logger	S25-04
S25-03			0.892	100.132	100.121	3/4" Pipe 2 m E of data logger	S25-01
S25-04	0.763	101.024		100.261	100.261	3/4" Pipe 4 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.152	98.872		Time WL Surveyed: 9:36	S25-01
Other:							S25-03
<b>Setup #2</b>							S25-04
S25-01	1.002	101.004		100.002	100.000	T-Post in PVC 2 m N of data logger	
S25-03			0.872	100.132	100.121	3/4" Pipe 2 m E of data logger	
S25-04			0.743	100.261	100.261	3/4" Pipe 4 m E of data logger	
Ice/PT:							
Water Level:			2.131	98.873		Time WL Surveyed: 9:38	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S25-03	0.872	101.004	100.132			
Water Level:			2.128	98.876		Time WL Surveyed: 10:03	
Water Level:			2.116	98.874		Time WL Surveyed: 10:05	
BM:	S25-03	0.858	100.990	100.132			

**WL Survey Summary**

	Before	After
Average WL:	98.873	98.875
Transducer Elevation:	98.596	98.597
Closing Error:	0.000	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	0.0537
Expected Discharge:	0.06
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	3%

**Field Personnel:**

SM, TR	Trip Date:	1-Nov-13
SM	Date:	1-Nov-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date:

January 22, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	1.20	0.20	0.09	-0.014	-0.014	0.02	0.000	0%
1	1.40	0.36		-0.057			1.0	1.20	1.50	0.30	0.36	-0.057	-0.057	0.11	-0.006	-3%
2	1.60	0.34		-0.021			1.0	1.50	1.70	0.20	0.34	-0.021	-0.021	0.07	-0.001	-1%
3	1.80	0.40		0.030			1.0	1.70	1.90	0.20	0.40	0.030	0.030	0.08	0.002	1%
4	2.00	0.38		0.074			1.0	1.90	2.10	0.20	0.38	0.074	0.074	0.08	0.006	2%
5	2.20	0.39		0.149			1.0	2.10	2.30	0.20	0.39	0.149	0.149	0.08	0.012	5%
6	2.40	0.40		0.301			1.0	2.30	2.45	0.15	0.40	0.301	0.301	0.06	0.018	8%
7	2.50	0.41		0.285			1.0	2.45	2.55	0.10	0.41	0.285	0.285	0.04	0.012	5%
8	2.60	0.40		0.358			1.0	2.55	2.65	0.10	0.40	0.358	0.358	0.04	0.014	6%
9	2.70	0.40		0.353			1.0	2.65	2.75	0.10	0.40	0.353	0.353	0.04	0.014	6%
10	2.80	0.40		0.360			1.0	2.75	2.85	0.10	0.40	0.360	0.360	0.04	0.014	6%
11	2.90	0.42		0.409			1.0	2.85	2.95	0.10	0.42	0.409	0.409	0.04	0.017	8%
12	3.00	0.43		0.400			1.0	2.95	3.05	0.10	0.43	0.400	0.400	0.04	0.017	8%
13	3.10	0.44		0.422			1.0	3.05	3.15	0.10	0.44	0.422	0.422	0.04	0.019	8%
14	3.20	0.45		0.407			1.0	3.15	3.25	0.10	0.45	0.407	0.407	0.04	0.018	8%
15	3.30	0.42		0.423			1.0	3.25	3.35	0.10	0.42	0.423	0.423	0.04	0.018	8%
16	3.40	0.42		0.308			1.0	3.35	3.45	0.10	0.42	0.308	0.308	0.04	0.013	6%
17	3.50	0.40		0.314			1.0	3.45	3.55	0.10	0.40	0.314	0.314	0.04	0.013	6%
18	3.60	0.40		0.230			1.0	3.55	3.65	0.10	0.40	0.230	0.230	0.04	0.009	4%
19	3.70	0.40		0.199			1.0	3.65	3.75	0.10	0.40	0.199	0.199	0.04	0.008	4%
20	3.80	0.40		0.161			1.0	3.75	3.90	0.15	0.40	0.161	0.161	0.06	0.010	4%
LB	4.00	0.00	0.00	0.00	0.00	0.00	1.0	3.90	4.00	0.10	0.10	0.040	0.040	0.01	0.000	0%
<b>Total Flow</b>														<b>0.226</b>		

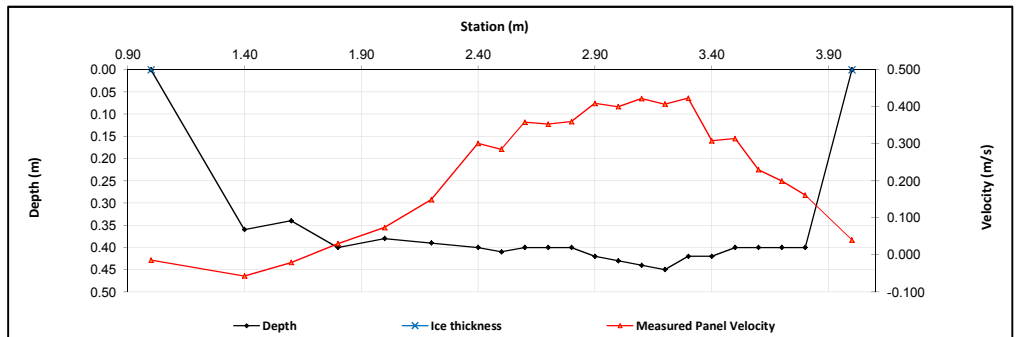
Measurement Details:	
Start Time (MST):	10:15
End Time (MST):	11:15
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -20°C

Flow characteristics:		
Total Flow:	0.226	(m <sup>3</sup> /s)
Perceived Measurement Quality:	0.226	
Cross Section Area:	1.10	(m <sup>2</sup> )
Wetted Width:	3.00	(m)
Hydraulic Depth:	0.366	(m)
Mean Velocity:	0.206	(m/s)
Froude Number:	0.109	

Logger Details:		
Transducer Reading (m):	Before	After
	0.195	
Water (°C):	0.4	
Battery (Main):	13.7	
Datalogger Clock:	10:19	
Laptop Clock:	10:18	
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	18168	
PT# (if Δ):	-	
Vent Tube Dessicant:	Good	
Vent Tube Checked:	Yes	

Datalogger / Station Notes:	

General Notes:	
- Flow measurement performed from bridge.	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S31-01			0.712	100.135	100.128	T-Post 8 m S of data logger
S31-03			1.120	99.727	99.726	3/4" Pipe 5 m NW of data logger
S31-04	0.865	100.847		99.982	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
S31-01			0.702	100.135	100.128	T-Post 8 m S of data logger
S31-03	1.110	100.837		99.727	99.726	3/4" Pipe 5 m NW of data logger
S31-04			0.854	99.983	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:						
Other:						

Closing Error	-0.001
WL Check	0.001

Average WL	98.238
Transducer Elevation Before	98.043
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	22-Jan-13
Data Entry Personnel:	SM	Date:	22-Jan-13
Data Check Personnel:	TR	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date:

February 13, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.45	0.05	0.04	0.000	0.000	0.00	0.000	0%
1	0.50	0.15		-0.001			1.0	0.45	0.65	0.20	0.15	-0.001	-0.001	0.03	0.000	0%
2	0.80	0.20		0.086			1.0	0.65	0.95	0.30	0.20	0.086	0.086	0.06	0.005	3%
3	1.10	0.26		0.106			1.0	0.95	1.25	0.30	0.26	0.106	0.106	0.08	0.008	5%
4	1.40	0.30		0.100			1.0	1.25	1.50	0.25	0.30	0.100	0.100	0.08	0.008	4%
5	1.60	0.29		0.209			1.0	1.50	1.70	0.20	0.29	0.209	0.209	0.06	0.012	7%
6	1.80	0.30		0.219			1.0	1.70	1.90	0.20	0.30	0.219	0.219	0.06	0.013	8%
7	2.00	0.30		0.119			1.0	1.90	2.10	0.20	0.30	0.119	0.119	0.06	0.007	4%
8	2.20	0.30		0.071			1.0	2.10	2.30	0.20	0.30	0.071	0.071	0.06	0.004	3%
9	2.40	0.29		0.193			1.0	2.30	2.50	0.20	0.29	0.193	0.193	0.06	0.011	7%
10	2.60	0.25		0.175			1.0	2.50	2.70	0.20	0.25	0.175	0.175	0.05	0.009	5%
11	2.80	0.28		0.185			1.0	2.70	2.90	0.20	0.28	0.185	0.185	0.05	0.010	6%
12	3.00	0.26		0.208			1.0	2.90	3.10	0.20	0.26	0.208	0.208	0.05	0.011	6%
13	3.20	0.25		0.188			1.0	3.10	3.30	0.20	0.25	0.188	0.188	0.05	0.009	6%
14	3.40	0.23		0.193			1.0	3.30	3.50	0.20	0.23	0.193	0.193	0.05	0.009	5%
15	3.60	0.25		0.189			1.0	3.50	3.75	0.25	0.25	0.189	0.189	0.06	0.012	7%
16	3.90	0.22		0.158			1.0	3.75	4.05	0.30	0.22	0.158	0.158	0.07	0.010	6%
17	4.20	0.22		0.157			1.0	4.05	4.40	0.35	0.22	0.157	0.157	0.08	0.012	7%
18	4.60	0.25		0.037			1.0	4.40	4.80	0.40	0.25	0.037	0.037	0.10	0.004	2%
19	5.00	0.21		0.105			1.0	4.80	5.20	0.40	0.21	0.105	0.105	0.08	0.009	5%
20	5.40	0.20		0.044			1.0	5.20	5.55	0.35	0.20	0.044	0.044	0.07	0.003	2%
21	5.70	0.19		0.013			1.0	5.55	5.85	0.30	0.19	0.013	0.013	0.06	0.001	0%
LB	6.00	0.00	0.00	0.00	0.00	0.00	1.0	5.85	6.00	0.15	0.05	0.003	0.003	0.01	0.000	0%
<b>Total Flow</b>														<b>0.168</b>		

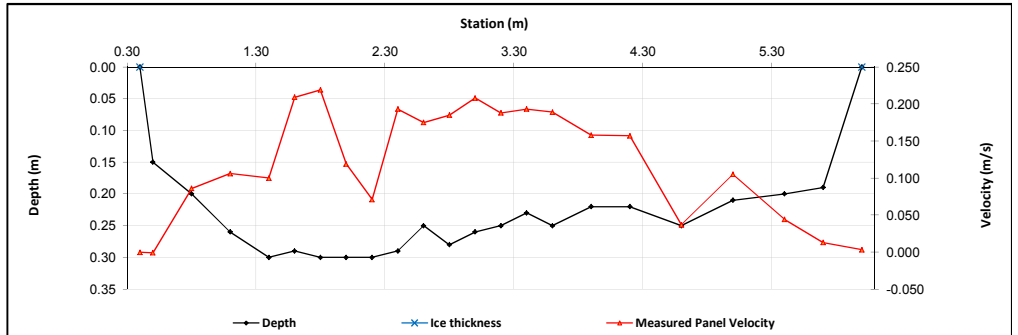
Measurement Details:	
Start Time (MST):	8:35
End Time (MST):	9:40
Equipment:	ADV
Method:	Wading
River Condition:	Open
Quality/Error (see reverse):	Excellent
Weather:	Light snow, calm, -5°C

Flow characteristics:	
Total Flow:	0.168 (m <sup>3</sup> /s)
Perceived Measurement Quality:	0.168
Cross Section Area:	1.32 (m <sup>2</sup> )
Wetted Width:	5.60 (m)
Hydraulic Depth:	0.235 (m)
Mean Velocity:	0.127 (m/s)
Froude Number:	0.084

Logger Details:		Before	After
Transducer Reading (m):	0.182		
Water (°C):	0.7		
Battery (Main):	12.9		
Datalogger Clock:	8:43		
Laptop Clock:	8:43		
Enclosure Dessicant:	Good		
Logger# (if Δ):	18168		
PT# (if Δ):	-		
Vent Tube Dessicant:	Good		
Vent Tube Checked:	Yes		

Datalogger / Station Notes:	
- Stream remains open	

General Notes:	
- ADV tested, all results good	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S31-01			1.188	100.138	100.128	T-Post 8 m S of data logger
S31-03	1.600	101.326		99.726	99.726	3/4" Pipe 5 m NW of data logger
S31-04			1.344	99.982	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.106	98.220		
Other:						Nail in tree
<b>Setup #2</b>						
S31-01			1.167	100.138	100.128	T-Post 8 m S of data logger
S31-03			1.580	99.725	99.726	3/4" Pipe 5 m NW of data logger
S31-04	1.323	101.305		99.982	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.084	98.221		
Other:						

Closing Error	0.001
WL Check	0.001

Average WL	98.221
Transducer Elevation Before	98.039
Transducer Elevation After	-

<b>Field Personnel:</b>	TR AND SM	<b>Trip Date:</b>	13-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	13-Feb-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	28-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date:

February 26, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.30	0.00	0.00	0.000	0.000	0.000	1.0	0.30	0.45	0.15	0.05	0.002	0.002	0.01	0.000	0%
1	0.60	0.19		0.007			1.0	0.45	0.80	0.35	0.19	0.007	0.007	0.07	0.000	0%
2	1.00	0.21		0.030			1.0	0.80	1.20	0.40	0.21	0.030	0.030	0.08	0.003	1%
3	1.40	0.21		0.056			1.0	1.20	1.55	0.35	0.21	0.056	0.056	0.07	0.004	2%
4	1.70	0.21		0.061			1.0	1.55	1.85	0.30	0.21	0.061	0.061	0.06	0.004	2%
5	2.00	0.22		0.119			1.0	1.85	2.15	0.30	0.22	0.119	0.119	0.07	0.008	5%
6	2.30	0.22		0.141			1.0	2.15	2.45	0.30	0.22	0.141	0.141	0.07	0.009	5%
7	2.60	0.24		0.174			1.0	2.45	2.75	0.30	0.24	0.174	0.174	0.07	0.013	7%
8	2.90	0.24		0.168			1.0	2.75	3.05	0.30	0.24	0.168	0.168	0.07	0.012	7%
9	3.20	0.25		0.179			1.0	3.05	3.35	0.30	0.25	0.179	0.179	0.08	0.013	8%
10	3.50	0.29		0.205			1.0	3.35	3.60	0.25	0.29	0.205	0.205	0.07	0.015	9%
11	3.70	0.28		0.185			1.0	3.60	3.80	0.20	0.28	0.185	0.185	0.06	0.010	6%
12	3.90	0.30		0.187			1.0	3.80	4.00	0.20	0.30	0.187	0.187	0.06	0.011	7%
13	4.10	0.31		0.097			1.0	4.00	4.20	0.20	0.31	0.097	0.097	0.06	0.006	3%
14	4.30	0.30		0.108			1.0	4.20	4.40	0.20	0.30	0.108	0.108	0.06	0.006	4%
15	4.50	0.30		0.222			1.0	4.40	4.60	0.20	0.30	0.222	0.222	0.06	0.013	8%
16	4.70	0.31		0.213			1.0	4.60	4.80	0.20	0.31	0.213	0.213	0.06	0.013	8%
17	4.90	0.30		0.176			1.0	4.80	5.00	0.20	0.30	0.176	0.176	0.06	0.011	6%
18	5.10	0.28		0.120			1.0	5.00	5.20	0.20	0.28	0.120	0.120	0.06	0.007	4%
19	5.30	0.25		0.096			1.0	5.20	5.40	0.20	0.25	0.096	0.096	0.05	0.005	3%
20	5.50	0.25		0.086			1.0	5.40	5.60	0.20	0.25	0.086	0.086	0.05	0.004	2%
21	5.70	0.20		0.091			1.0	5.60	5.80	0.20	0.20	0.091	0.091	0.04	0.004	2%
LB	5.90	0.00	0.00	0.00	0.00	0.00	1.0	5.80	5.90	0.10	0.05	0.023	0.023	0.00	0.000	0%
<b>Total Flow</b>														<b>0.172</b>		

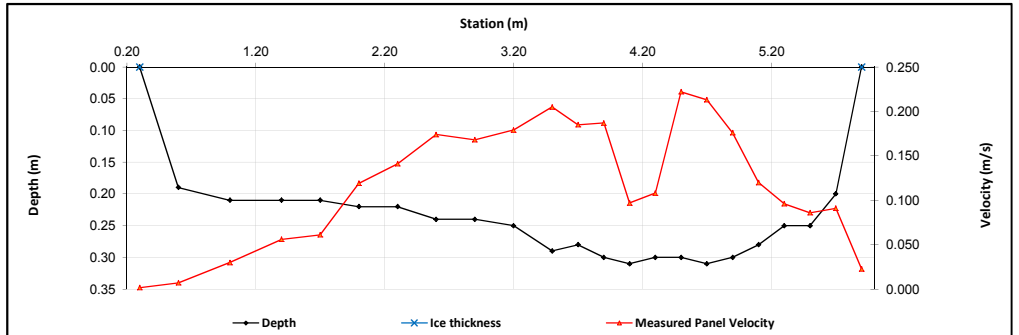
Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	9:50
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -12°C

Flow characteristics:	
Total Flow:	0.172 (m <sup>3</sup> /s)
Perceived Measurement Quality:	0.172
Cross Section Area:	1.34 (m <sup>2</sup> )
Wetted Width:	5.60 (m)
Hydraulic Depth:	0.239 (m)
Mean Velocity:	0.128 (m/s)
Froude Number:	0.084

Logger Details:		Before	After
Transducer Reading (m):		0.179	
Water (°C):		0.5	
Battery (Main):		13.1	
Datalogger Clock:		8:52	
Laptop Clock:		8:52	
Enclosure Dessicant:		Good	
Logger# (if Δ):		18168	
PT# (if Δ):		-	
Vent Tube Dessicant:		Good	
Vent Tube Checked:		Yes	

Datalogger / Station Notes:	

General Notes:	
- Water level survey conducted 10m upstream of PLS, due to access safety.	
- ADV test completed, all good	
- Broke away a bit of ice along bank to open up channel fully	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S31-01			1.302	100.136	100.128	T-Post 8 m S of data logger
S31-03	1.712	101.438		99.726	99.726	3/4" Pipe 5 m NW of data logger
S31-04			1.457	99.981	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.214	98.224		
Other:						Nail in tree
<b>Setup #2</b>						
S31-01			1.278	100.137	100.128	T-Post 8 m S of data logger
S31-03			1.687	99.728	99.726	3/4" Pipe 5 m NW of data logger
S31-04	1.434	101.415		99.981	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.192	98.223		
Other:						

Closing Error	-0.002	Average WL	98.224
WL Check	0.001	Transducer Elevation Before	98.045
		Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	26-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	26-Feb-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date:

April 3, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.80	0.00	0.00	0.000	0.000	0.000	1.0	0.80	0.85	0.05	0.04	0.009	0.009	0.00	0.000	0%
1	0.90	0.17		0.038			1.0	0.85	1.10	0.25	0.17	0.036	0.036	0.04	0.002	1%
2	1.30	0.20		0.059			1.0	1.10	1.50	0.40	0.20	0.059	0.059	0.08	0.005	4%
3	1.70	0.20		0.065			1.0	1.50	1.85	0.35	0.20	0.065	0.065	0.07	0.005	4%
4	2.00	0.20		0.076			1.0	1.85	2.15	0.30	0.20	0.076	0.076	0.06	0.005	4%
5	2.30	0.20		0.133			1.0	2.15	2.45	0.30	0.20	0.133	0.133	0.06	0.008	6%
6	2.60	0.22		0.113			1.0	2.45	2.75	0.30	0.22	0.113	0.113	0.07	0.007	6%
7	2.90	0.20		0.137			1.0	2.75	3.05	0.30	0.20	0.137	0.137	0.06	0.008	7%
8	3.20	0.20		0.121			1.0	3.05	3.35	0.30	0.20	0.121	0.121	0.06	0.007	6%
9	3.50	0.20		0.127			1.0	3.35	3.65	0.30	0.20	0.127	0.127	0.06	0.008	6%
10	3.80	0.20		0.099			1.0	3.65	3.95	0.30	0.20	0.099	0.099	0.06	0.006	5%
11	4.10	0.21		0.088			1.0	3.95	4.25	0.30	0.21	0.088	0.088	0.06	0.006	4%
12	4.40	0.20		0.169			1.0	4.25	4.55	0.30	0.20	0.169	0.169	0.06	0.010	8%
13	4.70	0.20		0.099			1.0	4.55	4.85	0.30	0.20	0.099	0.099	0.06	0.006	5%
14	5.00	0.19		0.048			1.0	4.85	5.15	0.30	0.19	0.048	0.048	0.06	0.003	2%
15	5.30	0.20		0.180			1.0	5.15	5.45	0.30	0.20	0.180	0.180	0.06	0.011	9%
16	5.60	0.22		0.163			1.0	5.45	5.75	0.30	0.22	0.163	0.163	0.07	0.011	9%
17	5.90	0.22		0.142			1.0	5.75	6.05	0.30	0.22	0.142	0.142	0.07	0.009	7%
18	6.20	0.20		0.117			1.0	6.05	6.40	0.35	0.20	0.117	0.117	0.07	0.008	6%
19	6.60	0.07		0.101			1.0	6.40	6.75	0.35	0.07	0.101	0.101	0.02	0.002	2%
LB	6.90	0.00	0.00	0.00	0.00	0.00	1.0	6.75	6.90	0.15	0.02	0.025	0.025	0.00	0.000	0%
<b>Total Flow</b>														<b>0.126</b>		

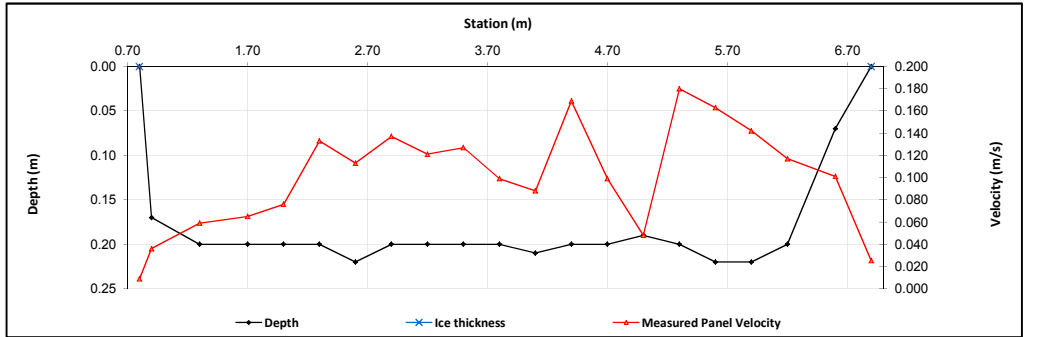
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:55
Equipment:	ADV
Method:	Wading
River Condition:	Ice along banks
Quality/Error (see reverse):	Good
Weather:	Clear, windy, 0°C

Flow characteristics:	
Total Flow:	0.126 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.15 (m <sup>2</sup> )
Wetted Width:	6.10 (m)
Hydraulic Depth:	0.188 (m)
Mean Velocity:	0.110 (m/s)
Froude Number:	0.081

Logger Details:		
	Before	After
Transducer Reading (m):	0.178	
Water (°C):	3.1	
Battery (Main):	13.3	
Datalogger Clock:	14:00	
Laptop Clock:	14:00	
Enclosure Dessoricant:	Good	
Logger# (if Δ):	18168	
PT# (if Δ):	-	
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
- TBRG was reinstated. 0.2 mm recorded.	

General Notes:	
- Low flow, ice along banks.	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S31-01			1.282	100.139	100.128	T-Post 8 m S of data logger
S31-03	1.695	101.421		99.726	99.726	3/4" Pipe 5 m NW of data logger
S31-04			1.439	99.982	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.205	98.216		
Other:						Nail in tree
<b>Setup #2</b>						
S31-01			1.264	100.141	100.128	T-Post 8 m S of data logger
S31-03			1.677	99.728	99.726	3/4" Pipe 5 m NW of data logger
S31-04	1.423	101.405		99.982	99.982	3/4" Pipe 3 m SW of logger
Ice/PT:						
Water Level:			3.187	98.218		
Other:						

Closing Error	-0.002	Average WL	98.217
WL Check	0.002	Transducer Elevation Before	98.039
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	3-Apr-13
Data Entry Personnel:	SM	Date:	3-Apr-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S31 Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: May 20, 2013  
 Site Visit Time (MST): 08:30



Flow Measurement:											Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)						
LB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000							
1	1.60	0.74		0.44	0.162		0.73	0.056	0.18	0.394	1.00	0.30	0.74	0.22	0.036	1%						
2	2.00	0.91					0.74	0.379	0.18	0.516	1.00	0.40	0.91	0.36	0.082	3%						
3	2.40	0.92					0.70	0.514	0.18	0.478	1.00	0.40	0.92	0.37	0.165	5%						
4	2.80	0.88					0.70	0.559	0.17	0.587	1.00	0.40	0.88	0.35	0.175	6%						
5	3.20	0.87					0.70	0.600	0.18	0.626	1.00	0.40	0.87	0.35	0.199	7%						
6	3.60	0.88					0.70	0.595	0.18	0.722	1.00	0.35	0.88	0.31	0.216	7%						
7	4.00	0.88					0.73	0.565	0.18	0.617	1.00	0.35	0.91	0.32	0.188	6%						
8	4.30	0.91					0.72	0.519	0.18	0.650	1.00	0.35	0.90	0.32	0.184	6%						
9	4.70	0.90					0.70	0.540	0.18	0.666	1.00	0.35	0.88	0.31	0.186	6%						
10	5.00	0.88					0.69	0.561	0.17	0.637	1.00	0.40	0.86	0.34	0.206	7%						
11	5.40	0.86					0.69	0.580	0.17	0.607	1.00	0.40	0.86	0.34	0.204	7%						
12	5.80	0.86					0.66	0.489	0.17	0.606	1.00	0.40	0.83	0.33	0.182	6%						
13	6.20	0.83					0.66	0.535	0.17	0.469	1.00	0.40	0.83	0.33	0.167	5%						
14	6.60	0.83					0.66	0.444	0.17	0.550	1.00	0.40	0.83	0.33	0.165	5%						
15	7.00	0.83					0.68	0.368	0.17	0.500	1.00	0.40	0.85	0.34	0.148	5%						
16	7.40	0.85					0.65	0.396	0.16	0.412	1.00	0.40	0.81	0.32	0.131	4%						
17	7.80	0.81					0.64	0.277	0.16	0.378	1.00	0.40	0.80	0.32	0.105	3%						
18	8.20	0.80									1.00	0.40	0.74	0.30	0.103	3%						
19	8.60	0.74		0.44	0.347						1.00	0.25	0.68	0.17	0.007	0%						
20	9.00	0.68		0.41	0.039						1.00	0.05	0.000	0.000	0.000	0%						
RB	9.10	0.00	0.00		0.00		0.00		0.00		1.00	0.05	0.000	0.000	0.000							
<b>Total Flow</b>														<b>3.05</b>	<b>100%</b>							

**Flow Measurement Details:**

Metering Section Location (describe): Across from TBRG

Meas. Start Time (MST):	9:00
Meas. End Time (MST):	9:50
Equipment:	ADV
Method:	Wading
River Condition:	WL high, good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, calm, 17°C

**Flow Characteristics:**

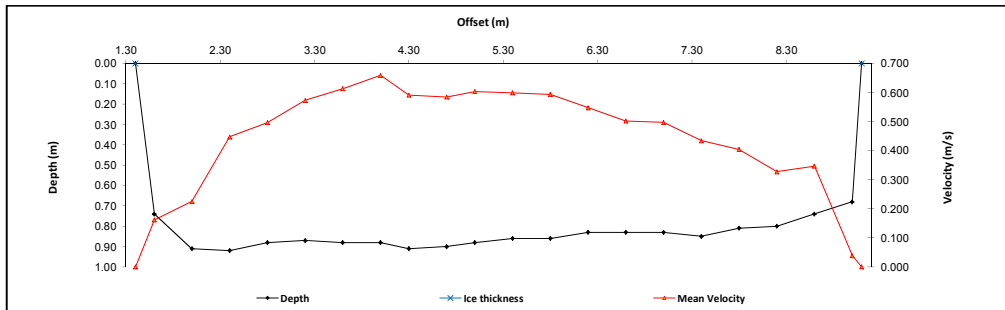
Total Flow:	3.05	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.39	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.83	(m)
Mean Velocity:	0.48	(m/s)
Froude Number:	0.17	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.870	0.863
Water (°C):	11.4	11.8
Rainfall (mm):	0.00	2.10
Datalogger Clock:	08:38	-
Laptop Clock:	08:38	-
Battery (Main):	14.2	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure D dessicant:	Replaced	-
Vent Tube D dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S31-01			0.835	100.127	100.128	T-Post 8 m S of data logger	S31-4
S31-03	1.236	100.962		99.726	99.726	3/4" Pipe 5 m NW of data logger	S31-1
S31-04			0.981	99.981	99.982	3/4" Pipe 3 m SW of logger	WL
Ice/PT:							WL
Water Level:		2.043		98.919		Time WL Surveyed: 8:50	S31-1
Other:						Nail in tree	S31-3
<b>Setup #2</b>							
S31-01	0.797	100.924		100.127	100.128	T-Post 8 m S of data logger	S31-4
S31-03			1.197	99.727	99.726	3/4" Pipe 5 m NW of data logger	S31-1
S31-04			0.941	99.983	99.982	3/4" Pipe 3 m SW of logger	WL
Ice/PT:							WL
Water Level:			2.009	98.915		Time WL Surveyed: 8:52	S31-1
Other:						Nail in tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S31-1	0.797	100.924		100.127		Time WL Surveyed: 9:52	
Water Level:			2.010	98.914		Time WL Surveyed: 9:53	
Water Level:			1.968	98.911			
BM: S31-1	0.752	100.879		100.127			

**WL Survey Summary**

	Before	After
Average WL:	98.917	98.913
Transducer Elevation:	98.047	98.050
Closing Error:	-0.001	-
WL Check:	0.004	0.003

**Site Rating Information**

Measured Discharge:	3.05
Expected Discharge:	2.80
Shift from Existing Rating (m <sup>3</sup> /s):	-0.25
Shift from Existing Rating (%):	-8%

**Field Personnel:**

TR & JVR	Trip Date:	20-May-13
JVR	Date:	20-May-13
TR	Date:	31-May-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S31 Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N



Site Visit Date: June 21, 2013  
 Site Visit Time (MST): 15:20

### Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.20	0.51		0.31	0.330					1.00	0.35	0.51	0.330	0.18	0.059	2%
2	1.60	0.83				0.66	0.380	0.17	0.370	1.00	0.40	0.83	0.375	0.33	0.125	5%
3	2.00	0.89				0.71	0.140	0.18	0.420	1.00	0.40	0.89	0.280	0.36	0.100	4%
4	2.40	0.85				0.68	0.530	0.17	0.510	1.00	0.40	0.85	0.520	0.34	0.177	7%
5	2.80	0.80				0.64	0.470	0.16	0.560	1.00	0.40	0.80	0.515	0.32	0.165	6%
6	3.20	0.79				0.63	0.520	0.16	0.540	1.00	0.40	0.79	0.530	0.32	0.167	6%
7	3.60	0.80				0.64	0.540	0.16	0.530	1.00	0.40	0.80	0.535	0.32	0.171	6%
8	4.00	0.83				0.66	0.570	0.17	0.610	1.00	0.30	0.83	0.590	0.25	0.147	6%
9	4.20	0.82				0.66	0.590	0.16	0.620	1.00	0.20	0.82	0.605	0.16	0.099	4%
10	4.40	0.81				0.65	0.610	0.16	0.680	1.00	0.30	0.81	0.635	0.24	0.154	6%
11	4.80	0.82				0.66	0.540	0.16	0.640	1.00	0.40	0.82	0.590	0.33	0.194	7%
12	5.20	0.80				0.64	0.540	0.16	0.610	1.00	0.40	0.80	0.575	0.32	0.184	7%
13	5.60	0.80				0.64	0.490	0.16	0.580	1.00	0.40	0.80	0.535	0.32	0.171	6%
14	6.00	0.79				0.63	0.540	0.16	0.530	1.00	0.40	0.79	0.535	0.32	0.169	6%
15	6.40	0.81				0.65	0.440	0.16	0.490	1.00	0.40	0.81	0.465	0.32	0.151	6%
16	6.80	0.80				0.64	0.350	0.16	0.490	1.00	0.40	0.80	0.415	0.32	0.133	5%
17	7.20	0.78				0.64	0.310	0.16	0.440	1.00	0.40	0.78	0.375	0.31	0.117	4%
18	7.60	0.75	0.45			0.62	0.310	0.16	0.390	1.00	0.40	0.75	0.310	0.30	0.093	3%
19	8.00	0.66	0.40		0.300					1.00	0.40	0.66	0.300	0.26	0.079	3%
20	8.40	0.60	0.36		0.050					1.00	0.30	0.60	0.050	0.18	0.009	0%
RB	8.60	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.66</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:31
Meas. End Time (MST):	15:56
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25°C

**Flow characteristics:**

Total Flow:	2.66	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.80	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.75	(m)
Mean Velocity:	0.46	(m/s)
Froude Number:	0.17	

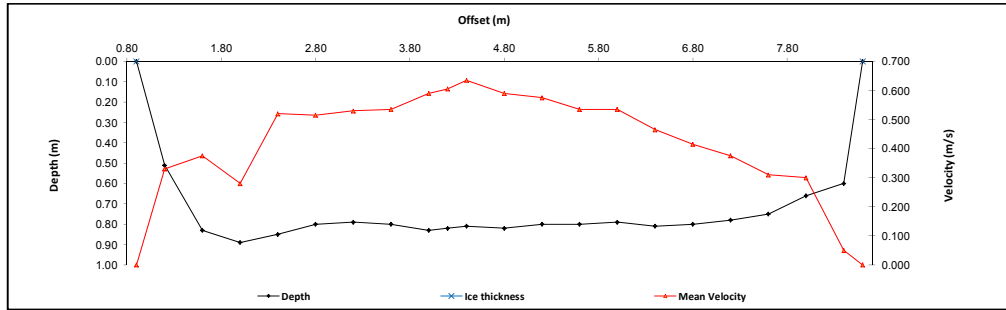
**Logger Details:**

	Before	After
Transducer Reading (m):	0.794	0.793
Water (°C):	18.6	18.9
Rainfall (mm):	0.00	0.00
Datalogger Clock:	15:16	16:05
Laptop Clock:	15:16	16:04
Battery (Main):	14.0	13.8
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	Good
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tested tipping bucket

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S31-01			0.884	100.125	100.128	T-Post 8 m S of data logger	S31-03
S31-03	1.283	101.009		99.726	99.726	3/4" Pipe 5 m NW of data logger	S31-01
S31-04			1.026	99.983	99.982	3/4" Pipe 3 m SW of logger	WL
Ice/PT:							WL
Water Level:			2.167	98.842		Time WL Surveyed: 15:25	S31-01
Other:						Nail in tree	S31-04
Setup #2							S31-03
S31-01	0.872	100.997		100.125	100.128	T-Post 8 m S of data logger	
S31-03			1.271	99.726	99.726	3/4" Pipe 5 m NW of data logger	
S31-04			1.014	99.983	99.982	3/4" Pipe 3 m SW of logger	
Ice/PT:							
Water Level:			2.154	98.843		Time WL Surveyed: 15:27	(must close survey loop on survey starting point)
Other:						Nail in tree	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S31-01	0.872	100.997		100.125		
Water Level:				2.125	98.872	Time WL Surveyed: 16:00	
Water Level:				2.117	98.868	Time WL Surveyed: 16:02	
BM:	S31-01	0.860	100.985		100.125		

**WL Survey Summary**

	Before	After
Average WL:	98.843	98.870
Transducer Elevation:	98.049	98.077
Closing Error:	0.000	-
WL Check:	0.001	0.004

**Site Rating Information**

Measured Discharge:	2.66
Expected Discharge:	2.39
Shift from Existing Rating (m <sup>3</sup> /s):	-0.27
Shift from Existing Rating (%):	-10%

**Field Personnel:**

	SM, TR	Trip Date:	21-Jun-13
Data Entry Personnel:	SM	Date:	21-Jun-13
Data Check Personnel:	TR	Date:	19-Sep-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

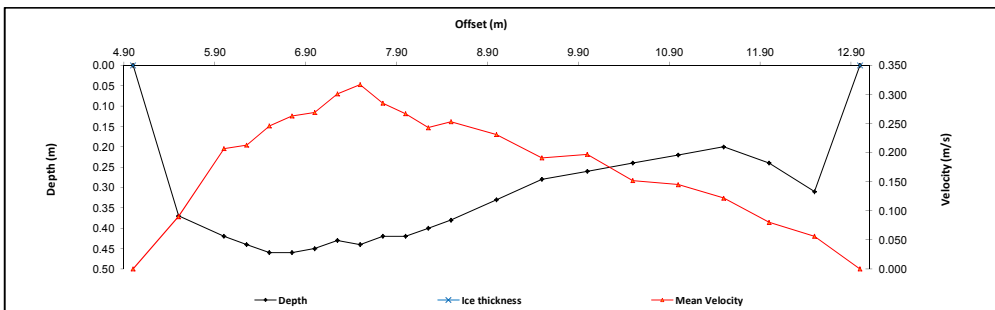
Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N



Site Visit Date: August 21, 2013  
 Site Visit Time (MST): 08:10

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	5.50	0.37		0.22	0.090					1.00	0.50	0.37	0.090	0.19	0.017	3%
2	6.00	0.42		0.25	0.207					1.00	0.38	0.42	0.207	0.16	0.033	6%
3	6.25	0.44		0.26	0.213					1.00	0.25	0.44	0.213	0.11	0.023	5%
4	6.50	0.46		0.28	0.246					1.00	0.25	0.46	0.246	0.12	0.028	6%
5	6.75	0.46		0.28	0.263					1.00	0.25	0.46	0.263	0.12	0.030	6%
6	7.00	0.45		0.27	0.269					1.00	0.25	0.45	0.269	0.11	0.030	6%
7	7.25	0.43		0.26	0.301					1.00	0.25	0.43	0.301	0.11	0.032	6%
8	7.50	0.44		0.26	0.317					1.00	0.25	0.44	0.317	0.11	0.035	7%
9	7.75	0.42		0.25	0.285					1.00	0.25	0.42	0.285	0.11	0.030	6%
10	8.00	0.42		0.25	0.267					1.00	0.25	0.42	0.267	0.11	0.028	6%
11	8.25	0.40		0.24	0.243					1.00	0.25	0.40	0.243	0.10	0.024	5%
12	8.50	0.38		0.23	0.253					1.00	0.38	0.38	0.253	0.14	0.036	7%
13	9.00	0.33		0.20	0.231					1.00	0.50	0.33	0.231	0.17	0.038	8%
14	9.50	0.28		0.17	0.191					1.00	0.50	0.28	0.191	0.14	0.027	5%
15	10.00	0.26		0.16	0.197					1.00	0.50	0.26	0.197	0.13	0.026	5%
16	10.50	0.24		0.14	0.152					1.00	0.50	0.24	0.152	0.12	0.018	4%
17	11.00	0.22		0.13	0.145					1.00	0.50	0.22	0.145	0.11	0.016	3%
18	11.50	0.20		0.12	0.122					1.00	0.50	0.20	0.122	0.10	0.012	2%
19	12.00	0.24		0.14	0.080					1.00	0.50	0.24	0.080	0.12	0.010	2%
20	12.50	0.31		0.19	0.056					1.00	0.50	0.31	0.056	0.16	0.009	2%
RB	13.00	0.00	0.00		0.00					1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.502</b>	<b>100%</b>	

<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b>	
Meas. Start Time (MST):	8:20
Meas. End Time (MST):	8:55
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15°C



<b>Flow characteristics:</b>		
Total Flow:	<b>0.502</b>	(m <sup>3</sup> /s)
Perceived Measurement Quality:	<b>Excellent</b>	
Cross Section Area:	<b>2.51</b>	(m <sup>2</sup> )
Wetted Width:	<b>8.00</b>	(m)
Hydraulic Depth:	<b>0.31</b>	(m)
Mean Velocity:	<b>0.20</b>	(m/s)
Froude Number:	<b>0.11</b>	

<b>Logger Details:</b>		
Transducer Reading (m):	Before: 0.348	After: 0.347
Water (°C):	13.1	13.2
Rainfall (mm):	0.00	0.00
Datalogger Clock:	8:16	8:59
Laptop Clock:	8:16	8:59
Battery (Main):	13.5	14.4
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

<b>Datalogger / Station Notes:</b>	
- TBRC not working, cable needs to be replaced	

<b>General Notes:</b>	

Level Survey:	BS (+) (m)	HI (m)	FS (-) (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S31-01			0.852	100.123	100.128	T-Post 8 m South of logger	S31-04
S31-03			1.247	99.728	99.726	3/4" Pipe 5 m NW of logger	S31-03
S31-04	0.993	100.975		99.982	99.982	3/4" Pipe 3 m SW of logger	S31-01
Ice/PT:							WL
Water Level:			2.602	98.373		Time WL Surveyed: 8:26	S31-01
Other:							S31-03
<b>Setup #2</b>							S31-04
S31-01			0.836	100.125	100.128	T-Post 8 m South of logger	
S31-03	1.233	100.961		99.728	99.726	3/4" Pipe 5 m NW of logger	
S31-04			0.977	99.984	99.982	3/4" Pipe 3 m SW of logger	
Ice/PT:							
Water Level:			2.584	98.377		Time WL Surveyed: 8:28	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S31-03	1.234	100.962		99.728		
Water Level:				2.587	98.375	Time WL Surveyed: 8:56	
Water Level:				2.575	98.376	Time WL Surveyed: 8:58	
BM	S31-03	1.223	100.951		99.728		

<b>WL Survey Summary</b>		
Average WL:	98.375	98.376
Transducer Elevation:	98.027	98.029
Closing Error:	-0.002	-
WL Check:	0.004	-0.001

<b>Site Rating Information</b>	
Measured Discharge:	0.502
Expected Discharge:	0.46
Shift from Existing Rating (m <sup>3</sup> /s):	-0.04
Shift from Existing Rating (%):	-8%

<b>Field Personnel:</b>			
SM & DW	Trip Date:	21-Aug-13	
Data Entry Personnel:	SM	Date:	21-Aug-13
Data Check Personnel:	TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N



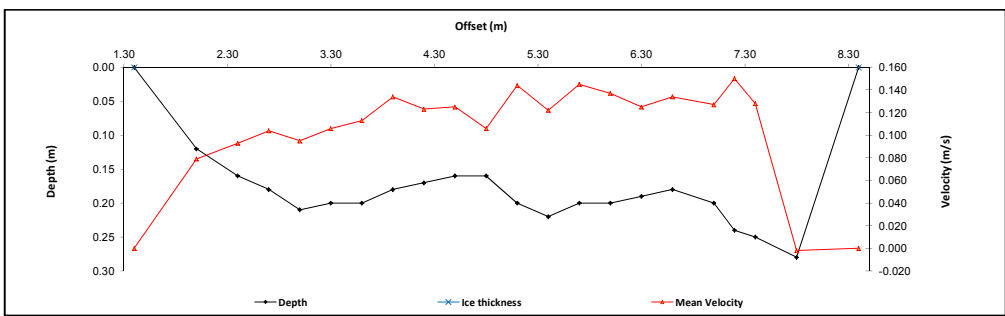
Site Visit Date: September 17, 2013  
 Site Visit Time (MST): 12:00

Flow Measurement											Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)				
RB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000					
1	2.00	0.12		0.07	0.079					1.00	0.50	0.12	0.079	0.06	0.005	4%				
2	2.40	0.16		0.10	0.093					1.00	0.35	0.16	0.093	0.06	0.005	4%				
3	2.70	0.18		0.11	0.104					1.00	0.30	0.18	0.104	0.05	0.006	4%				
4	3.00	0.21		0.13	0.095					1.00	0.30	0.21	0.095	0.06	0.006	5%				
5	3.30	0.20		0.12	0.106					1.00	0.30	0.20	0.106	0.06	0.006	5%				
6	3.60	0.20		0.12	0.113					1.00	0.30	0.20	0.113	0.06	0.007	5%				
7	3.90	0.18		0.11	0.134					1.00	0.30	0.18	0.134	0.05	0.007	5%				
8	4.20	0.17		0.10	0.123					1.00	0.30	0.17	0.123	0.05	0.006	5%				
9	4.50	0.16		0.10	0.125					1.00	0.30	0.16	0.125	0.05	0.006	5%				
10	4.80	0.16		0.10	0.106					1.00	0.30	0.16	0.106	0.05	0.005	4%				
11	5.10	0.20		0.12	0.144					1.00	0.30	0.20	0.144	0.06	0.009	6%				
12	5.40	0.22		0.13	0.122					1.00	0.30	0.22	0.122	0.07	0.008	6%				
13	5.70	0.20		0.12	0.145					1.00	0.30	0.20	0.145	0.06	0.009	7%				
14	6.00	0.20		0.12	0.137					1.00	0.30	0.20	0.137	0.06	0.008	6%				
15	6.30	0.19		0.11	0.125					1.00	0.30	0.19	0.125	0.06	0.007	5%				
16	6.60	0.18		0.11	0.134					1.00	0.35	0.18	0.134	0.06	0.008	6%				
17	7.00	0.20		0.12	0.127					1.00	0.30	0.20	0.127	0.06	0.008	6%				
18	7.20	0.24		0.14	0.150					1.00	0.20	0.24	0.150	0.05	0.007	5%				
19	7.40	0.25		0.15	0.128					1.00	0.30	0.25	0.128	0.07	0.010	7%				
20	7.80	0.28		0.17	-0.002					1.00	0.50	0.28	-0.002	0.14	0.000	0%				
LB	8.40	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000					
<b>Total Flow</b>														<b>0.133</b>	<b>100%</b>					

**Flow Measurement Details:**

Metering Section Location (describe):  
 10 m US of PT

Meas. Start Time (MST):	14:05
Meas. End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light rain, 10°C



**Flow characteristics:**

Total Flow:	0.133	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.24	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.98	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.211	0.213
Water (°C):	9.7	9.9
Rainfall (mm):	0.00	-
Datalogger Clock:	12:05	14:38
Laptop Clock:	12:06	14:39
Battery (Main):	12.9	13.5
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed new wiring for TBRC, new solar panel and new 3/4" BM  
 TBRC was beyond repair and was taken down

**General Notes:**

- TBRC and solar panel had both suffered gun shots damage Fallen trees were cleared around station

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S31-01					100.128	T-Post 8 m South of logger	S31-03
S31-03	0.996	100.722		99.726	99.726	3/4" Pipe 5 m NW of logger	S31-04
S31-04			0.739	99.983	99.982	3/4" Pipe 3 m SW of logger	Other
Ice/PT:							WL
Water Level:		2.484	98.238		98.238	Time WL Surveyed: 13:56	WL
Other:		0.729	99.993		99.993	3/4" Pipe 15 m NW of logger	Other
<b>Setup #2</b>							
S31-01					100.128	T-Post 8 m South of logger	S31-03
S31-03			0.938	99.726	99.726	3/4" Pipe 5 m NW of logger	S31-04
S31-04	0.681	100.664		99.983	99.982	3/4" Pipe 3 m SW of logger	
Ice/PT:							
Water Level:		2.422	98.242		98.242	Time WL Surveyed: 13:57	
Other:		0.673	99.991		99.993	3/4" Pipe 15 m NW of logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S31-03	0.939	100.865		99.726		
Water Level:			2.419	98.246	98.246	Time WL Surveyed: 14:32	
Water Level:			2.386	98.246	98.246	Time WL Surveyed: 14:34	
BM:	S31-03	0.906	100.632		99.726		

START  
↓  
END

**WL Survey Summary**

	Before	After
Average WL:	98.240	98.246
Transducer Elevation:	98.029	98.033
Closing Error:	0.000	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	0.133
Expected Discharge:	0.15
Shift from Existing Rating (m <sup>3</sup> /s):	0.02
Shift from Existing Rating (%):	14%

**Field Personnel:**

Field Personnel:	TR & CJ	Trip Date:	17-Sep-13
Data Entry Personnel:	TR	Date:	17-Sep-13
Data Check Personnel:	TR	Date:	18-Oct-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N



Site Visit Date: October 25, 2013  
 Site Visit Time (MST): 14:55

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	5.00	0.00	0.00		0.000		0.000			1.00	0.13	0.00	0.000	0.00	0.000	
1	5.25	0.04		0.02	0.132					1.00	0.25	0.04	0.132	0.01	0.001	1%
2	5.50	0.08		0.05	0.177					1.00	0.25	0.08	0.177	0.02	0.004	1%
3	5.75	0.11		0.07	0.184					1.00	0.25	0.11	0.184	0.03	0.005	2%
4	6.00	0.14		0.08	0.195					1.00	0.25	0.14	0.195	0.04	0.007	3%
5	6.25	0.15		0.09	0.220					1.00	0.25	0.15	0.220	0.04	0.008	3%
6	6.50	0.17		0.10	0.235					1.00	0.25	0.17	0.235	0.04	0.010	4%
7	6.75	0.20		0.12	0.222					1.00	0.25	0.20	0.222	0.05	0.011	5%
8	7.00	0.21		0.13	0.237					1.00	0.25	0.21	0.237	0.05	0.012	5%
9	7.25	0.24		0.14	0.231					1.00	0.25	0.24	0.231	0.06	0.014	6%
10	7.50	0.26		0.16	0.264					1.00	0.25	0.26	0.264	0.07	0.017	7%
11	7.75	0.28		0.17	0.249					1.00	0.25	0.28	0.249	0.07	0.017	7%
12	8.00	0.30		0.18	0.274					1.00	0.25	0.30	0.274	0.08	0.021	8%
13	8.25	0.31		0.19	0.282					1.00	0.25	0.31	0.282	0.08	0.022	9%
14	8.50	0.34		0.20	0.251					1.00	0.25	0.34	0.251	0.09	0.021	9%
15	8.75	0.33		0.20	0.230					1.00	0.25	0.33	0.230	0.08	0.019	8%
16	9.00	0.33		0.20	0.211					1.00	0.25	0.33	0.211	0.08	0.017	7%
17	9.25	0.32		0.19	0.181					1.00	0.25	0.32	0.181	0.08	0.014	6%
18	9.50	0.32		0.19	0.137					1.00	0.25	0.32	0.137	0.08	0.011	4%
19	9.75	0.32		0.19	0.083					1.00	0.25	0.32	0.083	0.08	0.007	3%
20	10.00	0.28		0.17	0.073					1.00	0.28	0.28	0.073	0.08	0.006	2%
LB	10.30	0.00	0.00		0.00		0.00			1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.245</b>	<b>100%</b>	

### Flow Measurement Details:

#### Metering Section Location (describe):

Meas. Start Time (MST):	15:19
Meas. End Time (MST):	15:37
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 3°C

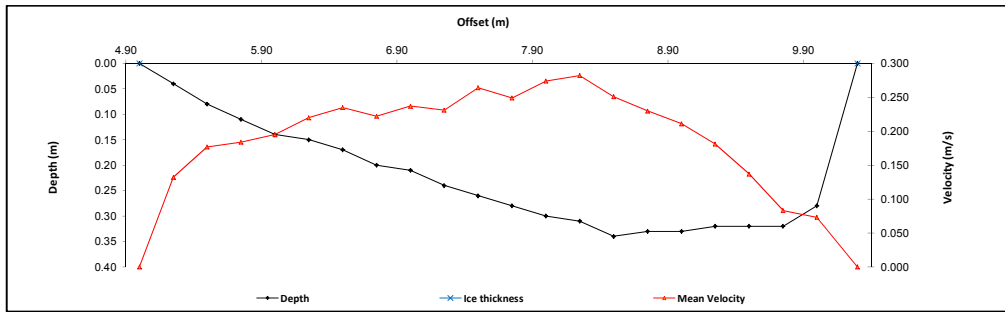
#### Flow characteristics:

Total Flow:	0.245	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.14	

#### Logger Details:

	Before	After
Transducer Reading (m):	0.261	0.260
Water (°C):	2.6	2.6
Rainfall (mm):	-	-
Datalogger Clock:	15:03	15:42
Laptop Clock:	15:03	15:42
Battery (Main):	14.7	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

#### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S31-05
S31-03	1.273	100.999		99.726	99.726	3/4" Pipe 6 m NW of logger	S31-04
S31-04			1.016	99.983	99.982	3/4" Pipe 3 m SW of logger	S31-03
S31-05			1.006	99.993	99.993	3/4" Pipe 15 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.708	98.291		Time WL Surveyed: 15:11	S31-03
Other:							S31-04
<b>Setup #2</b>							S31-05
S31-03			1.257	99.728	99.726	3/4" Pipe 5 m NW of logger	
S31-04	1.002	100.985		99.983	99.982	3/4" Pipe 3 m SW of logger	
S31-05			0.991	99.994	99.993	3/4" Pipe 15 m NW of logger	
Ice/PT:							
Water Level:			2.695	98.290		Time WL Surveyed: 15:13	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S31-03	1.257	100.983		99.726		
Water Level:				2.694	98.289	Time WL Surveyed: 15:45	
Water Level:				2.685	98.287	Time WL Surveyed: 15:47	
BM:	S31-03	1.246	100.972		99.726		

WL Survey Summary	Before	After
Average WL:	98.291	98.288
Transducer Elevation:	98.030	98.028
Closing Error:	-0.002	-
WL Check:	0.001	0.002

Site Rating Information	
Measured Discharge:	0.245
Expected Discharge:	0.25
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	3%

#### General Notes:

<b>Field Personnel:</b>	SM & DW	Trip Date:	25-Oct-13
Data Entry Personnel:	SM	Date:	25-Oct-13
Data Check Personnel:	TR	Date:	29-Oct-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: December 13, 2013  
 Site Visit Time (MST): 09:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.40	0.05		0.03	0.271					1.00	0.15	0.05	0.271	0.01	0.002	1%
2	0.60	0.05		0.03	0.369					1.00	0.20	0.05	0.369	0.01	0.004	3%
3	0.80	0.04		0.02	0.305					1.00	0.20	0.04	0.305	0.01	0.002	2%
4	1.00	0.05		0.03	0.521					1.00	0.20	0.05	0.521	0.01	0.005	4%
5	1.20	0.06		0.04	0.577					1.00	0.20	0.06	0.577	0.01	0.007	5%
6	1.40	0.07		0.04	0.525					1.00	0.20	0.07	0.525	0.01	0.007	5%
7	1.60	0.08		0.05	0.429					1.00	0.20	0.08	0.429	0.02	0.007	5%
8	1.80	0.09		0.05	0.526					1.00	0.20	0.09	0.526	0.02	0.009	6%
9	2.00	0.09		0.05	0.464					1.00	0.20	0.09	0.464	0.02	0.008	6%
10	2.20	0.09		0.05	0.416					1.00	0.20	0.09	0.416	0.02	0.007	5%
11	2.40	0.12		0.07	0.165					1.00	0.20	0.12	0.165	0.02	0.004	3%
12	2.60	0.12		0.07	0.280					1.00	0.20	0.12	0.280	0.02	0.007	5%
13	2.80	0.18		0.11	0.484					1.00	0.15	0.18	0.484	0.03	0.013	9%
14	2.90	0.15		0.09	0.381					1.00	0.10	0.15	0.381	0.02	0.006	4%
15	3.00	0.15		0.09	0.436					1.00	0.15	0.15	0.436	0.02	0.010	7%
16	3.20	0.15		0.09	0.265					1.00	0.20	0.15	0.265	0.03	0.008	5%
17	3.40	0.11		0.07	0.454					1.00	0.20	0.11	0.454	0.02	0.010	7%
18	3.60	0.10		0.06	0.475					1.00	0.20	0.10	0.475	0.02	0.010	7%
19	3.80	0.08		0.05	0.567					1.00	0.20	0.08	0.567	0.02	0.009	6%
20	4.00	0.08		0.05	0.414					1.00	0.30	0.08	0.414	0.02	0.010	7%
LB	4.40	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.146</b>	<b>100%</b>		

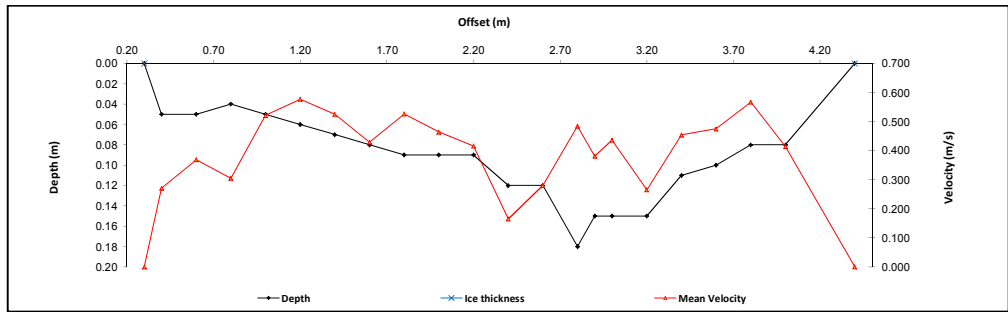
Flow Measurement Details:	
Metering Section Location (describe):	Rifle 15 m US of bridge
Meas. Start Time (MST):	9:40
Meas. End Time (MST):	10:05
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light snow, -20°C

Flow characteristics:	
Total Flow:	0.146 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.36 (m <sup>2</sup> )
Wetted Width:	4.10 (m)
Hydraulic Depth:	0.09 (m)
Mean Velocity:	0.41 (m/s)
Froude Number:	0.44

Logger Details:	
Transducer Reading (m):	Before: 0.202, After: 0.201
Water (°C):	0.4
Rainfall (mm):	0.00
Datalogger Clock:	9:19 - 10:11
Laptop Clock:	9:19 - 10:11
Battery (Main):	8.9 - 12.9
Battery Condition:	Replaced
Battery Serial #:	-
Enclosure Desiccant:	Replaced
Vent Tube Desiccant:	Good
PT# (if replaced):	-
Logger# (if replaced):	-

Datalogger / Station Notes:	
-	Ice very thin near station

General Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station Setup #1							
S31-03	1.142	100.868		99.726	99.726	3/4" Pipe 5 m NW of logger	S31-03
S31-04			0.885	99.983	99.982	3/4" Pipe 3 m SW of logger	S31-04
S31-05			0.878	99.990	99.993	3/4" Pipe 15 m NW of logger	S31-05
Ice/PT:							WL
Water Level:		2.633		98.235		Time WL Surveyed:	9:30
Other:							S31-04
Station Setup #2							S31-03
S31-03			1.124	99.726	99.726	3/4" Pipe 5 m NW of logger	S31-03
S31-04			0.865	99.985	99.982	3/4" Pipe 3 m SW of logger	S31-04
S31-05	0.860	100.850		99.990	99.993	3/4" Pipe 15 m NW of logger	S31-05
Ice/PT:							
Water Level:		2.616		98.234		Time WL Surveyed:	9:32
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S31-04	0.865	100.855		99.990	Time WL Surveyed:	10:07
Water Level:			2.617	98.238		Time WL Surveyed:	10:09
Water Level:			2.600	98.238		Time WL Surveyed:	
BM:	S31-04	0.848	100.838		99.990	Time WL Surveyed:	

WL Survey Summary	
Average WL:	Before: 98.235, After: 98.238
Transducer Elevation:	98.033, 98.037
Closing Error:	0.000
WL Check:	0.001 - 0.000

Site Rating Information	
Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:	
	SM, TR
Trip Date:	13-Dec-13
Data Entry Personnel:	SM
Date:	13-Dec-13
Data Check Personnel:	TR
Date:	17-Mar-14
Entered Digitally in the Field:	Yes

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881

UTM Location: 490252 E, 6254511 N

Site Visit Date:

February 13, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.33	0.13	0.06	0.000	0.000	0.01	0.000	0%
1	0.45	0.28	0.06	0.000			1.0	0.33	0.61	0.29	0.22	0.000	0.000	0.06	0.000	0%
2	0.77	0.30	0.20	0.000			1.0	0.61	0.96	0.35	0.10	0.000	0.000	0.04	0.000	0%
3	1.15	0.40	0.32	0.158			0.9	0.96	1.30	0.34	0.08	0.158	0.142	0.03	0.004	2%
4	1.45	0.41	0.30	0.428			0.9	1.30	1.53	0.23	0.11	0.428	0.385	0.02	0.010	5%
5	1.60	0.42	0.30	0.064			0.9	1.53	1.75	0.23	0.12	0.064	0.058	0.03	0.002	1%
6	1.90	0.40	0.26	0.056			0.9	1.75	2.08	0.33	0.14	0.056	0.050	0.05	0.002	1%
7	2.25	0.40	0.29	0.078			0.9	2.08	2.48	0.40	0.11	0.078	0.070	0.04	0.003	2%
8	2.70	0.40	0.32	-0.002			0.9	2.48	2.88	0.40	0.08	-0.002	-0.002	0.03	0.000	0%
9	3.05	0.54	0.30	0.047			0.9	2.88	3.10	0.23	0.24	0.047	0.042	0.05	0.002	1%
10	3.15	0.58	0.29	0.257			0.9	3.10	3.28	0.18	0.29	0.257	0.231	0.05	0.012	6%
11	3.40	0.55	0.33	0.451			0.9	3.28	3.48	0.20	0.22	0.451	0.406	0.04	0.018	10%
12	3.55	0.57	0.34	0.418			0.9	3.48	3.68	0.20	0.23	0.418	0.376	0.05	0.017	9%
13	3.80	0.57	0.34	0.366			0.9	3.68	3.93	0.25	0.23	0.366	0.347	0.06	0.020	11%
14	4.05	0.59	0.34	0.420			0.9	3.93	4.13	0.20	0.25	0.420	0.378	0.05	0.019	10%
15	4.20	0.68	0.35	0.413			0.9	4.13	4.25	0.13	0.33	0.413	0.372	0.04	0.015	8%
16	4.30	0.61	0.34	0.366			0.9	4.25	4.38	0.13	0.27	0.366	0.329	0.03	0.011	6%
17	4.45	0.68	0.35	0.306			0.9	4.38	4.53	0.15	0.33	0.306	0.275	0.05	0.014	7%
18	4.60	0.65	0.39	0.282			0.9	4.53	4.80	0.27	0.26	0.282	0.254	0.07	0.018	10%
19	5.00	0.51	0.39	0.234			0.9	4.80	5.15	0.35	0.12	0.234	0.211	0.04	0.009	5%
20	5.30	0.47	0.25	0.107			0.9	5.15	5.45	0.30	0.22	0.107	0.096	0.07	0.008	3%
21	5.60	0.42	0.16	0.022			0.9	5.45	5.75	0.30	0.26	0.022	0.020	0.08	0.002	1%
22	5.90	0.29	0.12	0.003			0.9	5.75	6.00	0.25	0.17	0.003	0.003	0.04	0.000	0%
LB	6.10	0.00	0.00	0.00	0.00	0.00	1.0	6.00	6.10	0.10	0.04	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.183</b>	

**Measurement Details:**

Start Time (MST):	12:45
End Time (MST):	13:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -6°C

**Flow characteristics:**

Total Flow:	0.183	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.04	(m <sup>2</sup> )
Wetted Width:	5.90	(m)
Hydraulic Depth:	0.176	(m)
Mean Velocity:	0.177	(m/s)
Froude Number:	0.135	

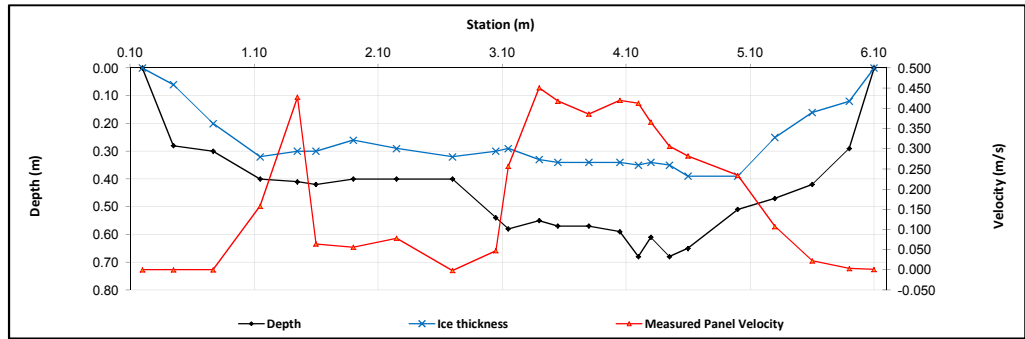
**Logger Details:**

	Before	After
Transducer Reading (m):	0.511	-
Water (°C):	0.4	-
Battery (Main):	12.3	12.65
Datalogger Clock:	12:51	-
Laptop Clock:	12:50	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	20961	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

- Replaced batteries
- BM4 hit and bent by snowmobile

**General Notes:**



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S32-02			1.053	98.981	98.981	Rebar 3 m S of data logger
S32-03	0.916	100.034		99.118	99.118	3/4" Pipe 10 m S of data logger
S32-04				99.412	99.412	3/4" Pipe 15 m S of data logger
Ice/PT:			3.074	96.960		
Water Level:			3.254	96.780		
Other:					97.939	Bolt on bridge
<b>Setup #2</b>						
S32-02	1.043	100.024		98.981	98.981	Rebar 3 m S of data logger
S32-03			0.907	99.117	99.118	3/4" Pipe 10 m S of data logger
S32-04				99.412	99.412	3/4" Pipe 15 m S of data logger
Ice/PT:			3.065	96.959		
Water Level:			3.240	96.784		
Other:					97.939	Bolt on bridge

Closing Error	0.001	Average WL	96.782
WL Check	0.004	Transducer Elevation Before	96.271
		Transducer Elevation After	-

<b>Field Personnel:</b>	SM & TR	<b>Trip Date:</b>	13-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	13-Feb-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	28-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="checked" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S32 Summit Creek at Hwy 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: May 20, 2013  
 Site Visit Time (MST): 11:05 -13:10



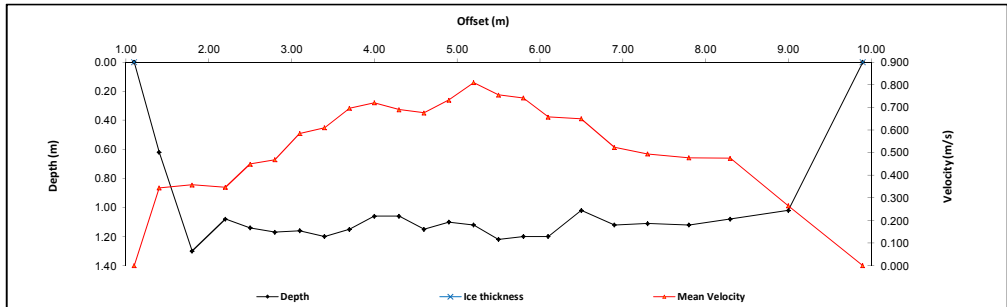
Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.40	0.62		0.37	0.344					1.00	0.35	0.62	0.344	0.22	0.075	2%
2	1.80	1.30				1.04	0.311	0.26	0.404	1.00	0.40	1.30	0.358	0.52	0.186	4%
3	2.20	1.08				0.86	0.346	0.22	0.347	1.00	0.35	1.08	0.347	0.38	0.131	3%
4	2.50	1.14				0.91	0.438	0.23	0.460	1.00	0.30	1.14	0.449	0.34	0.154	3%
5	2.80	1.17				0.94	0.464	0.23	0.473	1.00	0.30	1.17	0.469	0.35	0.164	3%
6	3.10	1.16				0.93	0.626	0.23	0.542	1.00	0.30	1.16	0.584	0.35	0.203	4%
7	3.40	1.20				0.96	0.701	0.24	0.518	1.00	0.30	1.20	0.610	0.36	0.219	4%
8	3.70	1.15				0.92	0.673	0.23	0.719	1.00	0.30	1.15	0.696	0.35	0.240	5%
9	4.00	1.06				0.85	0.715	0.21	0.726	1.00	0.30	1.06	0.721	0.32	0.229	5%
10	4.30	1.06				0.85	0.790	0.21	0.590	1.00	0.30	1.06	0.690	0.32	0.219	4%
11	4.60	1.15				0.92	0.735	0.23	0.616	1.00	0.30	1.15	0.676	0.35	0.233	5%
12	4.90	1.10				0.88	0.805	0.22	0.659	1.00	0.30	1.10	0.732	0.33	0.242	5%
13	5.20	1.12				0.90	0.808	0.22	0.811	1.00	0.30	1.12	0.810	0.34	0.272	6%
14	5.50	1.22				0.98	0.799	0.24	0.711	1.00	0.30	1.22	0.755	0.37	0.276	6%
15	5.80	1.20				0.96	0.718	0.24	0.765	1.00	0.30	1.20	0.742	0.36	0.267	5%
16	6.10	1.20				0.96	0.682	0.24	0.632	1.00	0.35	1.20	0.657	0.42	0.276	6%
17	6.50	1.02				0.82	0.607	0.20	0.692	1.00	0.40	1.02	0.650	0.41	0.265	5%
18	6.90	1.12				0.90	0.547	0.22	0.499	1.00	0.40	1.12	0.523	0.45	0.234	5%
19	7.30	1.11				0.89	0.394	0.22	0.594	1.00	0.45	1.11	0.494	0.50	0.247	5%
20	7.80	1.12				0.90	0.419	0.22	0.534	1.00	0.50	1.12	0.477	0.56	0.267	5%
21	8.30	1.08				0.86	0.444	0.22	0.505	1.00	0.60	1.08	0.475	0.65	0.307	6%
22	9.00	1.02				0.82	0.136	0.20	0.394	1.00	0.80	1.02	0.265	0.82	0.216	4%
LB	9.90	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
													<b>Total Flow</b>	<b>4.92</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 10 m DS of bridge

Meas. Start Time (MST): 11:55  
 Meas. End Time (MST): 12:45  
 Equipment: ADV  
 Method: Fishcat  
 River Condition: Good flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: P. Cloudy, light breeze, 20°C

**Flow characteristics:**

Total Flow:	4.92	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.03	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	1.25	(m)
Mean Velocity:	0.54	(m/s)
Froude Number:	0.16	



**Logger Details:**

	Before	After
Transducer Reading (m):	1.538	1.529
Water (°C):	9.9	10.2
Datalogger Clock:	11:31	-
Laptop Clock:	11:31	-
Battery (Main):	12.3	12.7
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- BM4 is bent
- Site was flooded, but WL dropping
- Functioning modem needs to be re-installed

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S32-02
S32-02			0.770	98.981	98.981	Rebar 3 m S of data logger	S32-03
S32-03	0.633	99.751		99.118	99.118	3/4" Pipe 10 m S of data logger	S32-04
S32-04				99.412	99.412	3/4" Pipe 15 m S of data logger	WL
Ice/PT:							WL
Water Level:			1.938	97.813		Time WL Surveyed: 11:48	S32-04
Other:						Bolt on bridge	S32-03
<b>Setup #2</b>							S32-02
S32-02	0.708	99.689		98.981	98.981	Rebar 3 m S of data logger	
S32-03			0.572	99.117	99.118	3/4" Pipe 10 m S of data logger	
S32-04				99.412	99.412	3/4" Pipe 15 m S of data logger	
Ice/PT:							
Water Level:			1.878	97.811		Time WL Surveyed: 11:50	(must close survey loop on survey starting point)
Other:						Bolt on bridge	

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

BM	S32-03				
Water Level:	0.571	99.689	1.883	97.806	Time WL Surveyed: 12:54
Water Level:			1.967	97.804	Time WL Surveyed: 12:56
BM	S32-03	0.653	99.771	99.118	

**WL Survey Summary**

	Before	After
Average WL:	97.812	97.805
Transducer Elevation:	96.274	96.276
Closing Error:	0.001	-
WL Check:	0.002	0.002

**Site Rating Information**

Measured Discharge:	4.92
Expected Discharge:	5.42
Shift from Existing Rating (m <sup>3</sup> /s):	0.50
Shift from Existing Rating (%):	10%

Field Personnel:	TR AND JVR	Trip Date:	20-May-13
Data Entry Personnel:	JVR	Date:	20-May-13
Data Check Personnel:	TR	Date:	31-May-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S32 Surmont Creek at Hwy 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: June 25, 2013  
 Site Visit Time (MST): 12:15

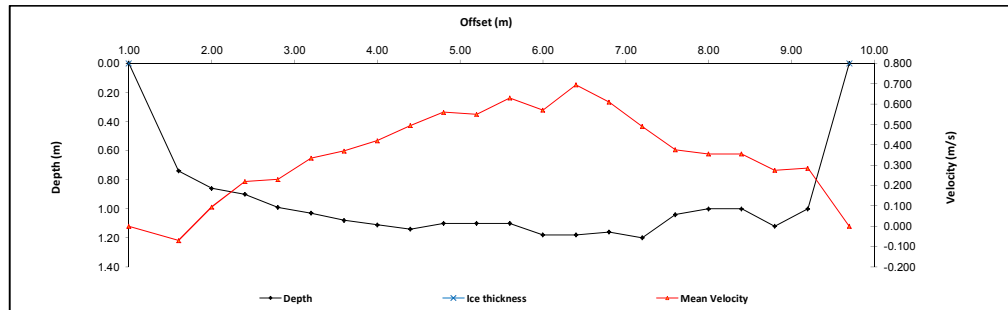


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	1.60	0.74		0.44	-0.070					1.00	0.50	0.74	-0.070	0.37	-0.026	-1%
2	2.00	0.86			0.69		0.000	0.17	0.190	1.00	0.40	0.86	0.095	0.34	0.033	1%
3	2.40	0.90			0.72		0.140	0.18	0.300	1.00	0.40	0.90	0.220	0.36	0.079	2%
4	2.80	0.99			0.79		0.190	0.20	0.270	1.00	0.40	0.99	0.230	0.40	0.091	3%
5	3.20	1.03			0.82		0.230	0.21	0.440	1.00	0.40	1.03	0.335	0.41	0.138	4%
6	3.60	1.08			0.86		0.330	0.22	0.410	1.00	0.40	1.08	0.370	0.43	0.160	5%
7	4.00	1.11			0.89		0.370	0.22	0.470	1.00	0.40	1.11	0.420	0.44	0.186	5%
8	4.40	1.14			0.91		0.430	0.23	0.560	1.00	0.40	1.14	0.495	0.46	0.226	7%
9	4.80	1.10			0.88		0.460	0.22	0.660	1.00	0.40	1.10	0.560	0.44	0.246	7%
10	5.20	1.10			0.88		0.490	0.22	0.610	1.00	0.40	1.10	0.550	0.44	0.242	7%
11	5.60	1.10			0.88		0.580	0.22	0.680	1.00	0.40	1.10	0.630	0.44	0.277	8%
12	6.00	1.18			0.94		0.480	0.24	0.660	1.00	0.40	1.18	0.570	0.47	0.269	8%
13	6.40	1.18			0.94		0.590	0.24	0.900	1.00	0.40	1.18	0.695	0.47	0.283	9%
14	6.80	1.16			0.93		0.520	0.23	0.700	1.00	0.40	1.16	0.610	0.46	0.283	9%
15	7.20	1.20			0.96		0.370	0.24	0.610	1.00	0.40	1.20	0.490	0.48	0.235	7%
16	7.60	1.04			0.83		0.340	0.21	0.410	1.00	0.40	1.04	0.375	0.42	0.156	5%
17	8.00	1.00			0.80		0.270	0.20	0.440	1.00	0.40	1.00	0.355	0.40	0.142	4%
18	8.40	1.00			0.80		0.230	0.20	0.480	1.00	0.40	1.00	0.355	0.40	0.142	4%
19	8.80	1.12			0.90		0.190	0.22	0.360	1.00	0.40	1.12	0.275	0.45	0.123	4%
20	9.20	1.00			0.80		0.230	0.20	0.340	1.00	0.45	1.00	0.285	0.45	0.128	4%
LB	9.70	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.46</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m DS of bridge

Meas. Start Time (MST):	13:45
Meas. End Time (MST):	14:05
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P.cloudy  calm, 25°C



**Flow characteristics:**

Total Flow:	3.46	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.54	(m <sup>2</sup> )
Wetted Width:	8.70	(m)
Hydraulic Depth:	0.98	(m)
Mean Velocity:	0.41	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.565	1.558
Water (°C):	12.8	12.8
Datalogger Clock:	12:55	14:16
Laptop Clock:	12:55	14:16
Battery (Main):	13.2	13.1
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Dessoricant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced battery, logger and uploaded new program
- Added mast and 1 BM
- Logger was flooded upon arrival

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S32-02			1.072	98.982	98.981	Rebar 3 m S of data logger	S32-03
S32-03	0.936	100.054		99.118	99.118	3/4" Pipe 10 m S of data logger	S32-05
S32-05			1.247	98.807	98.807	3/4" Pipe 4 m S of data logger	WL
Ice/PT:							WL
Water Level:			2.521	97.533	Time WL Surveyed:	13:22	S32-05
Other:					97.939		S32-02
<b>Setup #2</b>							S32-03
S32-02	1.085	100.067		98.982	98.981	Rebar 3 m S of data logger	
S32-03			0.949	99.118	99.118	3/4" Pipe 10 m S of data logger	
S32-05			1.261	98.806	98.807	3/4" Pipe 4m S of data logger	
Ice/PT:							
Water Level:			2.538	97.529	Time WL Surveyed:	13:35	(must close survey loop on survey starting point)
Other:					97.939	Bolt on bridge	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S32-03	0.935	100.053		98.118			
Water Level:			2.522	97.531	Time WL Surveyed:	14:11	
Water Level:			2.515	97.528	Time WL Surveyed:	14:12	
BM: S32-03	0.925	100.043		99.118			

**WL Survey Summary**

	Before	After
Average WL:	97.531	97.530
Transducer Elevation:	95.966	95.972
Closing Error:	0.000	-
WL Check:	0.004	0.003

**Site Rating Information**

Measured Discharge:	3.46
Expected Discharge:	3.43
Shift from Existing Rating (m <sup>3</sup> /s):	-0.03
Shift from Existing Rating (%):	-1%

**Field Personnel:**

Field Personnel:	SM, TR	Trip Date:	25-Jun-13
Data Entry Personnel:	SM	Date:	25-Jun-13
Data Check Personnel:	SG	Date:	16-Jul-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

**Hydrometric Measurement / Site Visit Record**

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: August 21, 2013  
 Site Visit Time (MST): 06:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.00	0.16		0.10	0.137					1.00	0.30	0.16	0.137	0.05	0.007	1%
2	2.30	0.24		0.14	0.163					1.00	0.30	0.24	0.163	0.07	0.012	2%
3	2.60	0.27		0.16	0.192					1.00	0.30	0.27	0.192	0.08	0.016	3%
4	2.90	0.34		0.20	0.233					1.00	0.30	0.34	0.233	0.10	0.024	4%
5	3.20	0.36		0.22	0.269					1.00	0.30	0.36	0.269	0.11	0.029	5%
6	3.50	0.38		0.23	0.350					1.00	0.30	0.38	0.350	0.11	0.040	6%
7	3.80	0.42		0.25	0.422					1.00	0.30	0.42	0.422	0.13	0.053	9%
8	4.10	0.45		0.27	0.414					1.00	0.30	0.45	0.414	0.14	0.056	9%
9	4.40	0.46		0.28	0.418					1.00	0.30	0.46	0.418	0.14	0.058	9%
10	4.70	0.44		0.26	0.461					1.00	0.23	0.44	0.461	0.10	0.046	7%
11	4.85	0.44		0.26	0.500					1.00	0.15	0.44	0.500	0.07	0.033	5%
12	5.00	0.46		0.28	0.475					1.00	0.15	0.46	0.475	0.07	0.033	5%
13	5.15	0.48		0.29	0.555					1.00	0.15	0.48	0.555	0.07	0.040	6%
14	5.30	0.47		0.28	0.506					1.00	0.23	0.47	0.506	0.11	0.054	9%
15	5.60	0.46		0.28	0.359					1.00	0.30	0.46	0.359	0.14	0.050	8%
16	5.90	0.38		0.23	0.299					1.00	0.30	0.38	0.299	0.11	0.034	5%
17	6.20	0.34		0.20	0.159					1.00	0.30	0.34	0.159	0.10	0.016	3%
18	6.50	0.28		0.17	0.118					1.00	0.30	0.28	0.118	0.08	0.010	2%
19	6.80	0.27		0.16	0.080					1.00	0.30	0.27	0.080	0.08	0.006	1%
20	7.10	0.22		0.13	0.053					1.00	0.45	0.22	0.053	0.10	0.005	1%
21	7.70	0.44		0.26	0.004					1.00	0.60	0.44	0.004	0.26	0.001	0%
LB	8.30	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.621</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	6:49
Meas. End Time (MST):	7:12
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 15°C

**Flow characteristics:**

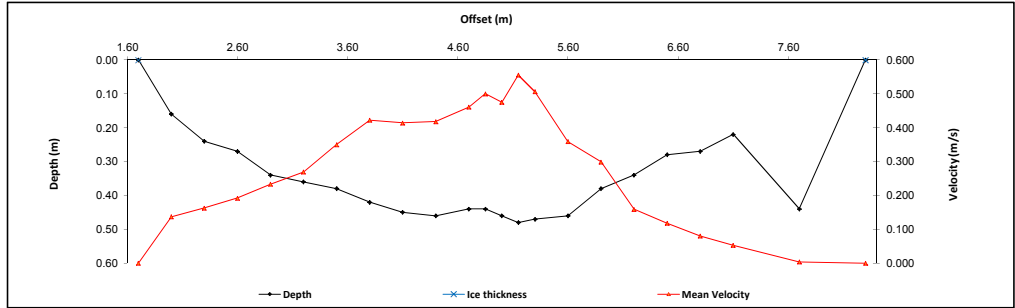
Total Flow:	0.621	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.22	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.724	0.678
Water (°C):	14.8	14.4
Datalogger Clock:	06:11	07:20
Laptop Clock:	06:11	07:20
Battery (Main):	12.8	12.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	248958	323016
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S32-03	1.300	100.418		99.118	99.118	3/4" Pipe 10 m S of logger	S32-03
S32-05			1.613	98.805	98.807	3/4" Pipe 4 m S of logger	S32-05
Water Level:			3.704	96.714			WL
Other:							WL
Setup #2							
S32-03			1.286	99.118	99.118	3/4" Pipe 10 m S of logger	S32-03
S32-05	1.600	100.405		98.805	98.807	3/4" Pipe 4 m S of logger	S32-05
Water Level:			3.692	96.713			WL
Other:							WL

*(must close survey loop on survey starting point)*

**WL Survey Summary**

	Before	After
Average WL:	96.714	96.712
Transducer Elevation:	95.990	96.034
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.621
Expected Discharge:	0.26
Shift from Existing Rating (m <sup>3</sup> /s):	-0.36
Shift from Existing Rating (%):	-59%

**Field Personnel:**

SM, DW	Trip Date:	21-Aug-13
SM	Date:	21-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881  
UTM Location: 490252 E, 6254511 N



Site Visit Date: September 17, 2013  
Site Visit Time (MST): 09:20

Flow Measurement:																
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.50	0.18		0.11	0.094					1.00	0.23	0.18	0.094	0.04	0.004	3%
2	1.65	0.26		0.16	0.116					1.00	0.18	0.26	0.116	0.05	0.005	4%
3	1.85	0.22		0.13	0.117					1.00	0.20	0.22	0.117	0.04	0.005	4%
4	2.05	0.24		0.14	0.208					1.00	0.20	0.24	0.208	0.05	0.010	8%
5	2.25	0.25		0.15	0.201					1.00	0.20	0.25	0.201	0.05	0.010	8%
6	2.45	0.24		0.14	0.191					1.00	0.20	0.24	0.191	0.05	0.009	7%
7	2.65	0.21		0.13	0.344					1.00	0.15	0.21	0.344	0.03	0.011	8%
8	2.75	0.22		0.13	0.339					1.00	0.10	0.22	0.339	0.02	0.007	6%
9	2.85	0.20		0.12	0.346					1.00	0.10	0.20	0.346	0.02	0.007	5%
10	2.95	0.21		0.13	0.368					1.00	0.10	0.21	0.368	0.02	0.008	6%
11	3.05	0.22		0.13	0.355					1.00	0.10	0.22	0.355	0.02	0.008	6%
12	3.15	0.20		0.12	0.338					1.00	0.10	0.20	0.338	0.02	0.007	5%
13	3.25	0.24		0.14	0.298					1.00	0.10	0.24	0.298	0.02	0.007	6%
14	3.35	0.26		0.16	0.281					1.00	0.10	0.26	0.281	0.03	0.007	6%
15	3.45	0.26		0.16	0.192					1.00	0.15	0.26	0.192	0.04	0.007	6%
16	3.65	0.26		0.16	0.174					1.00	0.20	0.26	0.174	0.05	0.009	7%
17	3.85	0.23		0.14	0.112					1.00	0.20	0.23	0.112	0.05	0.005	4%
18	4.05	0.20		0.12	0.065					1.00	0.20	0.20	0.065	0.04	0.003	2%
19	4.25	0.18		0.11	0.052					1.00	0.20	0.18	0.052	0.04	0.002	1%
20	4.45	0.14		0.08	-0.029					1.00	0.33	0.14	-0.029	0.05	-0.001	-1%
LB	4.90	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.130</b>	<b>100%</b>

**Flow Measurement Details:**  
Metering Section Location (describe):

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	10:49
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, breezy, 12°C

**Flow characteristics:**

Total Flow:	0.130	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.72	(m <sup>2</sup> )
Wetted Width:	3.70	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.13	

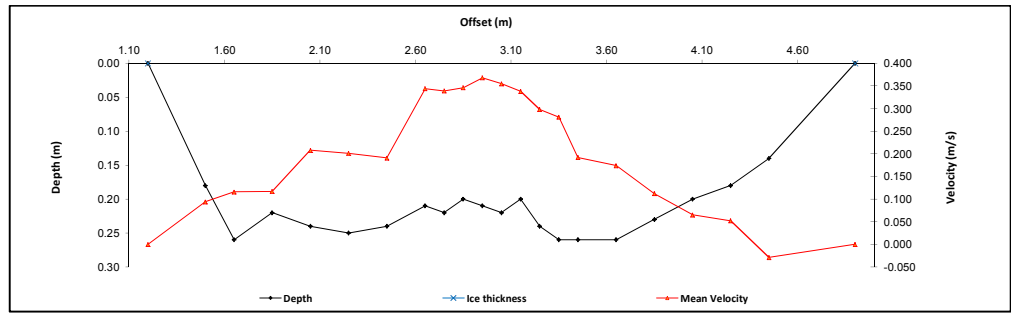
**Logger Details:**

	Before	After
Transducer Reading (m):	0.389	0.393
Water (°C):	13.4	13.5
Datalogger Clock:	09:30	10:56
Laptop Clock:	09:30	10:56
Battery (Main):	12.9	12.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Added BM6

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S32-03	0.898	100.016		99.118	99.118	3/4" Pipe 10 m S of logger	S32-05
S32-05			1.210	98.806	98.807	3/4" Pipe 4 m S of logger	S32-06
S32-06			1.352	98.664	98.664	3/4" Pipe 7 m S of logger	WL
Ice/PT:							WL
Water Level:			3.572	96.444		Time WL Surveyed: 10:20	S32-03
Other:					97.939	Bolt on bridge	S32-06
Setup #2							S32-05
S32-03			0.886	99.119	99.118	3/4" Pipe 10 m S of logger	
S32-05	1.199	100.005		98.806	98.807	3/4" Pipe 4 m S of logger	
S32-06			1.341	98.664	98.664	3/4" Pipe 7 m S of logger	
Ice/PT:							
Water Level:			3.561	96.444		Time WL Surveyed: 10:23	(must close survey loop on survey starting point)
Other:					97.939	Bolt on bridge	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S32-03	1.199	100.005	98.806			
Water Level:			3.561	96.444		Time WL Surveyed: 10:51	
Water Level:			3.552	96.443		Time WL Surveyed: 10:53	
BM:	S32-03	1.189	99.995	98.806			

**WL Survey Summary**

	Before	After
Average WL:	96.444	96.444
Transducer Elevation:	96.055	96.051
Closing Error:	-0.001	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	0.13
Expected Discharge:	0.01
Shift from Existing Rating (m <sup>3</sup> /s):	-0.12
Shift from Existing Rating (%):	-93%

**Field Personnel:**

	TR, CJ	Trip Date:	17-Sep-13
Data Entry Personnel:	CJ	Date:	17-Sep-13
Data Check Personnel:	TR	Date:	18-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: November 30, 2013  
 Site Visit Time (MST): 15:05

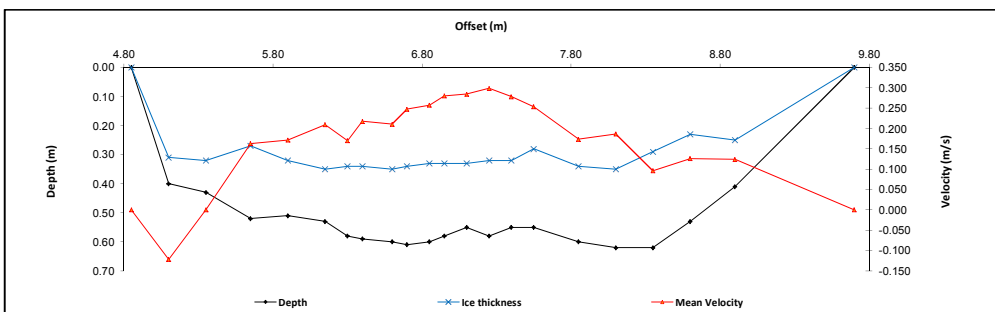


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.85	0.00	0.00		0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	5.10	0.40	0.31	0.36	-0.138				0.88	0.25	0.09	-0.121	0.02	-0.003	-2%	
2	5.35	0.43	0.32	0.38	0.000				0.88	0.28	0.09	0.000	0.03	0.000	0%	
3	5.65	0.52	0.27	0.40	0.185				0.88	0.28	0.25	0.163	0.07	0.011	7%	
4	5.90	0.51	0.32	0.42	0.195				0.88	0.25	0.19	0.172	0.05	0.008	5%	
5	6.15	0.53	0.35	0.44	0.238				0.88	0.20	0.18	0.209	0.04	0.008	4%	
6	6.30	0.58	0.34	0.46	0.193				0.88	0.13	0.24	0.170	0.03	0.005	3%	
7	6.40	0.59	0.34	0.47	0.247				0.88	0.15	0.25	0.217	0.04	0.008	5%	
8	6.60	0.60	0.35	0.48	0.239				0.88	0.15	0.25	0.210	0.04	0.008	5%	
9	6.70	0.61	0.34	0.48	0.281				0.88	0.13	0.27	0.247	0.03	0.008	5%	
10	6.85	0.60	0.33	0.47	0.292				0.88	0.13	0.27	0.257	0.03	0.009	5%	
11	6.95	0.58	0.33	0.46	0.318				0.88	0.13	0.25	0.280	0.03	0.009	5%	
12	7.10	0.55	0.33	0.44	0.323				0.88	0.15	0.22	0.284	0.03	0.009	5%	
13	7.25	0.58	0.32	0.45	0.339				0.88	0.15	0.26	0.298	0.04	0.012	7%	
14	7.40	0.55	0.32	0.44	0.316				0.88	0.15	0.23	0.278	0.03	0.010	6%	
15	7.55	0.55	0.28	0.42	0.288				0.88	0.23	0.27	0.253	0.06	0.015	9%	
16	7.85	0.80	0.34	0.47	0.197				0.88	0.28	0.26	0.173	0.07	0.012	7%	
17	8.10	0.82	0.35	0.49	0.212				0.88	0.25	0.27	0.187	0.07	0.013	7%	
18	8.35	0.62	0.29	0.46	0.109				0.88	0.25	0.33	0.096	0.08	0.008	5%	
19	8.60	0.53	0.23	0.38	0.143				0.88	0.28	0.30	0.126	0.08	0.010	6%	
20	8.90	0.41	0.25	0.33	0.141				0.88	0.55	0.16	0.124	0.09	0.011	6%	
RB	9.70	0.00	0.00		0.00		0.00		0.88	0.40	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.171</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): \_\_\_\_\_

Meas. Start Time (MST): 15:47  
 Meas. End Time (MST): 16:08  
 Equipment: ADV  
 Method: Ice  
 River Condition: Full ice cover  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Light snow, -2°C



**Flow characteristics:**

Total Flow:	0.171	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.97	(m <sup>2</sup> )
Wetted Width:	4.85	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.732	0.730
Water (°C):	0.8	0.8
Datalogger Clock:	15:22	16:15
Laptop Clock:	15:22	16:15
Battery (Main):	12.6	13.2
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent. Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**General Notes:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S32-03	1.194	100.312		99.118	99.118	3/4" Pipe 10 m S of logger	S32-05
S32-05			1.507	98.805	98.807	3/4" Pipe 4 m S of logger	S32-06
S32-06			1.651	98.661	98.664	3/4" Pipe 7 m S of logger	S32-03
Ice/PT:			3.533	96.779			WL
Water Level:			3.510	96.802	Time WL Surveyed: 15:42		Ice
Other:					97.939	Bolt on bridge	Ice
<b>Setup #2</b>							WL
S32-03			1.179	99.118	99.118	3/4" Pipe 10 m S of logger	S32-03
S32-05	1.492	100.297		98.805	98.807	3/4" Pipe 4 m S of logger	S32-06
S32-06			1.635	98.662	98.664	3/4" Pipe 7 m S of logger	S32-05
Ice/PT:			3.519	96.778			
Water Level:			3.495	96.802	Time WL Surveyed: 15:44		
Other:					97.939	Bolt on bridge	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							(must close survey loop on survey starting point)
BM:	S32-05	1.492	100.297	98.805			
Water Level:			3.500	96.797	Time WL Surveyed: 16:04		
Water Level:			3.485	96.798	Time WL Surveyed: 16:08		
BM:	S32-05	1.478	100.283	98.805			

**WL Survey Summary**

	Before	After
Average WL:	96.802	96.798
Transducer Elevation:	96.070	96.068
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM,TR	Trip Date:	30-Nov-13
SM,TR	Date:	30-Nov-13
TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

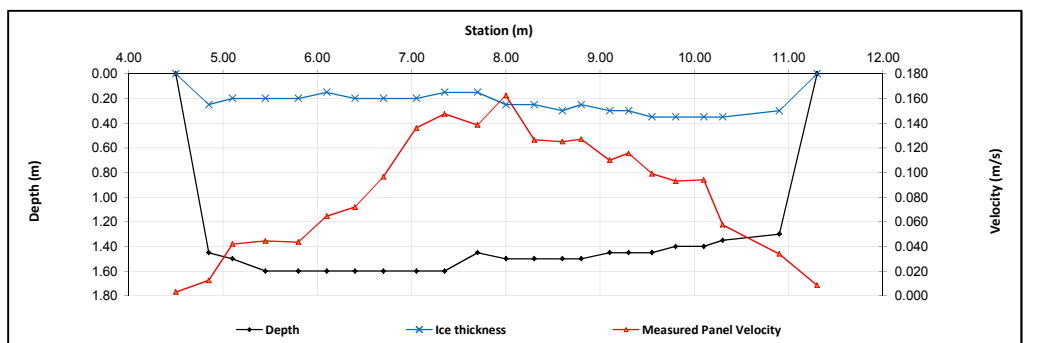
Site Visit Date:

January 14, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.50	0.00	0.00	0.000	0.000	0.000	1.0	4.50	4.68	0.18	0.30	0.003	0.003	0.05	0.000	0%
1	4.85	1.45	0.25	-0.004	0.029		1.0	4.68	4.98	0.30	1.20	0.013	0.013	0.36	0.005	1%
2	5.10	1.50	0.20	0.044	0.040		1.0	4.98	5.28	0.30	1.30	0.042	0.042	0.39	0.016	2%
3	5.45	1.60	0.20	0.048	0.041		1.0	5.28	5.63	0.35	1.40	0.045	0.045	0.49	0.022	3%
4	5.80	1.60	0.20	0.076	0.011		1.0	5.63	5.95	0.32	1.40	0.044	0.044	0.45	0.020	3%
5	6.10	1.60	0.15	0.097	0.032		1.0	5.95	6.25	0.30	1.45	0.065	0.065	0.44	0.028	4%
6	6.40	1.60	0.20	0.113	0.031		1.0	6.25	6.55	0.30	1.40	0.072	0.072	0.42	0.030	4%
7	6.70	1.60	0.20	0.119	0.074		1.0	6.55	6.88	0.32	1.40	0.097	0.097	0.45	0.044	6%
8	7.05	1.60	0.20	0.127	0.145		1.0	6.88	7.20	0.32	1.40	0.136	0.136	0.45	0.062	9%
9	7.35	1.60	0.15	0.141	0.154		1.0	7.20	7.53	0.33	1.45	0.148	0.148	0.47	0.070	10%
10	7.70	1.45	0.15	0.127	0.150		1.0	7.53	7.85	0.32	1.30	0.139	0.139	0.42	0.059	8%
11	8.00	1.50	0.25	0.167	0.158		1.0	7.85	8.15	0.30	1.25	0.163	0.163	0.38	0.061	8%
12	8.30	1.50	0.25	0.143	0.110		1.0	8.15	8.45	0.30	1.25	0.127	0.127	0.37	0.047	7%
13	8.60	1.50	0.30	0.153	0.097		1.0	8.45	8.70	0.25	1.20	0.125	0.125	0.30	0.038	5%
14	8.80	1.50	0.25	0.130	0.124		1.0	8.70	8.95	0.25	1.25	0.127	0.127	0.31	0.040	6%
15	9.10	1.45	0.30	0.108	0.112		1.0	8.95	9.20	0.25	1.15	0.110	0.110	0.29	0.032	4%
16	9.30	1.45	0.30	0.132	0.099		1.0	9.20	9.43	0.23	1.15	0.116	0.116	0.26	0.030	4%
17	9.55	1.45	0.35	0.094	0.104		1.0	9.43	9.68	0.25	1.10	0.099	0.099	0.28	0.027	4%
18	9.80	1.40	0.35	0.087	0.099		1.0	9.68	9.95	0.27	1.05	0.093	0.093	0.29	0.027	4%
19	10.10	1.40	0.35	0.089	0.099		1.0	9.95	10.20	0.25	1.05	0.094	0.094	0.26	0.025	3%
20	10.30	1.35	0.35	0.073	0.042		1.0	10.20	10.60	0.40	1.00	0.058	0.058	0.40	0.023	3%
21	10.90	1.30	0.30	0.048	0.020		1.0	10.60	11.10	0.50	1.00	0.034	0.034	0.50	0.017	2%
RB	11.30	0.00	0.00	0.00	0.00	0.00	1.0	11.10	11.30	0.20	0.25	0.009	0.009	0.05	0.000	0%
<b>Total Flow</b>														<b>0.721</b>		

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow, calm, -17°C



Flow characteristics:	
Total Flow:	0.721 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	8.09 (m <sup>2</sup> )
Wetted Width:	6.80 (m)
Hydraulic Depth:	1.190 (m)
Mean Velocity:	0.089 (m/s)
Froude Number:	0.026

Logger Details:	Before	After
Transducer Reading (m):	1.027	-
Water (°C):	0.3	-
Battery (Main):	12.8	-
Datalogger Clock:	9:51	-
Laptop Clock:	9:52	-
Enclosure Dessoricant:	Good	-
Logger# (if Δ):	6482	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S33-02	1.063	282.543		281.480	281.480	3/4" Pipe 8 m S of logger
S33-03			1.223	281.320	281.320	3/4" Pipe 8 m W of logger
S33-04			1.064	281.479	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.618	279.925		
Water Level:			2.703	279.840		
Other:						Rebar 15m W of logger
<b>Setup #2</b>						
S33-02			1.031	281.481	281.480	3/4" Pipe 8 m S of logger
S33-03	1.192	282.512		281.320	281.320	3/4" Pipe 8 m W of logger
S33-04			1.032	281.480	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.586	279.926		
Water Level:			2.673	279.839		
Other:						Rebar
Closing Error		-0.001				Average WL 279.840
WL Check		0.001				Transducer Elevation Before 278.8125
						Transducer Elevation After -

**Datalogger / Station Notes:**

**General Notes:**  
ADV TEST = Low SNR

Field Personnel:	DW, SM	Trip Date:	14-Jan-13
Data Entry Personnel:	DW	Date:	14-Jan-13
Data Check Personnel:	CJ	Date:	24-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: February 7, 2013



### Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.15	0.15	0.20	0.003	0.003	0.03	0.000	0%
1	4.30	1.10	0.30	0.008	0.018	0.000	1.0	4.15	4.50	0.35	0.80	0.013	0.013	0.28	0.004	1%
2	4.70	1.30	0.35	0.036	0.044	0.000	1.0	4.50	4.90	0.40	0.95	0.040	0.040	0.38	0.015	3%
3	5.10	1.35	0.35	0.026	0.060	0.000	1.0	4.90	5.25	0.35	1.00	0.043	0.043	0.35	0.015	3%
4	5.40	1.40	0.35	0.078	0.072	0.000	1.0	5.25	5.60	0.35	1.05	0.075	0.075	0.37	0.028	5%
5	5.80	1.40	0.35	0.074	0.086	0.000	1.0	5.60	5.95	0.35	1.05	0.080	0.080	0.37	0.029	5%
6	6.10	1.40	0.35	0.096	0.100	0.000	1.0	5.95	6.25	0.30	1.05	0.098	0.098	0.32	0.031	5%
7	6.40	1.45	0.35	0.113	0.120	0.000	1.0	6.25	6.55	0.30	1.10	0.117	0.117	0.33	0.038	7%
8	6.70	0.15	0.30	0.116	0.087	0.000	1.0	6.55	6.85	0.30	-0.16	0.102	0.102	-0.05	-0.005	-1%
9	7.00	1.40	0.30	0.129	0.114	0.000	1.0	6.85	7.15	0.30	1.10	0.122	0.122	0.33	0.040	7%
10	7.30	1.45	0.25	0.134	0.119	0.000	1.0	7.15	7.45	0.30	1.20	0.127	0.127	0.36	0.046	8%
11	7.60	1.40	0.20	0.150	0.148	0.000	1.0	7.45	7.75	0.30	1.20	0.149	0.149	0.36	0.054	9%
12	7.90	1.50	0.20	0.119	0.138	0.000	1.0	7.75	8.05	0.30	1.30	0.129	0.129	0.39	0.050	9%
13	8.20	1.50	0.25	0.117	0.133	0.000	1.0	8.05	8.40	0.35	1.25	0.125	0.125	0.44	0.055	9%
14	8.60	1.50	0.30	0.131	0.087	0.000	1.0	8.40	8.75	0.35	1.20	0.109	0.109	0.42	0.046	8%
15	8.90	1.55	0.25	0.121	0.093	0.000	1.0	8.75	9.08	0.32	1.30	0.107	0.107	0.42	0.045	8%
16	9.25	1.55	0.25	0.099	0.061	0.000	1.0	9.08	9.43	0.35	1.30	0.080	0.080	0.46	0.036	6%
17	9.60	1.55	0.25	0.082	0.065	0.000	1.0	9.43	9.80	0.38	1.30	0.074	0.074	0.49	0.036	6%
18	10.00	1.40	0.30	0.037	0.021	0.000	1.0	9.80	10.20	0.40	1.10	0.029	0.029	0.44	0.013	2%
19	10.40	1.30	0.35	0.006	-0.003	0.000	1.0	10.20	10.60	0.40	0.95	0.002	0.002	0.38	0.001	0%
20	10.80	1.20	0.75	-0.003	0.016	0.000	1.0	10.60	10.95	0.35	0.45	0.007	0.007	0.16	0.001	0%
LB	11.10	0.00	0.00	0.000	0.000	0.000	1.0	10.95	11.10	0.15	0.11	0.002	0.002	0.02	0.000	0%
<b>Total Flow</b>															<b>0.577</b>	

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	14:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, Calm, -10C

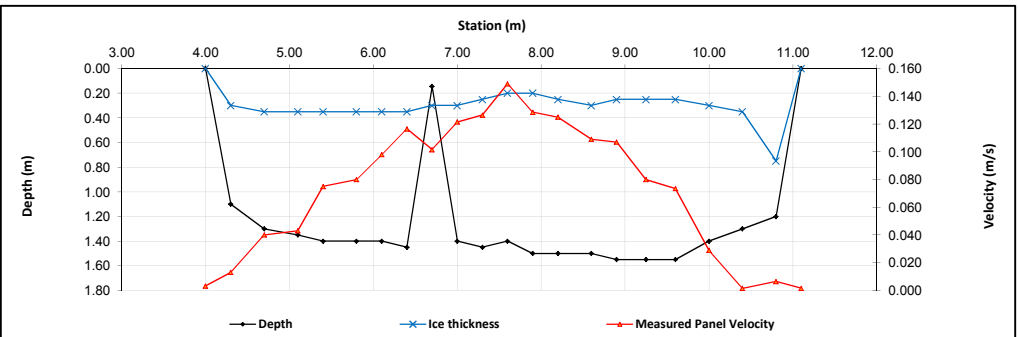
Flow Characteristics:	
Total Flow:	0.577 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	7.03 (m <sup>2</sup> )
Wetted Width:	7.10 (m)
Hydraulic Depth:	0.990 (m)
Mean Velocity:	0.082 (m/s)
Froude Number:	0.026

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.2	-
Battery (Main):	14.6	-
Datalogger Clock:	1:16	-
Laptop Clock:	1:16	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

**Datalogger / Station Notes:**

**General Notes:**

- Ice is thinner here than S5A
- Open water ~ 30 m DS
- BM2 has been run over and bent



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S33-02	1.343	282.663		281.320	281.320	3/4" Pipe 8 m W of logger
S33-03			1.182	281.481	281.480	3/4" Pipe 3 m W of logger
S33-04						
Ice/PT:			2.771	279.892		
Water Level:			2.852	279.811		
Other:						Rebar 15 m W of logger
<b>Setup #2</b>						
S33-02			1.335	281.318	281.320	3/4" Pipe 8 m W of logger
S33-03	1.172	282.653		281.481	281.480	3/4" Pipe 3 m W of logger
S33-04						
Ice/PT:			2.763	279.890		
Water Level:			2.843	279.810		
Other:						

Closing Error	0.002
WL Check	0.001

Average WL	279.811
Transducer Elevation Before	278.820
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	7-Feb-13
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	7-Feb-13
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	12-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

February 28, 2013



### Flow Measurement:

Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	4.60	0.00	0.00	0.000	0.000	0.000	0.9	4.60	4.75	0.15	0.06	0.007	0.006	0.01	0.000	0%
1	4.90	0.80	0.55	0.026			0.9	4.75	5.10	0.35	0.25	0.026	0.023	0.09	0.002	0%
2	5.30	1.10	0.15		0.048	0.008	1.0	5.10	5.43	0.33	0.95	0.027	0.027	0.31	0.008	1%
3	5.55	1.20	0.20		0.083	0.044	1.0	5.43	5.68	0.25	1.00	0.064	0.064	0.25	0.016	3%
4	5.80	1.35	0.24		0.079	0.016	1.0	5.68	5.93	0.25	1.11	0.048	0.048	0.28	0.013	2%
5	6.05	1.35	0.25		0.064	0.054	1.0	5.93	6.23	0.30	1.10	0.059	0.059	0.33	0.019	3%
6	6.40	1.40	0.30		0.105	0.066	1.0	6.23	6.55	0.33	1.10	0.086	0.086	0.36	0.031	5%
7	6.70	1.40	0.35		0.094	0.071	1.0	6.55	6.85	0.30	1.05	0.083	0.083	0.31	0.026	4%
8	7.00	1.50	0.33		0.106	0.117	1.0	6.85	7.15	0.30	1.17	0.112	0.112	0.35	0.039	7%
9	7.30	1.50	0.35		0.110	0.099	1.0	7.15	7.45	0.30	1.15	0.105	0.105	0.34	0.036	6%
10	7.60	1.50	0.25		0.125	0.097	1.0	7.45	7.75	0.30	1.25	0.111	0.111	0.38	0.042	7%
11	7.90	1.40	0.24		0.135	0.137	1.0	7.75	8.05	0.30	1.16	0.136	0.136	0.35	0.047	8%
12	8.20	1.45	0.17		0.128	0.150	1.0	8.05	8.40	0.35	1.28	0.139	0.139	0.45	0.062	10%
13	8.60	1.50	0.20		0.109	0.142	1.0	8.40	8.70	0.30	1.30	0.126	0.126	0.39	0.049	8%
14	8.80	1.50	0.25		0.123	0.134	1.0	8.70	8.90	0.20	1.25	0.129	0.129	0.25	0.032	5%
15	9.00	1.50	0.25		0.122	0.119	1.0	8.90	9.15	0.25	1.25	0.121	0.121	0.31	0.038	6%
16	9.30	1.50	0.30		0.118	0.081	1.0	9.15	9.45	0.30	1.20	0.100	0.100	0.36	0.036	6%
17	9.60	1.50	0.25		0.126	0.081	1.0	9.45	9.75	0.30	1.25	0.104	0.104	0.38	0.039	6%
18	9.90	1.50	0.25		0.084	0.073	1.0	9.75	10.05	0.30	1.25	0.079	0.079	0.38	0.029	5%
19	10.20	1.40	0.23		0.054	0.024	1.0	10.05	10.45	0.40	1.17	0.039	0.039	0.47	0.018	3%
20	10.70	1.20	0.25		0.041	0.017	1.0	10.45	10.95	0.50	0.95	0.029	0.029	0.48	0.014	2%
21	11.20	1.00	0.35	0.008			0.9	10.95	11.50	0.55	0.65	0.008	0.007	0.36	0.003	0%
LB	11.80	0.00	0.00	0.00	0.00	0.00	1.0	11.50	11.80	0.30	0.16	0.002	0.002	0.05	0.000	0%
<b>Total Flow</b>														<b>0.599</b>		

### Measurement Details:

Start Time (MST):	11:55
End Time (MST):	13:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, -4°C

### Flow Characteristics:

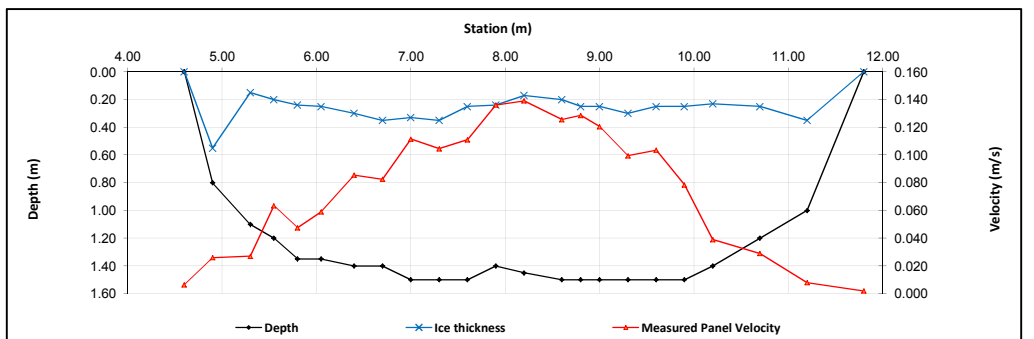
Total Flow:	0.599	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.21	(m²)
Wetted Width:	7.20	(m)
Hydraulic Depth:	1.002	(m)
Mean Velocity:	0.083	(m/s)
Froude Number:	0.026	

### Logger Details:

	Before	After
Transducer Reading (m):	0.965	-
Water (°C):	0.2	-
Battery (Main):	14.8	-
Datalogger Clock:	11:55	-
Laptop Clock:	11:56	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	6482	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

### Datalogger / Station Notes:

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
S33-03			1.434	281.318	281.320	3/4" Pipe 8 m W of logger
S33-04	1.272	282.752		281.480	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.919	279.833		
Water Level:			2.974	279.778		
Other:						Rebar 15 m W of logger
Setup #2						
S33-03	1.420	282.738		281.318	281.320	3/4" Pipe 8 m W of logger
S33-04			1.258	281.480	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.904	279.834		
Water Level:			2.963	279.775		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	279.777
Transducer Elevation Before	278.8115
Transducer Elevation After	-

Field Personnel:	DW, SM	Trip Date:	28-Feb-13
Data Entry Personnel:	DW	Date:	28-Feb-13
Data Check Personnel:	CJ	Date:	9-Apr-13
Entered Digitally in the Field:		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	



# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albian Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

April 2, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.70	0.00	0.00	0.000	0.000	0.000	1.0	3.70	3.85	0.15	0.26	0.003	0.003	0.04	0.000	0%
1	4.00	1.30	0.25	0.035	-0.009		1.0	3.85	4.18	0.33	1.05	0.013	0.013	0.34	0.004	1%
2	4.35	1.40	0.27	-0.049	0.027		1.0	4.18	4.53	0.35	1.13	-0.011	-0.011	0.40	-0.004	-1%
3	4.70	1.35	0.30	0.074	0.041		1.0	4.53	4.88	0.35	1.05	0.058	0.058	0.37	0.021	4%
4	5.05	1.40	0.35	0.074	0.074		1.0	4.88	5.23	0.35	1.05	0.074	0.074	0.37	0.027	5%
5	5.40	1.40	0.35	0.089	0.186		1.0	5.23	5.58	0.35	1.05	0.138	0.138	0.37	0.051	10%
6	5.75	1.50	0.35	0.107	0.104		1.0	5.58	5.90	0.33	1.15	0.106	0.106	0.37	0.039	8%
7	6.05	1.50	0.15	0.112	0.126		1.0	5.90	6.08	0.17	1.35	0.119	0.119	0.24	0.028	5%
8	6.10	1.50	0.30	0.153			1.0	6.08	6.30	0.23	1.20	0.077	0.077	0.27	0.021	4%
9	6.50	1.50	0.20	0.396	0.124		1.0	6.30	6.68	0.38	1.30	0.260	0.260	0.49	0.127	25%
10	6.85	1.50	0.15	0.118	0.114		1.0	6.68	7.03	0.35	1.35	0.116	0.116	0.47	0.055	11%
11	7.20	1.50	0.17	0.124	0.112		1.0	7.03	7.35	0.32	1.33	0.118	0.118	0.43	0.051	10%
12	7.50	1.50	0.25	0.107	0.104		1.0	7.35	7.68	0.33	1.25	0.106	0.106	0.41	0.043	8%
13	7.85	1.50	0.30	0.102	0.093		1.0	7.68	8.05	0.38	1.20	0.098	0.098	0.45	0.044	9%
14	8.25	1.50	0.25	0.070	0.080		1.0	8.05	8.43	0.38	1.25	0.075	0.075	0.47	0.035	7%
15	8.60	1.50	0.25	0.256	0.396		1.0	8.43	8.75	0.32	1.25	0.326	0.326	0.41	0.132	26%
16	8.90	1.50	0.25	0.013	-0.340		1.0	8.75	8.95	0.20	1.25	-0.164	-0.164	0.25	-0.041	-8%
17	9.00	1.50	0.25	0.022	0.023		1.0	8.95	9.13	0.18	1.25	0.023	0.023	0.22	0.005	1%
18	9.25	1.40	0.30	-0.450	-0.180		1.0	9.13	9.38	0.25	1.10	-0.315	-0.315	0.28	-0.087	-17%
19	9.50	1.20	0.35	0.093	-0.002		1.0	9.38	9.68	0.30	0.85	0.046	0.046	0.26	0.012	2%
20	9.85	1.05	0.40	-0.182			0.9	9.68	10.13	0.45	0.65	-0.182	-0.182	0.29	-0.048	-9%
LB	10.40	0.00	0.00	0.00	0.00	0.00	1.0	10.13	10.40	0.28	0.16	-0.046	-0.046	0.04	-0.002	0%
<b>Total Flow</b>															<b>0.513</b>	

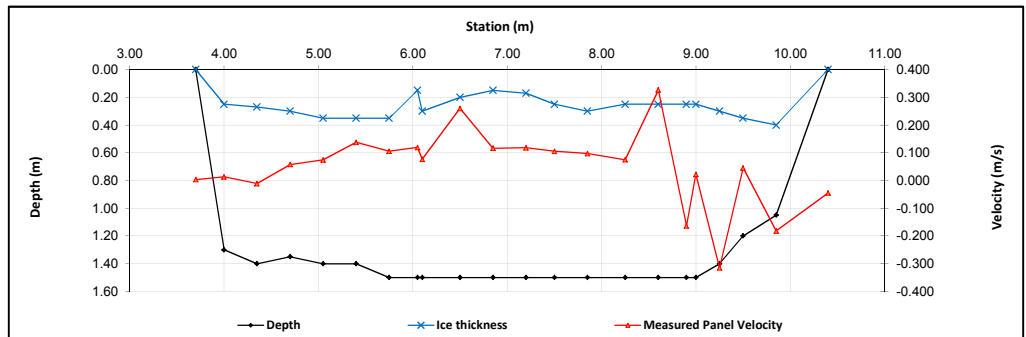
Measurement Details:	
Start Time (MST):	12:35
End Time (MST):	14:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Poor
Weather:	Clear, Windy, +7°C

Flow Characteristics:		
Total Flow:	0.513	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	7.22	(m <sup>2</sup> )
Wetted Width:	6.70	(m)
Hydraulic Depth:	1.077	(m)
Mean Velocity:	0.071	(m/s)
Froude Number:	0.022	

Logger Details:		
Transducer Reading (m):	0.994	-
Water (°C):	0.3	-
Battery (Main):	14.5	-
Datalogger Clock:	12:40	-
Laptop Clock:	12:42	-
Enclosure Dessicant:	Good	
Logger# (if Δ):	6482	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

General Notes:	
- Measurement 7 is slush affected	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S33-03			1.379	281.313	281.320	3/4" Pipe 8 m W of logger
S33-04	1.212	282.692		281.480	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.827	279.865		
Water Level:			2.881	279.811		
Other:						Rebar 15 m W of logger
<b>Setup #2</b>						
S33-03	1.364	282.677		281.313	281.320	3/4" Pipe 8 m W of logger
S33-04			1.197	281.480	281.480	3/4" Pipe 3 m W of logger
Ice/PT:			2.812	279.865		
Water Level:			2.866	279.811		
Other:						

Closing Error	0.000	Average WL	279.811
WL Check	0.000	Transducer Elevation Before	278.817
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	2-Apr-13
Data Entry Personnel:	SM, CJ	Date:	2-Apr-13
Data Check Personnel:	CJ	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: May 8, 2013  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
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20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
<b>No Flow Measurement Conducted</b>																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):  
 Adjacent to pressure transducer

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High flow, flooded banks
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

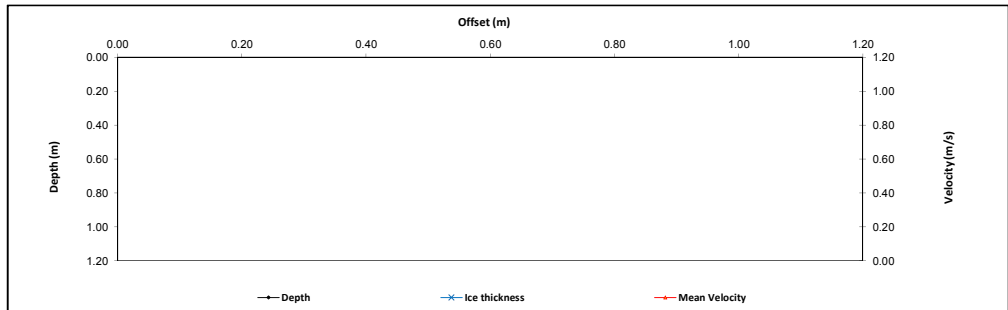
	Before	After
Transducer Reading (m):	2.513	-
Water (°C):	5.0	-
Datalogger Clock:	13:06	-
Laptop Clock:	13:07	-
Battery (Main):	13.1	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Good	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-

**General Notes:**

- No flow measurement conducted due to high water and flooding, see photos



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S33-04
S33-03			1.057	281.307	281.320	3/4" Pipe 8 m W of logger	S33-03
S33-04	0.884	282.364		281.480	281.480	3/4" Pipe 3 m W of logger	WL
Ice/PT:							WL
Water Level:			1.048	281.316	Time WL Surveyed:	1:14	S33-03
Other:						Rebar 15 m W of logger	S33-04
<b>Setup #2</b>							
S33-03	1.041	282.348		281.307	281.320	3/4" Pipe 8 m W of logger	
S33-04			0.866	281.482			
Ice/PT:							
Water Level:			1.031	281.317	Time WL Surveyed:	1:16	
Other:						Rebar 15 m W of logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							(must close survey loop on survey starting point)
Water Level:					Time WL Surveyed:		
Water Level:					Time WL Surveyed:		
BM:							

**WL Survey Summary**

	Before	After
Average WL:	281.317	-
Transducer Elevation:	279.804	-
Closing Error:	-0.002	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, DW	Trip Date:	8-May-13
<b>Data Entry Personnel:</b>	SM	Date:	8-May-13
<b>Data Check Personnel:</b>	CJ	Date:	21-May-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: May 8, 2013  
 Site Visit Time (MST): 13:00

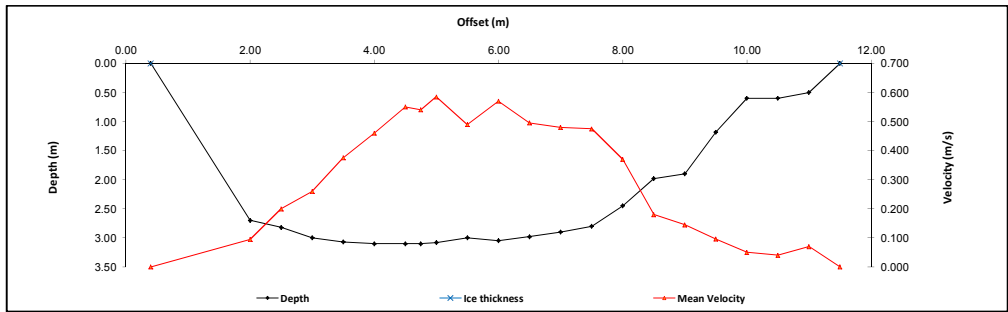


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.40	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	2.00	2.70				2.16	0.030	0.54	0.160	1.00	1.05	2.70	0.095	2.84	0.269	3%
2	2.50	2.82				2.26	0.160	0.56	0.240	1.00	0.50	2.82	0.200	1.41	0.282	3%
3	3.00	3.00				2.40	0.250	0.60	0.270	1.00	0.50	3.00	0.260	1.50	0.390	5%
4	3.50	3.07				2.46	0.360	0.61	0.390	1.00	0.50	3.07	0.375	1.54	0.576	7%
5	4.00	3.10				2.48	0.500	0.62	0.420	1.00	0.50	3.10	0.460	1.55	0.713	8%
6	4.50	3.10				2.48	0.570	0.62	0.530	1.00	0.38	3.10	0.550	1.16	0.639	7%
7	4.75	3.10				2.48	0.560	0.62	0.520	1.00	0.25	3.10	0.540	0.78	0.419	5%
8	5.00	3.08				2.46	0.610	0.62	0.560	1.00	0.38	3.08	0.585	1.16	0.676	8%
9	5.50	3.00				2.40	0.560	0.60	0.420	1.00	0.50	3.00	0.490	1.50	0.735	9%
10	6.00	3.05				2.44	0.590	0.61	0.550	1.00	0.50	3.05	0.570	1.53	0.869	10%
11	6.50	2.98				2.38	0.550	0.60	0.440	1.00	0.50	2.98	0.495	1.49	0.738	9%
12	7.00	2.90				2.32	0.480	0.58	0.480	1.00	0.50	2.90	0.480	1.45	0.696	8%
13	7.50	2.80				2.24	0.530	0.56	0.420	1.00	0.50	2.80	0.475	1.40	0.665	8%
14	8.00	2.45				1.96	0.440	0.49	0.300	1.00	0.50	2.45	0.370	1.23	0.453	5%
15	8.50	1.98				1.58	0.170	0.40	0.190	1.00	0.50	1.98	0.180	0.99	0.178	2%
16	9.00	1.90				1.52	0.110	0.38	0.180	1.00	0.50	1.90	0.145	0.95	0.138	2%
17	9.50	1.18				0.94	0.001	0.24	0.190	1.00	0.50	1.18	0.096	0.59	0.056	1%
18	10.00	0.60	0.36	0.050						1.00	0.50	0.60	0.050	0.30	0.015	0%
19	10.50	0.60	0.36	0.040						1.00	0.50	0.60	0.040	0.30	0.012	0%
20	11.00	0.50	0.30	0.070						1.00	0.50	0.50	0.070	0.25	0.018	0%
RB	11.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>8.54</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
At station

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	15:02
Equipment:	Marsh McBirney
Method:	Fishcat
River Condition:	Very flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, 27°C



**Flow characteristics:**

Total Flow:	8.54	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	23.89	(m <sup>2</sup> )
Wetted Width:	11.10	(m)
Hydraulic Depth:	2.15	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.88	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.507	2.504
Water (°C):	19.5	20.0
Datalogger Clock:	13:39	15:14
Laptop Clock:	13:40	15:15
Battery (Main):	14.0	14.0
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Site flooded, 0.5 m deep water at logger  
 - Water flowing from channel to flooded area.  
 - Installed 3/4" Pipe BM

**General Notes:**

- Site flooded, 0.5 m deep water at logger  
 - Water flowing from channel to flooded area.  
 - Installed 3/4" Pipe BM

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S33-03			1.083	281.308	281.320	3/4" Pipe 8 m W of logger	S33-04
S33-04	0.911	282.391		281.480	281.480	3/4" Pipe 3 m W of logger	S33-05
S33-05			0.930	281.461		New 3/4" Pipe	WL
Ice/PT:							WL
Water Level:			1.087	281.304		Time WL Surveyed: 14:13	S33-03
Other:						Rebar 15 m W of logger	S33-05
<b>Setup #2</b>							S33-04
S33-03	1.068	282.376		281.308	281.320	3/4" Pipe 8 m W of logger	
S33-04			0.896	281.480	281.480	3/4" Pipe 3 m W of logger	
S33-05			0.915	281.461		New 3/4" Pipe	
Ice/PT:							
Water Level:			1.072	281.304		Time WL Surveyed: 14:15	
Other:						Rebar 15 m W of logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S33-04	0.896	282.357	281.461		Time WL Surveyed: 15:09	
Water Level:			1.073	281.284		Time WL Surveyed: 15:10	
Water Level:			1.060	281.283			
BM:	S33-04	0.882	282.343	281.461			

**WL Survey Summary**

	Before	After
Average WL:	281.304	281.284
Transducer Elevation:	278.797	278.780
Closing Error:	0.000	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	8.54
Expected Discharge:	11.19
Shift from Existing Rating (m <sup>3</sup> /s):	2.65
Shift from Existing Rating (%):	31%

**Field Personnel:**

SM, TR	Trip Date:	20-Jun-13
SM	Date:	20-Jun-13
CJ	Date:	21-Jun-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: August 16, 2013  
 Site Visit Time (MST): 12:15

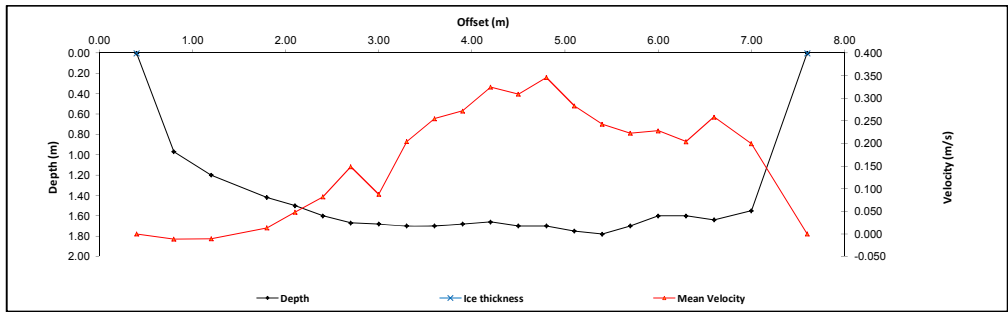


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	0.80	0.97			0.78	-0.008	0.19	-0.015	1.00	0.40	0.97	-0.012	0.39	-0.004	0%	
2	1.20	1.20			0.96	-0.001	0.24	-0.020	1.00	0.50	1.20	-0.011	0.60	-0.006	0%	
3	1.80	1.42			1.14	-0.014	0.28	0.041	1.00	0.45	1.42	0.014	0.64	0.009	0%	
4	2.10	1.50			1.20	0.023	0.30	0.073	1.00	0.30	1.50	0.048	0.45	0.022	1%	
5	2.40	1.60			1.28	0.040	0.32	0.124	1.00	0.30	1.60	0.082	0.48	0.039	2%	
6	2.70	1.67			1.34	0.104	0.33	0.193	1.00	0.30	1.67	0.149	0.50	0.074	4%	
7	3.00	1.68			1.34	0.155	0.34	0.200	1.00	0.30	1.68	0.088	0.50	0.044	2%	
8	3.30	1.70			1.36	0.196	0.34	0.213	1.00	0.30	1.70	0.205	0.51	0.104	5%	
9	3.60	1.70			1.36	0.255	0.34	0.255	1.00	0.30	1.70	0.255	0.51	0.130	7%	
10	3.90	1.68			1.34	0.240	0.34	0.304	1.00	0.30	1.68	0.272	0.50	0.137	7%	
11	4.20	1.66			1.33	0.297	0.33	0.352	1.00	0.30	1.66	0.325	0.50	0.162	8%	
12	4.50	1.70			1.36	0.274	0.34	0.344	1.00	0.30	1.70	0.309	0.51	0.158	8%	
13	4.80	1.70			1.36	0.315	0.34	0.377	1.00	0.30	1.70	0.346	0.51	0.176	9%	
14	5.10	1.75			1.40	0.262	0.35	0.304	1.00	0.30	1.75	0.283	0.53	0.149	8%	
15	5.40	1.78			1.42	0.210	0.36	0.275	1.00	0.30	1.78	0.243	0.53	0.129	7%	
16	5.70	1.70			1.36	0.224	0.34	0.222	1.00	0.30	1.70	0.223	0.51	0.114	6%	
17	6.00	1.80			1.28	0.220	0.32	0.236	1.00	0.30	1.60	0.228	0.48	0.109	6%	
18	6.30	1.80			1.28	0.188	0.32	0.220	1.00	0.30	1.60	0.204	0.48	0.098	5%	
19	6.60	1.64			1.31	0.235	0.33	0.282	1.00	0.35	1.64	0.259	0.57	0.148	8%	
20	7.00	1.55			1.24	0.141	0.31	0.258	1.00	0.50	1.55	0.200	0.78	0.155	8%	
LB	7.60	0.00	0.00		0.00		0.00	0.00	1.00	0.30	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.95</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Fishcat
River Condition:	Low-moderate flow
Channel Edges:	Straight Edge (e.g. bridge/piers)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 24°C



**Flow characteristics:**

Total Flow:	1.95	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.48	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	1.46	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.214	1.214
Water (°C):	19.8	19.9
Datalogger Clock:	12:18	13:40
Laptop Clock:	12:19	13:41
Battery (Main):	13.9	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S33-03			1.107	281.318	281.308	3/4" Pipe 8 m S of logger	S33-04
S33-04	0.945	282.425		281.480	281.480	3/4" Pipe 3 m W of logger	S33-05
S33-05			0.956	281.469	281.461	3/4" Pipe (new)	WL
Ice/PT:							WL
Water Level:			2.399	280.026	Time WL Surveyed: 12:33		S33-03
Other:					281.740	Rebar 15 m W of logger	S33-05
<b>Setup #2</b>							S33-04
S33-03	1.095	282.413		281.318	281.308	3/4" Pipe 8 m S of logger	
S33-04			0.934	281.479	281.480	3/4" Pipe 3 m W of logger	
S33-05			0.945	281.468	281.461	3/4" Pipe (new)	
Ice/PT:							
Water Level:			2.386	280.027	Time WL Surveyed: 12:35		(must close survey loop on survey starting point)
Other:					281.740	Rebar 15 m W of logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S33-04	0.933	282.413	281.480	Time WL Surveyed: 13:47		
Water Level:			2.385	280.028	Time WL Surveyed: 13:49		
Water Level:			2.375	280.028			
BM:	S33-04	0.923	282.403	281.480			

**WL Survey Summary**

	Before	After
Average WL:	280.027	280.028
Transducer Elevation:	278.813	278.814
Closing Error:	0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	1.95
Expected Discharge:	1.54
Shift from Existing Rating (m <sup>3</sup> /s):	-0.41
Shift from Existing Rating (%):	-21%

**Field Personnel:**

SM, DW	Trip Date:	16-Aug-13
DW, SM	Date:	16-Aug-13
CJ	Date:	19-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: September 18, 2013  
 Site Visit Time (MST): 12:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.60	0.74		0.44	-0.026		0.73	-0.005	0.18	1.00	0.50	0.74	-0.026	0.37	-0.010	-1%
2	3.00	0.91				0.88	-0.005	0.22	-0.005	1.00	0.40	0.91	-0.012	0.36	-0.004	-1%
3	3.40	1.10				0.96	-0.016	0.24	0.018	1.00	0.35	1.10	-0.005	0.44	-0.002	0%
4	3.80	1.20				1.06	0.001	0.26	0.040	1.00	0.30	1.20	0.001	0.42	0.000	0%
5	4.10	1.32				1.18	0.023	0.29	0.052	1.00	0.30	1.32	0.021	0.40	0.008	1%
6	4.40	1.47				1.15	0.044	0.29	0.069	1.00	0.30	1.47	0.038	0.44	0.017	2%
7	4.70	1.44				1.14	0.082	0.28	0.101	1.00	0.30	1.44	0.057	0.43	0.024	4%
8	5.00	1.42				1.18	0.107	0.29	0.106	1.00	0.30	1.42	0.092	0.43	0.039	6%
9	5.30	1.47				1.19	0.105	0.30	0.104	1.00	0.30	1.47	0.107	0.44	0.047	7%
10	5.60	1.49				1.20	0.124	0.30	0.122	1.00	0.30	1.49	0.105	0.45	0.047	7%
11	5.90	1.50				1.12	0.144	0.28	0.132	1.00	0.30	1.50	0.123	0.45	0.055	8%
12	6.20	1.40				1.17	0.120	0.29	0.161	1.00	0.30	1.40	0.138	0.42	0.058	9%
13	6.50	1.46				1.22	0.101	0.30	0.162	1.00	0.30	1.46	0.141	0.44	0.062	9%
14	6.80	1.52				1.21	0.103	0.30	0.151	1.00	0.30	1.52	0.132	0.46	0.060	9%
15	7.10	1.51				1.20	0.084	0.30	0.112	1.00	0.30	1.51	0.127	0.45	0.058	9%
16	7.40	1.50				1.18	0.056	0.30	0.102	1.00	0.35	1.50	0.098	0.45	0.044	7%
17	7.70	1.48				1.14	0.072	0.28	0.076	1.00	0.40	1.48	0.079	0.52	0.041	6%
18	8.10	1.42				1.12	0.078	0.28	0.088	1.00	0.50	1.42	0.074	0.57	0.042	6%
19	8.50	1.40				0.93	0.013	0.23	0.060	1.00	0.50	1.40	0.083	0.70	0.058	9%
20	9.10	1.16								1.00	0.20	1.16	0.037	0.58	0.021	3%
RB	9.50	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.665</b>	<b>100%</b>	

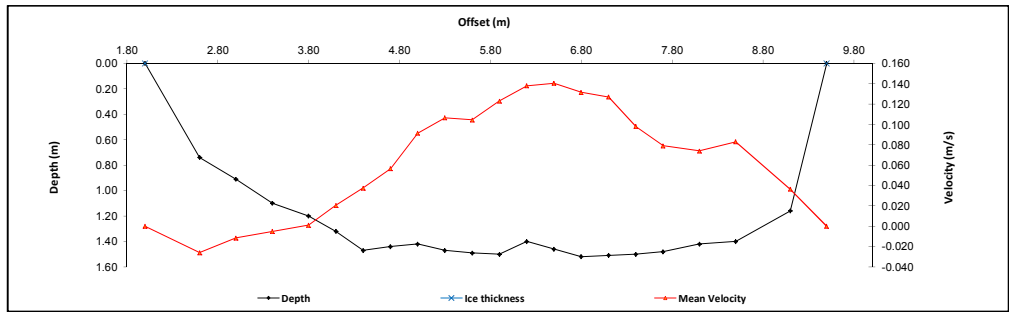
**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:07
Meas. End Time (MST):	14:04
Equipment:	ADV
Method:	Fishcat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 10°C

**Flow characteristics:**

Total Flow:	0.665	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.21	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	1.23	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.02	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.984	0.987
Water (°C):	12.8	12.8
Datalogger Clock:	12:39	14:21
Laptop Clock:	12:40	14:22
Battery (Main):	13.5	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S33-03			1.076	281.310	281.308	3/4" Pipe 8 m W of logger	S33-04
S33-04	0.906	282.386		281.480	281.480	3/4" Pipe 8 m S of logger	S33-05
S33-05			0.915	281.471	281.461	3/4" Pipe 12 m SW of logger	WL
Ice/PT:							WL
Water Level:		2.590		279.796	Time WL Surveyed:	12:50	S33-05
Other:					281.740	(BM1) Rebar 15 m W of logger	S33-03
Setup #2							S33-04
S33-03			1.052	281.318	281.308	3/4" Pipe 8 m W of logger	
S33-04			0.891	281.479	281.480	3/4" Pipe 8 m S of logger	
S33-05	0.899	282.370		281.471	281.461	3/4" Pipe 12 m SW of logger	
Ice/PT:							
Water Level:		2.572		279.798	Time WL Surveyed:	12:52	(must close survey loop on survey starting point)
Other:					281.740	(BM1) Rebar 15 m W of logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S33-04	0.891	282.371	281.480	Time WL Surveyed:	14:18	
Water Level:			2.569	279.802	Time WL Surveyed:	14:20	
Water Level:			2.552	279.802	Time WL Surveyed:		
BM:	S33-04	0.874	282.354	281.480			

**WL Survey Summary**

	Before	After
Average WL:	279.797	279.802
Transducer Elevation:	278.813	278.815
Closing Error:	0.001	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	0.665
Expected Discharge:	0.70
Shift from Existing Rating (m <sup>3</sup> /s):	0.03
Shift from Existing Rating (%):	5%

**Field Personnel:**

SM, CJ	Trip Date:	18-Sep-13
SM	Date:	18-Sep-13
DW	Date:	24-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albanian Boundary  
 UTM Location: 474876 E, 6350204 N

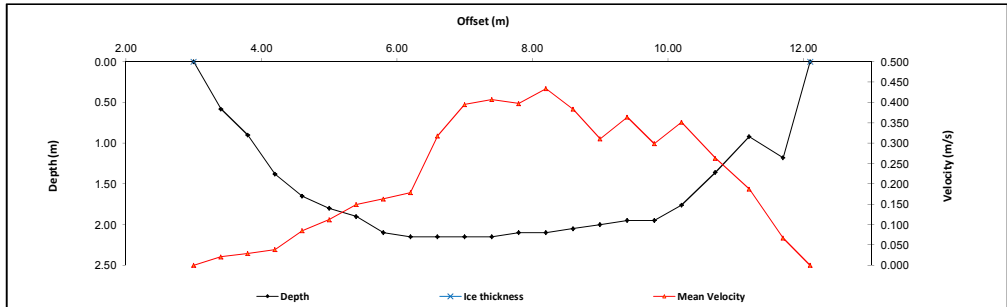
Site Visit Date: October 25, 2013  
 Site Visit Time (MST): 10:30



Flow Measurement:											Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)						
RB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000							
1	3.40	0.58		0.35	0.021					1.00	0.40	0.58	0.021	0.23	0.005	0%						
2	3.80	0.90				0.72	-0.020	0.18	0.078	1.00	0.40	0.90	0.029	0.36	0.010	0%						
3	4.20	1.38				1.10	-0.043	0.28	0.120	1.00	0.40	1.38	0.039	0.55	0.021	1%						
4	4.60	1.65				1.32	-0.007	0.33	0.177	1.00	0.40	1.65	0.085	0.66	0.056	1%						
5	5.00	1.80				1.44	0.001	0.36	0.223	1.00	0.40	1.80	0.112	0.72	0.081	2%						
6	5.40	1.90				1.52	0.005	0.38	0.294	1.00	0.40	1.90	0.150	0.76	0.114	3%						
7	5.80	2.10				1.68	0.017	0.42	0.309	1.00	0.40	2.10	0.163	0.84	0.137	4%						
8	6.20	2.15				1.72	0.004	0.43	0.353	1.00	0.40	2.15	0.179	0.86	0.154	4%						
9	6.60	2.15				1.72	0.251	0.43	0.384	1.00	0.40	2.15	0.318	0.86	0.273	7%						
10	7.00	2.15				1.72	0.366	0.43	0.424	1.00	0.40	2.15	0.395	0.86	0.340	9%						
11	7.40	2.15				1.72	0.353	0.43	0.461	1.00	0.40	2.15	0.407	0.86	0.350	9%						
12	7.80	2.10				1.68	0.349	0.42	0.446	1.00	0.40	2.10	0.398	0.84	0.334	9%						
13	8.20	2.10				1.68	0.390	0.42	0.478	1.00	0.40	2.10	0.434	0.84	0.365	9%						
14	8.60	2.05				1.64	0.320	0.41	0.447	1.00	0.40	2.05	0.384	0.82	0.314	8%						
15	9.00	2.00				1.60	0.260	0.40	0.361	1.00	0.40	2.00	0.311	0.80	0.248	6%						
16	9.40	1.95				1.56	0.356	0.39	0.372	1.00	0.40	1.95	0.364	0.78	0.284	7%						
17	9.80	1.95				1.56	0.276	0.39	0.321	1.00	0.40	1.95	0.299	0.78	0.233	6%						
18	10.20	1.76				1.41	0.366	0.35	0.337	1.00	0.45	1.76	0.352	0.79	0.278	7%						
19	10.70	1.36				1.09	0.344	0.27	0.182	1.00	0.50	1.36	0.263	0.68	0.179	5%						
20	11.20	0.92				0.74	0.252	0.18	0.123	1.00	0.50	0.92	0.188	0.46	0.086	2%						
21	11.70	1.18				0.94	0.083	0.24	0.051	1.00	0.45	1.18	0.067	0.53	0.036	1%						
LB	12.10	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000							
<b>Total Flow</b>														<b>3.90</b>	<b>100%</b>							

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 Adjacent to station

Meas. Start Time (MST):	11:20
Meas. End Time (MST):	12:14
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloudy, 5°C



**Flow characteristics:**

Total Flow:	3.90	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	14.89	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	1.64	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.605	1.607
Water (°C):	3.8	3.9
Datalogger Clock:	10:36	12:15
Laptop Clock:	10:34	12:14
Battery (Main):	13.4	13.4
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Ddessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 - Solar controller was heavily corroded  
 - Battery and solar controller replaced

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S33-03			1.017	281.312	281.308	3/4" Pipe 3 m W of logger	S33-04
S33-04	0.849	282.329		281.480	281.480	3/4" Pipe 8 m S of logger	S33-03
S33-05			0.865	281.464	281.461	3/4" Pipe (new)	S33-05
Ice/PT:							WL
Water Level:			1.919	280.410	Time WL Surveyed:	11:13	S33-05
Other:					281.740	(BM1) Rebar 15 m W of logger	S33-03
							S33-04
<b>Setup #2</b>							
S33-03			1.006	281.311	281.308	3/4" Pipe 3 m W of logger	
S33-04			0.838	281.479	281.480	3/4" Pipe 8 m S of logger	
S33-05	0.853	282.317		281.464	281.461	3/4" Pipe (new)	
Ice/PT:							
Water Level:			1.907	280.410	Time WL Surveyed:	11:14	
Other:					281.740	(BM1) Rebar 15 m W of logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S33-04	0.838	282.318		281.480		
Water Level:			1.909	280.409	Time WL Surveyed:	12:23	
Water Level:			1.897	280.410	Time WL Surveyed:	12:24	
BM:	S33-04	0.827	282.307		281.480		

**WL Survey Summary**

	Before	After
Average WL:	280.410	280.410
Transducer Elevation:	278.805	278.803
Closing Error:	0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	3.9
Expected Discharge:	3.59
Shift from Existing Rating (m <sup>3</sup> /s):	-0.31
Shift from Existing Rating (%):	-8%

**Field Personnel:**

SM, DW	Trip Date:	25-Oct-13
DW	Date:	25-Oct-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START

END

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: December 12, 2013  
 Site Visit Time (MST): 12:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	0.80	1.12	0.10		0.92	-0.008	0.30	-0.009	1.00	0.55	1.02	-0.009	0.56	-0.005	-1%	
2	1.10	1.25	0.15		1.03	0.37	0.10	0.023	0.88	0.35	1.10	0.023	0.39	0.009	1%	
3	1.50	1.30	0.20		1.08	0.098	0.42	0.016	1.00	0.35	1.10	0.057	0.39	0.022	4%	
4	1.80	1.35	0.23		1.13	0.115	0.45	0.040	1.00	0.30	1.12	0.078	0.34	0.026	4%	
5	2.10	1.40	0.25		1.17	0.099	0.48	0.069	1.00	0.35	1.15	0.084	0.40	0.034	5%	
6	2.50	1.45	0.24		1.21	0.074	0.48	0.130	1.00	0.40	1.21	0.102	0.48	0.049	8%	
7	2.90	1.50	0.25		1.25	0.097	0.50	0.133	1.00	0.35	1.25	0.115	0.44	0.050	8%	
8	3.20	1.45	0.25		1.21	0.109	0.49	0.130	1.00	0.35	1.20	0.120	0.42	0.050	8%	
9	3.60	1.45	0.25		1.21	0.120	0.49	0.133	1.00	0.38	1.20	0.127	0.45	0.057	9%	
10	3.95	1.47	0.25		1.23	0.139	0.49	0.137	1.00	0.40	1.22	0.138	0.49	0.067	11%	
11	4.40	1.50	0.25		1.25	0.132	0.50	0.144	1.00	0.38	1.25	0.138	0.47	0.065	10%	
12	4.70	1.50	0.25		1.25	0.090	0.50	0.127	1.00	0.25	1.25	0.109	0.31	0.034	5%	
13	4.90	1.45	0.25		1.21	0.076	0.49	0.107	1.00	0.25	1.20	0.092	0.30	0.027	4%	
14	5.20	1.50	0.25		1.25	0.090	0.50	0.099	1.00	0.30	1.25	0.095	0.37	0.035	6%	
15	5.50	1.45	0.25		1.21	0.050	0.49	0.094	1.00	0.30	1.20	0.072	0.36	0.026	4%	
16	5.90	1.45	0.25		1.21	0.070	0.49	0.092	1.00	0.30	1.20	0.066	0.36	0.024	4%	
17	6.10	1.30	0.22		1.08	0.069	0.44	0.051	1.00	0.35	1.08	0.060	0.38	0.023	4%	
18	6.50	1.25	0.20		1.04	0.067	0.41	0.047	1.00	0.30	1.05	0.057	0.32	0.018	3%	
19	6.70	1.15	0.20		0.96	-0.008	0.39	0.033	1.00	0.35	0.95	0.013	0.33	0.004	1%	
20	7.20	1.00	0.20		0.84	0.003	0.36	0.013	1.00	0.65	0.80	0.008	0.52	0.004	1%	
LB	8.00	0.00	0.00		0.00	0.00	0.00	0.00	0.88	0.40	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.620</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 3 m DS of station

Meas. Start Time (MST):	13:13
Meas. End Time (MST):	13:58
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -20°C

**Flow characteristics:**

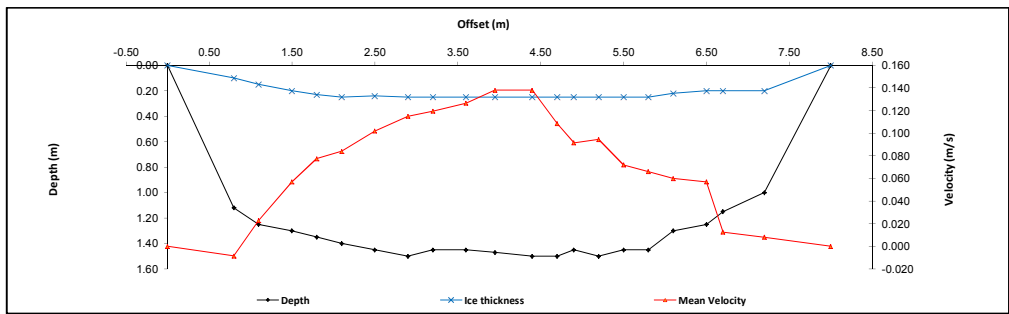
Total Flow:	0.620	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.07	(m <sup>2</sup> )
Wetted Width:	8.00	(m)
Hydraulic Depth:	1.01	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.953	0.963
Water (°C):	0.3	0.3
Datalogger Clock:	12:41	14:08
Laptop Clock:	12:42	14:09
Battery (Main):	12.7	12.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
Bench Mark 3:			1.124	281.321	281.308	3/4" Pipe 3 m W of logger	S33-04
Bench Mark 4:	0.965	282.445		281.480	281.480	3/4" Pipe 8 m S of logger	S33-03
Bench Mark 5:			0.973	281.472	281.461	3/4" Pipe 12 m SW of logger	S33-05
Ice/PT:			2.664	279.781			Ice
Water Level:			2.702	279.743			WL
Other:						Time WL Surveyed: 12:55	WL
<b>Setup #2</b>							
Bench Mark 3:			1.141	281.322	281.308	3/4" Pipe 3 m W of logger	Ice
Bench Mark 4:			0.983	281.480	281.480	3/4" Pipe 8 m S of logger	S33-05
Bench Mark 5:	0.991	282.463		281.472	281.461	3/4" Pipe 12 m SW of logger	S33-03
Ice/PT:			2.683	279.780			S33-04
Water Level:			2.722	279.741			
Other:						Time WL Surveyed: 12:57	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S33-04	0.965	282.445	281.480			
Water Level:			2.700	279.745		Time WL Surveyed: 14:03	
Water Level:			2.679	279.746		Time WL Surveyed: 14:05	
BM:	S33-04	0.945	282.425	281.480			

**WL Survey Summary**

	Before	After
Average WL:	279.742	279.746
Transducer Elevation:	278.789	278.783
Closing Error:	0.000	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, CJ	Trip Date:	12-Dec-13
SM	Date:	12-Dec-13
DW	Date:	28-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake

UTM Location: 440712 E, 6361615 N

Site Visit Date:

January 17, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	3.80	0.00	0.00	0.000	0.000	0.000	0.9	3.80	3.85	0.05	0.02	0.074	0.066	0.00	0.000	0%
1	3.90	0.21	0.14	0.294			0.9	3.85	4.00	0.15	0.07	0.294	0.265	0.01	0.003	2%
2	4.10	0.21	0.15	0.193			0.9	4.00	4.18	0.18	0.06	0.193	0.174	0.01	0.002	2%
3	4.25	0.22	0.15	0.127			0.9	4.18	4.30	0.13	0.07	0.127	0.114	0.01	0.001	1%
4	4.35	0.25	0.15	0.010			0.9	4.30	4.40	0.10	0.10	0.010	0.009	0.01	0.000	0%
5	4.45	0.26	0.19	0.007			0.9	4.40	4.50	0.10	0.07	0.007	0.006	0.01	0.000	0%
6	4.55	0.29	0.19	0.052			0.9	4.50	4.60	0.10	0.10	0.052	0.047	0.01	0.000	0%
7	4.65	0.30	0.20	0.542			0.9	4.60	4.70	0.10	0.10	0.542	0.488	0.01	0.005	4%
8	4.75	0.30	0.20	0.495			0.9	4.70	4.83	0.13	0.10	0.495	0.446	0.01	0.006	5%
9	4.90	0.29	0.19	0.789			0.9	4.83	4.95	0.13	0.10	0.789	0.710	0.01	0.009	8%
10	5.00	0.28	0.20	0.941			0.9	4.95	5.05	0.10	0.08	0.941	0.847	0.01	0.007	6%
11	5.10	0.31	0.23	0.256			0.9	5.05	5.18	0.13	0.08	0.256	0.230	0.01	0.002	2%
12	5.25	0.30	0.22	0.262			0.9	5.18	5.30	0.13	0.08	0.262	0.236	0.01	0.002	2%
13	5.35	0.30	0.24	0.503			0.9	5.30	5.43	0.13	0.06	0.503	0.453	0.01	0.003	3%
14	5.50	0.30	0.20	0.853			0.9	5.43	5.63	0.20	0.10	0.853	0.768	0.02	0.015	14%
15	5.75	0.30	0.17	0.449			0.9	5.63	5.88	0.25	0.13	0.449	0.404	0.03	0.013	12%
16	6.00	0.32	0.22	0.329			0.9	5.88	6.15	0.28	0.10	0.329	0.296	0.03	0.008	7%
17	6.30	0.30	0.21	0.582			0.9	6.15	6.40	0.25	0.09	0.582	0.524	0.02	0.012	11%
18	6.50	0.30	0.21	0.452			0.9	6.40	6.80	0.40	0.09	0.452	0.407	0.04	0.015	13%
19	7.10	0.30	0.24	0.476			0.9	6.80	7.20	0.40	0.06	0.476	0.428	0.02	0.010	9%
20	7.30	0.30	0.24	-0.068			0.9	7.20	7.45	0.25	0.06	-0.068	-0.061	0.02	-0.001	-1%
21	7.60	0.30	0.24	-0.082			0.9	7.45	7.65	0.20	0.06	-0.082	-0.074	0.01	-0.001	-1%
LB	7.70	0.00	0.00	0.00	0.00	0.00	1.0	7.65	7.70	0.05	0.02	-0.021	-0.021	0.00	0.000	0%
<b>Total Flow</b>														<b>0.112</b>		

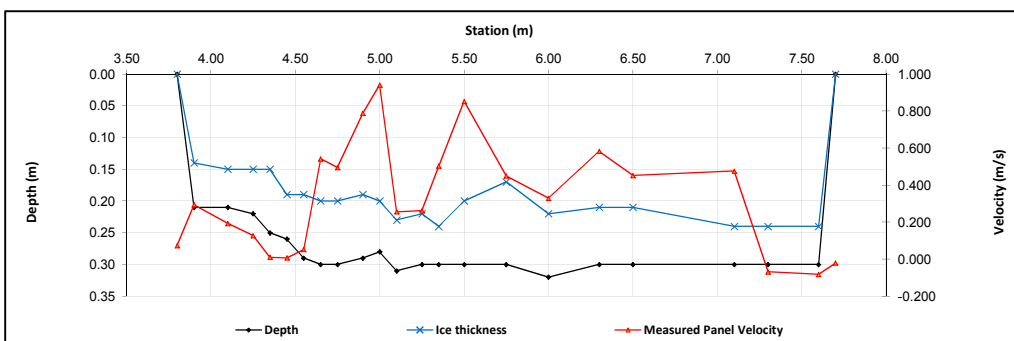
Measurement Details:	
Start Time (MST):	13:10
End Time (MST):	14:40
Equipment:	ADV
Method:	Ice
River Condition:	Full Ice Cover
Quality/Error (see reverse):	Fair
Weather:	Overcast, -18°C

Flow characteristics:	
Total Flow:	0.112 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.32 (m <sup>2</sup> )
Wetted Width:	3.90 (m)
Hydraulic Depth:	0.082 (m)
Mean Velocity:	0.352 (m/s)
Froude Number:	0.393

Logger Details:		
	Before	After
Transducer Reading (m):	0.333	-
Water (°C):	0.0	-
Battery (Main):	12.6	13.7
Datalogger Clock:	13:20	-
Laptop Clock:	13:18	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	
-	Battery was replaced

General Notes:	
-	From 6.5 m to 7.5 m there was lots of slush
-	1 m of channel is frozen to depth on the LB



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S34-03			1.156	98.467	98.460	2m South of Station
S34-04	0.983	99.623		98.640	98.640	2m East of Station
S34-05			1.413	98.210	98.210	8m South of Station
Ice/PT:			2.362	97.261		
Water Level:			2.476	97.147		
Other:						
<b>Setup #2</b>						
S34-03			1.139	98.468	98.460	2m South of Station
S34-04			0.966	98.641	98.640	2m East of Station
S34-05	1.397	99.607		98.210	98.210	8m South of Station
Ice/PT:			2.352	97.255		
Water Level:			2.458	97.149		
Other:						

Closing Error	-0.001
WL Check	0.002

Average WL	97.148
Transducer Elevation Before	98.815
Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	17-Jan-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	17-Jan-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	24-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake

UTM Location: 440712 E, 6361615 N

Site Visit Date:

February 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.90	0.00	0.00	0.000	0.000	0.000	0.9	0.90	1.00	0.10	0.03	0.001	0.000	0.00	0.000	0%
1	1.10	0.35	0.25	0.002			0.9	1.00	1.15	0.15	0.10	0.002	0.002	0.02	0.000	0%
2	1.20	0.35	0.25	0.000			1.0	1.15	1.25	0.10	0.10	0.000	0.000	0.01	0.000	0%
3	1.30	0.20	0.12	0.210			0.9	1.25	1.38	0.13	0.08	0.210	0.189	0.01	0.002	3%
4	1.45	0.20	0.12	0.000			1.0	1.38	1.53	0.15	0.08	0.000	0.000	0.01	0.000	0%
5	1.60	0.40	0.30	0.000			1.0	1.53	1.65	0.13	0.10	0.000	0.000	0.01	0.000	0%
6	1.70	0.43	0.32	0.391			0.9	1.65	1.83	0.18	0.11	0.391	0.352	0.02	0.007	11%
7	1.95	0.50	0.35	-0.082			0.9	1.83	2.03	0.20	0.15	-0.082	-0.074	0.03	-0.002	-4%
8	2.10	0.55	0.35	0.332			0.9	2.03	2.18	0.15	0.20	0.332	0.299	0.03	0.009	15%
9	2.25	0.58	0.35	0.333			0.9	2.18	2.33	0.15	0.23	0.333	0.300	0.03	0.010	17%
10	2.40	0.60	0.37	0.297			0.9	2.33	2.48	0.15	0.23	0.297	0.267	0.03	0.009	15%
11	2.55	0.55	0.37	0.286			0.9	2.48	2.63	0.15	0.18	0.286	0.257	0.03	0.007	12%
12	2.70	0.60	0.37	0.281			0.9	2.63	2.80	0.18	0.23	0.281	0.253	0.04	0.010	17%
13	2.90	0.58	0.37	0.196			0.9	2.80	2.98	0.18	0.21	0.196	0.176	0.04	0.006	11%
14	3.05	0.58	0.35	0.000			1.0	2.98	3.13	0.15	0.23	0.000	0.000	0.03	0.000	0%
15	3.20	0.50	0.43	0.058			0.9	3.13	3.40	0.28	0.07	0.058	0.052	0.02	0.001	2%
16	3.60	0.50	0.43	0.001			0.9	3.40	3.78	0.38	0.07	0.001	0.001	0.03	0.000	0%
17	3.95	0.35	0.30	0.000			1.0	3.78	4.23	0.45	0.05	0.000	0.000	0.02	0.000	0%
RB	4.50	0.00	0.00	0.00	0.00	0.00	1.0	4.23	4.50	0.28	0.01	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.060</b>	

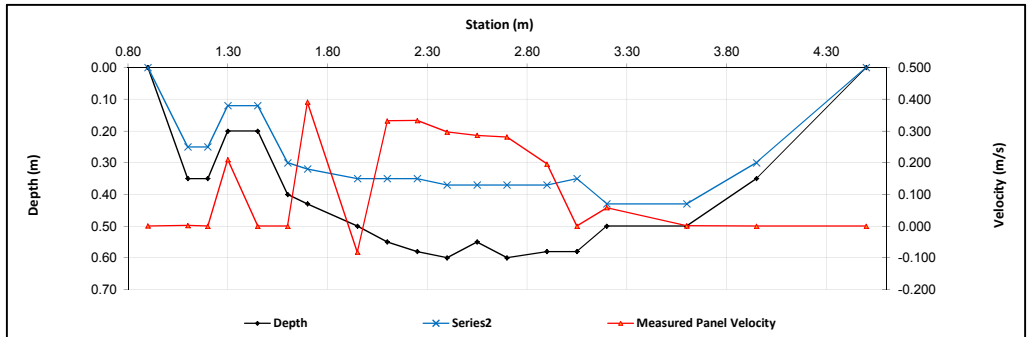
Measurement Details:	
Start Time (MST):	9:24
End Time (MST):	10:47
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Light snow, calm, -20°C

Flow characteristics:	
Total Flow:	0.060 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.42 (m <sup>2</sup> )
Wetted Width:	3.60 (m)
Hydraulic Depth:	0.117 (m)
Mean Velocity:	0.142 (m/s)
Froude Number:	0.133

Logger Details:		
Transducer Reading (m):	Before	After
	0.440	-
Water (°C):	0.0	-
Battery (Main):	12.8	-
Datalogger Clock:	9:30	-
Laptop Clock:	9:33	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	6104	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
- Data logger outputting incorrect data table name: S51	

General Notes:	
- Slush in hole at 1.45 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S34-03			1.485	98.473	98.460	2m South of Station
S34-04	1.318	99.958		98.640	98.640	2m East of Station
S34-05			1.748	98.210	98.210	8m South of Station
Ice/PT:			2.499	97.459		
Water Level:			2.763	97.195		
Other:						
<b>Setup #2</b>						
S34-03			1.467	98.475	98.460	2m South of Station
S34-04			1.303	98.639	98.640	2m East of Station
S34-05	1.732	99.942		98.210	98.210	8m South of Station
Ice/PT:			2.482	97.460		
Water Level:			2.745	97.197		
Other:						

Closing Error	0.001	Average WL	97.196
WL Check	0.002	Transducer Elevation Before	96.756
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	1-Feb-13
Data Entry Personnel:	SM, CJ	Date:	1-Feb-13
Data Check Personnel:	DW	Date:	12-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake

UTM Location: 440712 E, 6361615 N

Site Visit Date:

February 25, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.30	0.00	0.00	0.000	0.000	0.000	0.9	0.30	0.50	0.20	0.02	0.022	0.019	0.00	0.000	0%
1	0.70	0.30	0.21	0.088			0.9	0.50	0.83	0.33	0.09	0.086	0.077	0.03	0.002	4%
2	0.95	0.30	0.15	0.000			1.0	0.83	1.03	0.20	0.15	0.000	0.000	0.03	0.000	0%
3	1.10	0.31	0.15	0.000			1.0	1.03	1.17	0.14	0.16	0.000	0.000	0.02	0.000	0%
4	1.23	0.31	0.14	0.001			0.9	1.17	1.30	0.14	0.17	0.001	0.001	0.02	0.000	0%
5	1.37	0.27	0.14	0.148			0.9	1.30	1.45	0.15	0.13	0.148	0.133	0.02	0.003	4%
6	1.53	0.38	0.13	-0.001			0.9	1.45	1.61	0.16	0.25	-0.001	-0.001	0.04	0.000	0%
7	1.69	0.40	0.14	0.133			0.9	1.61	1.76	0.15	0.26	0.133	0.120	0.04	0.005	7%
8	1.83	0.41	0.15	0.125			0.9	1.76	1.90	0.14	0.26	0.125	0.113	0.04	0.004	6%
9	1.97	0.50	0.15	0.273			0.9	1.90	2.04	0.14	0.35	0.273	0.246	0.05	0.012	18%
10	2.10	0.50	0.15	0.284			0.9	2.04	2.15	0.12	0.35	0.284	0.256	0.04	0.010	16%
11	2.20	0.48	0.16	0.251			0.9	2.15	2.27	0.12	0.32	0.251	0.226	0.04	0.008	13%
12	2.33	0.49	0.16	0.240			0.9	2.27	2.40	0.14	0.33	0.240	0.216	0.04	0.010	15%
13	2.47	0.49	0.19	0.134			0.9	2.40	2.54	0.14	0.30	0.134	0.121	0.04	0.005	8%
14	2.60	0.45	0.24	0.110			0.9	2.54	2.68	0.14	0.21	0.110	0.099	0.03	0.003	5%
15	2.75	0.41	0.24	0.090			0.9	2.68	2.83	0.15	0.17	0.090	0.081	0.03	0.002	3%
16	2.90	0.37	0.24	-0.006			0.9	2.83	2.96	0.14	0.13	-0.006	-0.005	0.02	0.000	0%
17	3.02	0.32	0.25	0.000			1.0	2.96	3.11	0.15	0.07	0.000	0.000	0.01	0.000	0%
18	3.20	0.31	0.24	0.001			0.9	3.11	3.25	0.14	0.07	0.001	0.001	0.01	0.000	0%
19	3.30	0.28	0.20	0.000			1.0	3.25	3.55	0.30	0.08	0.000	0.000	0.02	0.000	0%
RB	3.80	0.00	0.00	0.00	0.00	0.00	1.0	3.55	3.80	0.25	0.02	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>0.063</b>	

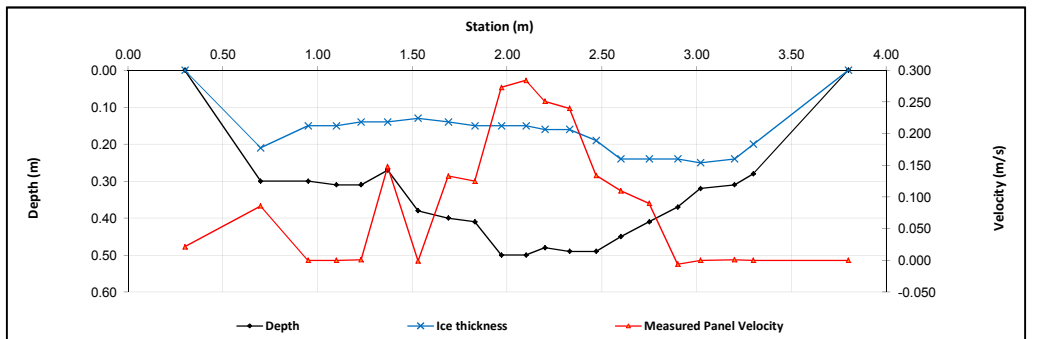
Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	10:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -5°C

Flow characteristics:		
Total Flow:	0.063	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.58	(m <sup>2</sup> )
Wetted Width:	3.50	(m)
Hydraulic Depth:	0.164	(m)
Mean Velocity:	0.110	(m/s)
Froude Number:	0.087	

Logger Details:		
Transducer Reading (m):	0.278	-
Water (°C):	0.0	-
Battery (Main):	13.1	-
Datalogger Clock:	9:25	-
Laptop Clock:	9:23	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	6104	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Slush in some flow meas holes.	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S34-03			1.404	98.480	98.460	2m South of Station
S34-04	1.244	99.884		98.640	98.640	2m East of Station
S34-05			1.675	98.209	98.210	8m South of Station
Ice/PT:			2.464	97.420		
Water Level:			2.848	97.036		
Other:						
<b>Setup #2</b>						
S34-03			1.388	98.479	98.460	2m South of Station
S34-04			1.227	98.640	98.640	2m East of Station
S34-05	1.658	99.867		98.209	98.210	8m South of Station
Ice/PT:			2.448	97.419		
Water Level:			2.835	97.032		
Other:						

Closing Error	0.000
WL Check	0.004

Average WL	97.034
Transducer Elevation Before	96.756
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	25-Feb-13
Data Entry Personnel:	SM	Date:	25-Feb-13
Data Check Personnel:	DW	Date:	12-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake

UTM Location: 440712 E, 6361615 N

Site Visit Date:

March 27, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	1.00	0.00	0.00	0.000	0.000	0.000	0.9	1.00	1.13	0.13	0.00	-0.029	-0.026	0.00	0.000	0%
1	1.25	0.46	0.45	-0.114			0.9	1.13	1.30	0.18	0.01	-0.114	-0.103	0.00	0.000	-1%
2	1.35	0.46	0.45	-0.168			0.9	1.30	1.48	0.18	0.01	-0.168	-0.151	0.00	0.000	-1%
3	1.60	0.53	0.45	-0.001			0.9	1.48	1.68	0.20	0.08	-0.001	-0.001	0.02	0.000	0%
4	1.75	0.53	0.40	0.119			0.9	1.68	1.88	0.20	0.13	0.119	0.107	0.03	0.003	9%
5	2.00	0.47	0.38	0.275			0.9	1.88	2.08	0.20	0.09	0.275	0.248	0.02	0.004	14%
6	2.15	0.53	0.38	0.321			0.9	2.08	2.28	0.20	0.15	0.321	0.289	0.03	0.009	27%
7	2.40	0.50	0.38	0.395			0.9	2.28	2.48	0.20	0.12	0.395	0.356	0.02	0.009	26%
8	2.55	0.50	0.38	0.346			0.9	2.48	2.64	0.16	0.12	0.346	0.311	0.02	0.006	19%
9	2.72	0.43	0.40	0.000			1.0	2.64	2.79	0.15	0.03	0.000	0.000	0.00	0.000	0%
10	2.85	0.44	0.40	0.303			0.9	2.79	2.95	0.17	0.04	0.303	0.273	0.01	0.002	6%
11	3.05	0.35	0.34	0.203			0.9	2.95	3.10	0.15	0.01	0.203	0.183	0.00	0.000	1%
12	3.15	0.35	0.34	0.218			0.9	3.10	3.23	0.13	0.01	0.218	0.196	0.00	0.000	1%
13	3.30	0.35	0.34	0.000			1.0	3.23	3.37	0.15	0.01	0.000	0.000	0.00	0.000	0%
14	3.44	0.35	0.34	0.001			0.9	3.37	3.62	0.25	0.01	0.001	0.001	0.00	0.000	0%
RB	3.80	0.00	0.00	0.00	0.00	0.00	1.0	3.62	3.80	0.18	0.00	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.032</b>	

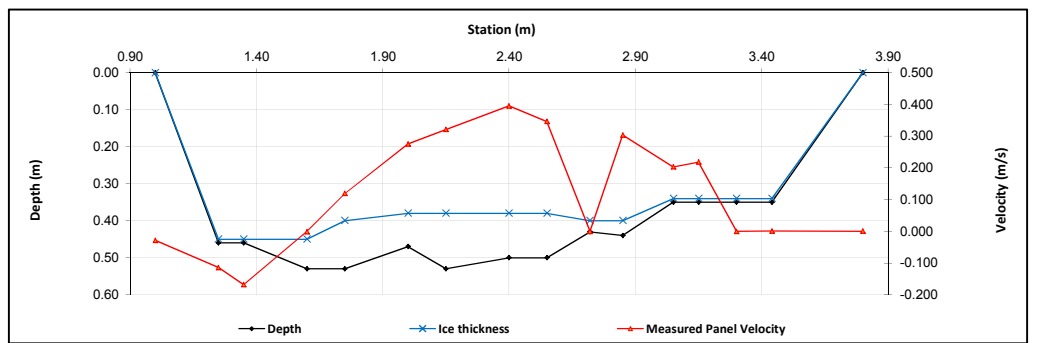
Measurement Details:	
Start Time (MST):	8:05
End Time (MST):	9:06
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Clear, -8°C

Flow characteristics:	
Total Flow:	0.032 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	0.16 (m <sup>2</sup> )
Wetted Width:	2.80 (m)
Hydraulic Depth:	0.055 (m)
Mean Velocity:	0.208 (m/s)
Froude Number:	0.282

Logger Details:		
	Before	After
Transducer Reading (m):	0.510	-
Water (°C):	-0.1	-
Battery (Main):	13.3	-
Datalogger Clock:	8:14	-
Laptop Clock:	8:12	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Poor flow measurement.	
- Could only drill 7 holes and there was very little water that could be measured.	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S34-03			1.542	98.486	98.460	2m South of Station
S34-04	1.388	100.028		98.640	98.640	2m East of Station
S34-05			1.813	98.215	98.210	8m South of Station
Ice/PT:			2.496	97.532		
Water Level:			2.789	97.239		
Other:						
<b>Setup #2</b>						
S34-03			1.528	98.486	98.460	2m South of Station
S34-04			1.376	98.638	98.640	2m East of Station
S34-05	1.799	100.014		98.215	98.210	8m South of Station
Ice/PT:			2.482	97.532		
Water Level:			2.775	97.239		
Other:						

Closing Error	0.002	Average WL	97.239
WL Check	0.000	Transducer Elevation Before	96.729
		Transducer Elevation After	-

<b>Field Personnel:</b>	CJ, XP	Trip Date:	27-Mar-13
<b>Data Entry Personnel:</b>	CJ	Date:	27-Mar-13
<b>Data Check Personnel:</b>	DW	Date:	8-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: May 16, 2013  
 Site Visit Time (MST): 12:00

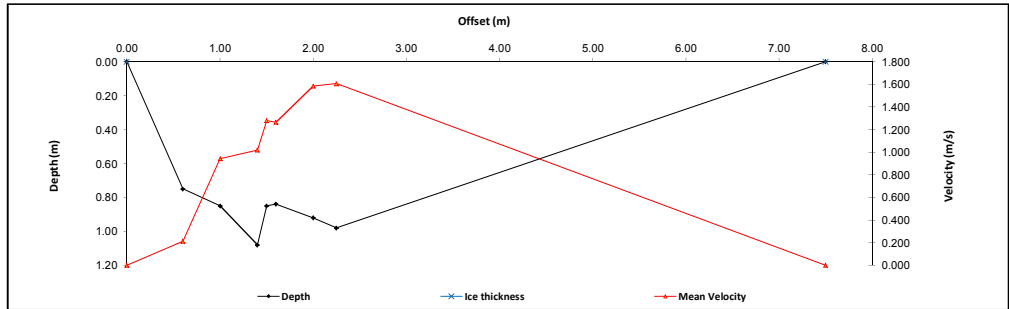


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	0.60	0.75		0.45	0.213					1.00	0.50	0.75	0.213	0.38	0.080	1%
2	1.00	0.85			0.943	0.68		0.17		1.00	0.40	0.85	0.943	0.34	0.321	5%
3	1.40	1.08			1.018	0.86		0.22		1.00	0.25	1.08	1.018	0.27	0.275	5%
4	1.50	0.85			1.280	0.68		0.17		1.00	0.10	0.85	1.280	0.09	0.109	2%
5	1.60	0.84			1.265	0.67		0.17		1.00	0.25	0.84	1.265	0.21	0.266	5%
6	2.00	0.92			1.585	0.74		0.18		1.00	0.33	0.92	1.585	0.30	0.474	8%
7	2.25	0.98			1.606	0.78		0.20		1.00	2.75	0.98	1.606	2.70	4.328	74%
RB	7.50	0.00	0.00		0.00		0.00		0.00	1.00	2.63	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.85</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST): 12:25  
 Meas. End Time (MST): 12:40  
 Equipment: ADV  
 Method: Wading  
 River Condition: Very high flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Poor  
 Weather: Sun and cloud, showers, 17°C



**Flow characteristics:**

Total Flow: 5.85 (m<sup>3</sup>/s)  
 Perceived Measurement Quality: Poor  
 Cross Section Area: 4.27 (m<sup>2</sup>)  
 Wetted Width: 7.50 (m)  
 Hydraulic Depth: 0.57 (m)  
 Mean Velocity: 1.37 (m/s)  
 Froude Number: 0.58

**Logger Details:**

	Before	After
Transducer Reading (m):	0.948	0.952
Water (°C):	3.9	3.9
Datalogger Clock:	12:14	12:49
Laptop Clock:	12:12	12:47
Battery (Main):	13.6	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV Test: Good.
- Flow measurement aborted due to safety concerns.
- Flow in center of channel was an estimated 1.8 m/s.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S34-04
S34-03			1.280	98.489	98.460	2m South of Station	S34-05
S34-04	1.129	99.769		98.640	98.640	2m East of Station	S34-06
S34-05			1.555	98.214	98.210	8m South of Station	WL
Ice/PT:							S34-06
Water Level:			2.123	97.646		Time WL Surveyed: 12:17	S34-05
Other:							S34-04
<b>Setup #2</b>							
S34-03			1.268	98.491	98.328	2m South of Station	
S34-04			1.118	98.641	98.508	2m East of Station	
S34-05	1.545	99.759		98.214	98.078	8m South of Station	
Ice/PT:							
Water Level:			2.115	97.644		Time WL Surveyed: 12:18	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S34-06	1.544	99.758		98.214			
Water Level:			2.112	97.646		Time WL Surveyed: 12:44	
Water Level:			2.100	97.647		Time WL Surveyed: 12:45	
BM: S34-06	1.533	99.747		98.214			

**WL Survey Summary**

	Before	After
Average WL:	97.645	97.647
Transducer Elevation:	96.897	96.695
Closing Error:	-0.001	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	5.85
Expected Discharge:	16.26
Shift from Existing Rating (m <sup>3</sup> /s):	10.41
Shift from Existing Rating (%):	178%

**Field Personnel:**

SM, TR	Trip Date:	16-May-13
SM	Date:	16-May-13
DW	Date:	26-May-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: June 7, 2013  
 Site Visit Time (MST): 13:15

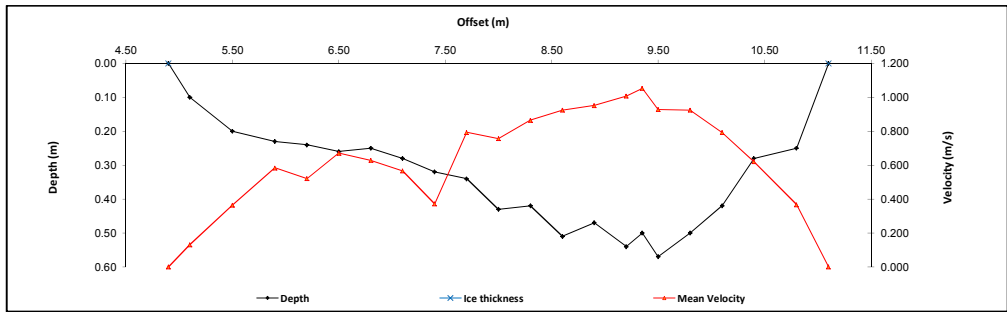


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.90	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	5.10	0.10		0.06	0.131					1.00	0.30	0.10	0.131	0.03	0.004	0%
2	5.50	0.20		0.12	0.364					1.00	0.40	0.20	0.364	0.08	0.029	2%
3	5.90	0.23		0.14	0.584					1.00	0.35	0.23	0.584	0.08	0.047	3%
4	6.20	0.24		0.14	0.521					1.00	0.30	0.24	0.521	0.07	0.038	2%
5	6.50	0.26		0.16	0.671					1.00	0.30	0.26	0.671	0.08	0.052	3%
6	6.80	0.25		0.15	0.628					1.00	0.30	0.25	0.628	0.07	0.047	3%
7	7.10	0.28		0.17	0.566					1.00	0.30	0.28	0.566	0.08	0.048	3%
8	7.40	0.32		0.19	0.372					1.00	0.30	0.32	0.372	0.10	0.036	2%
9	7.70	0.34		0.20	0.793					1.00	0.30	0.34	0.793	0.10	0.081	5%
10	8.00	0.43		0.26	0.756					1.00	0.30	0.43	0.756	0.13	0.098	6%
11	8.30	0.42		0.25	0.865					1.00	0.30	0.42	0.865	0.13	0.109	7%
12	8.60	0.51		0.31	0.924					1.00	0.30	0.51	0.924	0.15	0.141	9%
13	8.90	0.47		0.28	0.952					1.00	0.30	0.47	0.952	0.14	0.134	9%
14	9.20	0.54		0.32	1.008					1.00	0.22	0.54	1.008	0.12	0.122	8%
15	9.35	0.50		0.30	1.053					1.00	0.15	0.50	1.053	0.08	0.079	5%
16	9.50	0.57		0.34	0.928					1.00	0.23	0.57	0.928	0.13	0.119	8%
17	9.80	0.50		0.30	0.924					1.00	0.30	0.50	0.924	0.15	0.139	9%
18	10.10	0.42		0.25	0.792					1.00	0.30	0.42	0.792	0.13	0.100	7%
19	10.40	0.28		0.17	0.621					1.00	0.35	0.28	0.621	0.10	0.061	4%
20	10.80	0.25		0.15	0.367					1.00	0.35	0.25	0.367	0.09	0.032	2%
LB	11.10	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.52</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:35
Meas. End Time (MST):	14:06
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 16°C



**Flow characteristics:**

Total Flow:	1.52	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.03	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.75	(m/s)
Froude Number:	0.42	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.521	0.525
Water (°C):	12.9	12.9
Datalogger Clock:	13:20	14:21
Laptop Clock:	13:18	14:19
Battery (Main):	14.1	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

General Notes:

- Backwater
- A lag bolt was driven into a conifer 30m North of the station for a new BM. It has not been surveyed.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S34-03			1.367	98.486	98.460	2m South of Station	S34-04
S34-04	1.213	99.853		98.640	98.640	2m East of Station	S34-05
S34-05			1.637	98.216	98.210	8m South of Station	WL
Ice/PT:							WL
Water Level:			2.575	97.278		Time WL Surveyed: 13:30	S34-06
Other:							S34-05
Setup #2							S34-04
S34-03			1.346	98.488	98.460	2m South of Station	
S34-04			1.193	98.641	98.640	2m East of Station	
S34-05	1.618	99.834		98.216	98.210	8m South of Station	
Ice/PT:							
Water Level:			2.556	97.278		Time WL Surveyed: 13:31	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S34-05	1.193	99.833		98.640		
Water Level:				2.563	97.270	Time WL Surveyed: 14:13	
Water Level:				2.550	97.268	Time WL Surveyed: 14:15	
BM:	S34-05	1.178	99.818		98.640		

**WL Survey Summary**

	Before	After
Average WL:	97.278	97.269
Transducer Elevation:	96.757	96.744
Closing Error:	-0.001	-
WL Check:	0.000	0.002

**Site Rating Information**

Measured Discharge:	1.52
Expected Discharge:	5.27
Shift from Existing Rating (m <sup>3</sup> /s):	3.75
Shift from Existing Rating (%):	247%

**Field Personnel:**

SM, CJ	Trip Date:	7-Jun-13
SM	Date:	7-Jun-13
DW	Date:	13-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: August 12, 2013  
 Site Visit Time (MST): 15:35

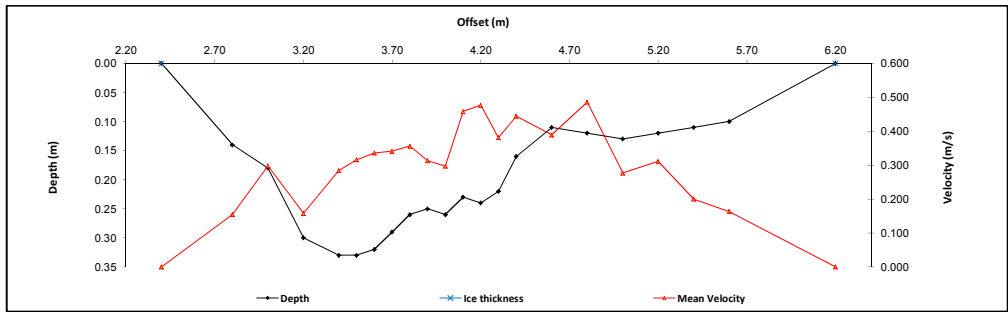


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
LB	2.40	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000								
1	2.80	0.14		0.08	0.155					1.00	0.30	0.14	0.155	0.04	0.007	4%							
2	3.00	0.18		0.11	0.298					1.00	0.20	0.18	0.298	0.04	0.011	6%							
3	3.20	0.30		0.18	0.158					1.00	0.20	0.30	0.158	0.06	0.009	5%							
4	3.40	0.33		0.20	0.284					1.00	0.15	0.33	0.284	0.05	0.014	8%							
5	3.50	0.33		0.20	0.316					1.00	0.10	0.33	0.316	0.03	0.010	6%							
6	3.60	0.32		0.19	0.336					1.00	0.10	0.32	0.336	0.03	0.011	6%							
7	3.70	0.29		0.17	0.341					1.00	0.10	0.29	0.341	0.03	0.010	5%							
8	3.80	0.26		0.16	0.356					1.00	0.10	0.26	0.356	0.03	0.009	5%							
9	3.90	0.25		0.15	0.313					1.00	0.10	0.25	0.313	0.03	0.008	4%							
10	4.00	0.26		0.16	0.297					1.00	0.10	0.26	0.297	0.03	0.008	4%							
11	4.10	0.23		0.14	0.458					1.00	0.10	0.23	0.458	0.02	0.011	6%							
12	4.20	0.24		0.14	0.477					1.00	0.10	0.24	0.477	0.02	0.011	6%							
13	4.30	0.22		0.13	0.381					1.00	0.10	0.22	0.381	0.02	0.008	5%							
14	4.40	0.16		0.10	0.444					1.00	0.15	0.16	0.444	0.02	0.011	6%							
15	4.60	0.11		0.07	0.389					1.00	0.20	0.11	0.389	0.02	0.009	5%							
16	4.80	0.12		0.07	0.486					1.00	0.20	0.12	0.486	0.02	0.012	6%							
17	5.00	0.13		0.08	0.277					1.00	0.20	0.13	0.277	0.03	0.007	4%							
18	5.20	0.12		0.07	0.311					1.00	0.20	0.12	0.311	0.02	0.007	4%							
19	5.40	0.11		0.07	0.200					1.00	0.20	0.11	0.200	0.02	0.004	2%							
20	5.60	0.10		0.06	0.163					1.00	0.40	0.10	0.163	0.04	0.007	4%							
RB	6.20	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.000	0.000								
<b>Total Flow</b>														<b>0.183</b>	<b>100%</b>								

**Flow Measurement Details:**

Metering Section Location (describe):  
 - Across from station

Meas. Start Time (MST):	16:20
Meas. End Time (MST):	16:45
Equipment:	ADV
Method:	Wading
River Condition:	Open, good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25°C



**Flow characteristics:**

Total Flow:	0.183	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.61	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.24	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.261	0.260
Water (°C):	18.3	18.3
Datalogger Clock:	15:45	16:54
Laptop Clock:	15:42	16:51
Battery (Main):	14.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Adjusted antenna, new RSSI -98

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S34-04	1.150	99.790		98.640	98.640	3/4" pipe 2 metres east of logger	S34-06
S34-05			1.577	98.213	98.210	3/4" pipe 8 metres south of logger	S34-04
S34-06			0.390	99.400	99.401	Lag bolt in conifer, 30m N of logger	WL
Ice/PT:							WL
Water Level:			2.793	96.997		Time WL Surveyed: 16:14	S34-04
Other:							S34-05
<b>Setup #2</b>							S34-06
S34-04			1.143	98.638	98.640	3/4" pipe 2 metres east of logger	
S34-05	1.568	99.781		98.213	98.210	3/4" pipe 8 metres south of logger	
S34-06			0.383	99.398	99.401	Lag bolt in conifer, 30m N of logger	
Ice/PT:							
Water Level:			2.784	96.997		Time WL Surveyed: 16:16	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S34-05	1.568	99.781	98.213		Time WL Surveyed: 16:48	
Water Level:			2.784	96.997		Time WL Surveyed: 16:50	
Water Level:			2.774	96.997			
BM:	S34-05	1.558	99.771	98.213			

**WL Survey Summary**

	Before	After
Average WL:	96.997	96.997
Transducer Elevation:	96.736	96.737
Closing Error:	0.002	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	0.183
Expected Discharge:	0.99
Shift from Existing Rating (m <sup>3</sup> /s):	0.80
Shift from Existing Rating (%):	439%

**Field Personnel:**

Field Personnel:	TR, SM	Trip Date:	12-Aug-13
Data Entry Personnel:	TR	Date:	12-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: September 13, 2013  
 Site Visit Time (MST): 12:15

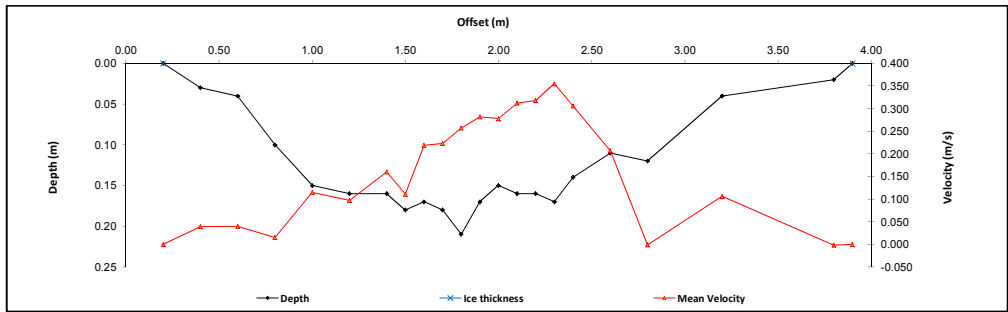


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.40	0.03		0.02	0.039					1.00	0.20	0.03	0.039	0.01	0.000	0%
2	0.60	0.04		0.02	0.040					1.00	0.20	0.04	0.040	0.01	0.000	0%
3	0.80	0.10		0.06	0.015					1.00	0.20	0.10	0.015	0.02	0.000	0%
4	1.00	0.15		0.09	0.115					1.00	0.20	0.15	0.115	0.03	0.003	5%
5	1.20	0.16		0.10	0.097					1.00	0.20	0.16	0.097	0.03	0.003	5%
6	1.40	0.16		0.10	0.160					1.00	0.15	0.16	0.160	0.02	0.004	6%
7	1.50	0.18		0.11	0.111					1.00	0.10	0.18	0.111	0.02	0.002	3%
8	1.60	0.17		0.10	0.219					1.00	0.10	0.17	0.219	0.02	0.004	6%
9	1.70	0.18		0.11	0.223					1.00	0.10	0.18	0.223	0.02	0.004	6%
10	1.80	0.21		0.13	0.257					1.00	0.10	0.21	0.257	0.02	0.005	8%
11	1.90	0.17		0.10	0.282					1.00	0.10	0.17	0.282	0.02	0.005	7%
12	2.00	0.15		0.09	0.278					1.00	0.10	0.15	0.278	0.02	0.004	6%
13	2.10	0.16		0.10	0.312					1.00	0.10	0.16	0.312	0.02	0.005	8%
14	2.20	0.16		0.10	0.318					1.00	0.10	0.16	0.318	0.02	0.005	8%
15	2.30	0.17		0.10	0.355					1.00	0.10	0.17	0.355	0.02	0.006	9%
16	2.40	0.14		0.08	0.306					1.00	0.15	0.14	0.306	0.02	0.006	10%
17	2.60	0.11		0.07	0.207					1.00	0.20	0.11	0.207	0.02	0.005	7%
18	2.80	0.12		0.07	-0.001					1.00	0.30	0.12	-0.001	0.04	0.000	0%
19	3.20	0.04		0.02	0.106					1.00	0.50	0.04	0.106	0.02	0.002	3%
20	3.80	0.02		0.01	-0.002					1.00	0.35	0.02	-0.002	0.01	0.000	0%
LB	3.90	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.065</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:37
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 20°C



**Flow characteristics:**

Total Flow:	0.065	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.38	(m <sup>2</sup> )
Wetted Width:	3.70	(m)
Hydraulic Depth:	0.10	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.17	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.208	0.195
Water (°C):	12.9	13.3
Datalogger Clock:	12:14	13:15
Laptop Clock:	12:11	13:12
Battery (Main):	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT repositioned

**General Notes:**

- Destroyed old BM
- BM Description changed
- Need updated BM labels

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S34-04	1.122	99.762		98.640	98.640	3/4" pipe 2 metres east of logger	S34-06
S34-05			1.548	98.214	98.210	3/4" pipe 8 metres south of logger	S34-04
S34-06			0.360	99.402	99.401	Lag bolt in conifer, 30m N of logger	WL
Ice/PT:							WL
Water Level:			2.823	96.939		Time WL Surveyed: 12:27	S34-04
Other:							S34-05
<b>Setup #2</b>							S34-06
S34-04			1.111	98.640	98.499	3/4" pipe 2 metres east of logger	
S34-05	1.537	99.751		98.214	98.068	3/4" pipe 8 metres south of logger	
S34-06			0.349	99.402		Lag bolt in conifer, 30m N of logger	
Ice/PT:							
Water Level:			2.807	96.944		Time WL Surveyed: 12:30	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S34-04	1.111	99.751	98.640			
Water Level:			2.807	96.944		Time WL Surveyed: 13:06	
Water Level:			2.802	96.943		Time WL Surveyed: 13:08	
BM:	S34-04	1.105	99.745	98.640			

**WL Survey Summary**

	Before	After
Average WL:	96.942	96.944
Transducer Elevation:	96.734	96.749
Closing Error:	0.000	-
WL Check:	0.005	0.001

**Site Rating Information**

Measured Discharge:	0.0645
Expected Discharge:	0.55
Shift from Existing Rating (m <sup>3</sup> /s):	0.49
Shift from Existing Rating (%):	752%

**Field Personnel:**

DW, CJ	Trip Date:	13-Sep-13
CJ	Date:	13-Sep-13
DW	Date:	16-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: October 19, 2013  
 Site Visit Time (MST): 15:20

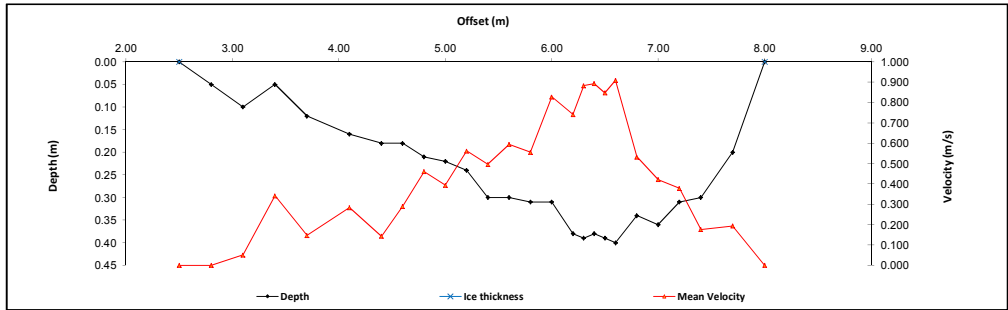


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.80	0.05		0.03	0.000					1.00	0.30	0.05	0.000	0.02	0.000	0%
2	3.10	0.10		0.06	0.051					1.00	0.30	0.10	0.051	0.03	0.002	0%
3	3.40	0.05		0.03	0.342					1.00	0.30	0.05	0.342	0.02	0.005	1%
4	3.70	0.12		0.07	0.147					1.00	0.35	0.12	0.147	0.04	0.006	1%
5	4.10	0.16		0.10	0.284					1.00	0.35	0.16	0.284	0.06	0.016	3%
6	4.40	0.18		0.11	0.143					1.00	0.25	0.18	0.143	0.05	0.006	1%
7	4.60	0.18		0.11	0.290					1.00	0.20	0.18	0.290	0.04	0.010	2%
8	4.80	0.21		0.13	0.461					1.00	0.20	0.21	0.461	0.04	0.019	3%
9	5.00	0.22		0.13	0.394					1.00	0.20	0.22	0.394	0.04	0.017	3%
10	5.20	0.24		0.14	0.562					1.00	0.20	0.24	0.562	0.05	0.027	5%
11	5.40	0.30		0.18	0.496					1.00	0.20	0.30	0.496	0.06	0.030	5%
12	5.60	0.30		0.18	0.594					1.00	0.20	0.30	0.594	0.06	0.036	6%
13	5.80	0.31		0.19	0.556					1.00	0.20	0.31	0.556	0.06	0.034	6%
14	6.00	0.31		0.19	0.828					1.00	0.20	0.31	0.828	0.06	0.051	9%
15	6.20	0.38		0.23	0.741					1.00	0.15	0.38	0.741	0.06	0.042	7%
16	6.30	0.39		0.23	0.883					1.00	0.10	0.39	0.883	0.04	0.034	6%
17	6.40	0.38		0.23	0.893					1.00	0.10	0.38	0.893	0.04	0.034	6%
18	6.50	0.39		0.23	0.847					1.00	0.10	0.39	0.847	0.04	0.033	6%
19	6.60	0.40		0.24	0.909					1.00	0.15	0.40	0.909	0.06	0.055	10%
20	6.80	0.34		0.20	0.532					1.00	0.20	0.34	0.532	0.07	0.036	6%
21	7.00	0.36		0.22	0.421					1.00	0.20	0.36	0.421	0.07	0.030	5%
22	7.20	0.31		0.19	0.378					1.00	0.20	0.31	0.378	0.06	0.023	4%
23	7.40	0.30		0.18	0.176					1.00	0.25	0.30	0.176	0.08	0.013	2%
24	7.70	0.20		0.12	0.193					1.00	0.30	0.20	0.193	0.06	0.012	2%
LB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.573</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:57
Meas. End Time (MST):	16:25
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 5°C



**Flow Characteristics:**

Total Flow:	0.573	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.48	(m/s)
Froude Number:	0.33	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.380	0.380
Water (°C):	3.8	3.6
Datalogger Clock:	15:32	16:34
Laptop Clock:	15:30	16:31
Battery (Main):	14.3	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S34-04	1.146	99.786		98.640	98.640	3/4" pipe 2 metres east of logger	S34-06
S34-05			1.572	98.214	98.210	3/4" pipe 8 metres south of logger	S34-05
S34-06			0.383	99.403	99.401	Lag bolt in conifer, 30m Nof logger	S34-04
Ice/PT:							WL
Water Level:		2.652		97.134			S34-04
Other:							S34-05
<b>Setup #2</b>							S34-06
S34-04			1.132	98.639	98.499	3/4" pipe 2 metres east of logger	
S34-05	1.557	99.771		98.214	98.068	3/4" pipe 8 metres south of logger	
S34-06			0.368	99.403		Lag bolt in conifer, 30m Nof logger	
Ice/PT:							
Water Level:		2.633		97.138			S34-04
Other:							S34-05
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							(must close survey loop on survey starting point)
BM: S34-05	1.558	99.772		98.214			
Water Level:			2.637	97.135			S34-04
Water Level:			2.625	97.133			S34-05
BM: S34-05	1.544	99.758		98.214			S34-06

**WL Survey Summary**

	Before	After
Average WL:	97.136	97.134
Transducer Elevation:	96.756	96.754
Closing Error:	0.001	-
WL Check:	0.004	0.002

**Site Rating Information**

Measured Discharge:	0.573
Expected Discharge:	2.67
Shift from Existing Rating (m <sup>3</sup> /s):	2.09
Shift from Existing Rating (%):	368%

**Field Personnel:**

SM, DW	Trip Date:	19-Oct-13
SM	Date:	19-Oct-13
CJ	Date:	23-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: December 6, 2013  
 Site Visit Time (MST): 13:05

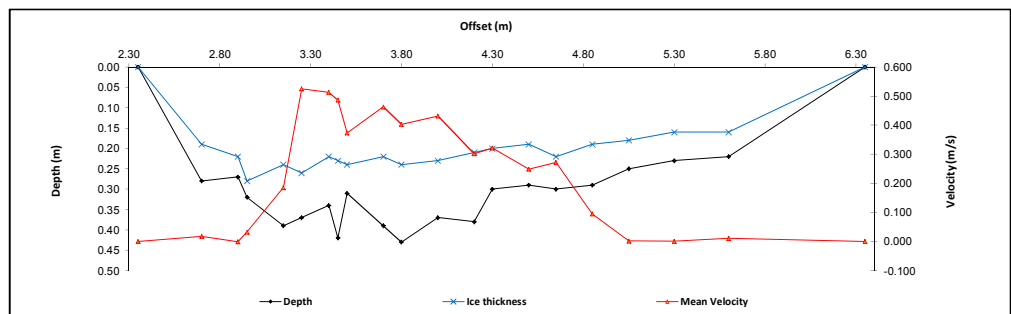


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.35	0.00	0.00		0.000				0.000	0.88	0.38	0.00	0.000	0.00	0.000	
1	5.60	0.22	0.16	0.19	0.012				0.88	0.53	0.06	0.011	0.03	0.000	0.00	0%
2	5.30	0.23	0.16	0.20	0.001				0.88	0.27	0.07	0.001	0.02	0.000	0.00	0%
3	5.05	0.25	0.18	0.22	0.002				0.88	0.23	0.07	0.002	0.02	0.000	0.00	0%
4	4.85	0.29	0.19	0.24	0.108				0.88	0.20	0.10	0.095	0.02	0.002	0.00	2%
5	4.65	0.30	0.22	0.26	0.309				0.88	0.18	0.08	0.272	0.01	0.004	0.00	5%
6	4.50	0.29	0.19	0.24	0.283				0.88	0.18	0.10	0.249	0.02	0.004	0.00	5%
7	4.30	0.30	0.20	0.25	0.365				0.88	0.15	0.10	0.321	0.02	0.005	0.00	6%
8	4.20	0.38	0.21	0.30	0.343				0.88	0.15	0.17	0.302	0.03	0.008	0.00	9%
9	4.00	0.37	0.23	0.30	0.490				0.88	0.20	0.14	0.431	0.03	0.012	0.00	14%
10	3.80	0.43	0.24	0.34	0.458				0.88	0.15	0.19	0.403	0.03	0.011	0.00	14%
11	3.70	0.39	0.22	0.31	0.526				0.88	0.15	0.17	0.463	0.03	0.012	0.00	14%
12	3.50	0.31	0.24	0.28	0.424				0.88	0.13	0.07	0.373	0.01	0.003	0.00	4%
13	3.45	0.42	0.23	0.33	0.553				0.88	0.05	0.19	0.487	0.01	0.005	0.00	5%
14	3.40	0.34	0.22	0.28	0.583				0.88	0.10	0.12	0.513	0.01	0.006	0.00	7%
15	3.25	0.37	0.26	0.32	0.597				0.88	0.13	0.11	0.525	0.01	0.007	0.00	9%
16	3.15	0.39	0.24	0.32	0.211				0.88	0.15	0.15	0.186	0.02	0.004	0.00	5%
17	2.95	0.32	0.28	0.30	0.037				0.88	0.13	0.04	0.033	0.01	0.000	0.00	0%
18	2.90	0.27	0.22	0.25	-0.001				0.88	0.13	0.05	-0.001	0.01	0.000	0.00	0%
19	2.70	0.28	0.19	0.24	0.020				0.88	0.27	0.09	0.018	0.02	0.000	0.00	1%
LB	2.35	0.00	0.00		0.00		0.00		0.88	0.18	0.00	0.000	0.00	0.000	0.00	
<b>Total Flow</b>														<b>0.084</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 2.0 m us of station

Meas. Start Time (MST):	14:10
Meas. End Time (MST):	15:05
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm -25°C



**Flow characteristics:**

Total Flow:	0.084	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.34	(m <sup>2</sup> )
Wetted Width:	4.00	(m)
Hydraulic Depth:	0.09	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.27	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.354	0.360
Water (°C):	-0.1	-0.1
Datalogger Clock:	13:12	15:17
Laptop Clock:	13:10	15:14
Battery (Main):	12.6	13.5
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- WL fluctuating by 4.0 cm during WL survey

**General Notes:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S34-04
S34-04			1.182	98.643	98.640	3/4" pipe 2 metres east of logger	S34-05
S34-05			1.603	98.222	98.210	3/4" pipe 8 metres south of logger	S34-06
S34-06	0.424	99.825		99.401	99.401	Lag bolt in conifer, 30m Nof logger	WL
Ice/PT:			2.422	97.403			Ice
Water Level:			2.712	97.113		Time WL Surveyed: 13:51	Ice
Other:							WL
<b>Setup #2</b>							S34-06
S34-04			1.161	98.645	98.499	3/4" pipe 2 metres east of logger	S34-05
S34-05	1.584	99.806		98.222	98.068	3/4" pipe 8 metres south of logger	S34-04
S34-06			0.405	99.401		Lag bolt in conifer, 30m Nof logger	
Ice/PT:			2.403	97.403			
Water Level:			2.697	97.109		Time WL Surveyed: 13:53	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S34-04	1.163	99.806		98.643		
Water Level:				2.682	97.124	Time WL Surveyed: 15:07	
Water Level:				2.648	97.128	Time WL Surveyed: 15:09	
BM:	S34-04	1.133	99.776		98.643		

**WL Survey Summary**

	Before	After
Average WL:	97.111	97.126
Transducer Elevation:	96.757	96.766
Closing Error:	0.000	-
WL Check:	0.004	-0.004

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, RM	Trip Date:	6-Dec-13
TR	Date:	6-Dec-13
DW	Date:	3-Jan-14
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date:

January 12, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	3.60	0.00	0.00	0.000	0.000	0.000	0.9	3.60	3.75	0.15	0.07	0.048	0.043	0.01	0.000	0%
1	3.90	0.63	0.36	0.191			0.9	3.75	4.25	0.50	0.27	0.191	0.172	0.14	0.023	6%
2	4.60	0.97	0.44	0.005			0.9	4.25	4.70	0.45	0.53	0.005	0.005	0.24	0.001	0%
3	4.80	1.00	0.45	0.269			0.9	4.70	5.00	0.30	0.55	0.269	0.242	0.17	0.040	11%
4	5.20	1.11	0.49	0.353			0.9	5.00	5.25	0.25	0.62	0.353	0.318	0.16	0.049	13%
5	5.30	1.12	0.57	0.611			0.9	5.25	5.35	0.10	0.55	0.611	0.550	0.05	0.030	8%
6	5.40	1.00	0.53	0.624			0.9	5.35	5.45	0.10	0.47	0.624	0.562	0.05	0.026	7%
7	5.50	1.05	0.55	0.580			0.9	5.45	5.55	0.10	0.50	0.580	0.522	0.05	0.026	7%
8	5.60	1.01	0.54	0.584			0.9	5.55	5.70	0.15	0.47	0.584	0.526	0.07	0.037	10%
9	5.80	0.97	0.50	0.561			0.9	5.70	5.85	0.15	0.47	0.561	0.505	0.07	0.036	10%
10	5.90	0.81	0.55	0.488			0.9	5.85	6.05	0.20	0.26	0.488	0.439	0.05	0.023	6%
11	6.20	0.79	0.55	0.318			0.9	6.05	6.35	0.30	0.24	0.318	0.286	0.07	0.021	6%
12	6.50	0.76	0.56	0.325			0.9	6.35	6.60	0.25	0.20	0.325	0.293	0.05	0.015	4%
13	6.70	0.80	0.56	-0.001			0.9	6.60	6.85	0.25	0.24	-0.001	-0.001	0.06	0.000	0%
14	7.00	0.71	0.55	0.193			0.9	6.85	7.15	0.30	0.16	0.193	0.174	0.05	0.008	2%
15	7.30	0.70	0.53	0.167			0.9	7.15	7.45	0.30	0.17	0.167	0.150	0.05	0.008	2%
16	7.60	0.67	0.52	0.045			0.9	7.45	7.75	0.30	0.15	0.045	0.041	0.05	0.002	0%
17	7.90	0.77	0.50	0.287			0.9	7.75	8.05	0.30	0.27	0.287	0.258	0.08	0.021	6%
18	8.20	0.63	0.49	0.172			0.9	8.05	8.35	0.30	0.14	0.172	0.155	0.04	0.007	2%
19	8.50	0.62	0.46	0.020			0.9	8.35	8.65	0.30	0.16	0.020	0.018	0.05	0.001	0%
20	8.80	0.55	0.44	-0.033			0.9	8.65	9.05	0.40	0.11	-0.033	-0.030	0.04	-0.001	0%
RB	9.30	0.00	0.00	0.00	0.00	0.00	1.0	9.05	9.30	0.25	0.03	-0.008	-0.008	0.01	0.000	0%
<b>Total Flow</b>															<b>0.372</b>	

## Measurement Details:

Start Time (MST):	14:00
End Time (MST):	15:35
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Sunny, -18°C

## Flow characteristics:

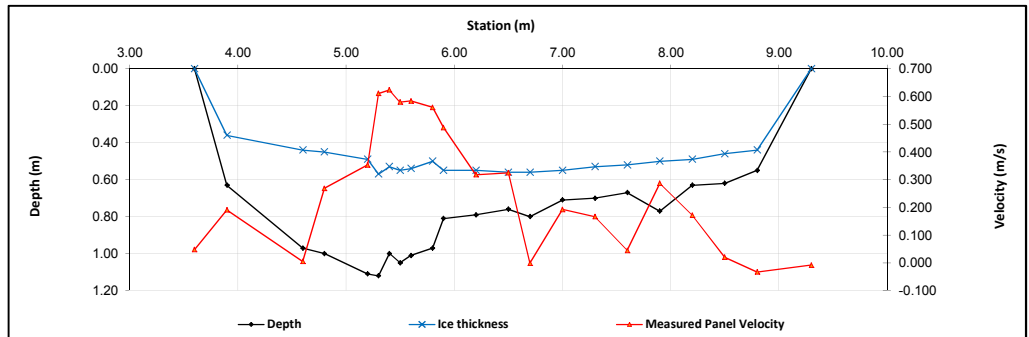
Total Flow:	0.372	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.59	(m <sup>2</sup> )
Wetted Width:	5.70	(m)
Hydraulic Depth:	0.278	(m)
Mean Velocity:	0.234	(m/s)
Froude Number:	0.142	

## Logger Details:

	Before	After
Transducer Reading (m):	0.812	-
Water (°C):	0.1	-
IQ Velocity (m/s)	0.000	-
Flow Mmt Start Time:		14:44
Flow Mmt End Time:		15:13
Battery (Main):	12.7	12.88
Datalogger Clock:	14:05	14:18
Laptop Clock:	14:05	14:18
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

## Datalogger / Station Notes:

- Both batteries were replaced
- IQ was reset
- IQ: "Idleing (Not Collecting data)"
- Could not get IQ to start to collect data



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S36-02	1.233	101.156		99.923	99.923	Pipe 8 m NE of Data Logger
S36-03			0.848	100.308	100.313	Pipe 6 m N of Data Logger
S36-04			0.913	100.243	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.606	99.550		
Water Level:			1.607	99.549		
Other:						
<b>Setup #2</b>						
S36-02			1.207	99.914	99.923	Pipe 8 m NE of Data Logger
S36-03	0.813	101.121		100.308	100.313	Pipe 6 m N of Data Logger
S36-04			0.888	100.233	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.574	99.547		
Water Level:			1.577	99.544		
Other:						

Closing Error	0.009
WL Check	0.005

Average WL	99.547
Transducer Elevation Before	98.7345
Transducer Elevation After	-

## General Notes:

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	12-Jan-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	12-Jan-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	24-Jan-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date:

February 9, 2013



Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.20	0.00	0.00	0.000	0.000	0.000	0.9	1.20	1.40	0.20	0.04	0.000	0.000	0.01	0.000	0%
1	1.60	0.69	0.54	-0.001			0.9	1.40	1.78	0.38	0.15	-0.001	-0.001	0.06	0.000	0%
2	1.95	0.83	0.57	0.333			0.9	1.78	2.15	0.38	0.26	0.333	0.300	0.10	0.029	6%
3	2.35	0.82	0.61	0.304			0.9	2.15	2.53	0.38	0.21	0.304	0.274	0.08	0.022	4%
4	2.70	0.89	0.58	0.316			0.9	2.53	2.88	0.35	0.31	0.316	0.284	0.11	0.031	6%
5	3.05	0.94	0.56	0.364			0.9	2.88	3.13	0.25	0.38	0.364	0.328	0.10	0.031	6%
6	3.20	0.94	0.56	0.384			0.9	3.13	3.28	0.15	0.38	0.384	0.346	0.06	0.020	4%
7	3.35	0.98	0.55	0.441			0.9	3.28	3.43	0.15	0.43	0.441	0.397	0.06	0.026	5%
8	3.50	0.98	0.55	0.419			0.9	3.43	3.60	0.18	0.43	0.419	0.377	0.08	0.028	6%
9	3.70	0.95	0.54	0.450			0.9	3.60	3.75	0.15	0.41	0.450	0.405	0.06	0.025	5%
10	3.80	1.04	0.51	0.524			0.9	3.75	3.88	0.13	0.53	0.524	0.472	0.07	0.031	6%
11	3.95	1.05	0.50	0.424			0.9	3.88	4.03	0.15	0.55	0.424	0.382	0.08	0.031	7%
12	4.10	1.07	0.44	0.491			0.9	4.03	4.20	0.17	0.63	0.491	0.442	0.11	0.049	10%
13	4.30	0.95	0.40	0.388			0.9	4.20	4.38	0.18	0.55	0.388	0.349	0.10	0.034	7%
14	4.45	0.91	0.35	0.491			0.9	4.38	4.53	0.15	0.56	0.491	0.442	0.08	0.037	8%
15	4.60	0.86	0.35	0.441			0.9	4.53	4.65	0.13	0.51	0.441	0.397	0.06	0.025	5%
16	4.70	0.80	0.34	0.423			0.9	4.65	4.80	0.15	0.46	0.423	0.381	0.07	0.026	5%
17	4.90	0.71	0.35	0.263			0.9	4.80	5.05	0.25	0.36	0.263	0.237	0.09	0.021	4%
18	5.20	0.68	0.31	0.156			0.9	5.05	5.33	0.27	0.37	0.156	0.140	0.10	0.014	3%
19	5.45	0.61	0.31	0.002			0.9	5.33	5.63	0.30	0.30	0.002	0.002	0.09	0.000	0%
20	5.80	0.41	0.33	0.052			0.9	5.63	5.85	0.23	0.08	0.052	0.047	0.02	0.001	0%
LB	5.90	0.00	0.00	0.00	0.00	0.00	1.0	5.85	5.90	0.05	0.02	0.013	0.013	0.00	0.000	0%
<b>Total Flow</b>															<b>0.482</b>	

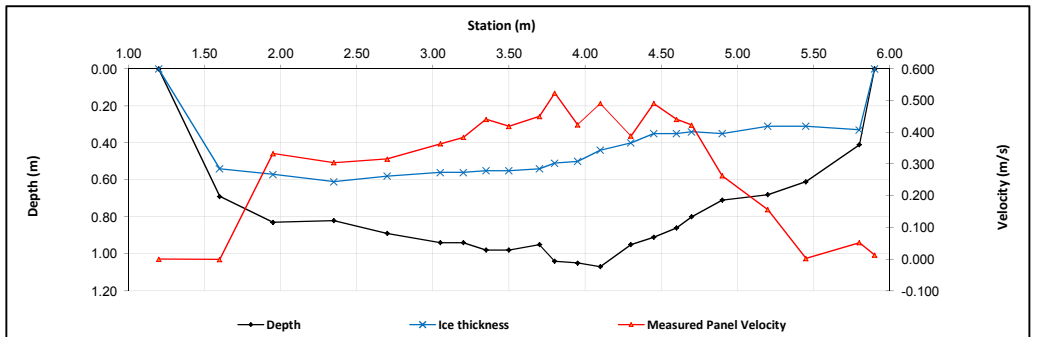
Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	14:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow. Windy. -7°C

Flow characteristics:		
Total Flow:	0.482	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.57	(m <sup>2</sup> )
Wetted Width:	4.70	(m)
Hydraulic Depth:	0.333	(m)
Mean Velocity:	0.308	(m/s)
Froude Number:	0.170	

Logger Details:		
Transducer Reading (m):	Before	After
	0.854	-
Water (°C):	0.1	-
IQ Velocity (m/s)	0.428	-
Flow Mmt Start Time:	13:55	
Flow Mmt End Time:	14:25	
Battery (Main):	12.8	-
Datalogger Clock:	13:32	-
Laptop Clock:	13:32	-
Enclosure Dessicant:	Good	
Logger# (if Δ):	18207	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

**Datalogger / Station Notes:**

- Station was not operating upon arrival
- Batteries were dead
- Replaced batteries



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S36-02	1.447	101.37		99.923	99.923	Pipe 8 m NE of Data Logger
S36-03			1.038	100.332	100.313	Pipe 6 m N of Data Logger
S36-04			1.093	100.277	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.731	99.639		
Water Level:			1.778	99.592		
Other:						
<b>Setup #2</b>						
S36-02			1.434	99.923	99.923	Pipe 8 m NE of Data Logger
S36-03	1.025	101.357		100.332	100.313	Pipe 6 m N of Data Logger
S36-04			1.078	100.279	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.717	99.640		
Water Level:			1.763	99.594		
Other:						

Closing Error	0.000	Average WL	99.593
WL Check	0.002	Transducer Elevation Before	98.739
		Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	9-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	9-Feb-13
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	11-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date:

March 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.40	0.00	0.00	0.000	0.000	0.000	0.9	0.40	0.60	0.20	0.02	0.018	0.016	0.00	0.000	0%
1	0.80	0.61	0.55	0.073			0.9	0.60	0.92	0.32	0.06	0.073	0.066	0.02	0.001	0%
2	1.03	0.71	0.55	0.278			0.9	0.92	1.18	0.26	0.16	0.278	0.250	0.04	0.010	2%
3	1.32	0.79	0.55	0.345			0.9	1.18	1.49	0.31	0.24	0.345	0.311	0.07	0.023	5%
4	1.65	0.82	0.56	0.316			0.9	1.49	1.80	0.31	0.26	0.316	0.284	0.08	0.023	5%
5	1.94	0.89	0.55	0.293			0.9	1.80	2.07	0.28	0.34	0.293	0.264	0.09	0.025	5%
6	2.20	0.92	0.56	0.331			0.9	2.07	2.37	0.30	0.36	0.331	0.298	0.11	0.032	6%
7	2.53	0.97	0.54	0.379			0.9	2.37	2.62	0.25	0.43	0.379	0.341	0.11	0.037	7%
8	2.70	0.99	0.51	0.400			0.9	2.62	2.79	0.18	0.48	0.400	0.360	0.08	0.030	6%
9	2.88	1.00	0.46	0.446			0.9	2.79	2.96	0.17	0.54	0.446	0.401	0.09	0.036	7%
10	3.03	1.01	0.44	0.473			0.9	2.96	3.12	0.16	0.57	0.473	0.426	0.09	0.039	8%
11	3.20	0.95	0.44	0.473			0.9	3.12	3.29	0.17	0.51	0.473	0.426	0.09	0.037	7%
12	3.37	0.93	0.36	0.448			0.9	3.29	3.44	0.15	0.57	0.448	0.403	0.09	0.034	7%
13	3.50	0.91	0.37	0.479			0.9	3.44	3.58	0.14	0.54	0.479	0.431	0.08	0.033	7%
14	3.65	0.89	0.33	0.387			0.9	3.58	3.78	0.20	0.56	0.387	0.348	0.11	0.039	8%
15	3.90	0.81	0.32	0.388			0.9	3.78	3.95	0.18	0.49	0.388	0.349	0.09	0.030	6%
16	4.00	0.75	0.31	0.270			0.9	3.95	4.07	0.12	0.44	0.270	0.243	0.05	0.013	3%
17	4.14	0.70	0.25	0.318			0.9	4.07	4.20	0.13	0.45	0.318	0.286	0.06	0.017	3%
18	4.26	0.68	0.25	0.305			0.9	4.20	4.36	0.16	0.43	0.305	0.275	0.07	0.018	4%
19	4.45	0.72	0.24	0.130			0.9	4.36	4.58	0.22	0.48	0.130	0.117	0.11	0.012	2%
20	4.70	0.56	0.30	0.151			0.9	4.58	4.85	0.27	0.26	0.151	0.136	0.07	0.010	2%
LB	5.00	0.00	0.00	0.00	0.00	0.00	1.0	4.85	5.00	0.15	0.07	0.038	0.038	0.01	0.000	0%
<b>Total Flow</b>															<b>0.499</b>	

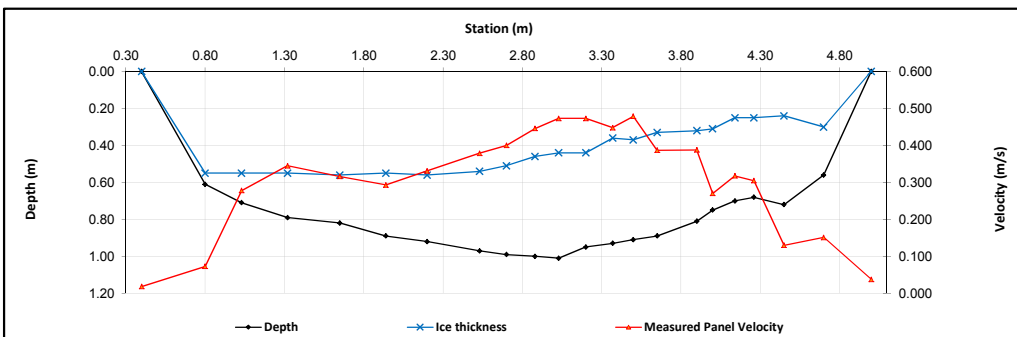
Measurement Details:	
Start Time (MST):	12:55
End Time (MST):	13:55
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow, calm, -4°C

Flow characteristics:		
Total Flow:	0.499	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.60	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.347	(m)
Mean Velocity:	0.312	(m/s)
Froude Number:	0.169	

Logger Details:		
Transducer Reading (m):	Before	After
	0.806	-
Water (°C):	0.1	-
IQ Velocity (m/s)	0.441	-
Flow Mmt Start Time:	13:30	-
Flow Mmt End Time:	13:55	-
Battery (Main):	12.2	-
Datalogger Clock:	12:57	-
Laptop Clock:	12:57	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S36-02	1.677	101.6		99.923	99.923	Pipe 8 m NE of Data Logger
S36-03			1.268	100.332	100.313	Pipe 6 m N of Data Logger
S36-04			1.302	100.298	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.961	99.639		
Water Level:			2.044	99.556		
Other:						
<b>Setup #2</b>						
S36-02			1.660	99.923	99.923	Pipe 8 m NE of Data Logger
S36-03	1.251	101.583	1.251	100.332	100.313	Pipe 6 m N of Data Logger
S36-04			1.294	100.289	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.943	99.640		
Water Level:			2.028	99.555		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	99.556
Transducer Elevation Before	98.750
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	10-Mar-13
Data Entry Personnel:	SM	Date:	10-Mar-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet

UTM Location: 490626 E, 6384064 N

Site Visit Date:

March 30, 2013



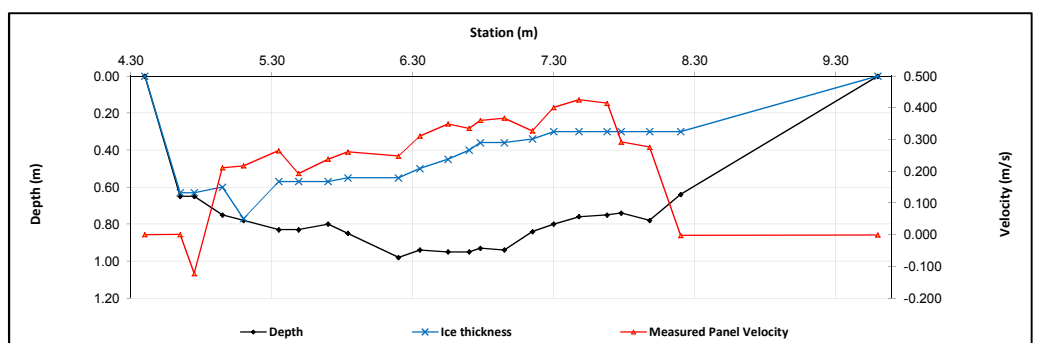
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.40	0.00	0.00	0.000	0.000	0.000	0.9	4.40	4.53	0.13	0.01	0.000	0.000	0.00	0.000	0%
1	4.65	0.65	0.63	0.001			0.9	4.53	4.70	0.18	0.02	0.001	0.001	0.00	0.000	0%
2	4.75	0.65	0.63	-0.122			0.9	4.70	4.85	0.15	0.02	-0.122	-0.110	0.00	0.000	0%
3	4.95	0.75	0.60	0.211			0.9	4.85	5.03	0.18	0.15	0.211	0.190	0.03	0.005	1%
4	5.10	0.78	0.77	0.217			0.9	5.03	5.23	0.20	0.01	0.217	0.195	0.00	0.000	0%
5	5.35	0.83	0.57	0.265			0.9	5.23	5.42	0.20	0.26	0.265	0.239	0.05	0.012	3%
6	5.49	0.83	0.57	0.193			0.9	5.42	5.60	0.18	0.26	0.193	0.174	0.05	0.008	2%
7	5.70	0.80	0.57	0.238			0.9	5.60	5.77	0.17	0.23	0.238	0.214	0.04	0.009	2%
8	5.84	0.85	0.55	0.261			0.9	5.77	6.02	0.25	0.30	0.261	0.235	0.08	0.018	5%
9	6.20	0.98	0.55	0.248			0.9	6.02	6.28	0.26	0.43	0.248	0.223	0.11	0.024	7%
10	6.35	0.94	0.50	0.311			0.9	6.28	6.45	0.17	0.44	0.311	0.280	0.08	0.022	6%
11	6.55	0.95	0.45	0.349			0.9	6.45	6.63	0.18	0.50	0.349	0.314	0.09	0.027	8%
12	6.70	0.95	0.40	0.335			0.9	6.63	6.74	0.12	0.55	0.335	0.302	0.06	0.019	5%
13	6.78	0.93	0.36	0.360			0.9	6.74	6.87	0.13	0.57	0.360	0.324	0.07	0.023	6%
14	6.95	0.94	0.36	0.367			0.9	6.87	7.05	0.19	0.58	0.367	0.330	0.11	0.035	10%
15	7.15	0.84	0.34	0.327			0.9	7.05	7.23	0.17	0.50	0.327	0.294	0.09	0.026	7%
16	7.30	0.80	0.30	0.401			0.9	7.23	7.39	0.17	0.50	0.401	0.361	0.08	0.030	8%
17	7.48	0.76	0.30	0.425			0.9	7.39	7.58	0.19	0.46	0.425	0.383	0.09	0.033	9%
18	7.68	0.75	0.30	0.414			0.9	7.58	7.73	0.15	0.45	0.414	0.373	0.07	0.025	7%
19	7.78	0.74	0.30	0.292			0.9	7.73	7.88	0.15	0.44	0.292	0.263	0.07	0.017	5%
20	7.98	0.78	0.30	0.276			0.9	7.88	8.09	0.21	0.48	0.276	0.248	0.10	0.025	7%
21	8.20	0.64	0.30	-0.002			0.9	8.09	8.90	0.81	0.34	-0.002	-0.002	0.28	0.000	0%
LB	9.60	0.00	0.00	0.00	0.00	0.00	1.0	8.90	9.60	0.70	0.09	-0.001	-0.001	0.06	0.000	0%
<b>Total Flow</b>														<b>0.358</b>		

Measurement Details:	
Start Time (MST):	11:40
End Time (MST):	13:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 2°C

Flow characteristics:	
Total Flow:	0.358 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.59 (m <sup>2</sup> )
Wetted Width:	5.20 (m)
Hydraulic Depth:	0.306 (m)
Mean Velocity:	0.225 (m/s)
Froude Number:	0.130

Logger Details:		
	Before	After
Transducer Reading (m):	0.823	-
Water (°C):	0.1	-
IQ Velocity (m/s)	0.459	-
Flow Mmt Start Time:	12:36	-
Flow Mmt End Time:	13:15	-
Battery (Main):	14.5	-
Datalogger Clock:	12:25	-
Laptop Clock:	12:26	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

Datalogger / Station Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S36-02	1.513	101.436		99.923	99.923	Pipe 8 m NE of Data Logger
S36-03			1.096	100.340	100.313	Pipe 6 m N of Data Logger
S36-04			1.136	100.300	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.788	99.648		
Water Level:			1.868	99.568		
Other:						
<b>Setup #2</b>						
S36-02			1.482	99.921	99.923	Pipe 8 m NE of Data Logger
S36-03	1.063	101.403		100.340	100.313	Pipe 6 m N of Data Logger
S36-04			1.103	100.300	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.756	99.647		
Water Level:			1.832	99.571		
Other:						

Closing Error	0.002	Average WL	99.570
WL Check	0.003	Transducer Elevation Before	98.747
		Transducer Elevation After	-

General Notes:  
 - Could not download all IQ data, too big of a file. Next time allow for more time to download and format the recorder afterwards.

<u>Field Personnel:</u>	CJ, XP	Trip Date:	30-Mar-13
Data Entry Personnel:	CJ	Date:	30-Mar-13
Data Check Personnel:	DW	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: May 12, 2013  
 Site Visit Time (MST): 07:50

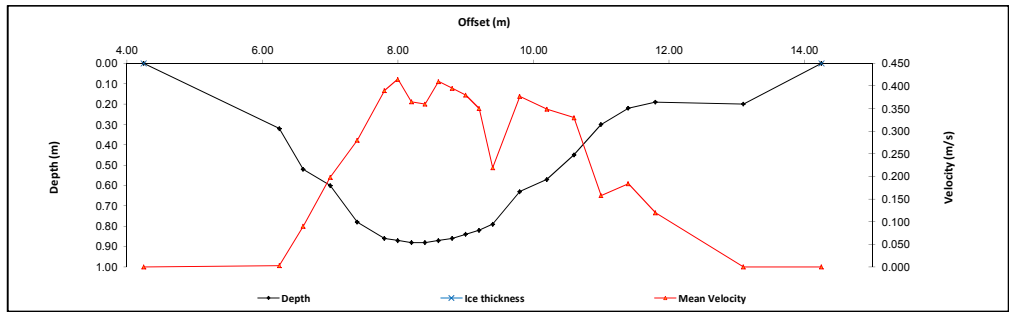


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.25	0.00	0.00		0.000				0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	6.25	0.32		0.19	0.003					1.00	1.18	0.32	0.003	0.38	0.001	0%
2	6.60	0.52		0.31	0.090					1.00	0.38	0.52	0.090	0.20	0.018	2%
3	7.00	0.60		0.36	0.198					1.00	0.40	0.60	0.198	0.24	0.048	4%
4	7.40	0.78				0.62	0.200	0.16	0.360	1.00	0.40	0.78	0.280	0.31	0.087	8%
5	7.80	0.86				0.69	0.360	0.17	0.420	1.00	0.30	0.86	0.390	0.26	0.101	9%
6	8.00	0.87				0.70	0.390	0.17	0.440	1.00	0.20	0.87	0.415	0.17	0.072	7%
7	8.20	0.88				0.70	0.320	0.18	0.410	1.00	0.20	0.88	0.365	0.18	0.064	6%
8	8.40	0.88				0.70	0.350	0.18	0.370	1.00	0.20	0.88	0.360	0.18	0.063	6%
9	8.60	0.87				0.70	0.360	0.17	0.460	1.00	0.20	0.87	0.410	0.17	0.071	7%
10	8.80	0.86				0.69	0.350	0.17	0.440	1.00	0.20	0.86	0.395	0.17	0.068	6%
11	9.00	0.84				0.67	0.290	0.17	0.470	1.00	0.20	0.84	0.380	0.17	0.064	6%
12	9.20	0.82				0.66	0.290	0.16	0.410	1.00	0.20	0.82	0.350	0.16	0.057	5%
13	9.40	0.79				0.63	0.019	0.16	0.420	1.00	0.30	0.79	0.219	0.24	0.052	5%
14	9.80	0.63	0.38	0.377						1.00	0.40	0.63	0.377	0.25	0.095	9%
15	10.20	0.57	0.34	0.349						1.00	0.40	0.57	0.349	0.23	0.080	8%
16	10.60	0.45	0.27	0.330						1.00	0.40	0.45	0.330	0.18	0.059	6%
17	11.00	0.30	0.18	0.158						1.00	0.40	0.30	0.158	0.12	0.019	2%
18	11.40	0.22	0.13	0.184						1.00	0.40	0.22	0.184	0.09	0.016	2%
19	11.80	0.19	0.11	0.120						1.00	0.85	0.19	0.120	0.16	0.019	2%
20	13.10	0.20	0.12	0.000						1.00	1.23	0.20	0.000	0.25	0.000	0%
RB	14.25	0.00	0.00		0.00				0.00	1.00	0.58	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.06</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:40
Equipment:	ADC
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 15°C



**Flow characteristics:**

Total Flow:	1.06	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.10	(m <sup>2</sup> )
Wetted Width:	10.00	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.079	0.079
Water (°C):	9.0	9.4
Datalogger Clock:	08:10	09:45
Laptop Clock:	08:10	09:45
Flow Mmt Start Time:	8:45	
Flow Mmt End Time:	9:35	
Battery (Main):	13.5	13.6
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- IQ is buried under 20 cm of sediment
- IQ cable was damaged while recovering the device during data download.
- Removed IQ, cable. It needs to be sent in for repair and testing.

**General Notes:**

- Low flow in grass to 6 m

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S36-02	1.286	101.209		99.923	99.923	Pipe 8 m NE of Data Logger	S36-02
S36-03			0.873	100.336	100.313	Pipe 6 m N of Data Logger	S36-03
S36-04			0.914	100.295	100.206	Pipe 8 m W of Data Logger	S36-04
Water Level:			1.783	99.426		Time WL Surveyed: 8:30	S36-04
Other:							S36-03
Setup #2							S36-02
S36-02			1.271	99.923	99.923	Pipe 8 m NE of Data Logger	
S36-03	0.858	101.194	0.858	100.336	100.313	Pipe 6 m N of Data Logger	
S36-04			0.899	100.295	100.206	Pipe 8 m W of Data Logger	
Water Level:			1.767	99.427		Time WL Surveyed: 8:31	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S36-02	1.272	101.195		99.923		Time WL Surveyed: 9:42	
Water Level:			1.768	99.427		Time WL Surveyed: 9:43	
Water Level:			1.750	99.425			
BM: S36-02	1.252	101.175		99.923			

**WL Survey Summary**

	Before	After
Average WL:	99.427	99.426
Transducer Elevation:	99.348	99.347
Closing Error:	0.000	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	1.06
Expected Discharge:	0.69
Shift from Existing Rating (m <sup>3</sup> /s):	-0.37
Shift from Existing Rating (%):	-35%

**Field Personnel:**

SM, DW	Trip Date:	12-May-13
SM, DW	Date:	12-May-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: June 14, 2013  
 Site Visit Time (MST): 09:11

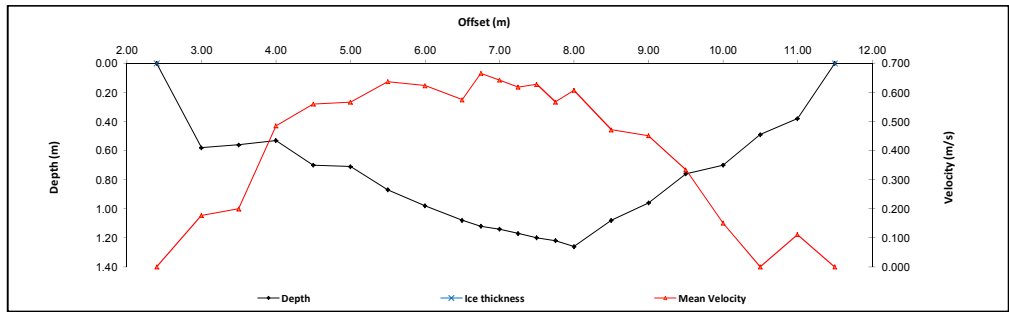


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000						
1	3.00	0.58		0.35	0.177					1.00	0.55	0.58	0.177	0.32	0.056	2%					
2	3.50	0.56		0.34	0.200					1.00	0.50	0.56	0.200	0.28	0.056	2%					
3	4.00	0.53		0.32	0.485					1.00	0.50	0.53	0.485	0.27	0.129	4%					
4	4.50	0.70		0.42	0.560					1.00	0.50	0.70	0.560	0.35	0.196	6%					
5	5.00	0.71		0.43	0.567					1.00	0.50	0.71	0.567	0.36	0.201	6%					
6	5.50	0.87				0.70	0.538	0.17	0.737	1.00	0.50	0.87	0.638	0.44	0.277	8%					
7	6.00	0.98				0.78	0.428	0.20	0.819	1.00	0.50	0.98	0.624	0.49	0.306	9%					
8	6.50	1.08				0.86	0.388	0.22	0.762	1.00	0.38	1.08	0.575	0.41	0.233	7%					
9	6.75	1.12				0.90	0.490	0.22	0.841	1.00	0.25	1.12	0.666	0.28	0.186	6%					
10	7.00	1.14				0.91	0.513	0.23	0.772	1.00	0.25	1.14	0.643	0.29	0.183	6%					
11	7.25	1.17				0.94	0.440	0.23	0.797	1.00	0.25	1.17	0.619	0.29	0.181	5%					
12	7.50	1.20				0.96	0.534	0.24	0.722	1.00	0.25	1.20	0.628	0.30	0.188	6%					
13	7.75	1.22				0.98	0.440	0.24	0.695	1.00	0.25	1.22	0.568	0.31	0.173	5%					
14	8.00	1.26				1.01	0.546	0.25	0.669	1.00	0.38	1.26	0.608	0.47	0.287	9%					
15	8.50	1.08				0.86	0.367	0.22	0.576	1.00	0.50	1.08	0.472	0.54	0.255	8%					
16	9.00	0.96				0.77	0.441	0.19	0.461	1.00	0.50	0.96	0.451	0.48	0.216	7%					
17	9.50	0.76				0.61	0.276	0.15	0.392	1.00	0.50	0.76	0.334	0.38	0.127	4%					
18	10.00	0.70	0.42	0.151						1.00	0.50	0.70	0.151	0.35	0.053	2%					
19	10.50	0.49	0.29	0.000						1.00	0.50	0.49	0.000	0.25	0.000	0%					
20	11.00	0.38	0.23	0.111						1.00	0.50	0.38	0.111	0.19	0.021	1%					
RB	11.50	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000						
<b>Total Flow</b>															<b>3.32</b>	<b>100%</b>					

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:05
Meas. End Time (MST):	10:45
Equipment:	ADV
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly Cloudy



**Flow characteristics:**

Total Flow:	3.32	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.02	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.47	(m/s)
Froude Number:	0.17	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.200	1.140
Water (°C):	15.1	15.6
Datalogger Clock:	09:15	10:50
Laptop Clock:	09:15	10:50
Flow Mmt Start Time:	-	-
Flow Mmt End Time:	-	-
Battery (Main):	13.9	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							S36-04
S36-02	1.448	101.371		99.923	99.923	Pipe 8 m NE of Data Logger	S36-03
S36-03			1.037	100.334	100.313	Pipe 6 m N of Data Logger	S36-02
S36-04			1.076	100.295	100.206	Pipe 8 m W of Data Logger	WL
Ice/PT:							WL
Water Level:			1.538	99.833		Time WL Surveyed: 9:42	S36-02
Other:							S36-03
Setup #2							S36-04
S36-02			1.395	99.919	99.923	Pipe 8 m NE of Data Logger	
S36-03	0.980	101.314		100.334	100.313	Pipe 6 m N of Data Logger	
S36-04			1.019	100.295	100.206	Pipe 8 m W of Data Logger	
Ice/PT:							
Water Level:			1.485	99.829		Time WL Surveyed: 9:44	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S36-02	1.390	101.313		99.923		
Water Level:				1.493	99.820	Time WL Surveyed: 10:50	
Water Level:				1.471	99.820	Time WL Surveyed: 10:52	
BM:	S36-02	1.368	101.291		99.923		

**WL Survey Summary**

	Before	After
Average WL:	99.831	99.820
Transducer Elevation:	98.631	98.680
Closing Error:	0.004	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	3.32
Expected Discharge:	1.45
Shift from Existing Rating (m <sup>3</sup> /s):	-1.87
Shift from Existing Rating (%):	-56%

**Field Personnel:**

Field Personnel:	SG, TR	Trip Date:	14-Jun-13
Data Entry Personnel:	SG	Date:	14-Jun-13
Data Check Personnel:	DW	Date:	25-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: August 12, 2013  
 Site Visit Time (MST): 11:30

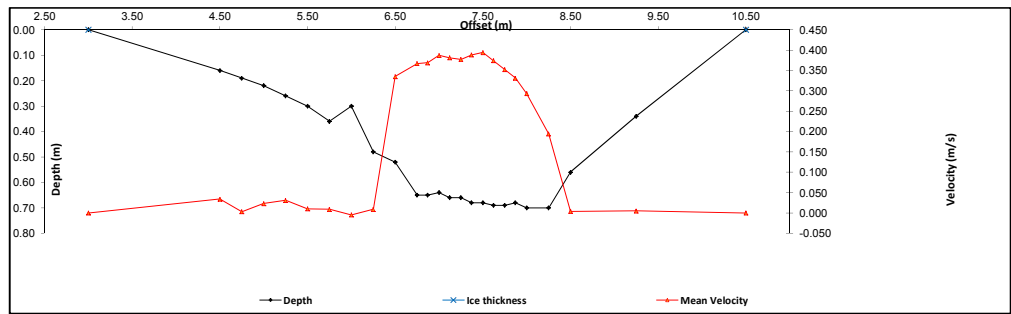


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	4.50	0.16		0.10	0.034					1.00	0.88	0.16	0.034	0.14	0.005	1%
2	4.75	0.19		0.11	0.003					1.00	0.25	0.19	0.003	0.05	0.000	0%
3	5.00	0.22		0.13	0.023					1.00	0.25	0.22	0.023	0.06	0.001	0%
4	5.25	0.26		0.16	0.031					1.00	0.25	0.26	0.031	0.07	0.002	0%
5	5.50	0.30		0.18	0.010					1.00	0.25	0.30	0.010	0.08	0.001	0%
6	5.75	0.36		0.22	0.009					1.00	0.25	0.36	0.009	0.09	0.001	0%
7	6.00	0.30		0.18	-0.005					1.00	0.25	0.30	-0.005	0.08	0.000	0%
8	6.25	0.48		0.29	0.009					1.00	0.25	0.48	0.009	0.12	0.001	0%
9	6.50	0.52		0.31	0.335					1.00	0.25	0.52	0.335	0.13	0.044	10%
10	6.75	0.65		0.39	0.367					1.00	0.19	0.65	0.367	0.12	0.044	10%
11	6.87	0.65		0.39	0.369					1.00	0.13	0.65	0.369	0.08	0.030	7%
12	7.00	0.64		0.38	0.387					1.00	0.13	0.64	0.387	0.08	0.031	7%
13	7.12	0.66		0.40	0.381					1.00	0.13	0.66	0.381	0.08	0.031	7%
14	7.25	0.66		0.40	0.377					1.00	0.13	0.66	0.377	0.08	0.031	7%
15	7.37	0.68		0.41	0.388					1.00	0.13	0.68	0.388	0.09	0.033	7%
16	7.50	0.68		0.41	0.394					1.00	0.13	0.68	0.394	0.09	0.033	7%
17	7.62	0.69		0.41	0.374					1.00	0.13	0.69	0.374	0.09	0.032	7%
18	7.75	0.69		0.41	0.352					1.00	0.13	0.69	0.352	0.09	0.030	7%
19	7.87	0.68		0.41	0.331					1.00	0.13	0.68	0.331	0.09	0.028	6%
20	8.00	0.70		0.42	0.293					1.00	0.19	0.70	0.293	0.13	0.039	9%
21	8.25	0.70		0.42	0.194					1.00	0.25	0.70	0.194	0.18	0.034	7%
22	8.50	0.56		0.34	0.004					1.00	0.50	0.56	0.004	0.28	0.001	0%
23	9.25	0.34		0.20	0.005					1.00	1.00	0.34	0.005	0.34	0.002	0%
RB	10.50	0.00	0.00		0.00		0.00		0.00	1.00	0.63	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.455</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:37
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 25°C



**Flow characteristics:**

Total Flow:	0.455	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.60	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.567	0.569
Water (°C):	14.5	14.2
Datalogger Clock:	11:41	12:46
Laptop Clock:	11:41	12:46
Flow Mmt Start Time:	12:00	
Flow Mmt End Time:	12:35	
Battery (Main):	12.8	12.9
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Replaced
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced # 5 element and cable on Goes antenna.
- Replaced PLS

**General Notes:**

- Vegetation in channel offsets 3 m to 6.3 m

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S36-02
S36-02	1.422	101.345		99.923	99.923	Pipe 8 m NE of Data Logger	S36-03
S36-03			1.010	100.335	100.313	Pipe 6 m N of Data Logger	S36-04
S36-04			1.048	100.297	100.206	Pipe 8 m W of Data Logger	WL
Ice/PT:							WL
Water Level:			1.982	99.363		Time WL Surveyed: 11:58	S36-04
Other:							S36-03
<b>Setup #2</b>							S36-02
S36-02			1.410	99.925	99.923	Pipe 8 m NE of Data Logger	
S36-03	1.000	101.335		100.335	100.313	Pipe 6 m N of Data Logger	
S36-04			1.037	100.298	100.206	Pipe 8 m W of Data Logger	
Ice/PT:							
Water Level:			1.972	99.363		Time WL Surveyed: 12:00	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S36-02	1.410	101.333		99.923			
Water Level:			1.975	99.358		Time WL Surveyed: 12:42	
Water Level:			1.964	99.359		Time WL Surveyed: 12:44	
BM: S36-02	1.400	101.323		99.923			

**WL Survey Summary**

	Before	After
Average WL:	99.363	99.359
Transducer Elevation:	98.796	98.790
Closing Error:	-0.002	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	0.455
Expected Discharge:	0.59
Shift from Existing Rating (m <sup>3</sup> /s):	0.13
Shift from Existing Rating (%):	30%

**Field Personnel:**

	SM, TR	Trip Date:	12-Aug-13
Data Entry Personnel:	SM	Date:	12-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: September 15, 2013  
 Site Visit Time (MST): 10:25



Flow Measurement:											Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)						
LB	2.75	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000							
1	3.00	0.29		0.17	0.124					1.00	0.25	0.29	0.124	0.07	0.009	2%						
2	3.25	0.41		0.25	0.158					1.00	0.25	0.41	0.158	0.10	0.016	3%						
3	3.50	0.60		0.36	0.160					1.00	0.25	0.60	0.160	0.15	0.024	4%						
4	3.75	0.78				0.62	0.179	0.16	0.165	1.00	0.25	0.78	0.172	0.20	0.034	6%						
5	4.00	0.82				0.66	0.239	0.16	0.184	1.00	0.25	0.82	0.212	0.21	0.043	7%						
6	4.25	0.84				0.67	0.285	0.17	0.194	1.00	0.25	0.84	0.240	0.21	0.050	8%						
7	4.50	0.88				0.70	0.304	0.18	0.226	1.00	0.20	0.88	0.265	0.18	0.047	8%						
8	4.65	0.88				0.70	0.302	0.18	0.228	1.00	0.13	0.88	0.265	0.11	0.029	5%						
9	4.75	0.90				0.72	0.320	0.18	0.227	1.00	0.10	0.90	0.274	0.09	0.025	4%						
10	4.85	0.90				0.72	0.301	0.18	0.246	1.00	0.13	0.90	0.274	0.11	0.031	5%						
11	5.00	0.93				0.74	0.325	0.19	0.243	1.00	0.10	0.93	0.284	0.09	0.026	4%						
12	5.05	0.92				0.74	0.302	0.18	0.225	1.00	0.13	0.92	0.264	0.12	0.030	5%						
13	5.25	0.92				0.74	0.325	0.18	0.211	1.00	0.23	0.92	0.268	0.21	0.055	9%						
14	5.50	0.97				0.78	0.249	0.19	0.216	1.00	0.25	0.97	0.233	0.24	0.056	9%						
15	5.75	0.97				0.78	0.228	0.19	0.177	1.00	0.25	0.97	0.203	0.24	0.049	8%						
16	6.00	0.95				0.76	0.149	0.19	0.183	1.00	0.25	0.95	0.166	0.24	0.039	7%						
17	6.25	0.84				0.67	0.108	0.17	0.142	1.00	0.25	0.84	0.125	0.21	0.028	4%						
18	6.50	0.72		0.43	0.039					1.00	0.25	0.72	0.039	0.18	0.007	1%						
19	6.75	0.36		0.22	-0.006					1.00	0.25	0.36	-0.006	0.09	-0.001	0%						
20	7.00	0.32		0.19	0.016					1.00	0.28	0.32	0.016	0.09	0.001	0%						
RB	7.30	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000							
<b>Total Flow</b>															<b>0.599</b>	<b>100%</b>						

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:18
Meas. End Time (MST):	11:52
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C

**Flow characteristics:**

Total Flow:	0.599	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.13	(m <sup>2</sup> )
Wetted Width:	4.55	(m)
Hydraulic Depth:	0.69	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.07	

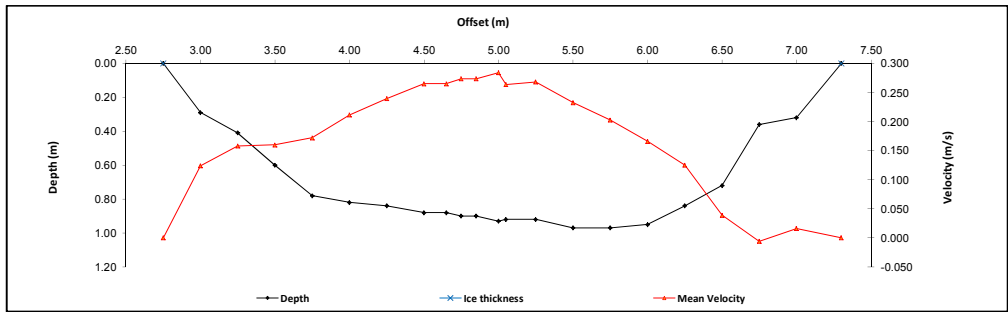
**Logger Details:**

	Before	After
Transducer Reading (m):	0.558	0.558
Water (°C):	8.2	8.4
Datalogger Clock:	10:55	12:02
Laptop Clock:	10:55	12:02
Flow Mmt Start Time:	11:18	
Flow Mmt End Time:	11:52	
Battery (Main):	14.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Installed new 3/4" BM
- BM tags not replaced
- Bear pulled solar cables and antenna cable on 22-Aug-2013 at 12:00
- Replaced solar controller and reinstated station



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S36-02	1.346	101.269	1.346	99.923	99.923	Pipe 8 m NE of Data Logger	S36-02
S36-03			0.938	100.331	100.313	Pipe 6 m N of Data Logger	S36-03
S36-04			0.978	100.291	100.206	Pipe 8 m W of Data Logger	Other
Ice/PT:							WL
Water Level:		1.922		99.347		Time WL Surveyed:	11:05
Other:			0.875	100.394			Other
<b>Setup #2</b>							
S36-02			1.333	99.922	99.923	Pipe 8 m NE of Data Logger	S36-03
S36-03			0.924	100.331	100.313	Pipe 6 m N of Data Logger	S36-02
S36-04	0.964	101.255		100.291	100.206	Pipe 8 m W of Data Logger	
Ice/PT:							
Water Level:			1.907	99.348		Time WL Surveyed:	11:08
Other:			0.861	100.394			(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S36-02	1.333	101.256		99.923	Time WL Surveyed:	11:57
Water Level:			1.905	99.351		Time WL Surveyed:	11:58
Water Level:			1.893	99.351		Time WL Surveyed:	
BM:	S36-02	1.321	101.244		99.923		

**WL Survey Summary**

	Before	After
Average WL:	99.348	99.351
Transducer Elevation:	98.790	98.793
Closing Error:	0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	0.599
Expected Discharge:	0.57
Shift from Existing Rating (m <sup>3</sup> /s):	-0.03
Shift from Existing Rating (%):	-5%

**Field Personnel:**

Field Personnel:	CJ, TR	Trip Date:	15-Sep-13
Data Entry Personnel:	CJ	Date:	15-Sep-13
Data Check Personnel:	DW	Date:	26-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: October 19, 2013  
 Site Visit Time (MST): 09:15

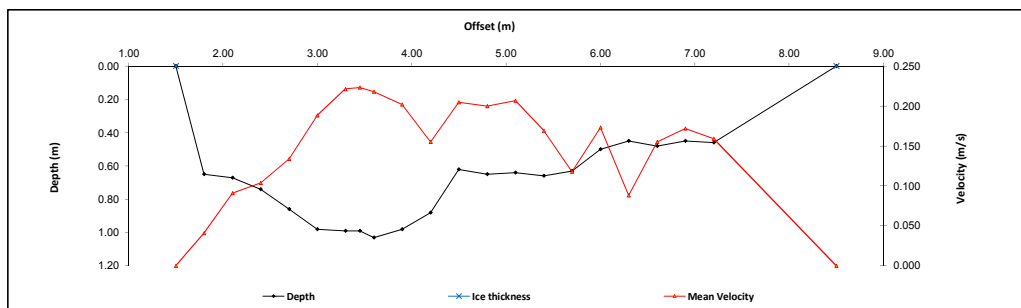


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.80	0.65		0.39	0.041				1.00	0.30	0.65	0.041	0.20	0.008	1%	
2	2.10	0.67		0.40	0.091				1.00	0.30	0.67	0.091	0.20	0.018	3%	
3	2.40	0.74		0.44	0.104				1.00	0.30	0.74	0.104	0.22	0.023	3%	
4	2.70	0.86				0.69	0.065	0.17	0.203	1.00	0.30	0.086	0.134	0.026	0.035	5%
5	3.00	0.98				0.78	0.171	0.20	0.206	1.00	0.30	0.098	0.189	0.029	0.055	8%
6	3.30	0.99				0.79	0.216	0.20	0.227	1.00	0.23	0.099	0.222	0.022	0.049	7%
7	3.45	0.99				0.79	0.232	0.20	0.215	1.00	0.15	0.099	0.224	0.015	0.033	5%
8	3.60	1.03				0.82	0.202	0.21	0.234	1.00	0.23	1.03	0.218	0.23	0.051	7%
9	3.90	0.98				0.78	0.176	0.20	0.228	1.00	0.30	0.98	0.202	0.29	0.059	9%
10	4.20	0.88				0.70	0.086	0.18	0.224	1.00	0.30	0.88	0.155	0.26	0.041	6%
11	4.50	0.62	0.37		0.205				1.00	0.30	0.62	0.205	0.19	0.038	6%	
12	4.80	0.65		0.39	0.200				1.00	0.30	0.65	0.200	0.19	0.039	6%	
13	5.10	0.64		0.38	0.207				1.00	0.30	0.64	0.207	0.19	0.040	6%	
14	5.40	0.66		0.40	0.169				1.00	0.30	0.66	0.169	0.20	0.033	5%	
15	5.70	0.63		0.38	0.118				1.00	0.30	0.63	0.118	0.19	0.022	3%	
16	6.00	0.50		0.30	0.173				1.00	0.30	0.50	0.173	0.15	0.026	4%	
17	6.30	0.45		0.27	0.088				1.00	0.30	0.45	0.088	0.14	0.012	2%	
18	6.60	0.48		0.29	0.155				1.00	0.30	0.48	0.155	0.14	0.022	3%	
19	6.90	0.45		0.27	0.172				1.00	0.30	0.45	0.172	0.14	0.023	3%	
20	7.20	0.46		0.28	0.159				1.00	0.80	0.46	0.159	0.37	0.058	9%	
RB	8.50	0.00	0.00		0.000				1.00	0.65	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.687</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:15
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 4°C



**Flow characteristics:**

Total Flow:	0.687	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.22	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.794	0.794
Water (°C):	5.1	5.2
Datalogger Clock:	08:31	14:40
Laptop Clock:	08:31	14:40
Battery (Main):	12.8	13.4
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed SL
- More data on tablet

**General Notes:**

- Weeds and grass from 7.8 m to 8.5 m

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S36-02				99.923	99.923	Pipe 8 m NE of Data Logger	S36-02
S36-03			0.901	100.331	100.313	Pipe 6 m N of Data Logger	S36-03
S36-04			0.942	100.290	100.206	Pipe 8 m W of Data Logger	S36-04
Water Level:			1.653	99.579	Time WL Surveyed:	12:35	WL
Other:			0.835	100.397		3/4" Pipe 6 m SW of Mast	Other
<b>Setup #2</b>							
S36-02			1.292	99.921	99.923	Pipe 8 m NE of Data Logger	S36-04
S36-03			0.884	100.329	100.313	Pipe 6 m N of Data Logger	S36-03
S36-04	0.923	101.213		100.290	100.206	Pipe 8 m W of Data Logger	S36-02
Water Level:			1.632	99.581	Time WL Surveyed:	12:36	(must close survey loop on survey starting point)
Other:			0.819	100.394		3/4" Pipe 6 m SW of Mast	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S36-02	1.292	101.215		99.923		
Water Level:			1.634	99.581	Time WL Surveyed:	14:48	
Water Level:			1.617	99.581	Time WL Surveyed:	14:49	
BM:	S36-02	1.275	101.198		99.923		

**WL Survey Summary**

	Before	After
Average WL:	99.580	99.581
Transducer Elevation:	98.786	98.787
Closing Error:	0.002	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	0.687
Expected Discharge:	0.95
Shift from Existing Rating (m <sup>3</sup> /s):	0.26
Shift from Existing Rating (%):	38%

**Field Personnel:**

Field Personnel:	DW, SM	Trip Date:	19-Oct-13
Data Entry Personnel:	SM	Date:	19-Oct-13
Data Check Personnel:	DW	Date:	29-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: December 11, 2013  
 Site Visit Time (MST): 12:10



Flow Measurement:												Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
LB	1.60	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000						
1	2.00	0.76	0.26	0.51	0.121					0.88	0.40	0.50	0.106	0.20	0.021	4%					
2	2.40	0.94	0.25	0.60	0.194					0.88	0.35	0.69	0.171	0.24	0.041	7%					
3	2.70	0.98	0.25	0.62	0.257					0.88	0.35	0.73	0.226	0.26	0.058	10%					
4	3.10	1.07	0.25			0.91	0.127	0.41	0.290	1.00	0.35	0.82	0.209	0.29	0.060	10%					
5	3.40	1.05	0.24			0.89	0.129	0.40	0.255	1.00	0.35	0.81	0.192	0.28	0.054	9%					
6	3.80	1.01	0.23			0.85	0.123	0.39	0.243	1.00	0.35	0.78	0.183	0.27	0.050	8%					
7	4.10	1.02	0.22			0.86	0.189	0.38	0.286	1.00	0.20	0.80	0.238	0.16	0.038	6%					
8	4.20	0.99	0.20			0.83	0.214	0.36	0.272	1.00	0.25	0.79	0.243	0.20	0.048	8%					
9	4.60	0.94	0.19	0.57	0.262					0.88	0.25	0.75	0.231	0.19	0.043	7%					
10	4.70	0.93	0.17			0.78	0.196	0.32	0.269	1.00	0.25	0.76	0.233	0.19	0.044	7%					
11	5.10	0.83	0.19	0.51	0.240					0.88	0.40	0.64	0.211	0.26	0.054	9%					
12	5.50	0.77	0.22	0.50	0.246					0.88	0.35	0.55	0.216	0.19	0.042	7%					
13	5.80	0.37	0.24	0.31	0.208					0.88	0.30	0.13	0.183	0.04	0.007	1%					
14	6.10	0.48	0.26	0.37	0.004					0.88	0.35	0.22	0.004	0.08	0.000	0%					
15	6.50	0.48	0.27	0.38	0.066					0.88	0.35	0.21	0.058	0.07	0.004	1%					
16	6.80	0.51	0.32	0.42	0.067					0.88	0.35	0.19	0.059	0.07	0.004	1%					
17	7.20	0.52	0.31	0.42	0.081					0.88	0.35	0.21	0.071	0.07	0.005	1%					
18	7.50	0.51	0.29	0.40	0.146					0.88	0.30	0.22	0.128	0.07	0.008	1%					
19	7.80	0.51	0.31	0.41	0.122					0.88	0.30	0.20	0.107	0.06	0.006	1%					
20	8.10	0.50	0.32	0.41	0.066					0.88	0.35	0.18	0.058	0.06	0.004	1%					
RB	8.50	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000						
<b>Total Flow</b>															<b>0.593</b>	<b>100%</b>					

Flow Measurement Details:	
Metering Section Location (describe):	
Meas. Start Time (MST):	14:00
Meas. End Time (MST):	14:27
Equipment:	ADC
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear and Cold

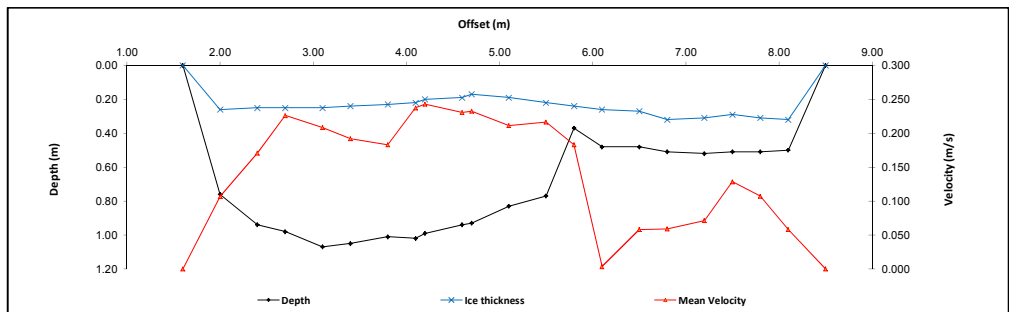
Flow characteristics:		
Total Flow:	0.593	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.24	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.09	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	-	0.870
Datalogger Clock:	-	14:27
Laptop Clock:	-	14:36
Battery (Main):	-	14:36
Battery (Main):	-	12.9
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent. Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Argonaut Details:		
Water Level (m):	Before	After
Index Velocity (m/s):	0.871	-
Discharge (m <sup>3</sup> /s):	0.314	-
Discharge (m <sup>3</sup> /s):	0	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S36-02	1.536	101.459		99.923	99.923	Pipe 8 m NE of Data Logger	S36-02
S36-03			1.107	100.352	100.313	Pipe 6 m N of Data Logger	S36-03
S36-04			1.131	100.328	100.206	Pipe 8 m W of Data Logger	Other
Ice/PT:			1.764	99.695			Ice
Water Level:			1.806	99.653		Time WL Surveyed: 13:46	WL
Other:			1.063	100.396		3/4" Pipe 6 m SW of Mast	WL
Setup #2							
S36-02			1.507	99.922	99.923	Pipe 8 m NE of Data Logger	Other
S36-03	1.077	101.429		100.352	100.313	Pipe 6 m N of Data Logger	S36-04
S36-04			1.105	100.324	100.206	Pipe 8 m W of Data Logger	S36-03
Ice/PT:			1.733	99.696			S36-02
Water Level:			1.778	99.651		Time WL Surveyed: 13:50	(must close survey loop on survey starting point)
Other:			1.033	100.396		3/4" Pipe 6 m SW of Mast	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	Other	1.033		101.429		100.396	
Water Level:				1.773		99.656	Time WL Surveyed: 14:29
Water Level:				1.745		99.655	Time WL Surveyed: 14:31
BM:	Other	1.004		101.400		100.396	

WL Survey Summary		
Average WL:	Before	After
Transducer Elevation:	99.652	99.656
Closing Error:	-	98.786
WL Check:	0.001	-
WL Check:	0.002	0.001

Site Rating Information	
Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:			
Data Entry Personnel:	TR, CJ	Trip Date:	11-Dec-13
Data Check Personnel:	TR, CJ	Date:	11-Dec-13
Entered Digitally in the Field:	DW	Date:	29-Jan-14

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: May 5, 2013  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
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23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
<b>No Flow Measurement Conducted</b>																	
															<b>Total Flow</b>		-

### Flow Measurement Details:

**Metering Section Location (describe):**

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

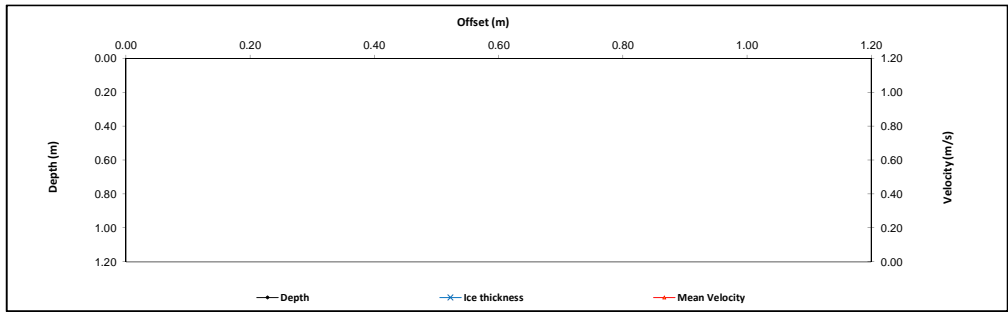
	Before	After
Transducer Reading (m):	1.011	1.015
Water (°C):	0.3	0.3
Datalogger Clock:	13:32	13:54
Laptop Clock:	13:33	13:55
Battery (Main):	14.2	14.1
Battery Condition:	-	New
Battery Serial #:	-	-
Enclosure Dessicant:	-	New
Vent Tube Dessicant:	-	New
PT# (if replaced):	284718	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Relay station operational

**General Notes:**

- Flow measurement postponed because of high water levels and safety concerns
- Very high water level, braided stream flow, station area flooded, see photos



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S37-03
S37-03	1.238	102.076		100.838	100.838	3/4" Pipe 3m S of logger	S37-04
S37-04			1.001	101.075	101.078	3/4" Pipe 4m SW of Station	S37-05
S37-05			0.899	101.177	101.178	3/4" Pipe 1.5m from Station	WL
Ice/PT:							WL
Water Level:		1.152		100.924		Time WL Surveyed: 13:44	S37-05
Other:						Nail in tree	S37-04
<b>Setup #2</b>							S37-03
S37-03			1.225	100.837	100.838	3/4" Pipe 3m S of logger	
S37-04			0.986	101.076	101.078	3/4" Pipe 4m SW of Station	
S37-05	0.885	102.062		101.177	101.178	3/4" Pipe 1.5m from Station	
Ice/PT:							
Water Level:			1.139	100.923		Time WL Surveyed: 13:47	(must close survey loop on survey starting point)
Other:						Nail in tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:							

**WL Survey Summary**

	Before	After
Average WL:	100.924	-
Transducer Elevation:	99.913	-
Closing Error:	0.001	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	5-May-13
Data Entry Personnel:	Date:	5-May-13
Data Check Personnel:	Date:	21-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: June 13, 2013  
 Site Visit Time (MST): 15:00

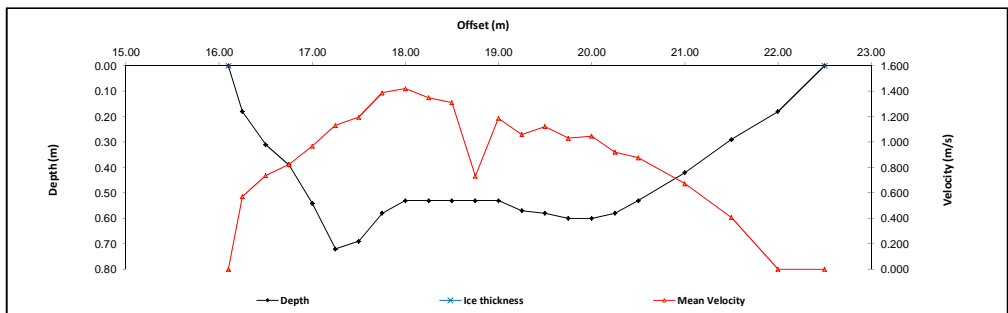


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	16.10	0.00	0.00		0.000		0.000		0.000	1.00	0.07	0.00	0.000	0.00	0.000	
1	16.25	0.18		0.11	0.571					1.00	0.20	0.18	0.571	0.04	0.021	1%
2	16.50	0.31		0.19	0.737					1.00	0.25	0.31	0.737	0.08	0.057	2%
3	16.75	0.39		0.23	0.825					1.00	0.25	0.39	0.825	0.10	0.080	3%
4	17.00	0.54		0.32	0.969					1.00	0.25	0.54	0.969	0.14	0.131	5%
5	17.25	0.72		0.43	1.131					1.00	0.25	0.72	1.131	0.18	0.204	7%
6	17.50	0.69		0.41	1.196					1.00	0.25	0.69	1.196	0.17	0.206	7%
7	17.75	0.58		0.35	1.387					1.00	0.25	0.58	1.387	0.15	0.201	7%
8	18.00	0.53		0.32	1.420					1.00	0.25	0.53	1.420	0.13	0.188	7%
9	18.25	0.53		0.32	1.348					1.00	0.25	0.53	1.348	0.13	0.179	6%
10	18.50	0.53		0.32	1.311					1.00	0.25	0.53	1.311	0.13	0.174	6%
11	18.75	0.53		0.32	0.732					1.00	0.25	0.53	0.732	0.13	0.097	3%
12	19.00	0.53		0.32	1.187					1.00	0.25	0.53	1.187	0.13	0.157	6%
13	19.25	0.57		0.34	1.059					1.00	0.25	0.57	1.059	0.14	0.161	5%
14	19.50	0.58		0.35	1.122					1.00	0.25	0.58	1.122	0.15	0.163	6%
15	19.75	0.60		0.36	1.030					1.00	0.25	0.60	1.030	0.15	0.155	5%
16	20.00	0.60		0.36	1.047					1.00	0.25	0.60	1.047	0.15	0.157	5%
17	20.25	0.58		0.35	0.921					1.00	0.25	0.58	0.921	0.15	0.134	5%
18	20.50	0.53		0.32	0.877					1.00	0.38	0.53	0.877	0.20	0.174	6%
19	21.00	0.42		0.25	0.673					1.00	0.50	0.42	0.673	0.21	0.141	5%
20	21.50	0.29		0.17	0.408					1.00	0.50	0.29	0.408	0.15	0.059	2%
21	22.00	0.18		0.11	0.000					1.00	0.50	0.18	0.000	0.09	0.000	0%
LB	22.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.83</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:55
Equipment:	ADV
Method:	Wading
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, windy



**Flow characteristics:**

Total Flow:	2.83	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.88	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.98	(m/s)
Froude Number:	0.47	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.707	0.708
Water (°C):	13.4	13.7
Datalogger Clock:	15:07	-
Laptop Clock:	15:08	-
Battery (Main):	14.2	-
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S37-04
S37-03			1.381	100.839	100.838	3/4" Pipe 3m S of logger	S37-05
S37-04	1.142	102.220		101.078	101.078	3/4" Pipe 4m SW of Station	S37-03
S37-05			1.039	101.181	101.178	3/4" Pipe 1.5m from Station	WL
Ice/PT:							WL
Water Level:			1.560	100.660		Time WL Surveyed: 15:16	S37-03
Other:						Nail in tree	S37-05
<b>Setup #2</b>							S37-04
S37-03	1.336	102.175		100.839	100.838	3/4" Pipe 3m S of logger	
S37-04			1.098	101.077	101.078	3/4" Pipe 4m SW of Station	
S37-05			0.996	101.179	101.178	3/4" Pipe 1.5m from Station	
Ice/PT:							
Water Level:			1.512	100.663		Time WL Surveyed: 15:17	
Other:						Nail in tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S37-04	1.100	102.178		101.078		
Water Level:			1.515	100.663		Time WL Surveyed: 15:59	
Water Level:			1.428	100.667		Time WL Surveyed: 16:00	
BM:	S37-04	1.017	102.095		101.078		

**WL Survey Summary**

	Before	After
Average WL:	100.662	100.665
Transducer Elevation:	99.955	99.957
Closing Error:	0.001	-
WL Check:	0.003	-0.004

**Site Rating Information**

Measured Discharge:	2.83
Expected Discharge:	1.84
Shift from Existing Rating (m <sup>3</sup> /s):	-0.99
Shift from Existing Rating (%):	-35%

**Field Personnel:**

TR, SG	Trip Date:	13-Jun-13
TR	Date:	13-Jun-13
CJ	Date:	19-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 16:30

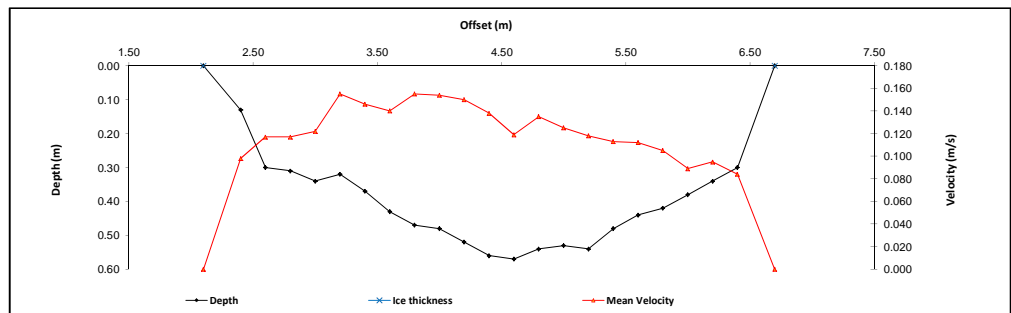


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.10	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.40	0.13		0.08	0.098					1.00	0.25	0.13	0.098	0.03	0.003	1%
2	2.60	0.30		0.18	0.117					1.00	0.20	0.30	0.117	0.06	0.007	3%
3	2.80	0.31		0.19	0.117					1.00	0.20	0.31	0.117	0.06	0.007	3%
4	3.00	0.34		0.20	0.122					1.00	0.20	0.34	0.122	0.07	0.008	4%
5	3.20	0.32		0.19	0.155					1.00	0.20	0.32	0.155	0.06	0.010	4%
6	3.40	0.37		0.22	0.146					1.00	0.20	0.37	0.146	0.07	0.011	5%
7	3.60	0.43		0.26	0.140					1.00	0.20	0.43	0.140	0.09	0.012	5%
8	3.80	0.47		0.28	0.155					1.00	0.20	0.47	0.155	0.09	0.015	7%
9	4.00	0.48		0.29	0.154					1.00	0.20	0.48	0.154	0.10	0.015	7%
10	4.20	0.52		0.31	0.150					1.00	0.20	0.52	0.150	0.10	0.016	7%
11	4.40	0.56		0.34	0.138					1.00	0.20	0.56	0.138	0.11	0.015	7%
12	4.60	0.57		0.34	0.119					1.00	0.20	0.57	0.119	0.11	0.014	6%
13	4.80	0.54		0.32	0.135					1.00	0.20	0.54	0.135	0.11	0.015	7%
14	5.00	0.53		0.32	0.125					1.00	0.20	0.53	0.125	0.11	0.013	6%
15	5.20	0.54		0.32	0.118					1.00	0.20	0.54	0.118	0.11	0.013	6%
16	5.40	0.48		0.29	0.113					1.00	0.20	0.48	0.113	0.10	0.011	5%
17	5.60	0.44		0.26	0.112					1.00	0.20	0.44	0.112	0.09	0.010	4%
18	5.80	0.42		0.25	0.105					1.00	0.20	0.42	0.105	0.08	0.009	4%
19	6.00	0.38		0.23	0.089					1.00	0.20	0.38	0.089	0.08	0.007	3%
20	6.20	0.34		0.20	0.095					1.00	0.20	0.34	0.095	0.07	0.006	3%
21	6.40	0.30		0.18	0.084					1.00	0.25	0.30	0.084	0.08	0.006	3%
LB	6.70	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.222</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	16:42
Meas. End Time (MST):	17:03
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, +25°C



**Flow characteristics:**

Total Flow:	0.222	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.78	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.86	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.350	0.809
Water (°C):	16.8	16.8
Datalogger Clock:	16:29	17:12
Laptop Clock:	16:29	17:12
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was relocated to original position

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S37-03			1.328	100.838	100.838	3/4" Pipe 3m S of logger	S37-05
S37-04			1.089	101.077	101.078	3/4" Pipe 4m SW of Station	S37-03
S37-05	0.988	102.166		101.178	101.178	3/4" Pipe 1.5m from Station	WL
Ice/PT:							WL
Water Level:			2.051	100.115		Time WL Surveyed: 16:36	S37-03
Other:						Nail in tree	S37-04
Setup #2							S37-05
S37-03	1.316	102.154		100.838	100.838	3/4" Pipe 3m S of logger	
S37-04			1.077	101.077	101.078	3/4" Pipe 4m SW of Station	
S37-05			0.976	101.178	101.178	3/4" Pipe 1.5m from Station	
Ice/PT:							
Water Level:			2.036	100.118		Time WL Surveyed: 16:38	
Other:						Nail in tree	(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S37-04	1.078	102.155	101.077			
Water Level:			2.037	100.118		Time WL Surveyed: 17:06	
Water Level:			2.026	100.118		Time WL Surveyed: 17:08	
BM:	S37-04	1.067	102.144	101.077			

**WL Survey Summary**

	Before	After
Average WL:	100.117	100.118
Transducer Elevation:	99.767	99.309
Closing Error:	0.000	-
WL Check:	0.003	0.000

**Site Rating Information**

Measured Discharge:	0.222
Expected Discharge:	0.30
Shift from Existing Rating (m <sup>3</sup> /s):	0.08
Shift from Existing Rating (%):	37%

**Field Personnel:**

SM, TR	Trip Date:	11-Aug-13
SM	Date:	11-Aug-13
CJ	Date:	27-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: September 13, 2013  
 Site Visit Time (MST): 07:00

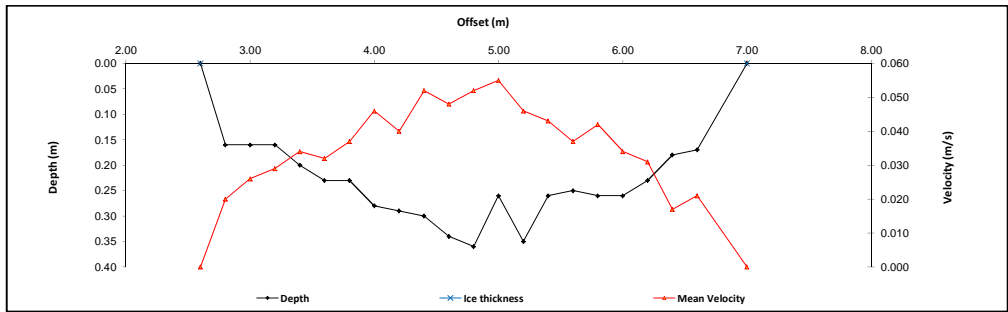


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.60	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.80	0.16		0.10	0.020					1.00	0.20	0.16	0.020	0.03	0.001	2%
2	3.00	0.16		0.10	0.026					1.00	0.20	0.16	0.026	0.03	0.001	2%
3	3.20	0.16		0.10	0.029					1.00	0.20	0.16	0.029	0.03	0.001	2%
4	3.40	0.20		0.12	0.034					1.00	0.20	0.20	0.034	0.04	0.001	3%
5	3.60	0.23		0.14	0.032					1.00	0.20	0.23	0.032	0.05	0.001	4%
6	3.80	0.23		0.14	0.037					1.00	0.20	0.23	0.037	0.05	0.002	4%
7	4.00	0.28		0.17	0.046					1.00	0.20	0.28	0.046	0.06	0.003	7%
8	4.20	0.29		0.17	0.040					1.00	0.20	0.29	0.040	0.06	0.002	6%
9	4.40	0.30		0.18	0.052					1.00	0.20	0.30	0.052	0.06	0.003	8%
10	4.60	0.34		0.20	0.048					1.00	0.20	0.34	0.048	0.07	0.003	8%
11	4.80	0.36		0.22	0.052					1.00	0.20	0.36	0.052	0.07	0.004	10%
12	5.00	0.26		0.16	0.055					1.00	0.20	0.26	0.055	0.05	0.003	7%
13	5.20	0.35		0.21	0.046					1.00	0.20	0.35	0.046	0.07	0.003	8%
14	5.40	0.26		0.16	0.043					1.00	0.20	0.26	0.043	0.05	0.002	6%
15	5.60	0.25		0.15	0.037					1.00	0.20	0.25	0.037	0.05	0.002	5%
16	5.80	0.26		0.16	0.042					1.00	0.20	0.26	0.042	0.05	0.002	6%
17	6.00	0.26		0.16	0.034					1.00	0.20	0.26	0.034	0.05	0.002	5%
18	6.20	0.23		0.14	0.031					1.00	0.20	0.23	0.031	0.05	0.001	4%
19	6.40	0.18		0.11	0.017					1.00	0.20	0.18	0.017	0.04	0.001	2%
20	6.60	0.17		0.10	0.021					1.00	0.30	0.17	0.021	0.05	0.001	3%
LB	7.00	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.039</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	7:30
Meas. End Time (MST):	7:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow, backwater
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, +15°C



**Flow characteristics:**

Total Flow:	0.039	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.00	(m <sup>2</sup> )
Wetted Width:	4.40	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.93	

**Logger Details:**

	Before	After
Transducer Reading (m):	-	1.291
Water (°C):	-	12.1
Datalogger Clock:	-	06:07
Laptop Clock:	-	08:06
Battery (Main):	-	13.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S37-03	1.618	102.456		100.838	100.838	3/4" Pipe 3m S of logger	S37-03
S37-04			1.380	101.076	101.078	3/4" Pipe 4m SW of Station	S37-05
S37-05			1.275	101.181	101.178	3/4" Pipe 1.5m from Station	WL
Ice/PT:							WL
Water Level:			1.872	100.584		Time WL Surveyed: 7:15	S37-04
Other:						Nail in tree	S37-05
<b>Setup #2</b>							
S37-03			1.603	100.838	100.838	3/4" Pipe 3m S of logger	
S37-04	1.365	102.441		101.076	101.078	3/4" Pipe 4m SW of Station	
S37-05			1.260	101.181	101.178	3/4" Pipe 1.5m from Station	
Ice/PT:							
Water Level:			1.855	100.586		Time WL Surveyed: 7:17	(must close survey loop on survey starting point)
Other:						Nail in tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S37-04	1.365	102.441		101.076		
Water Level:				1.856	100.585		Time WL Surveyed: 8:02
Water Level:				1.848	100.583		Time WL Surveyed: 8:03
BM:	S37-04	1.355	102.431		101.076		

**WL Survey Summary**

	Before	After
Average WL:	100.585	100.584
Transducer Elevation:	-	99.293
Closing Error:	0.000	-
WL Check:	0.002	0.002

**Site Rating Information**

Measured Discharge:	0.0392
Expected Discharge:	1.53
Shift from Existing Rating (m <sup>3</sup> /s):	1.49
Shift from Existing Rating (%):	3792%

**Field Personnel:**

Field Personnel:	DW, CJ	Trip Date:	13-Sep-13
Data Entry Personnel:	DW	Date:	13-Sep-13
Data Check Personnel:	CJ	Date:	26-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: November 1, 2013  
 Site Visit Time (MST): 12:20

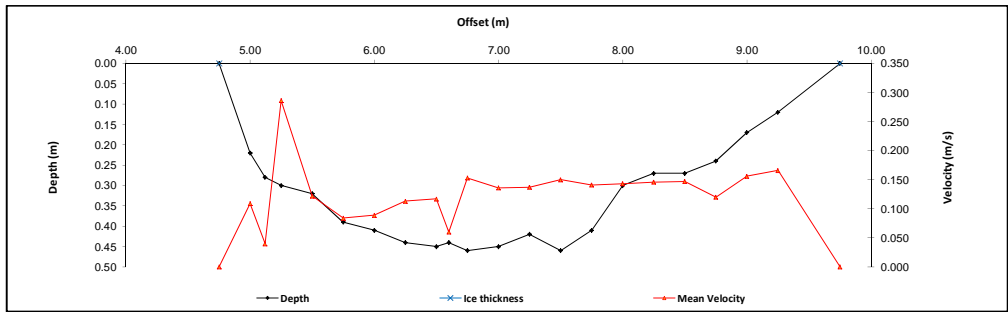


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.75	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	5.00	0.22		0.13	0.109					1.00	0.19	0.22	0.109	0.04	0.004	2%
2	5.12	0.28		0.17	0.040					1.00	0.13	0.28	0.040	0.04	0.001	1%
3	5.25	0.30		0.18	0.286					1.00	0.19	0.30	0.286	0.06	0.016	8%
4	5.50	0.32		0.19	0.122					1.00	0.25	0.32	0.122	0.08	0.010	5%
5	5.75	0.39		0.23	0.084					1.00	0.25	0.39	0.084	0.10	0.008	4%
6	6.00	0.41		0.25	0.089					1.00	0.25	0.41	0.089	0.10	0.009	5%
7	6.25	0.44		0.26	0.113					1.00	0.25	0.44	0.113	0.11	0.012	6%
8	6.50	0.45		0.27	0.117					1.00	0.18	0.45	0.117	0.08	0.009	5%
9	6.60	0.44		0.26	0.060					1.00	0.13	0.44	0.060	0.06	0.003	2%
10	6.75	0.46		0.28	0.153					1.00	0.20	0.46	0.153	0.09	0.014	7%
11	7.00	0.45		0.27	0.136					1.00	0.25	0.45	0.136	0.11	0.015	8%
12	7.25	0.42		0.25	0.137					1.00	0.25	0.42	0.137	0.11	0.014	7%
13	7.50	0.46		0.28	0.150					1.00	0.25	0.46	0.150	0.12	0.017	9%
14	7.75	0.41		0.25	0.141					1.00	0.25	0.41	0.141	0.10	0.014	7%
15	8.00	0.30		0.18	0.143					1.00	0.25	0.30	0.143	0.08	0.011	5%
16	8.25	0.27		0.16	0.146					1.00	0.25	0.27	0.146	0.07	0.010	5%
17	8.50	0.27		0.16	0.147					1.00	0.25	0.27	0.147	0.07	0.010	5%
18	8.75	0.24		0.14	0.120					1.00	0.25	0.24	0.120	0.06	0.007	4%
19	9.00	0.17		0.10	0.156					1.00	0.25	0.17	0.156	0.04	0.007	3%
20	9.25	0.12		0.07	0.166					1.00	0.38	0.12	0.166	0.05	0.007	4%
RB	9.75	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.201</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:44
Meas. End Time (MST):	13:03
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, backwater
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, +5°C



**Flow characteristics:**

Total Flow:	0.201	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.54	(m <sup>2</sup> )
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.98	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.382	1.382
Water (°C):	1.1	1.1
Datalogger Clock:	12:31	13:12
Laptop Clock:	12:30	13:11
Battery (Main):	14.7	14.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	284718	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Removed PLS for winter, s/n: 284718
- Anchor cable and weight left at base of logger tree
- Large beaver dam sited downstream of station

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S37-04
S37-03			1.327	100.838	100.838	3/4" Pipe 3m S of logger	S37-05
S37-04	1.087	102.165		101.078	101.078	3/4" Pipe 4m SW of Station	S37-03
S37-05			0.985	101.180	101.178	3/4" Pipe 1.5m from Station	WL
Ice/PT:							WL
Water Level:			1.466	100.699		Time WL Surveyed: 12:36	S37-03
Other:						Nail in tree	S37-05
<b>Setup #2</b>							S37-04
S37-03	1.305	102.143		100.838	100.838	3/4" Pipe 3m S of logger	
S37-04			1.067	101.078	101.078	3/4" Pipe 4m SW of Station	
S37-05			0.965	101.178	101.178	3/4" Pipe 1.5m from Station	
Ice/PT:							
Water Level:			1.448	100.695		Time WL Surveyed: 12:38	(must close survey loop on survey starting point)
Other:						Nail in tree	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S37-04	1.015	102.093	101.078			
Water Level:			1.395	100.698		Time WL Surveyed: 13:08	
Water Level:			1.407	100.699		Time WL Surveyed: 13:10	
BM:	S37-04	1.028	102.106	101.078			

**WL Survey Summary**

	Before	After
Average WL:	100.697	100.699
Transducer Elevation:	99.315	99.317
Closing Error:	0.002	-
WL Check:	0.004	-0.001

**Site Rating Information**

Measured Discharge:	0.201
Expected Discharge:	2.00
Shift from Existing Rating (m <sup>3</sup> /s):	1.80
Shift from Existing Rating (%):	894%

**Field Personnel:**

SM, TR	Trip Date:	1-Nov-13
SM	Date:	1-Nov-13
CJ	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

January 7, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.50	0.00	0.00	0.000	0.000	0.000	0.9	4.50	4.75	0.25	0.04	0.028	0.025	0.01	0.000	0%
1	5.00	0.50	0.35	0.110			0.9	4.75	5.90	1.15	0.15	0.110	0.099	0.17	0.017	2%
2	6.80	0.68	0.33	0.269			0.9	5.90	7.80	1.90	0.35	0.269	0.242	0.67	0.161	18%
3	8.80	0.80	0.35	0.306			0.9	7.80	9.15	1.35	0.45	0.306	0.275	0.61	0.167	19%
4	9.50	0.76	0.33	0.380			0.9	9.15	10.00	0.85	0.43	0.380	0.342	0.37	0.125	14%
5	10.50	0.85	0.31	0.319			0.9	10.00	10.95	0.95	0.54	0.319	0.287	0.51	0.147	17%
6	11.40	0.95	0.35	0.193			0.9	10.95	12.00	1.05	0.60	0.193	0.174	0.63	0.109	13%
7	12.60	0.92	0.35	0.000			1.0	12.00	13.10	1.10	0.57	0.000	0.000	0.63	0.000	0%
8	13.60	0.98	0.35	0.000			1.0	13.10	13.95	0.85	0.63	0.000	0.000	0.54	0.000	0%
9	14.30	0.90	0.34	0.000			1.0	13.95	15.15	1.20	0.56	0.000	0.000	0.67	0.000	0%
10	16.00	0.96	0.35	0.000			1.0	15.15	16.50	1.35	0.61	0.000	0.000	0.82	0.000	0%
11	17.00	1.00	0.35	-0.001			0.9	16.50	17.50	1.00	0.65	-0.001	-0.001	0.65	-0.001	0%
12	18.00	0.80	0.37	0.002			0.9	17.50	18.55	1.05	0.43	0.002	0.002	0.45	0.001	0%
13	19.10	0.89	0.35	0.099			0.9	18.55	19.60	1.05	0.54	0.099	0.089	0.57	0.051	6%
14	20.10	0.85	0.35	0.000			1.0	19.60	20.65	1.05	0.50	0.000	0.000	0.52	0.000	0%
15	21.20	0.60	0.35	0.179			0.9	20.65	21.85	1.20	0.25	0.179	0.161	0.30	0.048	6%
16	22.50	0.43	0.35	0.000			1.0	21.85	23.15	1.30	0.08	0.000	0.000	0.10	0.000	0%
17	23.80	0.50	0.36	0.001			0.9	23.15	24.35	1.20	0.14	0.001	0.001	0.17	0.000	0%
18	24.90	0.40	0.35	0.000			1.0	24.35	25.55	1.20	0.05	0.000	0.000	0.06	0.000	0%
19	26.20	0.45	0.30	0.000			1.0	25.55	27.10	1.55	0.15	0.000	0.000	0.23	0.000	0%
20	28.00	0.39	0.29	0.001			0.9	27.10	28.85	1.75	0.10	0.001	0.001	0.18	0.000	0%
21	29.70	0.40	0.23	0.099			0.9	28.85	30.35	1.50	0.17	0.099	0.089	0.26	0.023	3%
22	31.00	0.25	0.15	0.235			0.9	30.35	31.50	1.15	0.10	0.235	0.212	0.12	0.024	3%
LB	32.00	0.00	0.00	0.00	0.00	0.00	1.0	31.50	32.00	0.50	0.03	0.059	0.059	0.01	0.001	0%
<b>Total Flow</b>															<b>0.874</b>	

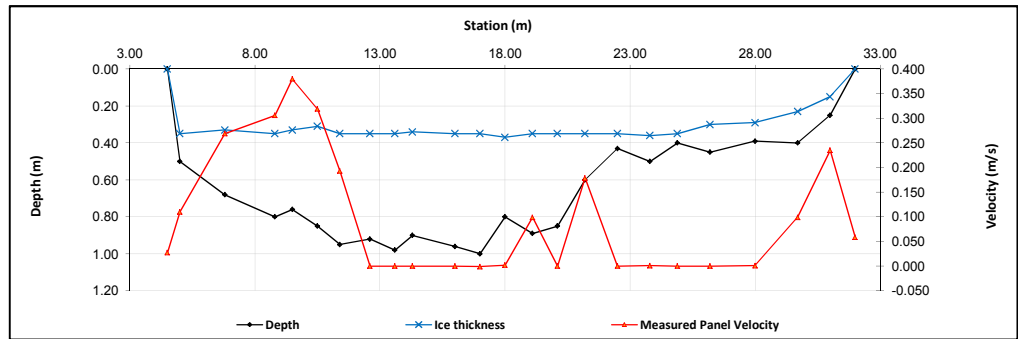
Measurement Details:	
Start Time (MST):	13:50
End Time (MST):	15:09
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -7°C

Flow characteristics:		
Total Flow:	0.874	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	9.24	(m <sup>2</sup> )
Wetted Width:	27.50	(m)
Hydraulic Depth:	0.336	(m)
Mean Velocity:	0.095	(m/s)
Froude Number:	0.052	

Logger Details:		
Transducer Reading (m):	0.435	-
Water (°C):	0.1	-
Rainfall (mm):	-	-
Battery (Main):	13.7	-
Datalogger Clock:	14:00	-
Laptop Clock:	14:01	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	9632.0	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Slush in holes from 12 m to 17 m	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S40-05			3.224	98.114	98.017	T-Post on lower bench
S40-06	1.203	101.338		100.135	100.135	Pipe 4 m NE of Logger
S40-07			1.273	100.065	100.067	Pipe 4 m S of Logger
Ice/PT:			4.855	96.483		
Water Level:			4.850	96.488		
Other:						
<b>Setup #2</b>						
S40-05	3.200	101.314		98.114	98.017	T-Post on lower bench
S40-06			1.180	100.134	100.135	Pipe 4 m NE of Logger
S40-07			1.248	100.066	100.067	Pipe 4 m S of Logger
Ice/PT:			4.830	96.484		
Water Level:			4.828	96.486		
Other:						

Closing Error	0.001	Average WL	96.487
WL Check	0.002	Transducer Elevation Before	96.052
		Transducer Elevation After	-

Field Personnel:	SM, DW, JG	Trip Date:	7-Jan-13
Data Entry Personnel:	SM	Date:	7-Jan-13
Data Check Personnel:	DW	Date:	24-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

February 8, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.08	0.08	0.01	0.015	0.014	0.00	0.000	0%
1	2.15	0.43	0.39	0.060			0.9	2.08	2.83	0.75	0.04	0.060	0.054	0.03	0.002	0%
2	3.50	0.62	0.45	0.089			0.9	2.83	4.15	1.33	0.17	0.089	0.080	0.23	0.018	2%
3	4.80	0.69	0.40	0.168			0.9	4.15	5.35	1.20	0.29	0.168	0.151	0.35	0.053	7%
4	5.90	0.73	0.45	0.169			0.9	5.35	6.58	1.23	0.28	0.169	0.152	0.34	0.052	7%
5	7.25	0.80	0.43	0.178			0.9	6.58	7.88	1.30	0.37	0.178	0.160	0.48	0.077	10%
6	8.50	0.87	0.40	0.165			0.9	7.88	9.25	1.38	0.47	0.165	0.149	0.65	0.096	12%
7	10.00	0.97	0.45	0.000			1.0	9.25	10.35	1.10	0.52	0.000	0.000	0.57	0.000	0%
8	10.70	1.00	0.36	0.009			0.9	10.35	11.00	0.65	0.64	0.009	0.008	0.42	0.003	0%
9	11.30	0.94	0.35	0.221			0.9	11.00	11.90	0.90	0.59	0.221	0.199	0.53	0.106	13%
10	12.50	0.91	0.37	0.194			0.9	11.90	13.25	1.35	0.54	0.194	0.175	0.73	0.127	16%
11	14.00	0.80	0.35	0.164			0.9	13.25	14.75	1.50	0.45	0.164	0.148	0.68	0.100	12%
12	15.50	0.75	0.38	0.067			0.9	14.75	16.25	1.50	0.37	0.067	0.060	0.56	0.033	4%
13	17.00	0.67	0.35	0.071			0.9	16.25	17.65	1.40	0.32	0.071	0.064	0.45	0.029	4%
14	18.30	0.50	0.35	0.108			0.9	17.65	19.25	1.60	0.15	0.108	0.097	0.24	0.023	3%
15	20.20	0.49	0.30	0.052			0.9	19.25	21.10	1.85	0.19	0.052	0.047	0.35	0.016	2%
16	22.00	0.51	0.35	0.023			0.9	21.10	23.00	1.90	0.16	0.023	0.021	0.30	0.006	1%
17	24.00	0.52	0.32	-0.117			0.9	23.00	25.05	2.05	0.20	0.117	0.105	0.41	0.043	5%
18	26.10	0.39	0.32	-0.006			0.9	25.05	27.05	2.00	0.07	-0.006	-0.005	0.14	-0.001	0%
19	28.00	0.30	0.15	0.061			0.9	27.05	29.05	2.00	0.15	0.061	0.055	0.30	0.016	2%
20	30.10	0.23	0.05	0.001			0.9	29.05	31.05	2.00	0.18	0.001	0.001	0.36	0.000	0%
21	32.00	0.23	0.03	0.005			0.9	31.05	32.25	1.20	0.20	0.005	0.005	0.24	0.001	0%
LB	32.50	0.00	0.00	0.00	0.00	0.00	1.0	32.25	32.50	0.25	0.05	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>														<b>0.802</b>		

## Measurement Details:

Start Time (MST):	14:41
End Time (MST):	15:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, light breeze, -2°C

## Flow characteristics:

Total Flow:	0.802	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	8.36	(m <sup>2</sup> )
Wetted Width:	30.50	(m)
Hydraulic Depth:	0.274	(m)
Mean Velocity:	0.096	(m/s)
Froude Number:	0.059	

## Logger Details:

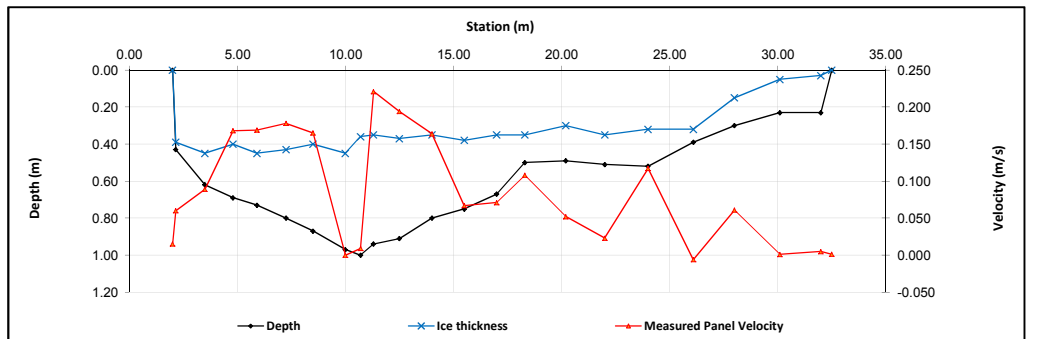
	Before	After
Transducer Reading (m):	0.399	-
Water (°C):	-0.1	-
Rainfall (mm):	-	-
Battery (Main):	14.0	-
Datalogger Clock:	14:43	-
Laptop Clock:	14:44	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	9632	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

## Datalogger / Station Notes:

- Slush in channel at offset 10.7 m.

## General Notes:

- Slush in channel at offset 10.7 m.



## Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S40-05			3.220	98.119	98.017	T-Post on lower bench
S40-06	1.204	101.339		100.135	100.135	Pipe 4 m NE of Logger
S40-07			1.272	100.067	100.067	Pipe 4 m S of Logger
Ice/PT:			4.891	96.448		
Water Level:			4.894	96.445		
Other:						
<b>Setup #2</b>						
S40-05	3.207	101.326		98.119	98.017	T-Post on lower bench
S40-06			1.192	100.134	100.135	Pipe 4 m NE of Logger
S40-07			1.258	100.068	100.067	Pipe 4 m S of Logger
Ice/PT:			4.878	96.448		
Water Level:			4.881	96.445		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	96.445
Transducer Elevation Before	96.046
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, TR, JG, HH	<b>Trip Date:</b>	8-Feb-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	8-Feb-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	18-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

March 4, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.28	0.28	0.03	0.000	0.000	0.01	0.000	0%
1	2.55	0.45	0.35	0.001			0.9	2.28	3.25	0.98	0.10	0.001	0.001	0.10	0.000	0%
2	3.95	0.75	0.47	-0.001			0.9	3.25	4.85	1.60	0.28	-0.001	-0.001	0.45	0.000	0%
3	5.75	0.75	0.50	0.101			0.9	4.85	6.28	1.43	0.25	0.101	0.091	0.36	0.032	5%
4	6.80	0.78	0.53	0.107			0.9	6.28	7.38	1.10	0.25	0.107	0.096	0.28	0.026	4%
5	7.95	0.78	0.53	0.102			0.9	7.38	8.60	1.23	0.25	0.102	0.092	0.31	0.028	4%
6	9.25	0.80	0.50	0.137			0.9	8.60	9.88	1.28	0.30	0.137	0.123	0.38	0.047	7%
7	10.50	0.80	0.47	0.121			0.9	9.88	11.13	1.25	0.33	0.121	0.109	0.41	0.045	7%
8	11.75	0.85	0.35	0.168			0.9	11.13	12.03	0.90	0.50	0.168	0.151	0.45	0.068	11%
9	12.30	0.90	0.35	0.130			0.9	12.03	12.63	0.60	0.55	0.130	0.117	0.33	0.039	6%
10	12.95	0.88	0.40	0.120			0.9	12.63	13.43	0.80	0.48	0.120	0.108	0.38	0.041	6%
11	13.90	0.90	0.45	0.137			0.9	13.43	14.53	1.10	0.45	0.137	0.123	0.50	0.061	9%
12	15.15	0.90	0.40	0.096			0.9	14.53	15.85	1.33	0.50	0.096	0.086	0.66	0.057	9%
13	16.55	0.77	0.35	0.044			0.9	15.85	17.25	1.40	0.42	0.044	0.040	0.59	0.023	4%
14	17.95	0.60	0.33	0.117			0.9	17.25	19.43	2.18	0.27	0.117	0.105	0.59	0.062	10%
15	20.90	0.50	0.25	0.065			0.9	19.43	21.65	2.23	0.25	0.065	0.059	0.56	0.033	5%
16	22.40	0.45	0.33	0.001			0.9	21.65	23.25	1.60	0.12	0.001	0.001	0.19	0.000	0%
17	24.10	0.50	0.27	0.135			0.9	23.25	24.88	1.63	0.23	0.135	0.122	0.37	0.045	7%
18	25.65	0.45	0.31	0.110			0.9	24.88	26.48	1.60	0.14	0.110	0.099	0.22	0.022	3%
19	27.30	0.31	0.20	0.101			0.9	26.48	28.13	1.65	0.11	0.101	0.091	0.18	0.016	3%
20	28.95	0.28	0.16	-0.001			0.9	28.13	29.58	1.45	0.12	-0.001	-0.001	0.17	0.000	0%
LB	30.20	0.00	0.00	0.00	0.00	0.00	1.0	29.58	30.20	0.63	0.03	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>															<b>0.647</b>	

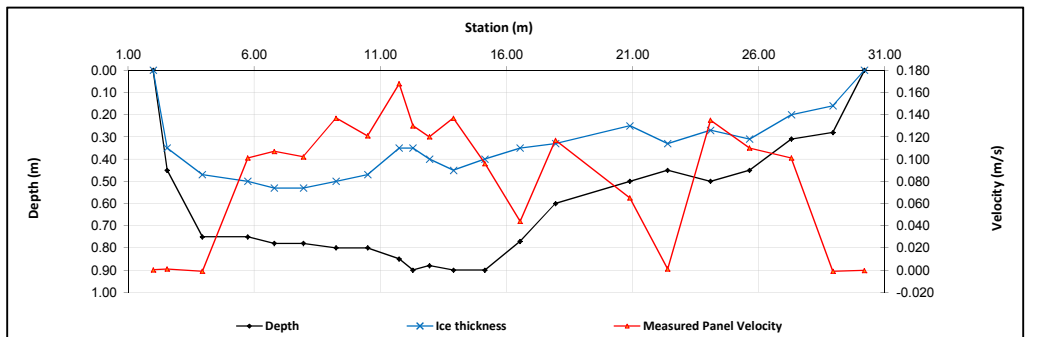
Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	11:04
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow, -8°C

Flow characteristics:		
Total Flow:	0.647	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.50	(m <sup>2</sup> )
Wetted Width:	28.20	(m)
Hydraulic Depth:	0.266	(m)
Mean Velocity:	0.086	(m/s)
Froude Number:	0.053	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.423	-
Rainfall (mm):	0.1	-
Battery (Main):	-	-
Datalogger Clock:	14.6	-
Laptop Clock:	9:53	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	9632.0	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S40-05			3.398	98.119	98.017	T-Post on lower bench
S40-06	1.382	101.517		100.135	100.135	Pipe 4 m NE of Logger
S40-07			1.449	100.068	100.067	Pipe 4 m S of Logger
Ice/PT:			5.038	96.479		
Water Level:			5.087	96.430		
Other:						
<b>Setup #2</b>						
S40-05	3.387	101.506		98.119	98.017	T-Post on lower bench
S40-06			1.372	100.134	100.135	Pipe 4 m NE of Logger
S40-07			1.438	100.068	100.067	Pipe 4 m S of Logger
Ice/PT:			5.027	96.479		
Water Level:			5.080	96.426		
Other:						

Closing Error	0.001
WL Check	0.004

Average WL	96.428
Transducer Elevation Before	96.005
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	4-Mar-12
Data Entry Personnel:	SM	Date:	4-Mar-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

April 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.00	0.00	0.00	0.000	0.000	0.000	0.9	0.00	0.50	0.50	0.05	0.022	0.020	0.03	0.000	0%
1	1.00	0.75	0.55	0.087			0.9	0.50	1.35	0.85	0.20	0.087	0.078	0.17	0.013	2%
2	1.70	0.75	0.55	0.102			0.9	1.35	2.10	0.75	0.20	0.102	0.092	0.15	0.014	3%
3	2.50	0.75	0.55	0.135			0.9	2.10	2.95	0.85	0.20	0.135	0.122	0.17	0.021	4%
4	3.40	0.80	0.65	0.073			0.9	2.95	3.70	0.75	0.15	0.073	0.066	0.11	0.007	1%
5	4.00	0.90	0.60	0.115			0.9	3.70	4.40	0.70	0.30	0.115	0.104	0.21	0.022	4%
6	4.80	0.85	0.65	0.099			0.9	4.40	5.20	0.80	0.20	0.099	0.089	0.16	0.014	3%
7	5.60	0.80	0.65	0.128			0.9	5.20	6.05	0.85	0.15	0.128	0.115	0.13	0.015	3%
8	6.50	0.80	0.60	0.130			0.9	6.05	6.85	0.80	0.20	0.130	0.117	0.16	0.019	3%
9	7.20	0.80	0.55	0.106			0.9	6.85	7.75	0.90	0.25	0.106	0.095	0.23	0.021	4%
10	8.30	0.90	0.43	0.160			0.9	7.75	8.90	1.15	0.47	0.160	0.144	0.54	0.078	14%
11	9.50	0.90	0.45	0.102			0.9	8.90	10.00	1.10	0.45	0.102	0.092	0.50	0.045	8%
12	10.50	0.90	0.50	0.111			0.9	10.00	10.75	0.75	0.40	0.111	0.100	0.30	0.030	5%
13	11.00	0.90	0.50	0.157			0.9	10.75	11.30	0.55	0.40	0.157	0.141	0.22	0.031	6%
14	11.60	0.90	0.45	0.450			0.9	11.30	11.75	0.45	0.45	0.450	0.405	0.20	0.082	15%
15	11.90	0.90	0.45	0.102			0.9	11.75	12.30	0.55	0.45	0.102	0.092	0.25	0.023	4%
16	12.70	0.85	0.45	0.021			0.9	12.30	13.35	1.05	0.40	0.021	0.019	0.42	0.008	1%
17	14.00	0.70	0.43	0.100			0.9	13.35	14.55	1.20	0.27	0.100	0.090	0.32	0.029	5%
18	15.10	0.60	0.40	0.036			0.9	14.55	15.65	1.10	0.20	0.036	0.032	0.22	0.007	1%
19	16.20	0.60	0.35	0.108			0.9	15.65	16.85	1.20	0.25	0.108	0.097	0.30	0.029	5%
20	17.50	0.50	0.35	0.031			0.9	16.85	17.95	1.10	0.15	0.031	0.028	0.17	0.005	1%
21	18.40	0.45	0.35	0.000			1.0	17.95	19.50	1.55	0.10	0.000	0.000	0.16	0.000	0%
22	20.60	0.55	0.35	0.045			0.9	19.50	21.95	2.45	0.20	0.045	0.041	0.49	0.020	4%
23	23.30	0.40	0.30	0.080			0.9	21.95	24.15	2.20	0.10	0.080	0.072	0.22	0.016	3%
LB	25.00	0.00	0.00	0.00	0.00	0.00	1.0	24.15	25.00	0.85	0.03	0.020	0.020	0.02	0.000	0%
<b>Total Flow</b>														<b>0.550</b>		

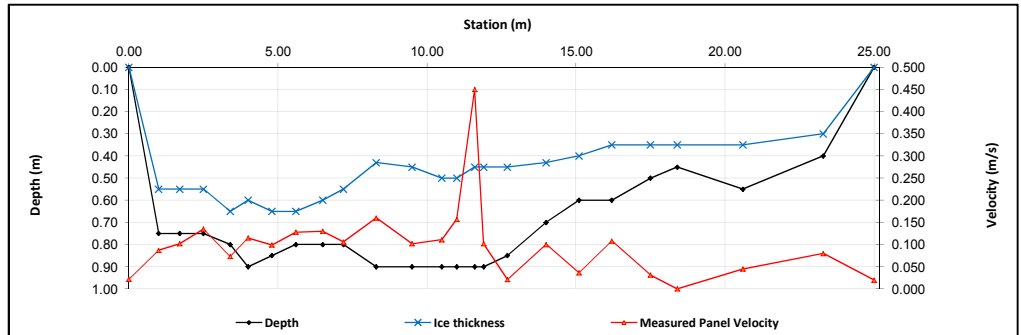
Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	16:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, 10°C

Flow characteristics:	
Total Flow:	0.550 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	5.83 (m <sup>2</sup> )
Wetted Width:	25.00 (m)
Hydraulic Depth:	0.233 (m)
Mean Velocity:	0.094 (m/s)
Froude Number:	0.062

Logger Details:		
	Before	After
Transducer Reading (m):	0.411	-
Water (°C):	0.1	-
Rainfall (mm):	0.00	-
Battery (Main):	14.5	-
Datalogger Clock:	15:19	-
Laptop Clock:	15:18	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	9632	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:

General Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S40-05			3.350	98.119	98.017	T-Post on lower bench
S40-06	1.334	101.469		100.135	100.135	Pipe 4 m NE of Logger
S40-07			1.402	100.067	100.067	Pipe 4 m S of Logger
Ice/PT:			4.916	96.553		
Water Level:			5.046	96.423		
Other:						
<b>Setup #2</b>						
S40-05	3.339	101.458		98.119	98.017	T-Post on lower bench
S40-06			1.323	100.135	100.135	Pipe 4 m NE of Logger
S40-07			1.390	100.068	100.067	Pipe 4 m S of Logger
Ice/PT:			4.905	96.553		
Water Level:			5.038	96.420		
Other:						

Closing Error	0.000	Average WL	96.422
WL Check	0.003	Transducer Elevation Before	96.011
		Transducer Elevation After	-

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	1-Apr-13
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	1-Apr-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	26-May-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: May 17, 2013  
 Site Visit Time (MST): 13:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00			0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High Log Jam
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	Mainly Sunny, 17°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

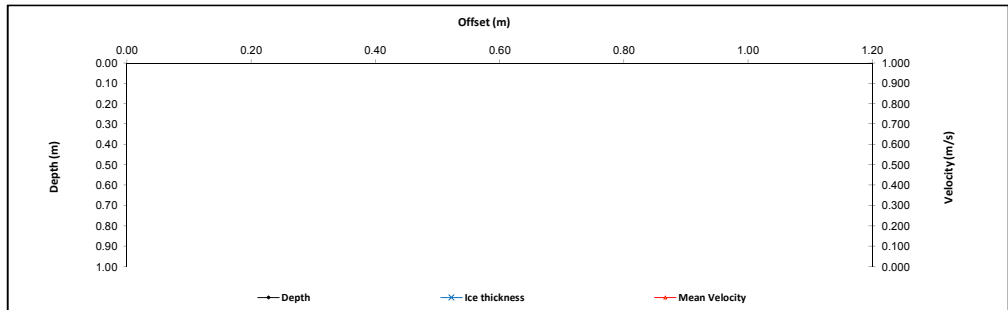
	Before	After
Transducer Reading (m):	1.873	-
Water (°C):	12.2	-
Rainfall (mm):	0.00	0.30
Datalogger Clock:	13:30	-
Laptop Clock:	13:31	-
Battery (Main):	13.8	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tested precip gauge. 0.3 mm

**General Notes:**

- The flow measurement was not conducted due to safety concerns. Velocity is estimated to be >2.0 m/s.  
 - There was standing waves and a log jam on the upstream side of the station.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S40-05
S40-05			3.085	98.118	98.017	T-Post on lower bench	S40-06
S40-06	1.068	101.203		100.135	100.135	Pipe 4 m NE of Logger	S40-07
S40-07			1.135	100.068	100.067	Pipe 4 m S of Logger	WL
Ice/PT:							WL
Water Level:			3.357	97.846		Time WL Surveyed: 13:44	S40-06
Other:							S40-05
<b>Setup #2</b>							
S40-05			3.074	98.118	98.017	T-Post on lower bench	
S40-06			1.056	100.136	100.135	Pipe 4 m NE of Logger	
S40-07	1.124	101.192		100.068	100.067	Pipe 4 m S of Logger	
Water Level:			3.345	97.847		Time WL Surveyed: 13:45	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.068			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.068			

**WL Survey Summary**

	Before	After
Average WL:	97.847	-
Transducer Elevation:	95.974	-
Closing Error:	-0.001	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	133.86
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	17-May-13
SM	Date:	17-May-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: June 5, 2013  
 Site Visit Time (MST): 12:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%

No Flow Measurement Conducted

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High Log Jam
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

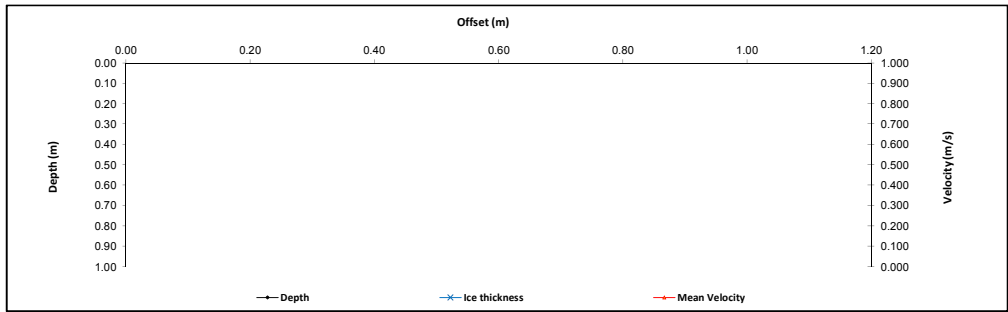
Logger Details:

	Before	After
Transducer Reading (m):	1.164	-
Water (°C):	18.7	-
Rainfall (mm):	0.60	-
Datalogger Clock:	13:21	-
Laptop Clock:	13:21	-
Battery (Main):	12.9	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

General Notes:

- No flow measurement conducted.
- Large log jam at bridge, fast water with standing waves downstream of bridge.
- Water too fast for fishcat upstream.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S40-05
S40-05			3.005	98.122	98.017	T-Post on lower bench	S40-06
S40-06	0.992	101.127		100.135	100.135	Pipe 4 m NE of Logger	S40-07
S40-07			1.056	100.071	100.067	Pipe 4 m S of Logger	WL
Ice/PT:							WL
Water Level:		4.001		97.126		Time WL Surveyed: 13:55	S40-06
Other:							S40-05
<b>Setup #2</b>							
S40-05			2.989	98.122	98.017	T-Post on lower bench	
S40-06			0.976	100.135	100.135	Pipe 4 m NE of Logger	
S40-07	1.040	101.111		100.071	100.067	Pipe 4 m S of Logger	
Water Level:			3.986	97.125		Time WL Surveyed: 13:56	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.071			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.071			

WL Survey Summary

	Before	After
Average WL:	97.125	-
Transducer Elevation:	95.962	-
Closing Error:	0.000	-
WL Check:	0.001	-

Site Rating Information

Measured Discharge:	
Expected Discharge:	48.80
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:

SM, CJ	Trip Date:	5-Jun-13
SM	Date:	5-Jun-13
DW	Date:	13-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: August 7, 2013  
 Site Visit Time (MST): 13:20

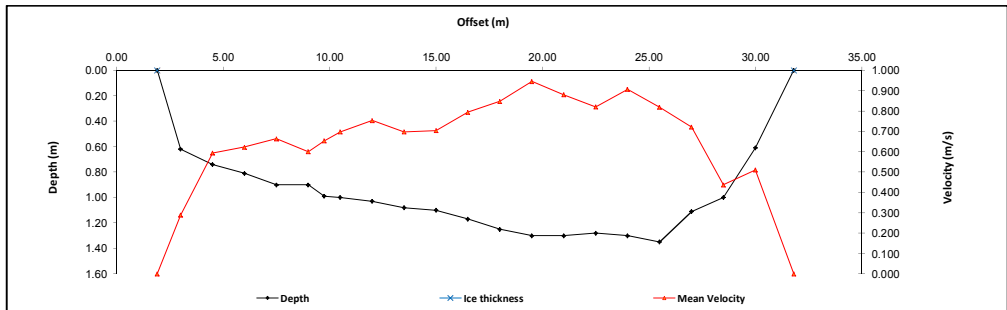


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
RB	31.80	0.00	0.00		0.000		0.000		0.000	1.00	0.90	0.00	0.000	0.00	0.000						
1	30.00	0.61		0.37	0.510					1.00	1.65	0.61	0.510	1.01	0.513	2%					
2	28.50	1.00				0.80	0.284	0.20	0.590	1.00	1.50	1.00	0.437	1.50	0.656	3%					
3	27.00	1.11				0.89	0.724	0.22	0.718	1.00	1.50	1.11	0.721	1.67	1.200	6%					
4	25.50	1.35				1.08	0.793	0.27	0.843	1.00	1.50	1.35	0.818	2.03	1.656	8%					
5	24.00	1.30				1.04	0.810	0.26	1.003	1.00	1.50	1.30	0.907	1.95	1.768	8%					
6	22.50	1.28				1.02	0.643	0.26	0.997	1.00	1.50	1.28	0.820	1.92	1.574	7%					
7	21.00	1.30				1.04	0.764		0.996	1.00	1.50	1.30	0.880	1.95	1.716	8%					
8	19.50	1.30				1.04	0.810	0.26	1.080	1.00	1.50	1.30	0.945	1.95	1.843	8%					
9	18.00	1.25				1.00	0.825	0.25	0.870	1.00	1.50	1.25	0.848	1.88	1.589	7%					
10	16.50	1.17				0.94	0.843	0.23	0.745	1.00	1.50	1.17	0.794	1.76	1.393	6%					
11	15.00	1.10				0.88	0.872	0.22	0.536	1.00	1.50	1.10	0.704	1.65	1.162	5%					
12	13.50	1.08				0.86	0.723	0.22	0.671	1.00	1.50	1.08	0.697	1.62	1.129	5%					
13	12.00	1.03				0.82	0.768	0.21	0.738	1.00	1.50	1.03	0.753	1.55	1.163	5%					
14	10.50	1.00				0.80	0.796	0.20	0.599	1.00	1.13	1.00	0.698	1.13	0.785	4%					
15	9.75	0.99				0.79	0.750	0.20	0.557	1.00	0.75	0.99	0.654	0.74	0.485	2%					
16	9.00	0.90				0.72	0.639	0.18	0.560	1.00	1.13	0.90	0.600	1.01	0.607	3%					
17	7.50	0.90				0.72	0.614	0.18	0.713	1.00	1.50	0.90	0.664	1.35	0.996	4%					
18	6.00	0.81				0.72	0.544	0.16	0.701	1.00	1.50	0.81	0.623	1.22	0.756	3%					
19	4.50	0.74		0.44	0.594					1.00	1.50	0.74	0.594	1.11	0.659	3%					
20	3.00	0.62		0.37	0.289					1.00	1.30	0.62	0.289	0.81	0.233	1%					
LB	1.90	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000						
<b>Total Flow</b>														<b>21.8</b>	<b>100%</b>						

**Flow Measurement Details:**

Metering Section Location (describe): 20 m US of bridge

Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:35
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P. cloudy, light breeze, 23°C



**Flow characteristics:**

Total Flow:	21.8	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	29.77	(m <sup>2</sup> )
Wetted Width:	29.90	(m)
Hydraulic Depth:	1.00	(m)
Mean Velocity:	0.73	(m/s)
Froude Number:	0.23	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.930	0.925
Water (°C):	17.5	18.0
Rainfall (mm):	0.00	-
Datalogger Clock:	13:27	-
Laptop Clock:	13:28	-
Battery (Main):	14.1	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger/ Station Notes:**

**General Notes:**

- New BM Installed
- Log jam has been washed out

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S40-05			3.066	98.121	98.017	Pipe 4 m NE of Logger	S40-05
S40-06	1.052	101.187		100.135	100.135	Pipe 4 m S of Logger	S40-06
S40-07			1.118	100.069	100.067	Pipe 3 m SE of logger	WL
Ice/PT:							WL
Water Level:			4.287	96.900		Time WL Surveyed: 13:41	S40-07
Other:			0.961	100.226			S40-06
							S40-05
S40-05			3.033	98.122	98.017	Pipe 4 m NE of Logger	
S40-06			1.020	100.135	100.135	Pipe 4 m S of Logger	
S40-07	1.086	101.155		100.069	100.067	Pipe 3 m SE of logger	
Ice/PT:							
Water Level:			4.256	96.899		Time WL Surveyed: 13:44	(must close survey loop on survey starting point)
Other:			0.928	100.227			

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

BM:	S40-05	1.019	99.140		98.121		
Water Level:				4.260	94.890	Time WL Surveyed:	15:45
Water Level:				4.238	94.881	Time WL Surveyed:	15:48
BM:	S40-05	0.998	99.119		98.121		

**WL Survey Summary**

	Before	After
Average WL:	96.900	94.881
Transducer Elevation:	95.970	93.956
Closing Error:	0.000	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	21.8
Expected Discharge:	22.91
Shift from Existing Rating (m <sup>3</sup> /s):	1.11
Shift from Existing Rating (%):	5%

**Field Personnel:**

Field Personnel:	TR, JVR	Trip Date:	7-Aug-13
Data Entry Personnel:	JVR	Date:	7-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: September 11, 2013  
 Site Visit Time (MST): 16:00

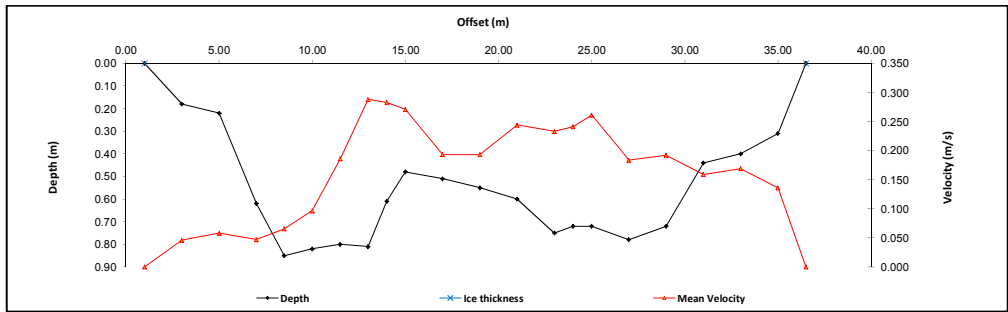


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	3.00	0.18		0.11	0.046					1.00	2.00	0.18	0.046	0.36	0.017	0%
2	5.00	0.22		0.13	0.058					1.00	2.00	0.22	0.058	0.44	0.026	1%
3	7.00	0.62		0.37	0.047					1.00	1.75	0.62	0.047	1.09	0.051	1%
4	8.50	0.85				0.68	0.061	0.17	0.070	1.00	1.50	0.85	0.066	1.28	0.084	2%
5	10.00	0.82				0.66	0.080	0.16	0.113	1.00	1.50	0.82	0.097	1.23	0.119	3%
6	11.50	0.80				0.64	0.133	0.16	0.239	1.00	1.50	0.80	0.186	1.20	0.223	6%
7	13.00	0.81				0.65	0.215	0.16	0.361	1.00	1.25	0.81	0.288	1.01	0.292	8%
8	14.00	0.61		0.37	0.283					1.00	1.00	0.61	0.283	0.61	0.173	5%
9	15.00	0.48		0.29	0.271					1.00	1.50	0.48	0.271	0.72	0.195	6%
10	17.00	0.51		0.31	0.193					1.00	2.00	0.51	0.193	1.02	0.197	6%
11	19.00	0.55		0.33	0.193					1.00	2.00	0.55	0.193	1.10	0.212	6%
12	21.00	0.60		0.36	0.244					1.00	2.00	0.60	0.244	1.20	0.293	8%
13	23.00	0.75		0.45	0.233					1.00	1.50	0.75	0.233	1.13	0.262	7%
14	24.00	0.72		0.43	0.241					1.00	1.00	0.72	0.241	0.72	0.174	5%
15	25.00	0.72		0.43	0.261					1.00	1.50	0.72	0.261	1.08	0.282	8%
16	27.00	0.78				0.62	0.146	0.16	0.221	1.00	2.00	0.78	0.184	1.56	0.286	8%
17	29.00	0.72		0.43	0.192					1.00	2.00	0.72	0.192	1.44	0.276	8%
18	31.00	0.44		0.26	0.159					1.00	2.00	0.44	0.159	0.88	0.140	4%
19	33.00	0.40		0.24	0.169					1.00	2.00	0.40	0.169	0.80	0.135	4%
20	35.00	0.31		0.19	0.136					1.00	1.75	0.31	0.136	0.54	0.074	2%
RB	36.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>3.51</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe)

Meas. Start Time (MST):	16:41
Meas. End Time (MST):	17:12
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25°C



**Flow characteristics:**

Total Flow:	3.51	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	19.40	(m <sup>2</sup> )
Wetted Width:	35.50	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.98	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.452	0.451
Water (°C):	15.6	16.0
Rainfall (mm):	0.00	0.00
Datalogger Clock:	16:07	17:26
Laptop Clock:	16:07	17:26
Battery (Main):	14.0	13.7
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tested precise gauge. 0.254 mm

**General Notes:**

- Updated BM plates

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S40-05			1.039	100.132	100.135	Pipe 4 m NE of Logger	S40-05
S40-06	1.104	101.171		100.067	100.067	Pipe 4 m S of Logger	S40-06
S40-07			0.948	100.223	100.227	Pipe 3 m SE of logger	WL
Ice/PT:							WL
Water Level:			4.755	96.416		Time WL Surveyed: 16:29	S40-07
Other:							S40-06
Setup #2							S40-05
S40-05	1.027	101.159		100.132	100.135	Pipe 4 m NE of Logger	
S40-06			1.092	100.067	100.067	Pipe 4 m S of Logger	
S40-07			0.935	100.224	100.227	Pipe 3 m SE of logger	
Ice/PT:							
Water Level:			4.743	96.416		Time WL Surveyed: 16:31	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S40-05	1.027	101.159	100.132			
Water Level:			4.743	96.416		Time WL Surveyed: 17:20	
Water Level:			4.730	96.416		Time WL Surveyed: 17:22	
BM:	S40-05	1.014	101.146	100.132			

**WL Survey Summary**

	Before	After
Average WL:	96.416	96.416
Transducer Elevation:	95.964	95.965
Closing Error:	0.000	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	3.51
Expected Discharge:	3.92
Shift from Existing Rating (m <sup>3</sup> /s):	0.41
Shift from Existing Rating (%):	12%

**Field Personnel:**

Field Personnel:	SM, CJ	Trip Date:	11-Sep-13
Data Entry Personnel:	SM	Date:	11-Sep-13
Data Check Personnel:	XP	Date:	17-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

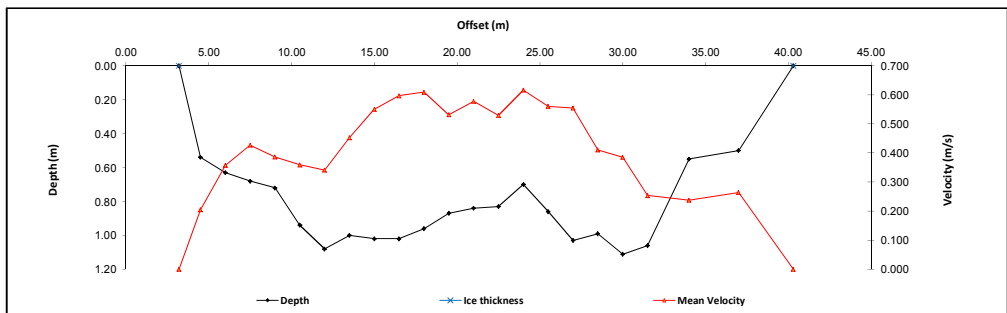
Site Visit Date: October 23, 2013  
 Site Visit Time (MST): 12:35



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.20	0.00	0.00		0.000				0.000	1.00	0.65	0.00	0.000	0.00	0.000	
1	4.50	0.54		0.32	0.205					1.00	1.40	0.54	0.205	0.76	0.155	1%
2	6.00	0.63		0.38	0.358					1.00	1.50	0.63	0.358	0.95	0.338	3%
3	7.50	0.68		0.41	0.427					1.00	1.50	0.68	0.427	1.02	0.436	3%
4	9.00	0.72		0.43	0.386					1.00	1.50	0.72	0.386	1.08	0.417	3%
5	10.50	0.94				0.75	0.303	0.19	0.416	1.00	1.50	0.94	0.360	1.41	0.507	4%
6	12.00	1.08				0.86	0.299	0.22	0.383	1.00	1.50	1.08	0.341	1.62	0.552	4%
7	13.50	1.00				0.80	0.480	0.20	0.426	1.00	1.50	1.00	0.453	1.50	0.680	5%
8	15.00	1.02				0.82	0.517	0.20	0.583	1.00	1.50	1.02	0.550	1.53	0.842	7%
9	16.50	1.02				0.82	0.533	0.20	0.661	1.00	1.50	1.02	0.597	1.53	0.913	7%
10	18.00	0.96				0.77	0.490	0.19	0.728	1.00	1.50	0.96	0.609	1.44	0.877	7%
11	19.50	0.87				0.70	0.435	0.17	0.628	1.00	1.50	0.87	0.532	1.31	0.694	6%
12	21.00	0.84				0.67	0.475	0.17	0.680	1.00	1.50	0.84	0.578	1.26	0.728	6%
13	22.50	0.83				0.66	0.443	0.17	0.616	1.00	1.50	0.83	0.530	1.25	0.659	5%
14	24.00	0.70	0.42		0.616					1.00	1.50	0.70	0.616	1.05	0.647	5%
15	25.50	0.86				0.69	0.384	0.17	0.736	1.00	1.50	0.86	0.560	1.29	0.722	6%
16	27.00	1.03				0.82	0.562	0.21	0.547	1.00	1.50	1.03	0.555	1.55	0.857	7%
17	28.50	0.99				0.79	0.343	0.20	0.478	1.00	1.50	0.99	0.411	1.49	0.610	5%
18	30.00	1.11				0.89	0.344	0.22	0.426	1.00	1.50	1.11	0.385	1.67	0.642	5%
19	31.50	1.06				0.85	0.230	0.21	0.277	1.00	2.00	1.06	0.254	2.12	0.537	4%
20	34.00	0.55		0.33	0.238					1.00	2.75	0.55	0.238	1.51	0.360	3%
21	37.00	0.50		0.30	0.284					1.00	3.15	0.50	0.264	1.58	0.416	3%
LB	40.30	0.00	0.00		0.00				0.00	1.00	1.65	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>12.6</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	13:06
Meas. End Time (MST):	13:42
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Mostly sunny, 3°C



**Flow characteristics:**

Total Flow:	12.6	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	28.89	(m <sup>2</sup> )
Wetted Width:	37.10	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.44	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.724	0.723
Water (°C):	3.3	3.4
Rainfall (mm):	0.00	0.00
Datalogger Clock:	12:41	13:43
Laptop Clock:	12:41	13:43
Battery (Main):	13.3	14.4
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tested tipping bucket
- The tipping bucket needs to be moved to its own post. The antenna must may be interfering

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S40-05
S40-05			1.083	100.134	100.135	Pipe 4 m NE of Logger	S40-06
S40-06			1.147	100.070	100.067	Pipe 4 m S of Logger	S40-07
S40-07	0.990	101.217		100.227	100.227		WL
Ice/PT:							WL
Water Level:			4.527	96.690	Time WL Surveyed:	12:59	S40-07
Other:							S40-06
<b>Setup #2</b>							S40-05
S40-05	1.097	101.231		100.134	100.135	Pipe 4 m NE of Logger	
S40-06			1.162	100.069	100.067	Pipe 4 m S of Logger	
S40-07			1.004	100.227	100.227		
Ice/PT:							
Water Level:			4.540	96.691	Time WL Surveyed:	12:53	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S40-05	1.083	101.217	100.134			
Water Level:			4.522	96.695	Time WL Surveyed:	13:49	
Water Level:			4.512	96.692	Time WL Surveyed:	13:51	
BM:	S40-05	1.070	101.204	100.134			

**WL Survey Summary**

	Before	After
Average WL:	96.691	96.694
Transducer Elevation:	95.967	95.971
Closing Error:	0.000	-
WL Check:	0.001	0.003

**Site Rating Information**

Measured Discharge:	12.6
Expected Discharge:	18.82
Shift from Existing Rating (m <sup>3</sup> /s):	6.22
Shift from Existing Rating (%):	49%

**Field Personnel:**

	DW, TR	Trip Date:	23-Oct-13
Data Entry Personnel:	DW	Date:	23-Oct-13
Data Check Personnel:	DW	Date:	29-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: December 3, 2013  
 Site Visit Time (MST): 08:45



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000				0.000	0.88	1.30	0.00	0.000	0.00	0.000	0.000
1	4.40	0.60	0.20	0.40	0.003				0.88	2.25	0.40	0.003	0.90	0.002	0.002	0%
2	6.30	0.38	0.28	0.33	0.039				0.88	2.03	0.10	0.034	0.20	0.007	0.007	0%
3	8.45	0.53	0.23	0.38	0.059				0.88	1.85	0.30	0.052	0.56	0.029	0.029	2%
4	10.00	0.75	0.23	0.49	0.230				0.88	1.65	0.52	0.202	0.86	0.174	0.174	11%
5	11.75	0.90	0.25	0.58	0.263				0.88	0.95	0.65	0.231	0.62	0.143	0.143	9%
6	11.90	0.90	0.25	0.58	0.268				0.88	0.93	0.65	0.236	0.60	0.142	0.142	9%
7	13.60	0.95	0.25	0.60	0.240				0.88	0.90	0.70	0.211	0.63	0.133	0.133	8%
8	13.70	0.92	0.25	0.59	0.227				0.88	0.95	0.67	0.200	0.64	0.127	0.127	8%
9	15.50	0.80	0.27	0.54	0.169				0.88	1.70	0.53	0.149	0.90	0.134	0.134	8%
10	17.10	0.80	0.25	0.53	0.080				0.88	1.73	0.55	0.070	0.95	0.067	0.067	4%
11	18.95	0.64	0.25	0.45	0.013				0.88	1.75	0.39	0.011	0.68	0.008	0.008	0%
12	20.60	0.66	0.27	0.47	-0.001				0.88	1.70	0.39	-0.001	0.66	-0.001	0.000	0%
13	22.35	0.78	0.25	0.52	0.001				0.88	1.60	0.53	0.001	0.85	0.001	0.001	0%
14	23.80	0.78	0.25	0.52	0.001				0.88	1.58	0.53	0.001	0.83	0.001	0.001	0%
15	25.50	0.92	0.27	0.60	0.004				0.88	1.55	0.65	0.004	1.01	0.004	0.004	0%
16	26.90	0.88	0.25	0.57	0.039				0.88	1.38	0.63	0.034	0.87	0.030	0.030	2%
17	28.25	0.80	0.25	0.53	0.144				0.88	1.10	0.55	0.127	0.61	0.077	0.077	5%
18	29.10	0.84	0.25	0.55	0.238				0.88	1.13	0.59	0.200	0.66	0.139	0.139	8%
19	30.50	0.77	0.27	0.52	0.299				0.88	1.25	0.50	0.263	0.63	0.164	0.164	10%
20	31.60	0.72	0.20	0.46	0.133				0.88	1.05	0.52	0.117	0.55	0.064	0.064	4%
21	32.60	0.68	0.18	0.43	0.132				0.88	1.05	0.50	0.116	0.53	0.061	0.061	4%
22	33.70	0.60	0.15	0.38	0.192				0.88	1.35	0.45	0.169	0.61	0.103	0.103	6%
23	35.30	0.60	0.20	0.40	0.076				0.88	1.58	0.40	0.067	0.63	0.042	0.042	3%
24	36.85	0.30	0.15	0.23	0.000				0.88	1.25	0.15	0.000	0.19	0.000	0.000	0%
RB	37.80	0.00	0.00		0.00		0.00		0.88	0.47	0.00	0.000	0.00	0.000	0.000	0%
<b>Total Flow</b>														<b>1.65</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m Ds of PT

Meas. Start Time (MST):	9:25
Meas. End Time (MST):	10:10
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -20°C

**Flow characteristics:**

Total Flow:	1.65	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	16.14	(m <sup>2</sup> )
Wetted Width:	36.00	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.05	

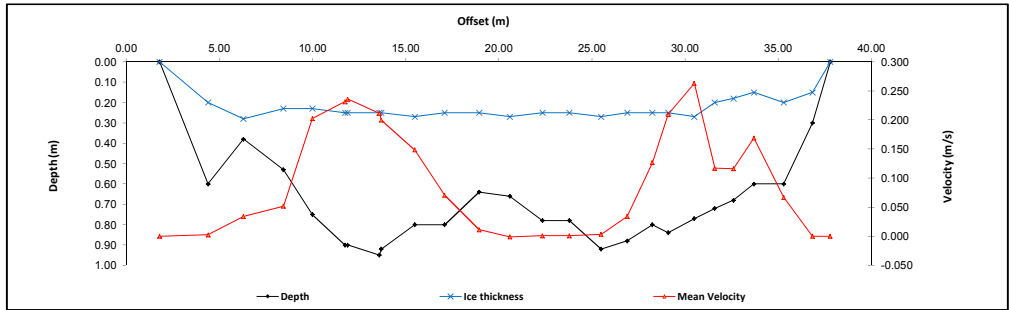
**Logger Details:**

	Before	After
Transducer Reading (m):	0.562	0.562
Water (°C):	0.1	0.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	08:56	10:19
Laptop Clock:	08:56	10:19
Battery (Main):	12.4	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Slush present under ice



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S40-06
S40-05			1.146	100.133	100.135	Pipe 4 m NE of Logger	S40-05
S40-06	1.212	101.279		100.067	100.067	Pipe 4 m S of Logger	S40-07
S40-07			1.054	100.225	100.227		WL
Ice/PT:			4.734	96.545			Ice
Water Level:			4.816	96.463		Time WL Surveyed: 9:14	Ice
Other:							WL
<b>Setup #2</b>							S40-07
S40-05	1.112	101.245		100.133	100.135	Pipe 4 m NE of Logger	S40-05
S40-06			1.177	100.068	100.067	Pipe 4 m S of Logger	S40-06
S40-07			1.019	100.226	100.227		
Ice/PT:			4.701	96.544			
Water Level:			4.785	96.460		Time WL Surveyed: 9:17	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S40-06	1.177	101.244	4.778	100.067		Time WL Surveyed: 10:15	
Water Level:			4.743	96.466		Time WL Surveyed: 10:17	
Water Level:			4.743	96.470			
BM: S40-06	1.146	101.213		100.067			

**WL Survey Summary**

	Before	After
Average WL:	96.462	96.468
Transducer Elevation:	95.900	95.906
Closing Error:	-0.001	-
WL Check:	0.003	-0.004

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, CJ, AH	Trip Date:	3-Dec-13
CJ	Date:	3-Dec-13
DW	Date:	19-Dec-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

January 17, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	2.80	0.00	0.00	0.000	0.000	0.000	0.9	2.80	3.35	0.55	0.10	0.039	0.035	0.06	0.002	0%
1	3.90	0.75	0.35	0.154			0.9	3.35	5.05	1.70	0.40	0.154	0.139	0.68	0.094	2%
2	6.20	1.03	0.50	0.189			0.9	5.05	7.50	2.45	0.53	0.189	0.170	1.30	0.221	4%
3	8.80	0.81	0.43	0.282			0.9	7.50	10.25	2.75	0.38	0.282	0.254	1.05	0.265	5%
4	11.70	0.93	0.40	0.346			0.9	10.25	12.30	2.05	0.53	0.346	0.311	1.09	0.338	6%
5	12.90	1.00	0.35	0.412			0.9	12.30	13.45	1.15	0.65	0.412	0.371	0.75	0.277	5%
6	14.00	1.00	0.35	0.434			0.9	13.45	14.55	1.10	0.65	0.434	0.391	0.72	0.279	5%
7	15.10	1.00	0.36	0.455			0.9	14.55	15.70	1.15	0.64	0.455	0.410	0.74	0.301	5%
8	16.30	1.02	0.35	0.317			0.9	15.70	16.90	1.20	0.67	0.317	0.285	0.80	0.229	4%
9	17.50	1.05	0.40	0.254			0.9	16.90	18.05	1.15	0.65	0.254	0.229	0.75	0.171	3%
10	18.60	1.10	0.43	0.285			0.9	18.05	19.90	1.85	0.67	0.285	0.257	1.24	0.318	6%
11	21.20	1.32	0.36		0.246	0.247	1.0	19.90	21.65	1.75	0.96	0.247	0.247	1.68	0.414	7%
12	22.10	1.45	0.37		0.206	0.279	1.0	21.65	22.90	1.25	1.05	0.243	0.243	1.35	0.327	6%
13	23.70	1.50	0.35		0.225	0.286	1.0	22.90	24.25	1.35	1.18	0.256	0.256	1.55	0.397	7%
14	24.80	1.58	0.40		0.196	0.262	1.0	24.25	25.40	1.15	1.18	0.229	0.229	1.36	0.311	5%
15	26.00	1.69	0.30		0.086	0.116	1.0	25.40	26.60	1.20	1.39	0.101	0.101	1.67	0.168	3%
16	27.20	1.83	0.49		0.049	0.114	1.0	26.60	28.05	1.45	1.34	0.082	0.082	1.94	0.158	3%
17	28.90	1.75	0.45		0.239	0.219	1.0	28.05	29.60	1.55	1.30	0.229	0.229	2.02	0.461	8%
18	30.30	1.45	0.55		0.523	0.005	1.0	29.60	32.00	2.40	0.90	0.264	0.264	2.16	0.570	10%
19	33.70	1.10	0.42	0.273			0.9	32.00	34.20	2.20	0.68	0.273	0.246	1.50	0.368	6%
20	34.70	1.03	0.58	0.220			0.9	34.20	35.25	1.05	0.45	0.220	0.198	0.47	0.094	2%
RB	35.80	0.00	0.00	0.00	0.00	0.00	1.0	35.25	35.80	0.55	0.11	0.055	0.055	0.06	0.003	0%
<b>Total Flow</b>															<b>5.77</b>	

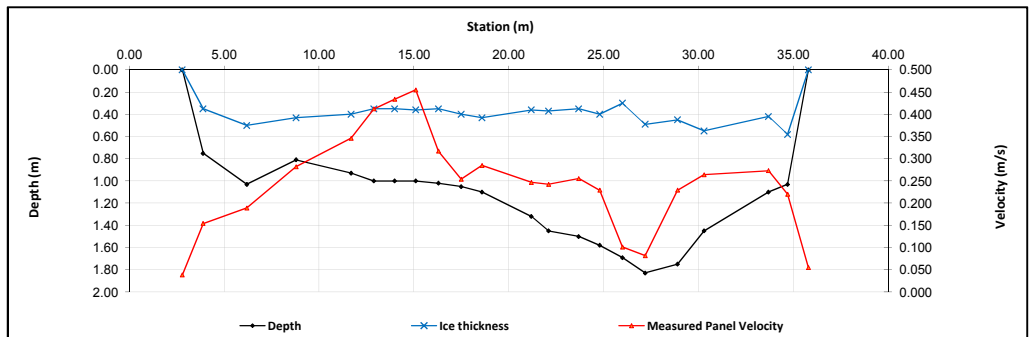
Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	11:10
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, -26°C

Flow characteristics:		
Total Flow:	5.77	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	24.91	(m <sup>2</sup> )
Wetted Width:	33.00	(m)
Hydraulic Depth:	0.755	(m)
Mean Velocity:	0.232	(m/s)
Froude Number:	0.085	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.033	-
Rainfall (mm):	0.3	-
Battery (Main):	-	-
Datalogger Clock:	11.9	12.85
Laptop Clock:	9:21	9:40
Enclosure Dessicant:	9:18	9:37
Logger# (if Δ):	Replaced	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	Good

Datalogger / Station Notes:	
-	Replaced battery and installed a second battery
-	Winterized precip gauge

General Notes:	
-	ADV Test: Good



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S43-01			1.454	100.268	100.270	3/4" pipe 1 m S of data logger
S43-03	1.609	101.722		100.113	100.113	3/4" pipe 5 m N of data logger
S43-04			1.385	100.337	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.243	99.479		
Water Level:			2.328	99.394		
Other:						
<b>Setup #2</b>						
S43-01	1.423	101.691		100.268	100.270	3/4" pipe 1 m S of data logger
S43-03			1.579	100.112	100.113	3/4" pipe 5 m N of data logger
S43-04			1.355	100.336	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.215	99.476		
Water Level:			2.299	99.392		
Other:						

Closing Error	0.001
WL Check	0.002

Average WL	99.393
Transducer Elevation Before	98.360
Transducer Elevation After	-

Field Personnel:	TR, DW	Trip Date:	17-Jan-13
Data Entry Personnel:	TR	Date:	17-Jan-13
Data Check Personnel:	DW	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag

UTM Location: 531528 E, 6354782 N

Site Visit Date:

February 6, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	1.90	0.00	0.00	0.000	0.000	0.000	0.9	1.90	2.70	0.80	0.13	0.031	0.028	0.10	0.003	0%
1	3.50	1.00	0.50	0.125			0.9	2.70	4.10	1.40	0.50	0.125	0.113	0.70	0.079	2%
2	4.70	1.20	0.50	0.159			0.9	4.10	5.50	1.40	0.70	0.159	0.143	0.98	0.140	3%
3	6.30	1.05	0.45	0.190			0.9	5.50	7.05	1.55	0.60	0.190	0.171	0.93	0.159	4%
4	7.80	1.00	0.55	0.217			0.9	7.05	8.60	1.55	0.45	0.217	0.195	0.70	0.136	3%
5	9.40	1.00	0.50	0.191			0.9	8.60	10.30	1.70	0.50	0.191	0.172	0.85	0.146	4%
6	11.20	1.15	0.40	0.209			0.9	10.30	12.15	1.85	0.75	0.209	0.188	1.39	0.261	6%
7	13.10	1.20	0.45	0.222			0.9	12.15	14.05	1.90	0.75	0.222	0.200	1.43	0.285	7%
8	15.00	1.30	0.50		0.131	0.163	1.0	14.05	15.90	1.85	0.80	0.147	0.147	1.48	0.218	5%
9	16.80	1.25	0.52	0.169			0.9	15.90	17.75	1.85	0.73	0.169	0.152	1.35	0.205	5%
10	18.70	1.25	0.55	0.147			0.9	17.75	19.50	1.75	0.70	0.147	0.132	1.23	0.162	4%
11	20.30	1.40	0.52		0.132	0.167	1.0	19.50	21.40	1.90	0.88	0.150	0.150	1.67	0.250	6%
12	22.50	1.50	0.55		0.134	0.245	1.0	21.40	23.40	2.00	0.95	0.190	0.190	1.90	0.360	9%
13	24.30	1.53	0.55		0.151	0.179	1.0	23.40	25.35	1.95	0.98	0.165	0.165	1.91	0.315	8%
14	26.40	1.48	0.55		0.085	0.137	1.0	25.35	27.25	1.90	0.93	0.111	0.111	1.77	0.196	5%
15	28.10	1.45	0.55		0.174	0.298	1.0	27.25	28.90	1.65	0.90	0.236	0.236	1.49	0.350	8%
16	29.70	1.30	0.57		0.326	0.463	1.0	28.90	30.40	1.50	0.73	0.395	0.395	1.10	0.432	10%
17	31.10	1.20	0.55	0.263			0.9	30.40	31.80	1.40	0.65	0.263	0.237	0.91	0.215	5%
18	32.50	1.05	0.55	0.201			0.9	31.80	33.10	1.30	0.50	0.201	0.181	0.65	0.118	3%
19	33.70	0.90	0.65	0.172			0.9	33.10	34.45	1.35	0.25	0.172	0.155	0.34	0.052	1%
20	35.20	0.95	0.60	0.174			0.9	34.45	36.05	1.60	0.35	0.174	0.157	0.56	0.088	2%
RB	36.90	0.00	0.00	0.00	0.00	0.00	1.0	36.05	36.90	0.85	0.09	0.044	0.044	0.07	0.003	0%
<b>Total Flow</b>															<b>4.17</b>	

Measurement Details:	
Start Time (MST):	9:05
End Time (MST):	10:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Partial, -20°C

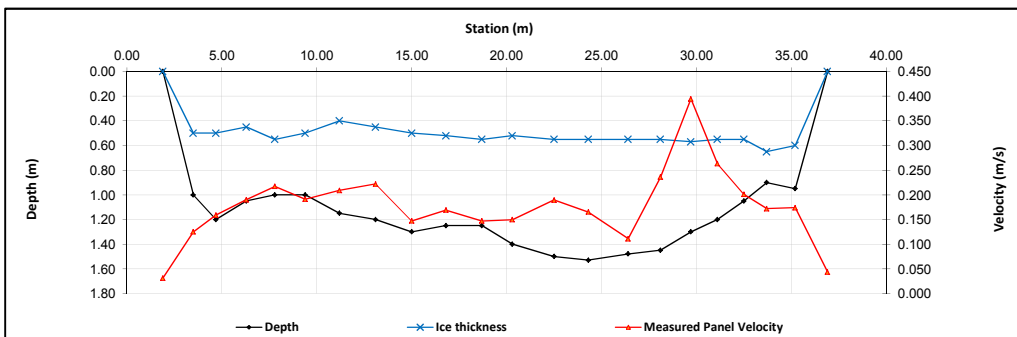
Flow characteristics:		
Total Flow:	4.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.49	(m <sup>2</sup> )
Wetted Width:	35.00	(m)
Hydraulic Depth:	0.671	(m)
Mean Velocity:	0.178	(m/s)
Froude Number:	0.069	

Logger Details:		
Transducer Reading (m):	Before	After
	1.056	-
Water (°C):	0.3	-
Rainfall (mm):	-	-
Battery (Main):	13.0	-
Datalogger Clock:	9:11	-
Laptop Clock:	9:11	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

**General Notes: 1.591**

- Ran ADV test
- Ice is very wet
- Open leads DS on LB around bend



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S43-01	1.671	101.941		100.270	100.270	3/4" pipe 1 m S of data logger
S43-03			1.827	100.114	100.113	3/4" pipe 5 m N of data logger
S43-04			1.604	100.337	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.508	99.433		
Water Level:			2.537	99.404		
Other:						
<b>Setup #2</b>						
S43-01			1.659	100.269	100.270	3/4" pipe 1 m S of data logger
S43-03			1.815	100.113	100.113	3/4" pipe 5 m N of data logger
S43-04	1.591	101.928		100.337	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.496	99.432		
Water Level:			2.523	99.405		
Other:						

Closing Error	0.001
WL Check	0.001

Average WL	99.405
Transducer Elevation Before	98.349
Transducer Elevation After	-

Field Personnel:	TR, CJ	Trip Date:	6-Feb-13
Data Entry Personnel:	CJ	Date:	6-Feb-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

March 12, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	2.25	0.00	0.00	0.000	0.000	0.000	0.9	2.25	2.63	0.38	0.10	0.063	0.057	0.04	0.002	0%
1	3.00	0.91	0.52	0.253			0.9	2.63	3.75	1.13	0.39	0.253	0.228	0.44	0.100	2%
2	4.50	0.95	0.52	0.268			0.9	3.75	4.88	1.13	0.43	0.268	0.241	0.48	0.117	2%
3	5.25	0.95	0.56	0.334			0.9	4.88	5.63	0.75	0.39	0.334	0.301	0.29	0.088	2%
4	6.00	0.90	0.54	0.365			0.9	5.63	6.50	0.88	0.36	0.365	0.329	0.32	0.103	2%
5	7.00	0.90	0.55	0.296			0.9	6.50	7.50	1.00	0.35	0.296	0.266	0.35	0.093	2%
6	8.00	1.04	0.63	0.304			0.9	7.50	8.88	1.38	0.41	0.304	0.274	0.56	0.154	3%
7	9.75	1.18	0.65	0.340			0.9	8.88	10.38	1.50	0.53	0.340	0.306	0.80	0.243	4%
8	11.00	1.34	0.62	0.459			0.9	10.38	11.63	1.25	0.72	0.459	0.413	0.90	0.372	6%
9	12.25	1.40	0.66		0.383	0.423	1.0	11.63	12.63	1.00	0.74	0.403	0.403	0.74	0.298	5%
10	13.00	1.29	0.65	0.510			0.9	12.63	14.00	1.38	0.64	0.510	0.459	0.88	0.404	7%
11	15.00	1.21	0.65	0.450			0.9	14.00	15.50	1.50	0.56	0.450	0.405	0.84	0.340	6%
12	16.00	1.26	0.70	0.336			0.9	15.50	16.50	1.00	0.56	0.336	0.302	0.56	0.169	3%
13	17.00	1.25	0.75	0.236			0.9	16.50	17.50	1.00	0.50	0.236	0.212	0.50	0.106	2%
14	18.00	1.31	0.80	0.207			0.9	17.50	18.75	1.25	0.51	0.207	0.186	0.64	0.119	2%
15	19.50	1.39	0.81	0.360			0.9	18.75	20.25	1.50	0.58	0.360	0.324	0.87	0.282	5%
16	21.00	1.37	0.74	0.505			0.9	20.25	22.00	1.75	0.63	0.505	0.455	1.10	0.501	9%
17	23.00	1.32	0.72	0.591			0.9	22.00	23.50	1.50	0.60	0.591	0.532	0.90	0.479	8%
18	24.00	1.30	0.74	0.373			0.9	23.50	25.00	1.50	0.56	0.373	0.336	0.84	0.282	5%
19	26.00	1.21	0.75	0.258			0.9	25.00	27.00	2.00	0.46	0.258	0.232	0.92	0.214	4%
20	28.00	1.07	0.80	0.142			0.9	27.00	28.50	1.50	0.27	0.142	0.128	0.41	0.052	1%
21	29.00	1.20	0.75	0.282			0.9	28.50	29.50	1.00	0.45	0.282	0.254	0.45	0.114	2%
22	30.00	1.19	0.62	0.445			0.9	29.50	31.00	1.50	0.57	0.445	0.401	0.86	0.342	6%
23	32.00	1.11	0.66	0.488			0.9	31.00	32.63	1.63	0.45	0.488	0.439	0.73	0.321	5%
24	33.25	1.20	0.68	0.311			0.9	32.63	33.88	1.25	0.52	0.311	0.280	0.65	0.182	3%
25	34.50	1.05	0.65	0.364			0.9	33.88	35.25	1.38	0.40	0.364	0.328	0.55	0.180	3%
26	36.00	0.90	0.56	0.486			0.9	35.25	36.55	1.30	0.34	0.486	0.437	0.44	0.193	3%
RB	37.10	0.00	0.00	0.00	0.00	0.00	1.0	36.55	37.10	0.55	0.09	0.122	0.122	0.05	0.006	0%
<b>Total Flow</b>														<b>5.86</b>		

Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	13:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Overcast, Calm, -7°C

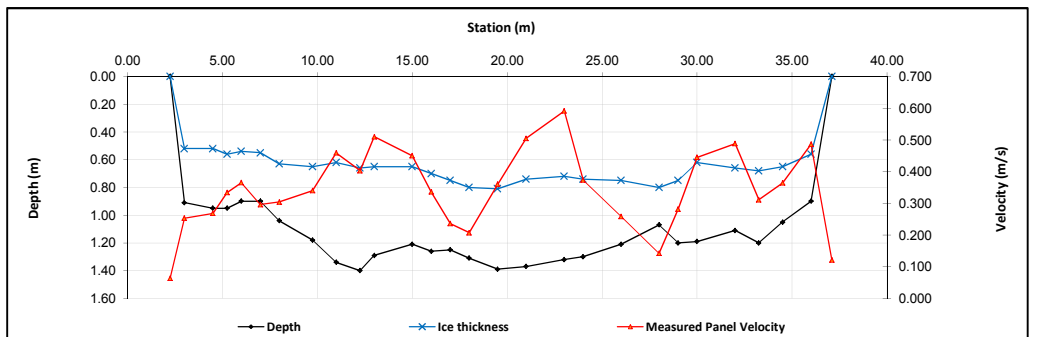
Flow characteristics:		
Total Flow:	5.86	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	17.10	(m <sup>2</sup> )
Wetted Width:	34.85	(m)
Hydraulic Depth:	0.491	(m)
Mean Velocity:	0.343	(m/s)
Froude Number:	0.156	

Logger Details:		
Transducer Reading (m):	1.090	-
Water (°C):	0.3	-
Rainfall (mm):	0.00	-
Battery (Main):	15.1	-
Datalogger Clock:	11:48	-
Laptop Clock:	11:49	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	9976	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:		

**General Notes:**

- Ran ADV test
- Open leads US and DS of sampling site slush on ice from overflow



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S43-01			1.568	100.268	100.270	3/4" pipe 1 m S of data logger
S43-03	1.723	101.836		100.113	100.113	3/4" pipe 5 m N of data logger
S43-04			1.501	100.335	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.463	99.373		
Water Level:			2.385	99.451		
Other:						
<b>Setup #2</b>						
S43-01			1.526	100.269	100.270	3/4" pipe 1 m S of data logger
S43-03			1.681	100.114	100.113	3/4" pipe 5 m N of data logger
S43-04	1.460	101.795		100.335	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.423	99.372		
Water Level:			2.347	99.448		
Other:						

Closing Error	-0.001	Average WL	99.450
WL Check	0.003	Transducer Elevation Before	98.360
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, BL	Trip Date:	12-Mar-13
Data Entry Personnel:	BL	Date:	12-Mar-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag

UTM Location: 531528 E, 6354782 N

Site Visit Date:

March 30, 2013



Flow Measurement:							Measured Data										Calculated Data						
Bank/	Offset	Depth	Ice	Velocity	Velocity	Velocity	Velocity	Pannel	Pannel	Pannel	Effective	Measured	Effective	Pannel	Pannel	Percent of							
Mmt #	(m)	(m)	Thickness	@ 0.5	@ 0.8	@ 0.2	Correction	Start	End	Width	Pannel Depth	Pannel Velocity	Pannel Velocity	Area	Discharge	total flow							
			(m)	Depth	Depth	Depth	(m)	(m)	(m)	(m)	(m)	(m/s)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)								
RB	1.00	0.00	0.00	0.000	0.000	0.000	0.9	1.00	2.10	1.10	0.09	0.104	0.093	0.10	0.009	0%							
1	3.20	1.00	0.65	0.414			0.9	2.10	3.75	1.65	0.35	0.414	0.373	0.58	0.215	4%							
2	4.30	1.10	0.65	0.560			0.9	3.75	4.90	1.15	0.45	0.560	0.504	0.52	0.261	5%							
3	5.50	1.13	0.56	0.834			0.9	4.90	6.15	1.25	0.57	0.834	0.751	0.71	0.535	11%							
4	6.80	1.10	0.55	0.954			0.9	6.15	7.30	1.15	0.55	0.954	0.499	0.63	0.315	6%							
5	7.80	1.10	0.70	0.338			0.9	7.30	8.48	1.18	0.40	0.338	0.304	0.47	0.143	3%							
6	9.15	1.19	0.78	0.070			0.9	8.48	9.83	1.35	0.41	0.070	0.063	0.55	0.035	1%							
7	10.50	1.06	0.83	0.096			0.9	9.83	11.15	1.33	0.23	0.096	0.086	0.30	0.026	1%							
8	11.80	1.13	0.75	0.445			0.9	11.15	12.55	1.40	0.38	0.445	0.401	0.53	0.213	4%							
9	13.30	1.20	0.70	0.398			0.9	12.55	13.90	1.35	0.50	0.398	0.358	0.68	0.242	5%							
10	14.50	1.25	0.74	0.479			0.9	13.90	15.15	1.25	0.51	0.479	0.431	0.64	0.275	5%							
11	15.80	1.34	0.75	0.493			0.9	15.15	16.25	1.10	0.59	0.493	0.444	0.65	0.288	6%							
12	16.70	1.35	0.80	0.379			0.9	16.25	17.45	1.20	0.55	0.379	0.341	0.66	0.225	4%							
13	18.20	1.40	0.85	0.232			0.9	17.45	18.85	1.40	0.55	0.232	0.209	0.77	0.161	3%							
14	19.50	1.27	0.85	0.146			0.9	18.85	20.15	1.30	0.42	0.146	0.131	0.55	0.072	1%							
15	20.80	1.15	0.74	0.307			0.9	20.15	21.50	1.35	0.41	0.307	0.276	0.55	0.153	3%							
16	22.20	1.20	0.70	0.395			0.9	21.50	22.70	1.20	0.50	0.395	0.356	0.60	0.213	4%							
17	23.20	1.24	0.65	0.450			0.9	22.70	23.75	1.05	0.59	0.450	0.405	0.62	0.251	5%							
18	24.30	1.45	0.70	0.429			0.9	23.75	24.90	1.15	0.75	0.429	0.386	0.86	0.333	7%							
19	25.50	1.45	0.72		0.043	0.394	1.0	24.90	26.05	1.15	0.73	0.219	0.219	0.84	0.183	4%							
20	26.60	1.35	0.70	0.420			0.9	26.05	27.20	1.15	0.65	0.420	0.378	0.75	0.283	6%							
21	27.80	1.13	0.67	0.284			0.9	27.20	28.35	1.15	0.46	0.284	0.256	0.53	0.135	3%							
22	28.90	1.05	0.67	0.257			0.9	28.35	29.65	1.30	0.38	0.257	0.231	0.49	0.114	2%							
23	30.40	1.05	0.60	0.353			0.9	29.65	31.10	1.45	0.45	0.353	0.318	0.65	0.207	4%							
24	31.80	1.00	0.57	0.342			0.9	31.10	32.40	1.30	0.43	0.342	0.308	0.56	0.172	3%							
LB	33.00	0.00	0.00	0.00	0.00	0.00	1.0	32.40	33.00	0.60	0.11	0.086	0.086	0.06	0.006	0%							
<b>Total Flow</b>														<b>5.07</b>									

Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -10°C

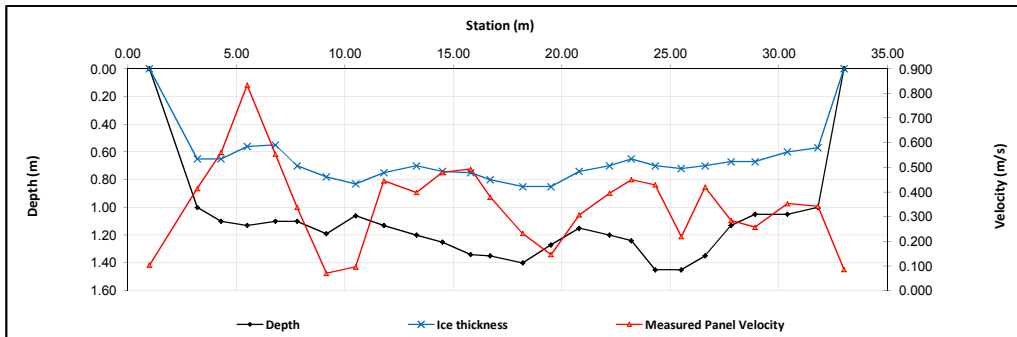
Flow characteristics:	
Total Flow:	5.07 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	14.86 (m <sup>2</sup> )
Wetted Width:	32.00 (m)
Hydraulic Depth:	0.464 (m)
Mean Velocity:	0.341 (m/s)
Froude Number:	0.160

Logger Details:		
	Before	After
Transducer Reading (m):	1.106	-
Water (°C):	0.3	-
Rainfall (mm):	-	-
Battery (Main):	15.1	-
Datalogger Clock:	9:38	-
Laptop Clock:	9:38	-
Enclosure Dessoricant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessoricant:	Good	-

Datalogger / Station Notes:	

**General Notes:**

- Assessed ice conditions upon arrival. Poor ice conditions, white ice and slush layers about 30 cm down. Open water at LB.
- Flow measurement started at 9:36, ended at 10:30



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S43-01	1.349	101.619		100.270	100.270	3/4" pipe 1 m S of data logger
S43-03			1.507	100.112	100.113	3/4" pipe 5 m N of data logger
S43-04			1.283	100.336	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.138	99.481		
Water Level:			2.158	99.461		
Other:						
<b>Setup #2</b>						
S43-01			1.257	100.267	100.270	3/4" pipe 1 m S of data logger
S43-03	1.412	101.524		100.112	100.113	3/4" pipe 5 m N of data logger
S43-04			1.188	100.336	100.338	3/4" pipe 1 m E of data logger
Ice/PT:			2.043	99.481		
Water Level:			2.066	99.458		
Other:						

Closing Error	0.003	Average WL	99.460
WL Check	0.003	Transducer Elevation Before	98.354
		Transducer Elevation After	-

Field Personnel:			
Data Entry Personnel:	CJ, XP	Trip Date:	30-Mar-13
Data Check Personnel:	CJ	Date:	30-Mar-13
Entered Digitally in the Field:	DW	Date:	8-Apr-13
	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: May 11, 2013  
 Site Visit Time (MST): 14:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>																<b>0%</b>

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	Sunny, 18°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

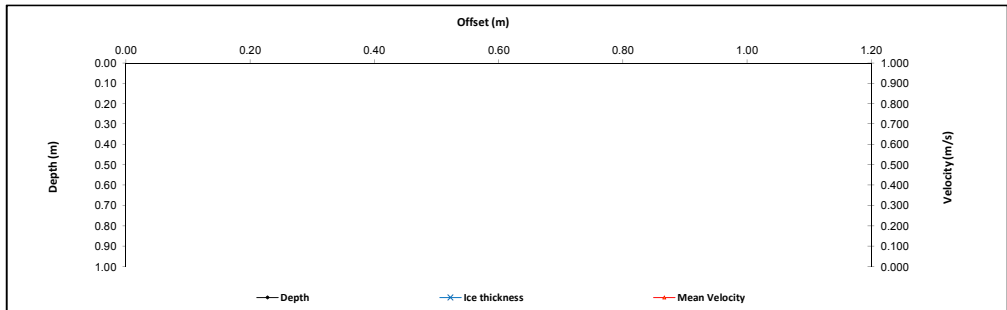
	Before	After
Transducer Reading (m):	1.867	1.865
Water (°C):	5.1	5.4
Rainfall (mm):	0.00	3.90
Datalogger Clock:	15:02	16:17
Laptop Clock:	14:59	16:19
Battery (Main):	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Reinstated precip gauge. Repaired precious gauge mast.

**General Notes:**

- No flow measurement. River flow was too fast to operate boat.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S43-01
S43-01	1.670	101.940		100.270	100.270	3/4" pipe 1 m S of data logger	S43-03
S43-03			1.827	100.113	100.113	3/4" pipe 5 m N of data logger	S43-04
S43-04			1.612	100.328	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:							WL
Water Level:		1.801		100.139		Time WL Surveyed: 15:27	S43-04
Other:							S43-03
<b>Setup #2</b>							S43-01
S43-01			1.656	100.269	100.270	3/4" pipe 1 m S of data logger	
S43-03	1.812	101.925		100.113	100.113	3/4" pipe 5 m N of data logger	
S43-04			1.597	100.328	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:							
Water Level:			1.786	100.139		Time WL Surveyed: 15:28	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.328			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.328			

**WL Survey Summary**

	Before	After
Average WL:	100.139	-
Transducer Elevation:	98.272	-
Closing Error:	0.001	-
WL Check:	0.000	-

**Site Rating Information**

Measured Discharge:	
Expected Discharge:	80.75
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, DW	Trip Date:	11-May-23
<b>Data Entry Personnel:</b>	SM	Date:	11-May-13
<b>Data Check Personnel:</b>	DW	Date:	26-May-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: June 14, 2013  
 Site Visit Time (MST): 08:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%

No Flow Measurement Conducted

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High and fast
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Clear, calm, 20°C

Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

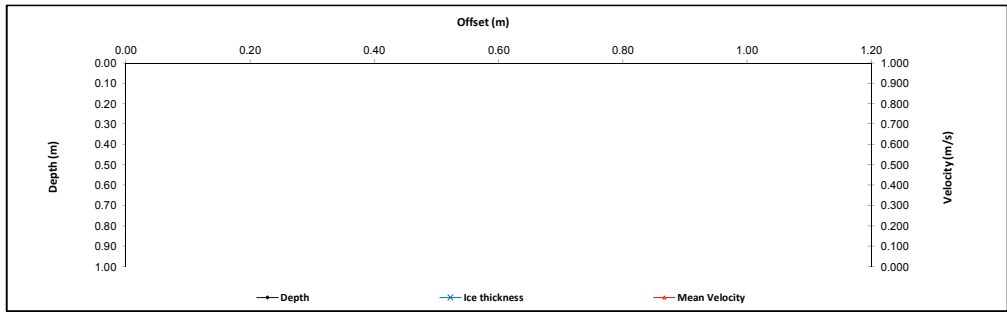
Logger Details:

	Before	After
Transducer Reading (m):	1.950	1.949
Water (°C):	13.3	13.4
Rainfall (mm):	0.00	0.02
Datalogger Clock:	07:40	-
Laptop Clock:	07:38	-
Battery (Main):	14.5	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Tipping bucket was not level, problem was rectified
- Tested tipping bucket
- Standing waves present, no discharge measurement possible

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S43-01
S43-01	1.303	101.573		100.270	100.270	3/4" pipe 1 m S of data logger	S43-03
S43-03			1.456	100.117	100.113	3/4" pipe 5 m N of data logger	S43-04
S43-04			1.239	100.334	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:							WL
Water Level:		1.340		100.233		Time WL Surveyed: 8:16	S43-04
Other:							S43-03
<b>Setup #2</b>							S43-01
S43-01			1.286	100.266	100.270	3/4" pipe 1 m S of data logger	
S43-03			1.435	100.117	100.113	3/4" pipe 5 m N of data logger	
S43-04	1.218	101.552		100.334	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:							
Water Level:			1.320	100.232		Time WL Surveyed: 8:18	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.334			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.334			

WL Survey Summary

	Before	After
Average WL:	100.233	-
Transducer Elevation:	98.283	-
Closing Error:	0.004	-
WL Check:	0.001	-

Site Rating Information

Measured Discharge:	89.39
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:	TR, SG	Trip Date:	14 June 2013
Data Entry Personnel:	TR	Date:	14-Jun-13
Data Check Personnel:	DW	Date:	25-Jun-13
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: August 12, 2013  
 Site Visit Time (MST): 09:00

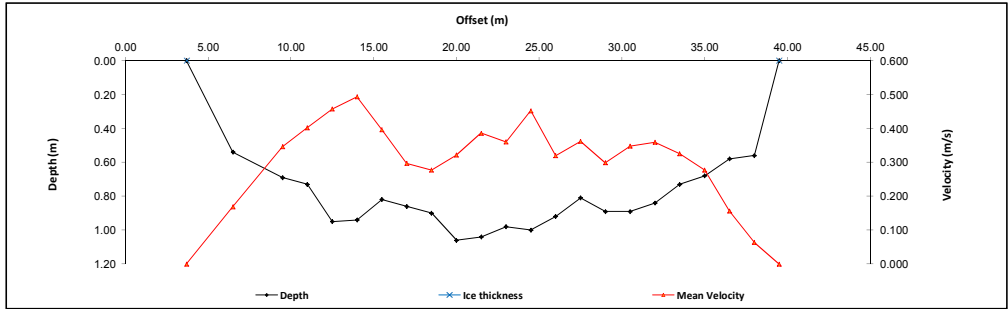


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
LB	3.70	0.00	0.00		0.000		0.000		0.000	1.00	1.40	0.00	0.000	0.00	0.000						
1	6.50	0.54		0.32	0.169					1.00	2.90	0.54	0.169	1.57	0.265	3%					
2	9.50	0.69		0.41	0.346					1.00	2.25	0.69	0.346	1.55	0.537	6%					
3	11.00	0.73		0.44	0.402					1.00	1.50	0.73	0.402	1.10	0.440	5%					
4	12.50	0.95				0.76	0.367	0.19	0.548	1.00	1.50	0.95	0.458	1.43	0.652	7%					
5	14.00	0.94				0.75	0.386	0.19	0.600	1.00	1.50	0.94	0.493	1.41	0.695	8%					
6	15.50	0.82				0.66	0.295	0.16	0.497	1.00	1.50	0.82	0.396	1.23	0.487	5%					
7	17.00	0.86				0.69	0.212	0.17	0.382	1.00	1.50	0.86	0.297	1.29	0.383	4%					
8	18.50	0.90				0.72	0.171	0.18	0.383	1.00	1.50	0.90	0.277	1.35	0.374	4%					
9	20.00	1.06				0.85	0.175	0.21	0.468	1.00	1.50	1.06	0.322	1.59	0.511	6%					
10	21.50	1.04				0.83	0.298	0.21	0.474	1.00	1.50	1.04	0.386	1.56	0.602	7%					
11	23.00	0.98				0.78	0.232	0.20	0.488	1.00	1.50	0.98	0.360	1.47	0.529	6%					
12	24.50	1.00				0.80	0.396	0.20	0.508	1.00	1.50	1.00	0.452	1.50	0.678	7%					
13	26.00	0.92				0.74	0.216	0.18	0.423	1.00	1.50	0.92	0.320	1.38	0.441	5%					
14	27.50	0.81				0.65	0.300	0.16	0.424	1.00	1.50	0.81	0.362	1.22	0.440	5%					
15	29.00	0.89				0.71	0.167	0.18	0.431	1.00	1.50	0.89	0.299	1.34	0.399	4%					
16	30.50	0.89				0.71	0.285	0.18	0.411	1.00	1.50	0.89	0.359	1.34	0.465	5%					
17	32.00	0.84				0.67	0.263	0.17	0.455	1.00	1.50	0.84	0.359	1.26	0.452	5%					
18	33.50	0.73	0.44		0.325					1.00	1.50	0.73	0.325	1.10	0.356	4%					
19	35.00	0.68	0.41		0.277					1.00	1.50	0.68	0.277	1.02	0.283	3%					
20	36.50	0.58	0.35		0.156					1.00	1.50	0.58	0.156	0.87	0.136	1%					
21	38.00	0.56	0.34		0.064					1.00	1.50	0.56	0.064	0.84	0.054	1%					
RB	39.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000						
<b>Total Flow</b>														<b>9.18</b>	<b>100%</b>						

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:24
Meas. End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	9.18	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	27.39	(m <sup>2</sup> )
Wetted Width:	35.80	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.794	0.794
Water (°C):	17.5	17.8
Rainfall (mm):	0.00	0.20
Datalogger Clock:	09:09	10:11
Laptop Clock:	09:06	10:08
Battery (Main):	14.3	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tested precip gauge 0.2 mm - OK
- handed multiplier for precip gauge to 0.254
- Negative wire had been disconnected from the battery by an animal. Wire was reconnected.

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S43-01
S43-01	1.431	101.701		100.270	100.270	3/4" pipe 1 m S of data logger	S43-03
S43-03			1.587	100.114	100.113	3/4" pipe 5 m N of data logger	S43-04
S43-04			1.372	100.329	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.625	99.076		Time WL Surveyed: 9:17	S43-04
Other:							S43-03
<b>Setup #2</b>							S43-01
S43-01			1.421	100.270	100.270	3/4" pipe 1 m S of data logger	
S43-03	1.577	101.691		100.114	100.113	3/4" pipe 5 m N of data logger	
S43-04			1.362	100.329	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:							
Water Level:			2.615	99.076		Time WL Surveyed: 9:19	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S43-03	1.577	101.691	100.114			
Water Level:			2.617	99.074		Time WL Surveyed: 10:05	
Water Level:			2.605	99.075		Time WL Surveyed: 10:07	
BM:	S43-03	1.566	101.680	100.114			

**WL Survey Summary**

	Before	After
Average WL:	99.076	99.075
Transducer Elevation:	98.282	98.281
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	9.18
Expected Discharge:	8.43
Shift from Existing Rating (m <sup>3</sup> /s):	-0.75
Shift from Existing Rating (%):	-8%

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	12-Aug-13
Data Check Personnel:	SM	Date:	12-Aug-13
Entered Digitally in the Field:	DW	Date:	23-Aug-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: September 15, 2013  
 Site Visit Time (MST): 07:25

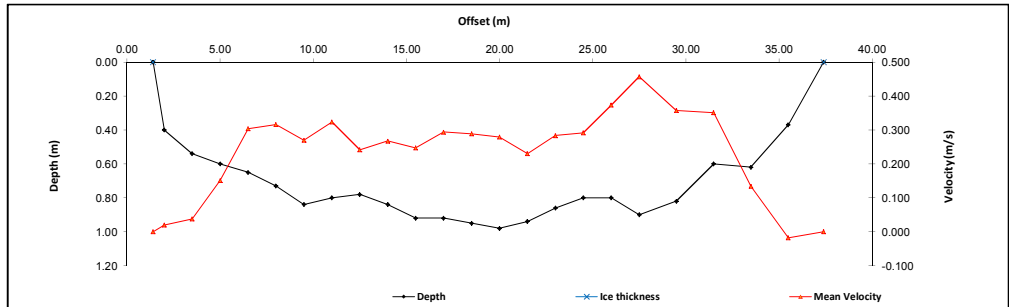


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.00	0.40		0.24	0.020					1.00	1.05	0.40	0.020	0.42	0.008	0%
2	3.50	0.54		0.32	0.038					1.00	1.50	0.54	0.038	0.81	0.031	0%
3	5.00	0.60		0.36	0.151					1.00	1.50	0.60	0.151	0.90	0.136	2%
4	6.50	0.65		0.39	0.304					1.00	1.50	0.65	0.304	0.98	0.296	4%
5	8.00	0.73		0.44	0.316					1.00	1.50	0.73	0.316	1.10	0.346	5%
6	9.50	0.84				0.67	0.129	0.17	0.410	1.00	1.50	0.84	0.270	1.26	0.340	5%
7	11.00	0.80				0.64	0.227	0.16	0.420	1.00	1.50	0.80	0.324	1.20	0.388	5%
8	12.50	0.78				0.62	0.155	0.16	0.328	1.00	1.50	0.78	0.242	1.17	0.283	4%
9	14.00	0.84				0.67	0.189	0.17	0.346	1.00	1.50	0.84	0.268	1.26	0.337	5%
10	15.50	0.92				0.74	0.124	0.18	0.370	1.00	1.50	0.92	0.247	1.38	0.341	5%
11	17.00	0.92				0.74	0.214	0.18	0.374	1.00	1.50	0.92	0.294	1.38	0.406	6%
12	18.50	0.95				0.76	0.233	0.19	0.344	1.00	1.50	0.95	0.289	1.43	0.411	6%
13	20.00	0.98				0.78	0.205	0.20	0.353	1.00	1.50	0.98	0.279	1.47	0.410	6%
14	21.50	0.94				0.75	0.121	0.19	0.339	1.00	1.50	0.94	0.230	1.41	0.324	5%
15	23.00	0.86				0.69	0.229	0.17	0.338	1.00	1.50	0.86	0.284	1.29	0.366	5%
16	24.50	0.80				0.64	0.208	0.16	0.375	1.00	1.50	0.80	0.292	1.20	0.350	5%
17	26.00	0.80				0.64	0.298	0.16	0.449	1.00	1.50	0.80	0.374	1.20	0.448	6%
18	27.50	0.90				0.72	0.369	0.18	0.545	1.00	1.75	0.90	0.457	1.58	0.720	10%
19	29.50	0.82				0.66	0.218	0.16	0.497	1.00	2.00	0.82	0.358	1.64	0.586	8%
20	31.50	0.60		0.36	0.351					1.00	2.00	0.60	0.351	1.20	0.421	6%
21	33.50	0.62		0.37	0.134					1.00	2.00	0.62	0.134	1.24	0.166	2%
22	35.50	0.37		0.22	-0.018					1.00	1.95	0.37	-0.018	0.72	-0.013	0%
LB	37.40	0.00	0.00		0.00		0.00		0.00	1.00	0.95	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>7.10</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across from PT

Meas. Start Time (MST):	8:30
Meas. End Time (MST):	9:20
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 10°C



**Flow characteristics:**

Total Flow:	7.10	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	26.22	(m <sup>2</sup> )
Wetted Width:	36.00	(m)
Hydraulic Depth:	0.73	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.807	0.807
Water (°C):	11.7	12.2
Rainfall (mm):	0.00	0.00
Datalogger Clock:	08:13	09:28
Laptop Clock:	08:16	09:30
Battery (Main):	14.6	14.4
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	284729	252795
Logger# (if replaced):		

**Datalogger / Station Notes:**

- Replaced PT, old depth 0.746 m
- Needs BM Tags
- TBRG was disturbed by wildlife and found not level.
- Levelled TBRG

**General Notes:**

- Ran ADV test

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S43-04
S43-01			1.443	100.270	100.270	3/4" pipe 1 m S of data logger	S43-03
S43-03	1.600	101.713		100.113	100.113	3/4" pipe 5 m N of data logger	S43-01
S43-04			1.383	100.330	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.688	99.025		Time WL Surveyed: 8:20	S43-01
Other:							S43-03
<b>Setup #2</b>							S43-04
S43-01	1.419	101.689		100.270	100.270	3/4" pipe 1 m S of data logger	
S43-03			1.576	100.113	100.113	3/4" pipe 5 m N of data logger	
S43-04			1.361	100.328	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:							
Water Level:			2.667	99.022		Time WL Surveyed: 8:21	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S43-03	1.578	101.691		100.113		
Water Level:			2.665	99.026		Time WL Surveyed: 9:25	
Water Level:			2.614	99.025		Time WL Surveyed: 9:26	
BM:	S43-03	1.526	101.639		100.113		

**WL Survey Summary**

	Before	After
Average WL:	99.024	99.026
Transducer Elevation:	98.217	98.219
Closing Error:	0.000	-
WL Check:	0.003	0.001

**Site Rating Information**

Measured Discharge:	7.1
Expected Discharge:	6.42
Shift from Existing Rating (m <sup>3</sup> /s):	-0.68
Shift from Existing Rating (%):	-10%

**Field Personnel:**

TR, CJ	Trip Date:	15-Sep-13
TR	Date:	15-Sep-13
DW	Date:	28-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: November 1, 2013  
 Site Visit Time (MST): 13:55

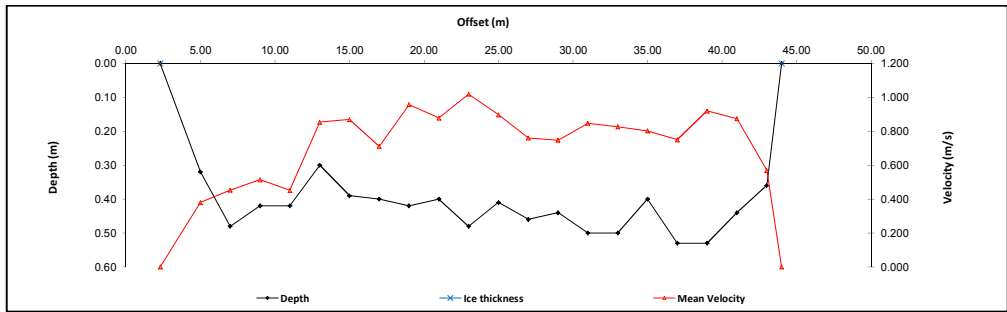


Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
RB	44.00	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000						
1	43.00	0.36		0.22	0.569					1.00	1.50	0.36	0.569	0.54	0.307	2%					
2	41.00	0.44		0.26	0.874					1.00	2.00	0.44	0.874	0.88	0.769	6%					
3	39.00	0.53		0.32	0.920					1.00	2.00	0.53	0.920	1.06	0.975	8%					
4	37.00	0.53		0.32	0.750					1.00	2.00	0.53	0.750	1.06	0.795	6%					
5	35.00	0.40		0.24	0.802					1.00	2.00	0.40	0.802	0.80	0.642	5%					
6	33.00	0.50		0.30	0.826					1.00	2.00	0.50	0.826	1.00	0.826	6%					
7	31.00	0.50		0.30	0.847					1.00	2.00	0.50	0.847	1.00	0.847	7%					
8	29.00	0.44		0.26	0.747					1.00	2.00	0.44	0.747	0.88	0.657	5%					
9	27.00	0.46		0.28	0.760					1.00	2.00	0.46	0.760	0.92	0.699	5%					
10	25.00	0.41		0.25	0.897					1.00	2.00	0.41	0.897	0.82	0.736	6%					
11	23.00	0.48		0.29	1.019					1.00	2.00	0.48	1.019	0.96	0.978	8%					
12	21.00	0.40		0.24	0.878					1.00	2.00	0.40	0.878	0.80	0.702	5%					
13	19.00	0.42		0.25	0.956					1.00	2.00	0.42	0.956	0.84	0.803	6%					
14	17.00	0.40		0.24	0.711					1.00	2.00	0.40	0.711	0.80	0.569	4%					
15	15.00	0.39		0.23	0.869					1.00	2.00	0.39	0.869	0.78	0.678	5%					
16	13.00	0.30		0.18	0.854					1.00	2.00	0.30	0.854	0.60	0.512	4%					
17	11.00	0.42		0.25	0.452					1.00	2.00	0.42	0.452	0.84	0.380	3%					
18	9.00	0.42		0.25	0.514					1.00	2.00	0.42	0.514	0.84	0.432	3%					
19	7.00	0.48		0.29	0.453					1.00	2.00	0.48	0.453	0.96	0.435	3%					
20	5.00	0.32		0.19	0.380					1.00	2.35	0.32	0.380	0.75	0.286	2%					
LB	2.30	0.00	0.00		0.00		0.00		0.00	1.00	1.35	0.00	0.000	0.00	0.000						
<b>Total Flow</b>															<b>13.0</b>	<b>100%</b>					

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:00
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Wading
River Condition:	Good Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 0°C



**Flow characteristics:**

Total Flow:	13.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.13	(m <sup>2</sup> )
Wetted Width:	41.70	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.76	(m/s)
Froude Number:	0.38	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.926	0.860
Water (°C):	1.1	1.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	14:15	15:40
Laptop Clock:	14:12	15:37
Battery (Main):	14.1	0.6
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Telemetry cable had been pulled out of the goes antenna, it was replaced.
- PT was repositioned, looks to have been moving
- Winterized tipping bucket.
- Bring bag to cover tipping bucket next visit

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S43-01			1.387	100.269	100.270	3/4" pipe 1 m S of data logger	S43-04
S43-03	1.543	101.656		100.113	100.113	3/4" pipe 5 m N of data logger	S43-01
S43-04			1.327	100.329	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.515	99.141		Time WL Surveyed: 14:38	S43-01
Other:							S43-03
<b>Setup #2</b>							S43-04
S43-01	1.367	101.636		100.269	100.270	3/4" pipe 1 m S of data logger	
S43-03			1.525	100.111	100.113	3/4" pipe 5 m N of data logger	
S43-04			1.307	100.329	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:							
Water Level:			2.494	99.142		Time WL Surveyed: 14:40	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S43-04	1.307	101.636	100.329		Time WL Surveyed: 15:33	
Water Level:			2.495	99.141		Time WL Surveyed: 15:34	
BM:	S43-04	1.292	101.621	100.329			

**WL Survey Summary**

	Before	After
Average WL:	99.142	99.142
Transducer Elevation:	98.216	98.282
Closing Error:	0.002	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	13
Expected Discharge:	11.21
Shift from Existing Rating (m <sup>3</sup> /s):	-1.79
Shift from Existing Rating (%):	-14%

**Field Personnel:**

Field Personnel:	SM, TR	Trip Date:	1-Nov-13
Data Entry Personnel:	SM	Date:	1-Nov-13
Data Check Personnel:	DW	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: December 11, 2013  
 Site Visit Time (MST): 09:10

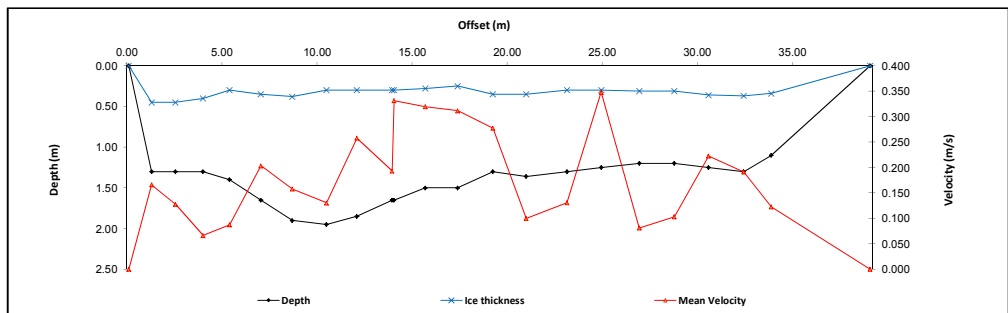


Measured Data										Calculated Data						
Bank/ Mmt #	Offset	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.10	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	1.30	1.30	0.45			1.13	0.178	0.62	0.154	1.00	1.23	0.85	0.166	1.04	0.173	2%
2	2.55	1.30	0.45			1.13	0.114	0.62	0.141	1.00	1.35	0.85	0.128	1.15	0.146	2%
3	4.00	1.30	0.40			1.12	0.135	0.58	-0.002	1.00	1.43	0.90	0.067	1.28	0.085	1%
4	5.40	1.40	0.30			1.18	0.176	0.52	-0.001	1.00	1.53	1.10	0.088	1.68	0.147	2%
5	7.05	1.65	0.35			1.39	0.190	0.61	0.217	1.00	1.65	1.30	0.204	2.15	0.437	6%
6	8.70	1.90	0.38			1.60	0.162	0.68	0.154	1.00	1.73	1.52	0.158	2.62	0.414	6%
7	10.50	1.95	0.30			1.62	0.134	0.63	0.127	1.00	1.70	1.65	0.131	2.81	0.366	5%
8	12.10	1.85	0.30			1.54	0.246	0.61	0.270	1.00	1.73	1.55	0.258	2.67	0.690	9%
9	13.95	1.65	0.30			1.38	0.386	0.57	0.001	1.00	0.98	1.35	0.194	1.32	0.255	3%
10	14.05	1.65	0.30			1.38	0.401	0.57	0.262	1.00	0.88	1.35	0.332	1.18	0.392	5%
11	15.70	1.50	0.28			1.26	0.304	0.52	0.335	1.00	1.68	1.22	0.320	2.04	0.653	9%
12	17.40	1.50	0.25			1.25	0.267	0.50	0.358	1.00	1.78	1.25	0.312	2.22	0.691	9%
13	19.25	1.30	0.35			1.11	0.295	0.54	0.260	1.00	1.80	0.95	0.278	1.71	0.475	7%
14	21.00	1.36	0.35			1.16	0.200	0.55	0.000	1.00	1.95	1.01	0.100	1.97	0.197	3%
15	23.15	1.30	0.30			1.10	0.264	0.50	-0.002	1.00	1.98	1.00	0.131	1.98	0.259	4%
16	24.95	1.25	0.30			1.06	0.234	0.49	0.462	1.00	1.90	0.95	0.348	1.81	0.628	9%
17	26.95	1.20	0.31			1.02	0.096	0.49	0.076	1.00	1.93	0.89	0.081	1.71	0.139	2%
18	28.90	1.20	0.31			1.02	0.210	0.49	-0.004	1.00	1.83	0.89	0.103	1.62	0.167	2%
19	30.60	1.25	0.36			1.07	0.155	0.54	0.290	1.00	1.83	0.89	0.223	1.62	0.361	5%
20	32.45	1.30	0.37			1.11	0.157	0.56	0.225	1.00	1.65	0.93	0.191	1.53	0.293	4%
21	33.90	1.10	0.34			0.95	0.147	0.49	0.098	1.00	3.33	0.76	0.123	2.53	0.310	4%
LB	39.10	0.00	0.00		0.00		0.00		0.00	0.88	2.60	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>7.28</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across from station

Meas. Start Time (MST):	10:20
Meas. End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -30°C



**Flow characteristics:**

Total Flow:	7.28	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	38.64	(m <sup>2</sup> )
Wetted Width:	39.00	(m)
Hydraulic Depth:	0.99	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.86	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.270	1.269
Water (°C):	0.1	0.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	09:25	11:27
Laptop Clock:	09:25	11:27
Battery (Main):	12.4	13.3
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- S43-03 is frozen in overflow
- Slush under ice

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S43-04
S43-01	1.498	101.768		100.270	100.270	3/4" pipe 1 m S of data logger	S43-01
S43-03				100.113	100.113	3/4" pipe 5 m N of data logger	Ice
S43-04			1.436	100.332	100.338	3/4" pipe 1 m E of data logger	WL
Ice/PT:			2.091	99.677			WL
Water Level:			2.210	99.558		Time WL Surveyed: 10:02	Ice
Other:							S43-01
<b>Setup #2</b>							S43-04
S43-01			1.488	100.271	100.270	3/4" pipe 1 m S of data logger	
S43-03				100.113	100.113	3/4" pipe 5 m N of data logger	
S43-04	1.427	101.759		100.332	100.338	3/4" pipe 1 m E of data logger	
Ice/PT:			2.082	99.677			
Water Level:			2.202	99.557		Time WL Surveyed: 10:12	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S43-04	1.428	101.760		100.332			
Water Level:			2.205	99.555		Time WL Surveyed: 11:20	
Water Level:			2.191	99.555		Time WL Surveyed: 11:21	
BM: S43-04	1.414	101.746		100.332			

**WL Survey Summary**

	Before	After
Average WL:	99.558	99.555
Transducer Elevation:	98.288	98.286
Closing Error:	-0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Data Entry Personnel:	TR, CJ	Trip Date:	11-Dec-13
Data Check Personnel:	CJ	Date:	11-Dec-13
Entered Digitally in the Field:	DW	Date:	24-Mar-14

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: May 1, 2013  
 Site Visit Time (MST): 14:40

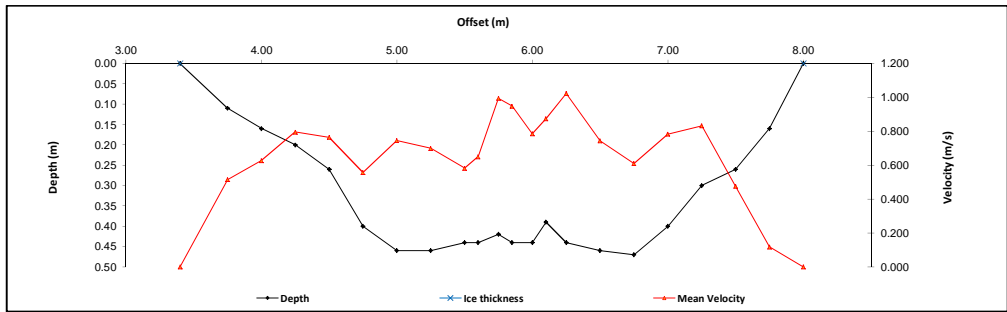


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.40	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	3.75	0.11		0.07	0.515					1.00	0.30	0.11	0.515	0.03	0.017	2%
2	4.00	0.16		0.10	0.627					1.00	0.25	0.16	0.627	0.04	0.025	2%
3	4.25	0.20		0.12	0.795					1.00	0.25	0.20	0.795	0.05	0.040	4%
4	4.50	0.26		0.16	0.764					1.00	0.25	0.26	0.764	0.07	0.050	5%
5	4.75	0.40		0.24	0.557					1.00	0.25	0.40	0.557	0.10	0.056	5%
6	5.00	0.46		0.28	0.745					1.00	0.25	0.46	0.745	0.12	0.086	8%
7	5.25	0.46		0.28	0.699					1.00	0.25	0.46	0.699	0.12	0.080	8%
8	5.50	0.44		0.26	0.582					1.00	0.18	0.44	0.582	0.08	0.045	4%
9	5.60	0.44		0.26	0.650					1.00	0.13	0.44	0.650	0.06	0.036	3%
10	5.75	0.42		0.25	0.994					1.00	0.13	0.42	0.994	0.05	0.052	5%
11	5.85	0.44		0.26	0.948					1.00	0.13	0.44	0.948	0.06	0.052	5%
12	6.00	0.44		0.26	0.785					1.00	0.13	0.44	0.785	0.06	0.043	4%
13	6.10	0.39		0.23	0.873					1.00	0.13	0.39	0.873	0.05	0.043	4%
14	6.25	0.44		0.26	1.022					1.00	0.20	0.44	1.022	0.09	0.090	9%
15	6.50	0.46		0.28	0.743					1.00	0.25	0.46	0.743	0.12	0.085	8%
16	6.75	0.47		0.28	0.609					1.00	0.25	0.47	0.609	0.12	0.072	7%
17	7.00	0.40		0.24	0.763					1.00	0.25	0.40	0.763	0.10	0.078	7%
18	7.25	0.30		0.18	0.832					1.00	0.25	0.30	0.832	0.08	0.062	6%
19	7.50	0.26		0.16	0.476					1.00	0.25	0.26	0.476	0.07	0.031	3%
20	7.75	0.16		0.10	0.118					1.00	0.25	0.16	0.118	0.04	0.005	0%
LB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.05</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
 - 25 m DS of station

Meas. Start Time (MST):	15:22
Meas. End Time (MST):	15:47
Equipment:	ADV
Method:	Wading
River Condition:	Open, high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, slight breeze, 7°C



**Flow characteristics:**

Total Flow:	1.05	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.46	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.72	(m/s)
Froude Number:	0.41	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.631	0.604
Water (°C):	0.3	-
Datalogger Clock:	14:54	-
Laptop Clock:	14:53	-
Battery (Main):	14.8	-
Battery Condition:	-	New
Battery Serial #:	-	-
Enclosure Dessicant:	-	New
Vent Tube Dessicant:	-	New
PT# (if replaced):	278515	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed 15 m PT 278515
- RSSI: -85

**General Notes:**

- Some bed ice along banks

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S44-02	0.781	100.659		99.878	99.878	3/4" Pipe 8 m E of logger	BM2
S44-03			0.874	99.785	99.784	3/4" Pipe 2 m W of logger	BM3
S44-04			0.572	100.087	100.086	3/4" Pipe 6 m E of logger	BM4
Ice/PT:							WL
Water Level:			2.721	97.938			BM4
Other:							BM3
<b>Setup #2</b>							BM2
S44-02			0.698	99.879	99.878	3/4" Pipe 8 m E of logger	
S44-03	0.792	100.577		99.785	99.784	3/4" Pipe 2 m W of logger	
S44-04			0.488	100.089	100.086	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:			2.637	97.940			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S44-03	0.792	100.577		99.785		
Water Level:			2.653	97.924			
Water Level:			2.532	97.920			
BM	S44-03	0.667	100.452		99.785		

**WL Survey Summary**

	Before	After
Average WL:	97.939	97.922
Transducer Elevation:	97.308	97.318
Closing Error:	-0.001	-
WL Check:	0.002	0.004

**Site Rating Information**

Measured Discharge:	1.05
Expected Discharge:	1.34
Shift from Existing Rating (m <sup>3</sup> /s):	0.29
Shift from Existing Rating (%):	28%

**Field Personnel:**

Field Personnel:	TR, SM	Trip Date:	1-May-13
Data Entry Personnel:	TR	Date:	1-May-13
Data Check Personnel:	DW	Date:	26-May-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: June 13, 2012  
 Site Visit Time (MST): 12:08

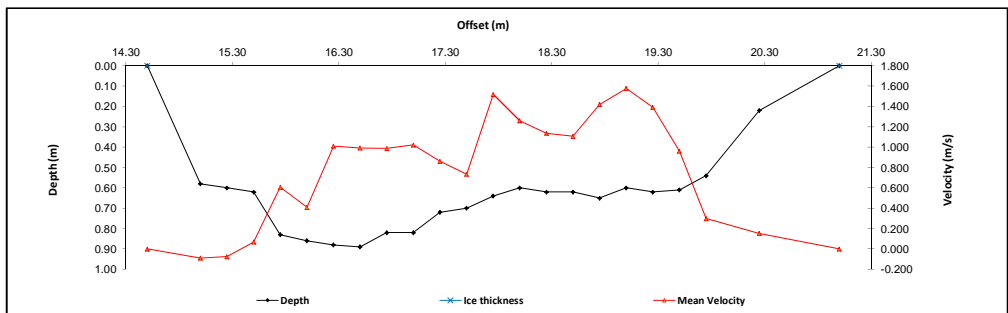


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	14.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	15.00	0.58		0.35	-0.089					1.00	0.38	0.58	-0.089	0.22	-0.019	-1%
2	15.25	0.60		0.36	-0.076					1.00	0.25	0.60	-0.076	0.15	-0.011	0%
3	15.50	0.62		0.37	0.067					1.00	0.25	0.62	0.067	0.16	0.010	0%
4	15.75	0.83				0.66	0.590	0.17	0.623	1.00	0.25	0.83	0.607	0.21	0.126	4%
5	16.00	0.86				0.69	0.232	0.17	0.586	1.00	0.25	0.86	0.409	0.22	0.088	3%
6	16.25	0.88				0.70	1.176	0.18	0.845	1.00	0.25	0.88	1.011	0.22	0.222	7%
7	16.50	0.89				0.71	1.137	0.18	0.845	1.00	0.25	0.89	0.991	0.22	0.220	7%
8	16.75	0.82				0.66	0.781	0.16	1.192	1.00	0.25	0.82	0.987	0.21	0.202	7%
9	17.00	0.82			1.021	0.66		0.16		1.00	0.25	0.82	1.021	0.21	0.209	7%
10	17.25	0.72	0.43		0.861					1.00	0.25	0.72	0.861	0.18	0.155	5%
11	17.50	0.70		0.42	0.733					1.00	0.25	0.70	0.733	0.18	0.128	4%
12	17.75	0.64		0.38	1.518					1.00	0.25	0.64	1.518	0.16	0.243	8%
13	18.00	0.60		0.36	1.258					1.00	0.25	0.60	1.258	0.15	0.189	6%
14	18.25	0.62		0.37	1.136					1.00	0.25	0.62	1.136	0.16	0.176	6%
15	18.50	0.62		0.37	1.107					1.00	0.25	0.62	1.107	0.16	0.172	6%
16	18.75	0.65		0.39	1.420					1.00	0.25	0.65	1.420	0.16	0.231	8%
17	19.00	0.60		0.36	1.577					1.00	0.25	0.60	1.577	0.15	0.237	8%
18	19.25	0.62		0.37	1.391					1.00	0.25	0.62	1.391	0.16	0.216	7%
19	19.50	0.61		0.37	0.961					1.00	0.25	0.61	0.961	0.15	0.147	5%
20	19.75	0.54		0.32	0.299					1.00	0.38	0.54	0.299	0.20	0.061	2%
21	20.25	0.22		0.13	0.152					1.00	0.63	0.22	0.152	0.14	0.021	1%
LB	21.00	0.00	0.00		0.00		0.00		0.00	1.00	0.38	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.02</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - At ATV crossing us of station

Meas. Start Time (MST):	12:28
Meas. End Time (MST):	13:01
Equipment:	ADV
Method:	Wading
River Condition:	Very fast flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. cloudy, light breeze, 16°C



**Flow characteristics:**

Total Flow:	3.020	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.73	(m <sup>2</sup> )
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.61	(m/s)
Froude Number:	0.34	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.744	0.760
Water (°C):	13.0	13.3
Datalogger Clock:	12:11	-
Laptop Clock:	12:11	-
Battery (Main):	13.2	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT had been pulled, it was repositioned

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM4
S44-02	0.866	100.744		99.878	99.878	3/4" Pipe 8 m E of logger	BM3
S44-03			0.962	99.782	99.784	3/4" Pipe 2 m W of logger	BM2
S44-04			0.658	100.086	100.086	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:			2.527	98.217		Time WL Surveyed: 12:16	BM2
Other:							BM3
<b>Setup #2</b>							BM4
S44-02			0.809	99.876	99.878	3/4" Pipe 8 m E of logger	
S44-03			0.902	99.783	99.784	3/4" Pipe 2 m W of logger	
S44-04	0.599	100.685		100.086	100.086	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:			2.474	98.211		Time WL Surveyed: 12:18	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S44-03	0.902	100.684	99.782			
Water Level:			2.483	98.201		Time WL Surveyed: 13:06	
Water Level:			2.464	98.196		Time WL Surveyed: 13:07	
BM:	S44-03	0.878	100.660	99.782			

**WL Survey Summary**

	Before	After
Average WL:	98.214	98.199
Transducer Elevation:	97.470	97.439
Closing Error:	0.002	-
WL Check:	0.006	0.005

**Site Rating Information**

Measured Discharge:	3.02
Expected Discharge:	3.07
Shift from Existing Rating (m <sup>3</sup> /s):	0.05
Shift from Existing Rating (%):	2%

**Field Personnel:**

TR, SG	Trip Date:	13-Jun-13
TR	Date:	13-Jun-13
DW	Date:	28-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: August 13, 2013  
 Site Visit Time (MST): 14:10

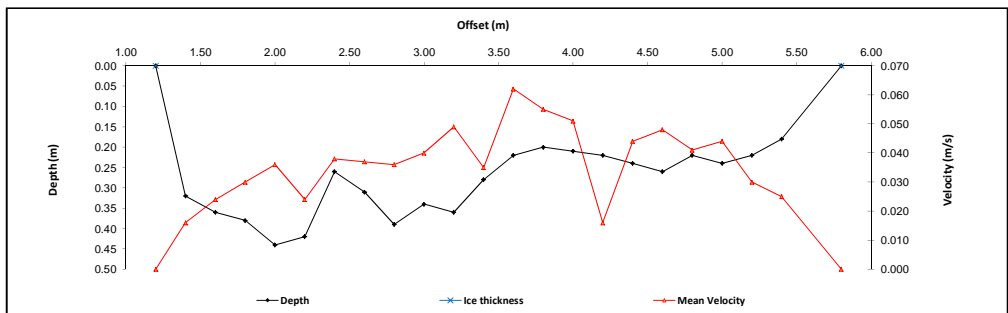


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.40	0.32		0.19	0.016					1.00	0.20	0.32	0.016	0.06	0.001	2%
2	1.60	0.36		0.22	0.024					1.00	0.20	0.36	0.024	0.07	0.002	4%
3	1.80	0.38		0.23	0.030					1.00	0.20	0.38	0.030	0.08	0.002	5%
4	2.00	0.44		0.26	0.036					1.00	0.20	0.44	0.036	0.09	0.003	7%
5	2.20	0.42		0.25	0.024					1.00	0.20	0.42	0.024	0.08	0.002	5%
6	2.40	0.26		0.16	0.038					1.00	0.20	0.26	0.038	0.05	0.002	4%
7	2.60	0.31		0.19	0.037					1.00	0.20	0.31	0.037	0.06	0.002	5%
8	2.80	0.39		0.23	0.036					1.00	0.20	0.39	0.036	0.08	0.003	6%
9	3.00	0.34		0.20	0.040					1.00	0.20	0.34	0.040	0.07	0.003	6%
10	3.20	0.36		0.22	0.049					1.00	0.20	0.36	0.049	0.07	0.004	8%
11	3.40	0.28		0.17	0.035					1.00	0.20	0.28	0.035	0.06	0.002	4%
12	3.60	0.22		0.13	0.062					1.00	0.20	0.22	0.062	0.04	0.003	6%
13	3.80	0.20		0.12	0.055					1.00	0.20	0.20	0.055	0.04	0.002	5%
14	4.00	0.21		0.13	0.051					1.00	0.20	0.21	0.051	0.04	0.002	5%
15	4.20	0.22		0.13	0.016					1.00	0.20	0.22	0.016	0.04	0.001	2%
16	4.40	0.24		0.14	0.044					1.00	0.20	0.24	0.044	0.05	0.002	5%
17	4.60	0.26		0.16	0.048					1.00	0.20	0.26	0.048	0.05	0.002	6%
18	4.80	0.22		0.13	0.041					1.00	0.20	0.22	0.041	0.04	0.002	4%
19	5.00	0.24		0.14	0.044					1.00	0.20	0.24	0.044	0.05	0.002	5%
20	5.20	0.22		0.13	0.030					1.00	0.20	0.22	0.030	0.04	0.001	3%
21	5.40	0.18		0.11	0.025					1.00	0.30	0.18	0.025	0.05	0.001	3%
LB	5.80	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.045</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:35
Meas. End Time (MST):	15:00
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 25°C



**Flow characteristics:**

Total Flow:	0.045	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.23	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.199	0.201
Water (°C):	17.1	17.4
Datalogger Clock:	14:18	15:19
Laptop Clock:	14:18	15:19
Battery (Main):	13.7	13.7
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	Replaced
Vent Tube Dessiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							BM4
S44-02			1.048	99.875	99.878	3/4" Pipe 8 m E of logger	BM3
S44-03	1.139	100.923		99.784	99.784	3/4" Pipe 2 m W of logger	BM2
S44-04			0.840	100.083	100.086	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:			3.284	97.639		Time WL Surveyed: 14:24	BM2
Other:							BM3
<b>Setup #2</b>							BM4
S44-02	1.032	100.907		99.875	99.878	3/4" Pipe 8 m E of logger	
S44-03			1.124	99.783	99.784	3/4" Pipe 2 m W of logger	
S44-04			0.823	100.084	100.086	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:			3.272	97.635		Time WL Surveyed: 14:30	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S44-03	1.093	100.877		99.784		
Water Level:			3.245	97.632		Time WL Surveyed: 15:10	
Water Level:			3.268	97.628		Time WL Surveyed: 15:11	
BM:	S44-03	1.112	100.896		99.784		

**WL Survey Summary**

	Before	After
Average WL:	97.637	97.630
Transducer Elevation:	97.438	97.429
Closing Error:	0.001	-
WL Check:	0.004	0.004

**Site Rating Information**

Measured Discharge:	0.0445
Expected Discharge:	0.59
Shift from Existing Rating (m <sup>3</sup> /s):	0.55
Shift from Existing Rating (%):	1234%

**Field Personnel:**

DW, TR	Trip Date:	13-Aug-13
DW	Date:	13-Aug-13
DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: September 12, 2013  
 Site Visit Time (MST): 13:15

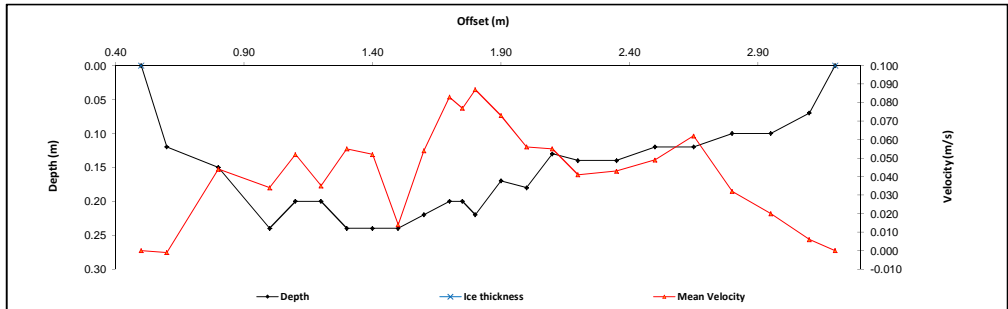


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.60	0.12		0.07	-0.001					1.00	0.15	0.12	-0.001	0.02	0.000	0%
2	0.80	0.15		0.09	0.044					1.00	0.20	0.15	0.044	0.03	0.001	7%
3	1.00	0.24		0.14	0.034					1.00	0.15	0.24	0.034	0.04	0.001	6%
4	1.10	0.20		0.12	0.052					1.00	0.10	0.20	0.052	0.02	0.001	5%
5	1.20	0.20		0.12	0.035					1.00	0.10	0.20	0.035	0.02	0.001	4%
6	1.30	0.24		0.14	0.055					1.00	0.10	0.24	0.055	0.02	0.001	7%
7	1.40	0.24		0.14	0.052					1.00	0.10	0.24	0.052	0.02	0.001	6%
8	1.50	0.24		0.14	0.014					1.00	0.10	0.24	0.014	0.02	0.000	2%
9	1.60	0.22		0.13	0.054					1.00	0.10	0.22	0.054	0.02	0.001	6%
10	1.70	0.20		0.12	0.083					1.00	0.08	0.20	0.083	0.02	0.001	6%
11	1.75	0.20		0.12	0.077					1.00	0.05	0.20	0.077	0.01	0.001	4%
12	1.80	0.22		0.13	0.087					1.00	0.08	0.22	0.087	0.02	0.001	7%
13	1.90	0.17		0.10	0.073					1.00	0.10	0.17	0.073	0.02	0.001	6%
14	2.00	0.18		0.11	0.056					1.00	0.10	0.18	0.056	0.02	0.001	5%
15	2.10	0.13		0.08	0.055					1.00	0.10	0.13	0.055	0.01	0.001	4%
16	2.20	0.14		0.08	0.041					1.00	0.13	0.14	0.041	0.02	0.001	4%
17	2.35	0.14		0.08	0.043					1.00	0.15	0.14	0.043	0.02	0.001	5%
18	2.50	0.12		0.07	0.049					1.00	0.15	0.12	0.049	0.02	0.001	5%
19	2.65	0.12		0.07	0.062					1.00	0.15	0.12	0.062	0.02	0.001	6%
20	2.80	0.10		0.06	0.032					1.00	0.15	0.10	0.032	0.02	0.000	3%
21	2.95	0.10		0.06	0.020					1.00	0.15	0.10	0.020	0.02	0.000	2%
22	3.10	0.07		0.04	0.006					1.00	0.13	0.07	0.006	0.01	0.000	0%
RB	3.20	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.019</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:43
Meas. End Time (MST):	14:10
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 25°C



**Flow characteristics:**

Total Flow:	0.019	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.42	(m <sup>2</sup> )
Wetted Width:	2.70	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.181	0.416
Water (°C):	11.2	12.7
Datalogger Clock:	13:22	14:32
Laptop Clock:	13:22	14:32
Battery (Main):	12.7	12.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS to deeper water

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S44-02	0.891	100.769		99.878	99.878	3/4" Pipe 8 m E of logger	BM2
S44-03			0.984	99.785	99.784	3/4" Pipe 2 m W of logger	BM4
S44-04			0.683	100.086	100.086	3/4" Pipe 6 m E of logger	BM3
Ice/PT:							WL
Water Level:		3.143		97.626			WL
Other:							BM3
<b>Setup #2</b>							BM4
S44-02			0.873	99.878	99.878	3/4" Pipe 8 m E of logger	BM2
S44-03	0.966	100.751		99.785	100.086	3/4" Pipe 6 m E of logger	
S44-04			0.664	100.087	99.784	3/4" Pipe 2 m W of logger	
Ice/PT:							
Water Level:		3.123		97.628			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S44-02	0.873	100.751	3.125	99.878		
Water Level:				97.626			Time WL Surveyed: 14:28
Water Level:				3.111	97.624		Time WL Surveyed: 14:30
BM:	S44-02	0.857	100.735		99.878		

**WL Survey Summary**

	Before	After
Average WL:	97.627	97.625
Transducer Elevation:	97.446	97.209
Closing Error:	0.000	-
WL Check:	0.002	0.002

**Site Rating Information**

Measured Discharge:	0.0192
Expected Discharge:	0.48
Shift from Existing Rating (m <sup>3</sup> /s):	0.46
Shift from Existing Rating (%):	2392%

**Field Personnel:**

SM, CJ	Trip Date:	12-Sep-13
SM	Date:	12-Sep-13
DW	Date:	26-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: November 2, 2013  
 Site Visit Time (MST): 14:35

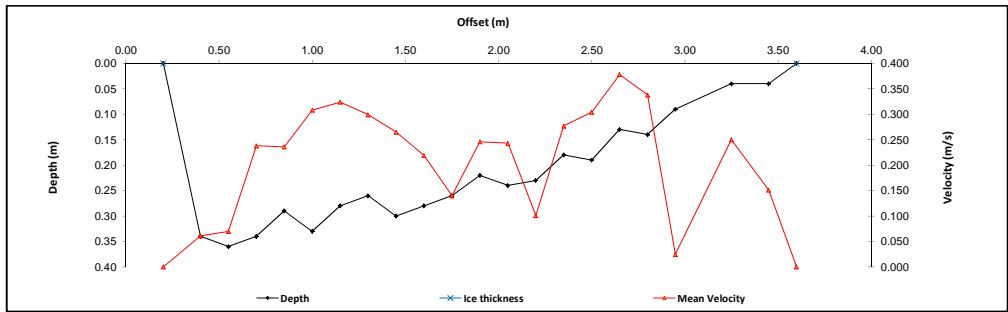


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.40	0.34		0.20	0.061					1.00	0.18	0.34	0.061	0.06	0.004	2%
2	0.55	0.36		0.22	0.070					1.00	0.15	0.36	0.070	0.05	0.004	2%
3	0.70	0.34		0.20	0.238					1.00	0.15	0.34	0.238	0.05	0.012	8%
4	0.85	0.29		0.17	0.236					1.00	0.15	0.29	0.236	0.04	0.010	7%
5	1.00	0.33		0.20	0.308					1.00	0.15	0.33	0.308	0.05	0.015	10%
6	1.15	0.28		0.17	0.324					1.00	0.15	0.28	0.324	0.04	0.014	9%
7	1.30	0.26		0.16	0.299					1.00	0.15	0.26	0.299	0.04	0.012	8%
8	1.45	0.30		0.18	0.265					1.00	0.15	0.30	0.265	0.05	0.012	8%
9	1.60	0.28		0.17	0.219					1.00	0.15	0.28	0.219	0.04	0.009	6%
10	1.75	0.26		0.16	0.140					1.00	0.15	0.26	0.140	0.04	0.005	4%
11	1.90	0.22		0.13	0.246					1.00	0.15	0.22	0.246	0.03	0.008	5%
12	2.05	0.24		0.14	0.243					1.00	0.15	0.24	0.243	0.04	0.009	6%
13	2.20	0.23		0.14	0.101					1.00	0.15	0.23	0.101	0.03	0.003	2%
14	2.35	0.18		0.11	0.277					1.00	0.15	0.18	0.277	0.03	0.007	5%
15	2.50	0.19		0.11	0.304					1.00	0.15	0.19	0.304	0.03	0.009	6%
16	2.65	0.13		0.08	0.378					1.00	0.15	0.13	0.378	0.02	0.007	5%
17	2.80	0.14		0.08	0.338					1.00	0.15	0.14	0.338	0.02	0.007	5%
18	2.95	0.09		0.05	0.025					1.00	0.23	0.09	0.025	0.02	0.001	0%
19	3.25	0.04		0.02	0.250					1.00	0.25	0.04	0.250	0.01	0.003	2%
20	3.45	0.04		0.02	0.151					1.00	0.18	0.04	0.151	0.01	0.001	1%
RB	3.60	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.152</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:13
Equipment:	ADV
Method:	Wading
River Condition:	Med flow, ice along banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy



**Flow characteristics:**

Total Flow:	0.152	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.70	(m <sup>2</sup> )
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.21	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.493	0.492
Water (°C):	1.6	1.6
Datalogger Clock:	14:42	15:22
Laptop Clock:	14:42	15:22
Battery (Main):	11.1	11.1
Battery Condition:	-	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	278515	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS removed for winter
- Weight and anchor cable left at base of stump marked with pink ribbon
- Battery voltage was low
- Battery was removed for winter

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S44-02	1.023	100.901		99.878	99.878	3/4" Pipe 8 m E of logger	BM2
S44-03			1.115	99.786	99.784	3/4" Pipe 2 m W of logger	BM3
S44-04			0.816	100.085	100.086	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:			3.205	97.696		Time WL Surveyed: 14:47	BM3
Other:							BM4
<b>Setup #2</b>							BM2
S44-02			1.011	99.879	99.878	3/4" Pipe 8 m E of logger	
S44-03	1.104	100.890		99.786	99.784	3/4" Pipe 6 m E of logger	
S44-04			0.804	100.086	100.086	3/4" Pipe 2 m W of logger	
Ice/PT:							
Water Level:			3.195	97.695		Time WL Surveyed: 14:48	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S44-03	1.104	100.890		99.786		
Water Level:			3.195	97.695		Time WL Surveyed: 15:19	
Water Level:			3.189	97.691		Time WL Surveyed:	
BM:	S44-03	1.094	100.880		99.786		

**WL Survey Summary**

	Before	After
Average WL:	97.696	97.693
Transducer Elevation:	97.203	97.201
Closing Error:	-0.001	-
WL Check:	0.001	0.004

**Site Rating Information**

Measured Discharge:	0.152
Expected Discharge:	1.82
Shift from Existing Rating (m <sup>3</sup> /s):	1.67
Shift from Existing Rating (%):	1101%

**Field Personnel:**

SM, TR	Trip Date:	2-Nov-13
SM	Date:	2-Nov-13
DW	Date:	5-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

January 30, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.50	0.00	0.00	0.000	0.000	0.000	0.9	1.50	1.60	0.10	0.19	-0.003	-0.003	0.02	0.000	0%
1	1.70	1.10	0.35	-0.013			0.9	1.60	2.45	0.85	0.75	-0.013	-0.012	0.64	-0.007	0%
2	3.20	1.60	0.45		0.031	0.045	1.0	2.45	3.50	1.05	1.15	0.038	0.038	1.21	0.046	3%
3	3.80	1.40	0.35		0.045	0.062	1.0	3.50	4.20	0.70	1.05	0.054	0.054	0.73	0.039	2%
4	4.60	1.15	0.35		0.062	0.080	1.0	4.20	5.05	0.85	0.80	0.071	0.071	0.68	0.048	3%
5	5.50	1.10	0.45	0.068			0.9	5.05	5.90	0.85	0.65	0.068	0.061	0.55	0.034	2%
6	6.30	1.35	0.45		0.105	0.109	1.0	5.90	6.65	0.75	0.90	0.107	0.107	0.68	0.072	4%
7	7.00	1.62	0.45		0.072	0.160	1.0	6.65	7.35	0.70	1.17	0.116	0.116	0.82	0.095	5%
8	7.70	1.55	0.45		0.163	0.219	1.0	7.35	8.05	0.70	1.10	0.191	0.191	0.77	0.147	8%
9	8.40	1.50	0.50		0.204	0.223	1.0	8.05	8.80	0.75	1.00	0.214	0.214	0.75	0.160	9%
10	9.20	1.40	0.50		0.222	0.235	1.0	8.80	9.60	0.80	0.90	0.229	0.229	0.72	0.165	9%
11	10.00	1.35	0.50		0.219	0.233	1.0	9.60	10.35	0.75	0.85	0.226	0.226	0.64	0.144	8%
12	10.70	1.30	0.45		0.208	0.257	1.0	10.35	11.00	0.65	0.85	0.233	0.233	0.55	0.128	7%
13	11.30	1.24	0.43		0.192	0.256	1.0	11.00	11.70	0.70	0.81	0.224	0.224	0.57	0.127	7%
14	12.10	1.15	0.45	0.204			0.9	11.70	12.45	0.75	0.70	0.204	0.184	0.53	0.096	5%
15	12.80	1.15	0.45	0.199			0.9	12.45	13.20	0.75	0.70	0.199	0.179	0.53	0.094	5%
16	13.60	1.00	0.45	0.220			0.9	13.20	13.95	0.75	0.55	0.220	0.198	0.41	0.082	5%
17	14.30	1.00	0.40	0.216			0.9	13.95	14.75	0.80	0.60	0.216	0.194	0.48	0.093	5%
18	15.20	0.95	0.40	0.205			0.9	14.75	15.60	0.85	0.55	0.205	0.185	0.47	0.086	5%
19	16.00	0.80	0.39	0.181			0.9	15.60	17.10	1.50	0.41	0.181	0.163	0.62	0.100	6%
20	18.20	0.50	0.35	0.084			0.9	17.10	19.60	2.50	0.15	0.084	0.076	0.38	0.028	2%
LB	21.00	0.00	0.00	0.00	0.00	0.00	1.0	19.60	21.00	1.40	0.04	0.021	0.021	0.05	0.001	0%
<b>Total Flow</b>															<b>1.78</b>	

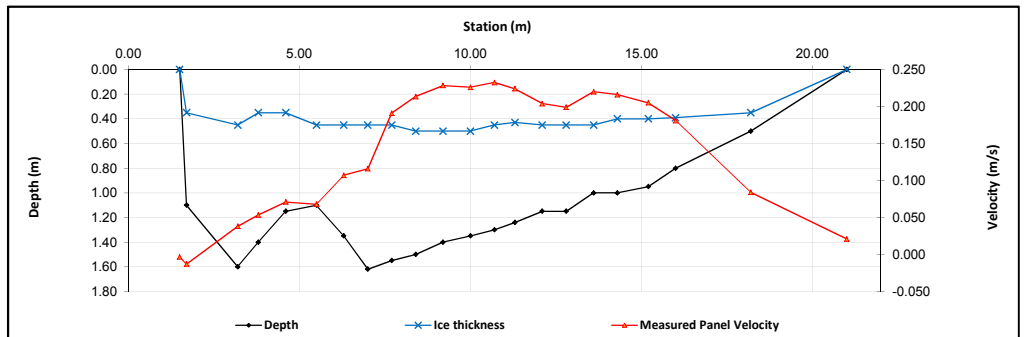
Measurement Details:	
Start Time (MST):	9:25
End Time (MST):	11:20
Equipment:	ADV
Method:	Ice
River Condition:	Full Ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -33°C

Flow characteristics:		
Total Flow:	1.78	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.77	(m <sup>2</sup> )
Wetted Width:	19.50	(m)
Hydraulic Depth:	0.655	(m)
Mean Velocity:	0.139	(m/s)
Froude Number:	0.055	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.2	-
Battery (Main):	12.6	12.77
Datalogger Clock:	9:30	-
Laptop Clock:	9:30	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	9630	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S45-03	0.932	100.932		100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05			1.052	99.880	99.880	3/4" Pipe 3 m N of data logger
S45-06			1.147	99.785	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			3.042	97.890		
Water Level:			3.148	97.784		
Other:						
<b>Setup #2</b>						
S45-03			0.920	100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05			1.039	99.881	99.880	3/4" Pipe 3 m N of data logger
S45-06	1.135	100.920		99.785	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			3.041	97.879		
Water Level:			3.135	97.785		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	97.785
Transducer Elevation Before	97.022
Transducer Elevation After	-

Field Personnel:	TR, SM	Trip Date:	30-Jan-33
Data Entry Personnel:	TR	Date:	30-Jan-13
Data Check Personnel:	DV <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	18-Mar-13
Entered Digitally in the Field:			

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

February 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.80	0.00	0.00	0.000	0.000	0.000	0.9	4.80	4.95	0.15	0.04	-0.005	-0.004	0.01	0.000	0%
1	5.10	0.50	0.35	-0.018			0.9	4.95	5.73	0.78	0.15	-0.018	-0.016	0.12	-0.002	0%
2	6.35	1.65	0.45		-0.003	-0.024	1.0	5.73	6.90	1.18	1.20	-0.014	-0.014	1.41	-0.019	-1%
3	7.45	1.65	0.45		0.006	0.035	1.0	6.90	7.78	0.88	1.20	0.021	0.021	1.05	0.022	1%
4	8.10	1.55	0.45		0.046	0.064	1.0	7.78	8.43	0.65	1.10	0.055	0.055	0.72	0.039	2%
5	8.75	1.30	0.45		0.081	0.080	1.0	8.43	9.15	0.73	0.85	0.081	0.081	0.62	0.050	3%
6	9.55	1.10	0.55	0.080			0.9	9.15	9.83	0.67	0.55	0.080	0.072	0.37	0.027	1%
7	10.10	1.40	0.55		0.038	0.034	1.0	9.83	10.38	0.55	0.85	0.036	0.036	0.47	0.017	1%
8	10.65	1.60	0.55		0.106	0.071	1.0	10.38	11.03	0.65	1.05	0.089	0.089	0.68	0.060	3%
9	11.40	1.60	0.50		0.152	0.213	1.0	11.03	11.70	0.67	1.10	0.183	0.183	0.74	0.136	8%
10	12.00	1.65	0.55		0.189	0.217	1.0	11.70	12.45	0.75	1.10	0.203	0.203	0.83	0.167	9%
11	12.90	1.55	0.55		0.211	0.252	1.0	12.45	13.43	0.98	1.00	0.232	0.232	0.98	0.226	13%
12	13.95	1.45	0.55		0.238	0.267	1.0	13.43	14.38	0.95	0.90	0.253	0.253	0.85	0.216	12%
13	14.80	1.30	0.50		0.218	0.267	1.0	14.38	15.18	0.80	0.80	0.243	0.243	0.64	0.155	9%
14	15.55	1.15	0.45	0.268			0.9	15.18	16.33	1.15	0.70	0.268	0.241	0.81	0.194	11%
15	17.10	1.05	0.50	0.238			0.9	16.33	17.80	1.48	0.55	0.238	0.214	0.81	0.174	10%
16	18.50	1.00	0.50	0.250			0.9	17.80	19.08	1.28	0.50	0.250	0.225	0.64	0.143	8%
17	19.65	0.80	0.45	0.239			0.9	19.08	20.28	1.20	0.35	0.239	0.215	0.42	0.090	5%
18	20.90	0.65	0.35	0.196			0.9	20.28	21.58	1.30	0.30	0.196	0.176	0.39	0.069	4%
19	22.25	0.55	0.35	0.116			0.9	21.58	22.73	1.15	0.20	0.116	0.104	0.23	0.024	1%
20	23.20	0.45	0.35	0.000			1.0	22.73	23.40	0.67	0.10	0.000	0.000	0.07	0.000	0%
LB	23.60	0.00	0.00	0.00	0.00	0.00	1.0	23.40	23.60	0.20	0.03	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>1.79</b>	

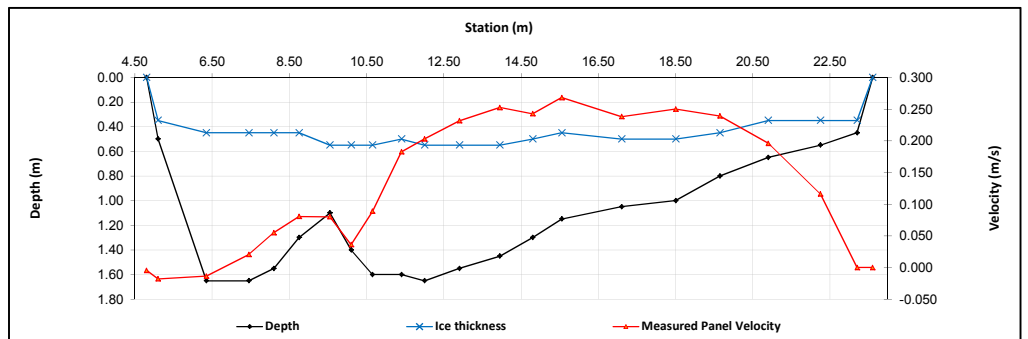
Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	10:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -8°C

Flow characteristics:		
Total Flow:	1.79	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.84	(m <sup>2</sup> )
Wetted Width:	18.80	(m)
Hydraulic Depth:	0.683	(m)
Mean Velocity:	0.139	(m/s)
Froude Number:	0.054	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.2	-
Battery (Main):	12.9	-
Datalogger Clock:	9:08	-
Laptop Clock:	9:08	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	9630	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	
- Ran ADV test	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S45-03	0.935	100.935		100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05			1.053	99.882	99.880	3/4" Pipe 3 m N of data logger
S45-06			1.148	99.787	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			3.05	97.885		
Water Level:			3.127	97.808		
Other:						
<b>Setup #2</b>						
S45-03			0.923	100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05	1.041	100.923		99.882	99.880	3/4" Pipe 3 m N of data logger
S45-06			1.136	99.787	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			3.038	97.885		
Water Level:			3.113	97.810		
Other:						

Closing Error	0.000
WL Check	0.002

Average WL	97.809
Transducer Elevation Before	97.042
Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	10-Feb-13
Data Entry Personnel:	SM	Date:	10-Feb-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Elys River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

February 24, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB		0.00	0.00	0.00	0.00	0.00										
<b>Total Flow</b>																

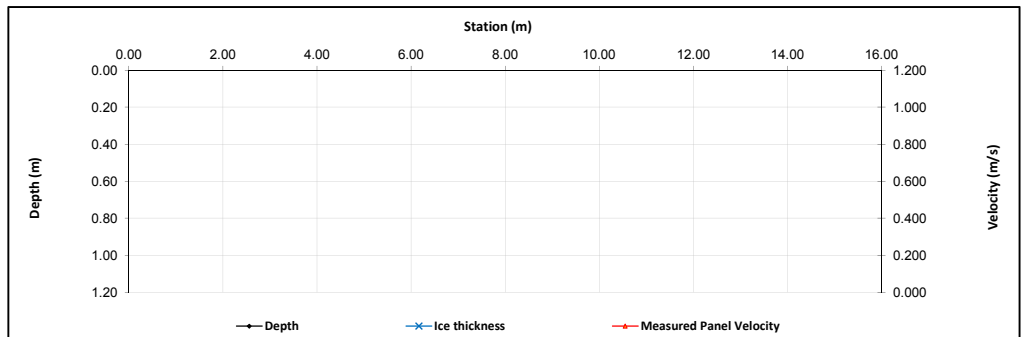
Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	10:05
Equipment:	-
Method:	-
River Condition:	Frozen
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:		
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
	Before	After
Transducer Reading (m):	0.746	-
Water (°C):	0.2	-
Battery (Main):	13.4	-
Datalogger Clock:	9:34	-
Laptop Clock:	9:35	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	9630	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	Installed logger and modem in new enclosure.
-	Modem not getting signal

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S45-03					100.000	3/4" Pipe 12 m N of data logger
S45-05					99.880	3/4" Pipe 3 m N of data logger
S45-06					99.784	3/4" Pipe 3 m E of data logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
S45-03					100.000	3/4" Pipe 12 m N of data logger
S45-05					99.880	3/4" Pipe 3 m N of data logger
S45-06					99.784	3/4" Pipe 3 m E of data logger
Ice/PT:						
Water Level:						
Other:						
Closing Error	-					
WL Check	-					
Average WL					-	
Transducer Elevation Before					-	
Transducer Elevation After					-	

Field Personnel:		TR AND SM	Trip Date:	24-Feb-13
Data Entry Personnel:	SM		Date:	24-Feb-13
Data Check Personnel:	DW		Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

March 11, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	7.00			0.000	0.000	0.000	0.9	7.00	7.25	0.25	0.01	0.000	0.000	0.00	0.000	0%
1	7.50	0.35	0.30	0.001			0.9	7.25	8.00	0.75	0.05	0.001	0.001	0.04	0.000	0%
2	8.50	0.43	0.34	0.000			1.0	8.00	8.75	0.75	0.09	0.000	0.000	0.07	0.000	0%
3	9.00	0.51	0.41	0.115			0.9	8.75	9.75	1.00	0.10	0.115	0.104	0.10	0.010	1%
4	10.50	0.55	0.43	0.139			0.9	9.75	10.75	1.00	0.12	0.139	0.125	0.12	0.015	1%
5	11.00	0.66	0.42	0.209			0.9	10.75	11.25	0.50	0.24	0.209	0.188	0.12	0.023	1%
6	11.50	0.70	0.45	0.251			0.9	11.25	11.75	0.50	0.25	0.251	0.226	0.13	0.028	2%
7	12.00	0.75	0.45	0.247			0.9	11.75	12.50	0.75	0.30	0.247	0.222	0.23	0.050	3%
8	13.00	0.89	0.51	0.263			0.9	12.50	13.75	1.25	0.38	0.263	0.237	0.48	0.112	7%
9	14.50	1.00	0.54	0.256			0.9	13.75	15.25	1.50	0.46	0.256	0.230	0.69	0.159	10%
10	16.00	1.12	0.53	0.280			0.9	15.25	16.50	1.25	0.59	0.280	0.252	0.74	0.186	11%
11	17.00	1.22	0.54	0.275			0.9	16.50	17.50	1.00	0.68	0.275	0.248	0.68	0.168	10%
12	18.00	1.30	0.65	0.274			0.9	17.50	18.50	1.00	0.65	0.274	0.247	0.65	0.160	10%
13	19.00	1.59	0.55		0.274	0.246	1.0	18.50	19.13	0.63	1.04	0.260	0.260	0.65	0.169	10%
14	19.25	1.60	0.56		0.259	0.250	1.0	19.13	19.88	0.75	1.04	0.255	0.255	0.78	0.199	12%
15	20.50	1.67	0.55		0.144	0.235	1.0	19.88	21.00	1.13	1.12	0.190	0.190	1.26	0.239	14%
16	21.50	1.49	0.55		0.031	0.054	1.0	21.00	22.00	1.00	0.94	0.043	0.043	0.94	0.040	2%
17	22.50	0.75	0.55	-0.071			0.9	22.00	23.00	1.00	0.20	-0.071	-0.064	0.20	-0.013	-1%
18	23.50	1.00	0.50	0.119			0.9	23.00	24.00	1.00	0.50	0.119	0.107	0.50	0.054	3%
19	24.50	0.13	0.45		-0.004	0.012	1.0	24.00	25.00	1.00	-0.32	0.004	0.004	-0.32	-0.001	0%
20	25.50	0.13	0.40		-0.013	-0.003	1.0	25.00	26.00	1.00	-0.27	-0.008	-0.008	-0.27	0.002	0%
21	26.50	0.98	0.35	0.114			0.9	26.00	26.85	0.85	0.63	0.114	0.103	0.54	0.055	3%
22	27.20	0.40	0.29	0.001			0.9	26.85	27.20	0.35	0.11	0.001	0.001	0.04	0.000	0%
RB	27.20	0.00	0.00	0.00	0.00	0.00	1.0	27.20	27.20	0.00	0.03	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>1.65</b>		

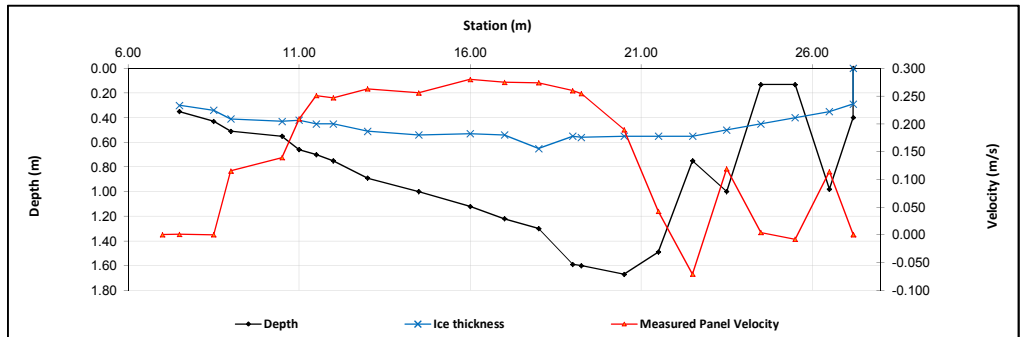
Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	13:45
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, calm, -1°C

Flow characteristics:	
Total Flow:	1.65 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	8.35 (m <sup>2</sup> )
Wetted Width:	20.20 (m)
Hydraulic Depth:	0.413 (m)
Mean Velocity:	0.198 (m/s)
Froude Number:	0.098

Logger Details:		Before	After
Transducer Reading (m):		0.758	-
Water (°C):		0.2	-
Battery (Main):		14.9	-
Datalogger Clock:		11:55	-
Laptop Clock:		11:55	-
Enclosure Dessicant:		Replaced	-
Logger# (if Δ):		9630	-
PT# (if Δ):		-	-
Vent Tube Dessicant:		Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S45-03	0.872	100.872		100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05			0.993	99.879	99.880	3/4" Pipe 3 m N of data logger
S45-06			1.086	99.786	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			2.876	97.996		
Water Level:			3.071	97.801		
Other:						
<b>Setup #2</b>						
S45-03			0.807	100.001	100.000	3/4" Pipe 12 m N of data logger
S45-05			0.929	99.879	99.880	3/4" Pipe 3 m N of data logger
S45-06	1.022	100.808		99.786	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			2.801	98.007		
Water Level:			3.007	97.801		
Other:						

Closing Error	-0.001	Average WL	97.801
WL Check	0.000	Transducer Elevation Before	97.043
		Transducer Elevation After	-

Field Personnel:	TR, BL	Trip Date:	11-Mar-13
Data Entry Personnel:	BL	Date:	11-Mar-13
Data Check Personnel:	DW	Date:	18-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

March 29, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.40	4.60	0.20	0.00	0.000	0.000	0.00	0.000	0%
1	4.80	0.35	0.34	0.000			1.0	4.60	5.10	0.50	0.01	0.000	0.000	0.00	0.000	0%
2	5.40	0.45	0.44	-0.001			0.9	5.10	5.25	0.15	0.01	-0.001	-0.001	0.00	0.000	0%
3	5.10	0.47	0.46	0.000			1.0	5.25	5.43	0.18	0.01	0.000	0.000	0.00	0.000	0%
4	5.75	0.51	0.50	-0.008			0.9	5.43	6.68	1.25	0.01	-0.008	-0.007	0.01	0.000	0%
5	7.60	0.65	0.49	0.116			0.9	6.68	7.89	1.22	0.16	0.116	0.104	0.19	0.020	2%
6	8.18	0.69	0.52	0.166			0.9	7.89	8.64	0.75	0.17	0.166	0.149	0.13	0.019	2%
7	9.10	0.75	0.55	0.175			0.9	8.64	9.70	1.06	0.20	0.175	0.158	0.21	0.033	3%
8	10.30	0.83	0.60	0.208			0.9	9.70	10.78	1.08	0.23	0.208	0.187	0.25	0.046	5%
9	11.25	0.94	0.62	0.214			0.9	10.78	11.83	1.05	0.32	0.214	0.193	0.34	0.065	6%
10	12.40	1.10	0.62	0.229			0.9	11.83	13.13	1.30	0.48	0.229	0.206	0.62	0.129	13%
11	13.85	1.17	0.62	0.221			0.9	13.13	14.53	1.40	0.55	0.221	0.199	0.77	0.153	15%
12	15.20	1.28	0.70	0.254			0.9	14.53	15.88	1.35	0.58	0.254	0.229	0.78	0.179	18%
13	16.55	1.47	0.63		0.170	0.213	1.0	15.88	16.95	1.08	0.84	0.192	0.192	0.90	0.173	17%
14	17.35	1.51	0.60		0.132	0.195	1.0	16.95	17.68	0.72	0.91	0.164	0.164	0.66	0.108	11%
15	18.00	1.23	0.61		0.030	0.084	1.0	17.68	18.38	0.70	0.62	0.057	0.057	0.43	0.025	2%
16	18.75	0.66	0.68	0.002			0.9	18.38	19.23	0.85	-0.02	0.002	0.002	-0.02	0.000	0%
17	19.70	0.77	0.60	0.003			0.9	19.23	20.13	0.90	0.17	0.003	0.003	0.15	0.000	0%
18	20.55	1.04	0.55	0.083			0.9	20.13	20.85	0.73	0.49	0.083	0.075	0.36	0.027	3%
19	21.15	1.12	0.52	0.014			0.9	20.85	21.51	0.66	0.60	0.014	0.013	0.40	0.005	0%
20	21.87	0.06	0.52		-0.011	0.012	1.0	21.51	22.49	0.98	-0.46	0.001	0.001	-0.45	0.000	0%
21	23.10	0.81	0.44	0.066			0.9	22.49	23.30	0.82	0.37	0.066	0.059	0.30	0.018	2%
RB	23.50	0.00	0.00	0.00	0.00	0.00	1.0	23.30	23.50	0.20	0.09	0.017	0.017	0.02	0.000	0%
<b>Total Flow</b>														<b>1.00</b>		

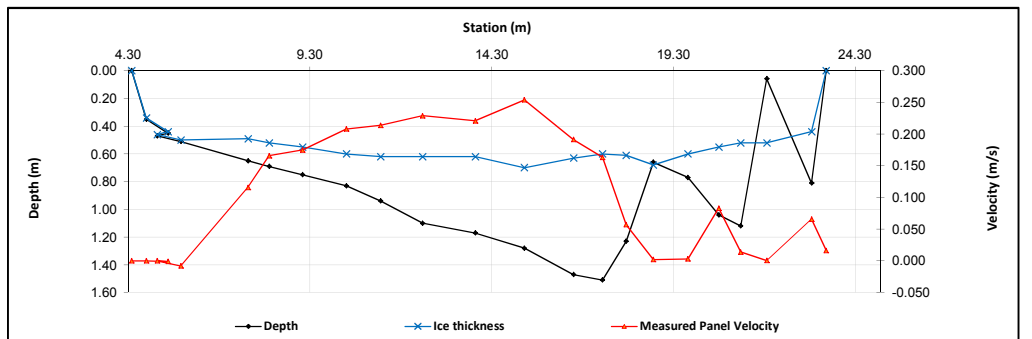
Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	12:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Fair
Weather:	Sunny, 0°C

Flow characteristics:	
Total Flow:	1.00 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	6.07 (m <sup>2</sup> )
Wetted Width:	19.10 (m)
Hydraulic Depth:	0.318 (m)
Mean Velocity:	0.165 (m/s)
Froude Number:	0.093

Logger Details:		
	Before	After
Transducer Reading (m):	0.745	-
Water (°C):	0.2	-
Battery (Main):	14.8	-
Datalogger Clock:	10:25	-
Laptop Clock:	10:25	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S45-03	0.803	100.803		100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05			0.924	99.879	99.880	3/4" Pipe 3 m N of data logger
S45-06			1.018	99.785	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			2.938	97.865		
Water Level:			3.013	97.790		
Other:						
<b>Setup #2</b>						
S45-03			0.733	100.000	100.000	3/4" Pipe 12 m N of data logger
S45-05	0.854	100.733		99.879	99.880	3/4" Pipe 3 m N of data logger
S45-06			0.948	99.785	99.784	3/4" Pipe 3 m E of data logger
Ice/PT:			2.868	97.865		
Water Level:			2.940	97.793		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	97.792
Transducer Elevation Before	97.047
Transducer Elevation After	-

Field Personnel:	CJ, XP	Trip Date:	29-Mar-13
Data Entry Personnel:	CJ, XP	Date:	29-Mar-13
Data Check Personnel:	DW	Date:	8-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: May 16, 2013  
 Site Visit Time (MST): 08:30



Flow Measurement:										Calculated Data						
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00			0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%

No Flow Measurement Conducted

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	Sunny, 17°C

Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

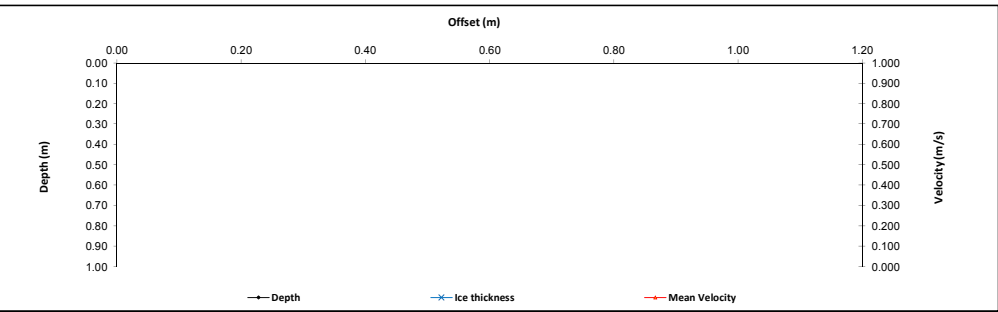
	Before	After
Transducer Reading (m):	1.936	-
Water (°C):	7.7	-
Datalogger Clock:	08:49	-
Laptop Clock:	08:50	-
Battery (Main):	14.4	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Installed 30' mast
- Best RSSI achieved was -103

General Notes:

- Flow measurement not conducted due to safety concerns.
- Flow is estimated to be about 1.5 m/s
- Installed fence enclosure around the station



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							S45-03
S45-03	0.626	100.626		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-05
S45-05			0.748	99.878	99.880	3/4" Pipe 3 m N of data logger	S45-06
S45-06			0.844	99.782	99.784	3/4" Pipe 3 m E of data logger	WL
Ice/PT:							WL
Water Level:		1.697		98.929		Time WL Surveyed: 9:57	S45-06
Other:							S45-05
Setup #2							S45-03
S45-03			0.614	99.999	100.000	3/4" Pipe 12 m N of data logger	
S45-05	0.735	100.613		99.878	99.880	3/4" Pipe 3 m E of data logger	
S45-06			0.832	99.781	99.784	3/4" Pipe 6 m N of data logger	
Ice/PT:							
Water Level:			1.683	98.930		Time WL Surveyed: 9:59	(must close survey loop on survey starting point)
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:				99.782		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				99.782			

WL Survey Summary

	Before	After
Average WL:	98.930	-
Transducer Elevation:	98.994	-
Closing Error:	0.001	-
WL Check:	0.001	-

Site Rating Information

Measured Discharge:	
Expected Discharge:	49.48
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:

SM, TR	Trip Date:	16-May-13
SM	Date:	16-May-13
DW	Date:	16-May-13
Yes	Entered Digitally in the Field:	26-May-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: June 7, 2013  
 Site Visit Time (MST): 16:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%

No Flow Measurement Conducted

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:

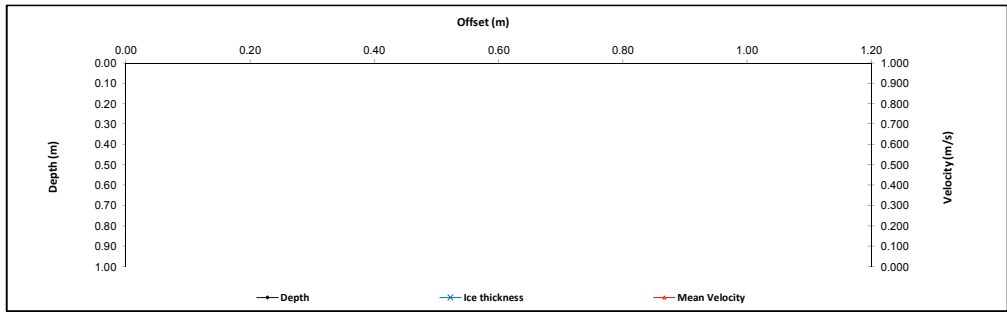
	Before	After
Transducer Reading (m):	1.407	-
Water (°C):	16.6	-
Datalogger Clock:	15:16	-
Laptop Clock:	15:17	-
Battery (Main):	14.2	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:

- Poor cell reception, RSSI -104.
- Modem logs on to network.

General Notes:

- Flow measurement not conducted due to safety concerns.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-03
S45-03	0.590	100.590		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-06
S45-05			0.713	99.877	99.880	3/4" Pipe 3 m N of data logger	S45-05
S45-06			0.806	99.784	99.784	3/4" Pipe 3 m E of data logger	WL
Ice/PT:							WL
Water Level:		2.173		98.417		Time WL Surveyed: 16:07	S45-05
Other:							S45-06
<b>Setup #2</b>							S45-03
S45-03			0.578	99.999	100.000	3/4" Pipe 12 m N of data logger	
S45-05	0.700	100.577		99.877	99.880	3/4" Pipe 3 m N of data logger	
S45-06			0.793	99.784	99.784	3/4" Pipe 3 m E of data logger	
Ice/PT:							
Water Level:			2.159	98.418		Time WL Surveyed: 16:08	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				99.784			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				99.784			

WL Survey Summary

	Before	After
Average WL:	98.418	-
Transducer Elevation:	97.011	-
Closing Error:	0.001	-
WL Check:	0.001	-

Site Rating Information

Measured Discharge:	
Expected Discharge:	27.91
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:	SM, CJ	Trip Date:	7-Jun-13
Data Entry Personnel:	SM, CJ	Date:	7-Jun-13
Data Check Personnel:	DW	Date:	13-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: June 16, 2013  
 Site Visit Time (MST): 09:00

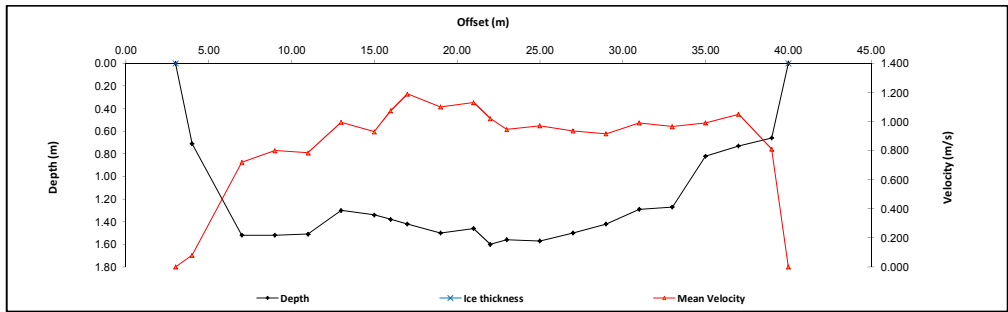


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	40.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	39.00	0.66		0.40	0.810					1.00	1.50	0.66	0.810	0.99	0.802	2%
2	37.00	0.73		0.44	1.050					1.00	2.00	0.73	1.050	1.46	1.533	4%
3	35.00	0.82				0.66	0.770	0.16	1.210	1.00	2.00	0.82	0.990	1.64	1.624	4%
4	33.00	1.27				1.02	0.720	0.25	1.210	1.00	2.00	1.27	0.965	2.54	2.451	6%
5	31.00	1.29				1.03	0.800	0.26	1.180	1.00	2.00	1.29	0.990	2.58	2.554	6%
6	29.00	1.42				1.14	0.640	0.28	1.190	1.00	2.00	1.42	0.915	2.84	2.599	6%
7	27.00	1.50				1.20	0.720	0.30	1.150	1.00	2.00	1.50	0.935	3.00	2.805	6%
8	25.00	1.57				1.26	0.730	0.31	1.210	1.00	2.00	1.57	0.970	3.14	3.046	7%
9	23.00	1.56				1.25	0.760	0.31	1.200	1.00	1.50	1.56	0.945	2.34	2.211	5%
10	22.00	1.60				1.28	0.840	0.32	1.200	1.00	1.00	1.60	1.020	1.60	1.632	4%
11	21.00	1.46				1.17	0.990	0.29	1.270	1.00	1.50	1.46	1.130	2.19	2.475	6%
12	19.00	1.50				1.20	0.970	0.30	1.230	1.00	2.00	1.50	1.100	3.00	3.300	8%
13	17.00	1.42				1.14	1.040	0.28	1.340	1.00	1.50	1.42	1.190	2.13	2.535	6%
14	16.00	1.38				1.10	0.950	0.28	1.200	1.00	1.00	1.38	1.075	1.38	1.484	3%
15	15.00	1.34				1.07	0.790	0.27	1.070	1.00	1.50	1.34	0.930	2.01	1.869	4%
16	13.00	1.30				1.04	0.920	0.26	1.070	1.00	2.00	1.30	0.955	2.60	2.587	6%
17	11.00	1.51				1.21	0.690	0.30	0.890	1.00	2.00	1.51	0.785	3.04	2.371	5%
18	9.00	1.52				1.22	0.600	0.30	1.000	1.00	2.00	1.52	0.800	3.02	2.432	6%
19	7.00	1.52				1.22	0.630	0.30	0.810	1.00	2.50	1.52	0.720	3.80	2.736	6%
20	4.00	0.71		0.43	0.080					1.00	2.00	0.71	0.080	1.42	0.114	0%
RB	3.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>43.2</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:50
Equipment:	Marsh McBirney
Method:	Boat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny



**Flow characteristics:**

Total Flow:	43.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	46.72	(m <sup>2</sup> )
Wetted Width:	37.00	(m)
Hydraulic Depth:	1.26	(m)
Mean Velocity:	0.92	(m/s)
Froude Number:	0.26	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.791	1.811
Water (°C):	14.1	14.6
Datalogger Clock:	9:03	-
Laptop Clock:	09:03	-
Battery (Main):	14.3	-
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S45-03	1.127	101.127		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-03
S45-05			1.247	99.880	99.880	3/4" Pipe 3 m N of data logger	S45-05
S45-06			1.342	99.785	99.784	3/4" Pipe 3 m E of data logger	S45-06
Water Level:			2.328	98.799		Time WL Surveyed: 9:07	WL
Other:							WL
Setup #2							
S45-03			1.099	100.001	100.000	3/4" Pipe 12 m N of data logger	S45-03
S45-05			1.221	99.879	99.880	3/4" Pipe 3 m N of data logger	S45-05
S45-06	1.315	101.100		99.785	99.784	3/4" Pipe 3 m E of data logger	S45-06
Water Level:			2.302	98.798		Time WL Surveyed: 9:09	WL
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S45-06	1.273	101.058		99.785		Time WL Surveyed: 10:59	
Water Level:			2.259	98.799		Time WL Surveyed: 11:00	
Water Level:			2.228	98.796			
BM: S45-06	1.239	101.024		99.785			

**WL Survey Summary**

	Before	After
Average WL:	98.799	98.798
Transducer Elevation:	97.008	96.987
Closing Error:	-0.001	-
WL Check:	0.001	0.003

**Site Rating Information**

Measured Discharge:	43.2
Expected Discharge:	43.63
Shift from Existing Rating (m <sup>3</sup> /s):	0.43
Shift from Existing Rating (%):	1%

**Field Personnel:**

Field Personnel:	TR, SG	Trip Date:	16-Jun-13
Data Entry Personnel:	SG	Date:	16-Jun-13
Data Check Personnel:	SG	Date:	17-Jul-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

August 13, 2013

Site Visit Time (MST):

16:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	2.50	0.30		0.18	0.350					1.00	1.50	0.30	0.350	0.45	0.158	2%
2	4.00	0.43		0.26	0.548					1.00	1.50	0.43	0.548	0.65	0.353	4%
3	5.50	0.71		0.43	0.813					1.00	1.50	0.71	0.813	1.07	0.866	9%
4	7.00	0.60		0.36	0.827					1.00	1.50	0.60	0.827	0.90	0.744	8%
5	8.50	0.50		0.30	0.819					1.00	1.50	0.50	0.819	0.75	0.614	6%
6	10.00	0.46		0.28	0.794					1.00	1.50	0.46	0.794	0.69	0.548	6%
7	11.50	0.47		0.28	0.844					1.00	1.50	0.47	0.844	0.71	0.595	6%
8	13.00	0.46		0.28	0.872					1.00	1.50	0.46	0.872	0.69	0.602	6%
9	14.50	0.52		0.31	0.618					1.00	1.50	0.52	0.618	0.78	0.482	5%
10	16.00	0.50		0.30	0.764					1.00	1.50	0.50	0.764	0.75	0.573	6%
11	17.50	0.56		0.34	0.698					1.00	1.50	0.56	0.698	0.84	0.586	6%
12	19.00	0.52		0.31	0.654					1.00	1.50	0.52	0.654	0.78	0.510	5%
13	20.50	0.50		0.30	0.798					1.00	1.50	0.50	0.798	0.75	0.599	6%
14	22.00	0.52		0.31	0.813					1.00	1.50	0.52	0.813	0.78	0.634	7%
15	23.50	0.60		0.36	0.921					1.00	1.50	0.60	0.921	0.90	0.829	9%
16	25.00	0.40		0.24	0.918					1.00	1.50	0.40	0.918	0.60	0.551	6%
17	26.50	0.18		0.10	0.565					1.00	1.50	0.16	0.565	0.24	0.136	1%
18	28.00	0.18		0.11	0.460					1.00	1.50	0.18	0.460	0.27	0.124	1%
19	29.50	0.20		0.12	0.557					1.00	1.50	0.20	0.557	0.30	0.167	2%
20	31.00	0.14		0.08	0.208					1.00	1.50	0.14	0.208	0.21	0.044	0%
LB	32.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>9.71</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across from BM1

Meas. Start Time (MST):	16:40
Meas. End Time (MST):	17:05
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 23°C

**Flow characteristics:**

Total Flow:	9.71	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.10	(m²)
Wetted Width:	31.50	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.74	(m/s)
Froude Number:	0.37	

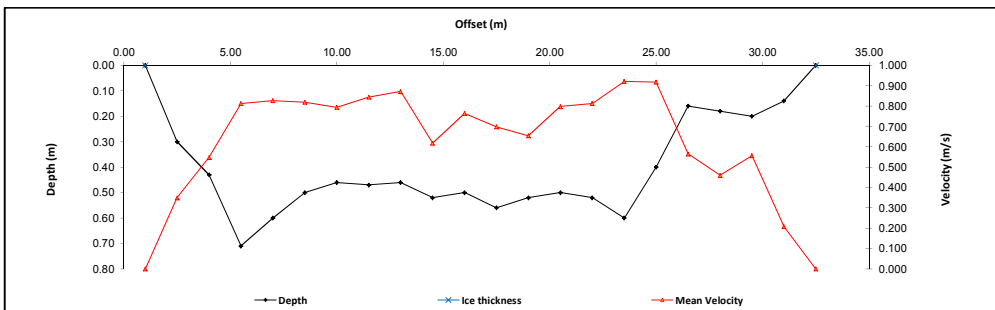
**Logger Details:**

	Before	After
Transducer Reading (m):	0.938	0.921
Water (°C):	21.4	21.7
Datalogger Clock:	16:04	17:12
Laptop Clock:	16:03	17:12
Battery (Main):	14.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Replaced	
PT# (if replaced):	278516	298706
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Added new 30 m PLS  
- Original PLS Depth: 0.869

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							S45-03
S45-03	1.098	101.098		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-05
S45-05			1.218	99.880	99.880	3/4" Pipe 3 m N of data logger	S45-06
S45-06			1.313	99.785	99.784	3/4" Pipe 3 m E of data logger	WL
Ice/PT:							WL
Water Level:			3.235	97.863		Time WL Surveyed: 16:34	S45-06
Other:							S45-05
Setup #2							S45-03
S45-03			1.051	100.001	100.000	3/4" Pipe 12 m N of data logger	
S45-05	1.172	101.052		99.880	99.784	3/4" Pipe 3 m N of data logger	
S45-06			1.267	99.785	99.880	3/4" Pipe 3 m E of data logger	
Ice/PT:							
Water Level:			3.192	97.860		Time WL Surveyed: 16:35	(must close survey loop on survey starting point)
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S45-06	1.267	101.052		99.785		Time WL Surveyed: 17:10	
Water Level:			3.191	97.861		Time WL Surveyed: 17:10	
Water Level:			3.139	97.865		Time WL Surveyed: 17:10	
BM: S45-06	1.219	101.004		99.785			

**WL Survey Summary**

	Before	After
Average WL:	97.862	97.863
Transducer Elevation:	96.924	96.942
Closing Error:	-0.001	-
WL Check:	0.003	-0.004

**Site Rating Information**

Measured Discharge:	9.71
Expected Discharge:	9.20
Shift from Existing Rating (m³/s):	-0.51
Shift from Existing Rating (%):	-5%

**Field Personnel:**

Field Personnel:	TR, DW	Trip Date:	13-Aug-13
Data Entry Personnel:	TR	Date:	13-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

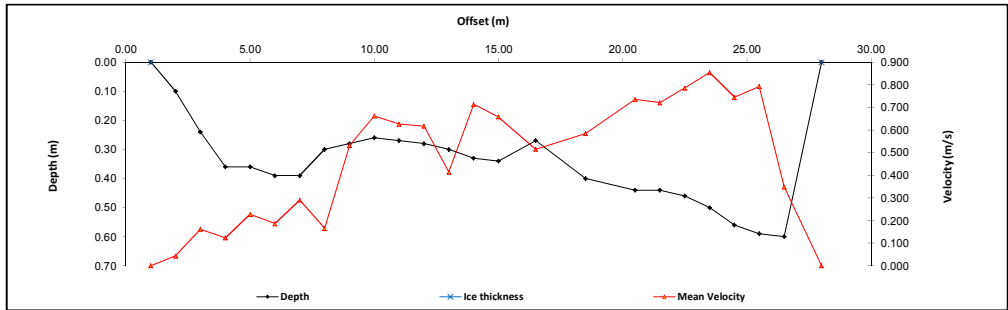
Site Visit Date: September 13, 2013  
 Site Visit Time (MST): 13:40



Measured Data									Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	2.00	0.10		0.06	0.043					1.00	1.00	0.10	0.043	0.10	0.004	0%
2	3.00	0.24		0.14	0.161					1.00	1.00	0.24	0.161	0.24	0.039	1%
3	4.00	0.36		0.22	0.123					1.00	1.00	0.36	0.123	0.36	0.044	1%
4	5.00	0.36		0.22	0.227					1.00	1.00	0.36	0.227	0.36	0.082	2%
5	6.00	0.39		0.23	0.186					1.00	1.00	0.39	0.186	0.39	0.073	1%
6	7.00	0.39		0.23	0.290					1.00	1.00	0.39	0.290	0.39	0.113	2%
7	8.00	0.30		0.18	0.165					1.00	1.00	0.30	0.165	0.30	0.050	1%
8	9.00	0.28		0.17	0.532					1.00	1.00	0.28	0.532	0.28	0.149	3%
9	10.00	0.26		0.16	0.662					1.00	1.00	0.26	0.662	0.26	0.172	3%
10	11.00	0.27		0.16	0.626					1.00	1.00	0.27	0.626	0.27	0.169	3%
11	12.00	0.28		0.17	0.617					1.00	1.00	0.28	0.617	0.28	0.173	3%
12	13.00	0.30		0.18	0.414					1.00	1.00	0.30	0.414	0.30	0.124	2%
13	14.00	0.33		0.20	0.714					1.00	1.00	0.33	0.714	0.33	0.236	5%
14	15.00	0.34		0.20	0.698					1.00	1.25	0.34	0.698	0.43	0.280	5%
15	16.50	0.27		0.16	0.515					1.00	1.75	0.27	0.515	0.47	0.243	5%
16	18.50	0.40		0.24	0.594					1.00	2.00	0.40	0.594	0.80	0.467	9%
17	20.50	0.44		0.26	0.735					1.00	1.50	0.44	0.735	0.66	0.485	9%
18	21.50	0.44		0.26	0.721					1.00	1.00	0.44	0.721	0.44	0.317	6%
19	22.50	0.46		0.28	0.786					1.00	1.00	0.46	0.786	0.46	0.362	7%
20	23.50	0.50		0.30	0.854					1.00	1.00	0.50	0.854	0.50	0.427	8%
21	24.50	0.56		0.34	0.745					1.00	1.00	0.56	0.745	0.56	0.417	8%
22	25.50	0.59		0.35	0.792					1.00	1.00	0.59	0.792	0.59	0.467	9%
23	26.50	0.60		0.36	0.349					1.00	1.25	0.60	0.349	0.75	0.262	5%
LB	28.00	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.15</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	14:05
Meas. End Time (MST):	14:34
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 20°C



**Flow characteristics:**

Total Flow:	5.15	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.52	(m <sup>2</sup> )
Wetted Width:	27.00	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.54	(m/s)
Froude Number:	0.29	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.836	0.799
Water (°C):	16.2	16.3
Datalogger Clock:	13:45	14:44
Laptop Clock:	13:46	14:44
Battery (Main):	14.2	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- PT was repositioned
- Need to trench PT cable
- BM labels need replacement
- Bring solar panel mounts, U-Bolts and screws to remount the solar panel

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							S45-03
S45-03	1.135	101.135		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-05
S45-05			1.255	99.880	99.880	3/4" Pipe 3 m N of data logger	S45-06
S45-06			1.349	99.786	99.784	3/4" Pipe 3 m E of data logger	WL
Ice/PT:							WL
Water Level:			3.440	97.695		Time WL Surveyed:	S45-06
Other:							S45-05
Setup #2							S45-03
S45-03			1.122	100.002	100.000	3/4" Pipe 12 m N of data logger	
S45-05	1.244	101.124		99.880	99.880	3/4" Pipe 3 m N of data logger	
S45-06			1.338	99.786	99.784	3/4" Pipe 3 m E of data logger	
Ice/PT:							
Water Level:			3.426	97.698		Time WL Surveyed:	S45-06
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S45-06	1.338	101.124		99.786			
Water Level:			3.429	97.695		Time WL Surveyed:	S45-06
Water Level:			3.412	97.699		Time WL Surveyed:	S45-06
BM: S45-06	1.325	101.111		99.786			

**WL Survey Summary**

	Before	After
Average WL:	97.697	97.697
Transducer Elevation:	96.861	96.898
Closing Error:	-0.002	-
WL Check:	0.003	-0.004

**Site Rating Information**

Measured Discharge:	5.15
Expected Discharge:	4.94
Shift from Existing Rating (m <sup>3</sup> /s):	-0.21
Shift from Existing Rating (%):	-4%

**Field Personnel:**

Data Entry Personnel:	DW, CJ	Trip Date:	13-Sep-13
Data Check Personnel:	XP	Date:	13-Sep-13
Entered Digitally in the Field:	Yes	Date:	17-Sep-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N



Site Visit Date: October 21, 2013  
 Site Visit Time (MST): 10:10

Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.90	0.00	0.00		0.000		0.000			1.00	0.30	0.00	0.000	0.00	0.000	
1	4.50	0.55		0.33	0.226					1.00	0.80	0.55	0.226	0.44	0.099	1%
2	5.50	0.64		0.38	0.433					1.00	1.25	0.64	0.433	0.80	0.346	5%
3	7.00	0.68		0.41	0.584					1.00	1.50	0.68	0.584	1.02	0.596	8%
4	8.50	0.59		0.35	0.822					1.00	1.50	0.59	0.822	0.89	0.727	10%
5	10.00	0.53		0.32	0.697					1.00	1.50	0.53	0.697	0.80	0.554	8%
6	11.50	0.50		0.30	0.692					1.00	1.50	0.50	0.692	0.75	0.519	7%
7	13.00	0.45		0.27	0.673					1.00	1.50	0.45	0.673	0.68	0.454	6%
8	14.50	0.39		0.23	0.827					1.00	1.50	0.39	0.827	0.59	0.484	7%
9	16.00	0.36		0.22	0.561					1.00	1.50	0.36	0.561	0.54	0.303	4%
10	17.50	0.40		0.24	0.682					1.00	1.50	0.40	0.682	0.60	0.409	6%
11	19.00	0.50		0.30	0.779					1.00	1.25	0.50	0.779	0.63	0.487	7%
12	20.00	0.50		0.30	0.710					1.00	1.00	0.50	0.710	0.50	0.355	5%
13	21.00	0.44		0.26	0.550					1.00	1.00	0.44	0.550	0.44	0.242	3%
14	22.00	0.54		0.32	0.779					1.00	1.00	0.54	0.779	0.54	0.421	6%
15	23.00	0.57		0.34	0.878					1.00	1.00	0.57	0.878	0.57	0.500	7%
16	24.00	0.63		0.38	0.419					1.00	1.00	0.63	0.419	0.63	0.264	4%
17	25.00	0.61		0.37	0.550					1.00	1.00	0.61	0.550	0.61	0.336	5%
18	26.00	0.56		0.34	0.144					1.00	1.00	0.56	0.144	0.56	0.081	1%
19	27.00	0.59		0.35	-0.049					1.00	1.50	0.59	-0.049	0.89	-0.043	-1%
20	29.00	0.34		0.20	0.010					1.00	2.00	0.34	0.010	0.68	0.007	0%
21	31.00	0.25		0.15	-0.005					1.00	2.25	0.25	-0.005	0.56	-0.003	0%
LB	33.50	0.00	0.00		0.00		0.00			1.00	1.25	0.00	0.000	0.00	0.000	
													<b>Total Flow</b>	<b>7.14</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe): \_\_\_\_\_

Meas. Start Time (MST):	11:13
Meas. End Time (MST):	11:35
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 11°C

### Flow characteristics:

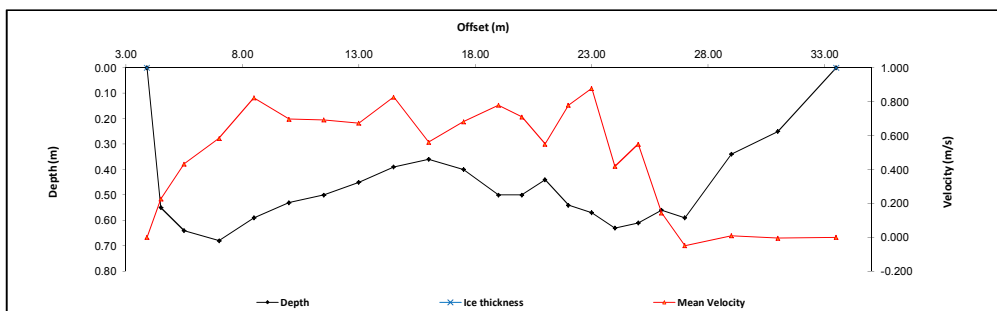
Total Flow:	7.14	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.69	(m <sup>2</sup> )
Wetted Width:	29.60	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.52	(m/s)
Froude Number:	0.24	

### Logger Details:

	Before	After
Transducer Reading (m):	0.846	0.876
Water (°C):	3.3	3.4
Datalogger Clock:	10:20	11:41
Laptop Clock:	10:20	11:41
Battery (Main):	14.8	14.6
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

General Notes:  
 - Trenched PT cable  
 - Mounted new solar panel to station mast



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S45-03			1.103	99.999	100.000	3/4" Pipe 12 m N of data logger	S45-03
S45-05	1.318	101.102		99.784	99.784	3/4" Pipe 3 m N of data logger	S45-05
S45-06			1.223	99.879	99.880	3/4" Pipe 3 m E of data logger	S45-06
Water Level:			3.290	97.812			WL
Ice/PT:							WL
Other:							S45-06
Time WL Surveyed:						11:11	S45-05
Setup #2							S45-03
S45-03	1.119	101.118		99.999	100.000	3/4" Pipe 12 m N of data logger	
S45-05			1.335	99.783	99.784	3/4" Pipe 3 m N of data logger	
S45-06			1.242	99.876	99.880	3/4" Pipe 3 m E of data logger	
Water Level:			3.309	97.809			WL
Ice/PT:							WL
Other:							(must close survey loop on survey starting point)
Time WL Surveyed:						11:04	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM	S45-05	1.319	101.103		99.784		
Water Level:			3.291	97.812			WL
Water Level:			3.282	97.811			WL
BM	S45-05	1.309	101.093		99.784		
Time WL Surveyed:						11:47	
Time WL Surveyed:						11:49	

WL Survey Summary	Before	After
Average WL:	97.811	97.812
Closing Error:	0.001	0.001
WL Check:	0.003	0.001

Site Rating Information	
Measured Discharge:	7.14
Expected Discharge:	7.80
Shift from Existing Rating (m <sup>3</sup> /s):	0.66
Shift from Existing Rating (%):	9%

Field Personnel:	DW, TR	Trip Date:	21-Oct-13
Data Entry Personnel:	DW	Date:	21-Oct-13
Data Check Personnel:	CJ	Date:	24-Oct-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date: December 12, 2013

Site Visit Time (MST): 09:15

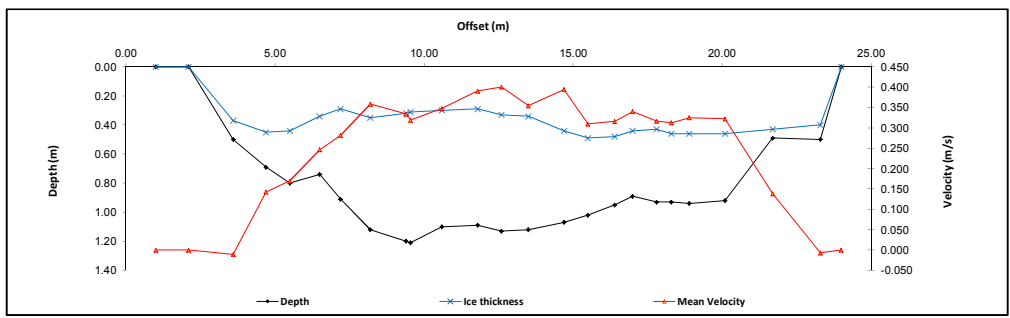


Flow Measurement:											Calculated Data					
Measured Data																
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.55	0.00	0.000	0.00	0.000	
1	2.10	0.00	0.00	0.00	0.000				0.88	1.30	0.00	0.000	0.00	0.000	0%	
2	3.60	0.50	0.37	0.44	-0.012				0.88	1.30	0.13	-0.011	0.17	-0.002	0%	
3	4.70	0.69	0.45	0.57	0.162				0.88	0.95	0.24	0.143	0.23	0.033	1%	
4	5.50	0.80	0.44	0.62	0.193				0.88	0.90	0.36	0.170	0.32	0.055	2%	
5	6.50	0.74	0.34	0.54	0.280				0.88	0.85	0.40	0.246	0.34	0.084	3%	
6	7.20	0.91	0.29	0.60	0.320				0.88	0.85	0.62	0.282	0.53	0.148	4%	
7	8.20	1.12	0.35			0.97	0.350	0.50	0.367	1.00	1.10	0.77	0.359	0.85	0.304	9%
8	9.40	1.20	0.32			1.02	0.330	0.50	0.338	1.00	0.68	0.88	0.334	0.59	0.198	6%
9	9.55	1.21	0.31			1.03	0.330	0.49	0.308	1.00	0.60	0.90	0.319	0.54	0.172	5%
10	10.60	1.10	0.30			0.94	0.318	0.46	0.377	1.00	1.13	0.80	0.348	0.90	0.313	9%
11	11.80	1.09	0.29			0.93	0.359	0.45	0.422	1.00	1.00	0.80	0.391	0.80	0.312	9%
12	12.60	1.13	0.33			0.97	0.400	0.49	0.401	1.00	0.85	0.80	0.401	0.68	0.272	8%
13	13.50	1.12	0.34			0.96	0.284	0.50	0.425	1.00	1.05	0.78	0.355	0.82	0.290	9%
14	14.70	1.07	0.44	0.76	0.448					0.88	1.00	0.63	0.394	0.63	0.248	7%
15	15.50	1.02	0.49	0.76	0.352					0.88	0.85	0.53	0.310	0.45	0.140	4%
16	16.40	0.95	0.48	0.72	0.359					0.88	0.75	0.47	0.316	0.35	0.111	3%
17	17.00	0.89	0.44	0.67	0.386					0.88	0.70	0.45	0.340	0.32	0.107	3%
18	17.90	0.93	0.43	0.68	0.380					0.88	0.65	0.50	0.317	0.33	0.103	3%
19	18.30	0.93	0.46	0.70	0.355					0.88	0.55	0.47	0.312	0.26	0.081	2%
20	18.90	0.94	0.46	0.70	0.369					0.88	0.90	0.48	0.325	0.43	0.140	4%
21	20.10	0.92	0.46	0.69	0.366					0.88	1.40	0.46	0.322	0.64	0.207	6%
22	21.70	0.49	0.43	0.46	0.157					0.88	1.60	0.06	0.138	0.10	0.013	0%
23	23.30	0.50	0.40	0.45	-0.008					0.88	1.15	0.10	-0.007	0.12	-0.001	0%
LB	24.00	0.00	0.00		0.00		0.00		0.00	0.88	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>3.33</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): \_\_\_\_\_

Meas. Start Time (MST):	9:15
Meas. End Time (MST):	10:05
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	-



**Flow characteristics:**

Total Flow:	3.33	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	10.39	(m <sup>2</sup> )
Wetted Width:	23.00	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.015	1.021
Water (°C):	0.1	0.2
Datalogger Clock:	09:21	10:42
Laptop Clock:	09:21	10:42
Battery (Main):	12.1	14.8
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

\_\_\_\_\_

**General Notes:**

\_\_\_\_\_

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-03
S45-03	1.328	101.328		100.000	100.000	3/4" Pipe 12 m N of data logger	S45-05
S45-05			1.546	99.782	99.784	3/4" Pipe 6 m N of data logger	S45-06
S45-06			1.451	98.877	99.880	3/4" Pipe 3 m E of data logger	Ice
Ice/PT:			3.288	98.040			WL
Water Level:			3.370	97.958		Time WL Surveyed: 9:40	WL
Other:							Ice
<b>Setup #2</b>							S45-06
S45-03			1.321	99.999	100.000	3/4" Pipe 12 m N of data logger	S45-05
S45-05	1.538	101.320		99.782	99.784	3/4" Pipe 6 m N of data logger	S45-03
S45-06			1.443	99.877	99.880	3/4" Pipe 3 m E of data logger	
Ice/PT:			3.280	98.040			
Water Level:			3.364	97.956		Time WL Surveyed: 9:42	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S45-05	1.483	101.265		99.782			
Water Level:			3.309	97.956		Time WL Surveyed: 10:45	
Water Level:			3.268	97.956		Time WL Surveyed: 10:50	
BM: S45-05	1.442	101.224		99.782			

**WL Survey Summary**

	Before	After
Average WL:	97.957	97.956
Transducer Elevation:	96.942	96.935
Closing Error:	0.001	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

	DB, TR	Trip Date:	12-Dec-13
Data Entry Personnel:	DB	Date:	12-Dec-13
Data Check Personnel:	DW	Date:	24-Mar-14
Entered Digitally in the Field:	Yes		

START

↓

END

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta

UTM Location: 470235 E, 6463205 N

Site Visit Date: January 11, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	2.45	2.45	0.84	0.061	0.061	2.05	0.125	0%
1	4.90	3.71	0.36	0.107	0.380		1.0	2.45	9.35	6.90	3.35	0.244	0.244	23.12	5.629	3%
2	13.80	4.55	0.41	0.282	0.507		1.0	9.35	16.90	7.55	4.14	0.395	0.395	31.26	12.331	7%
3	20.00	4.70	0.42	0.480	0.667		1.0	16.90	23.00	6.10	4.28	0.574	0.574	26.11	14.973	9%
4	26.00	5.00	0.46	0.736	0.828		1.0	23.00	29.50	6.50	4.54	0.782	0.782	29.51	23.077	14%
5	33.00	4.95	0.48	0.476	0.810		1.0	29.50	37.25	7.75	4.47	0.643	0.643	34.64	22.275	14%
6	41.50	4.80	0.50	0.216	0.806		1.0	37.25	45.25	8.00	4.30	0.511	0.511	34.40	17.578	11%
7	49.00	4.70	0.50	0.300	0.688		1.0	45.25	51.75	6.50	4.20	0.494	0.494	27.30	13.486	8%
8	54.50	4.70	0.51	0.394	0.569		1.0	51.75	57.75	6.00	4.19	0.482	0.482	25.14	12.105	7%
9	61.00	4.55	0.52	0.357	0.478		1.0	57.75	64.75	7.00	4.03	0.418	0.418	28.21	11.778	7%
10	68.50	4.50	0.56	0.319	0.386		1.0	64.75	75.50	10.75	3.94	0.353	0.353	42.36	14.930	9%
11	82.50	3.65	0.51	0.303	0.278		1.0	75.50	90.90	15.40	3.14	0.291	0.291	48.36	14.047	9%
12	99.30	3.18	0.53	0.038	-0.018		1.0	90.90	102.80	11.90	2.65	0.010	0.010	31.54	0.315	0%
13	106.30	1.66	0.48	-0.176	-0.176	-0.054	1.0	102.80	115.40	12.60	1.18	-0.115	-0.115	14.87	-1.710	-1%
14	124.50	0.95	0.34	-0.178			0.9	115.40	131.75	16.35	0.61	-0.178	-0.160	9.97	-1.598	-1%
15	139.00	0.85	0.45	-0.101			0.9	131.75	145.50	13.75	0.40	-0.101	-0.091	5.50	-0.500	0%
16	152.00	0.98	0.52	0.001			0.9	145.50	159.65	14.15	0.46	0.001	0.001	6.51	0.006	0%
17	167.30	1.00	0.45	-0.253			0.9	159.65	175.45	15.80	0.55	-0.253	-0.228	8.69	-1.979	-1%
18	183.60	0.90	0.43	0.130			0.9	175.45	193.30	17.85	0.47	0.130	0.117	8.39	0.982	1%
19	203.00	0.98	0.46	0.155			0.9	193.30	209.55	16.25	0.52	0.155	0.140	8.45	1.179	1%
20	216.10	0.90	0.51	-0.098			0.9	209.55	223.30	13.75	0.39	-0.098	-0.086	5.36	-0.463	0%
21	230.50	0.80	0.45	0.382			0.9	223.30	238.60	15.30	0.35	0.382	0.344	5.35	1.841	1%
22	246.70	0.98	0.38	-0.187			0.9	238.60	250.95	12.35	0.60	-0.187	-0.168	7.41	-1.247	-1%
23	255.20	1.05	0.43	-0.205			0.9	250.95	262.95	12.00	0.62	-0.205	-0.185	7.44	-1.373	-1%
24	270.70	1.07	0.47	0.001			0.9	262.95	283.85	20.90	0.60	0.001	0.001	12.54	0.011	0%
25	297.00	1.19	0.45	0.068			0.9	283.85	302.00	18.15	0.74	0.068	0.061	13.43	0.822	0%
26	307.00	1.41	0.50	0.140	0.017		1.0	302.00	319.90	17.90	0.91	0.079	0.079	16.29	1.279	1%
27	332.80	1.41	0.50	0.046	0.018		1.0	319.90	340.15	20.25	0.91	0.032	0.032	18.43	0.590	0%
28	347.50	1.55	0.44	0.090	0.182		1.0	340.15	355.95	15.80	1.11	0.136	0.136	17.54	2.385	1%
28	364.40	1.85	0.44	0.026	0.150		1.0	355.95	370.20	14.25	1.41	0.088	0.088	20.09	1.768	1%
LB	376.00	0.00	0.00	0.00	0.00	0.00	1.0	370.20	376.00	5.80	0.35	0.022	0.022	2.04	0.045	0%

Total Flow 165

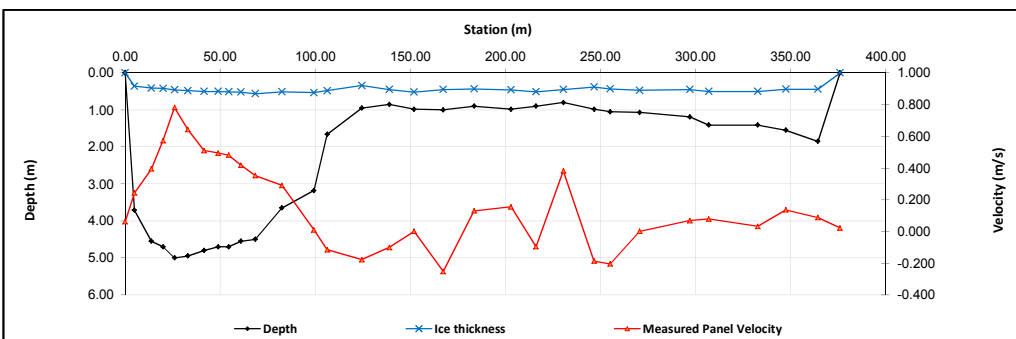
Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	13:55
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, -17°C

Flow characteristics:	
Total Flow:	165 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	572.29 (m <sup>2</sup> )
Wetted Width:	376.00 (m)
Hydraulic Depth:	1.522 (m)
Mean Velocity:	0.288 (m/s)
Froude Number:	0.075

Logger Details:		
	Before	After
Transducer Reading (m):	1.154	-
Transducer Reading (m):	5.344	-
Water (°C):	0.1	-
Battery (Main):	14.6	13.55
Datalogger Clock:	1:13	13:31
Laptop Clock:	1:12	13:30
Enclosure Dessoricant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessoricant:	Good	-

**Datalogger / Station Notes:**  
- Installed second battery

**General Notes:**  
- Negative velocity readings were suspicious. An alternate ADV was used but produced similar readings to the first unit. Poor readings may be caused by slush under the ice, or ice conditions upstream.



Level Survey:						
Station	BS (+) (m)	HI (m)	FS (-) (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
S46-01	0.88	100.88		100.000	100.000	3/4" Pipe 2 m S of logger
S46-02			1.106	99.774	99.771	3/4" Pipe 6 m S of logger
S46-03			2.367	98.513	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.673	95.207		
Water Level:			5.661	95.219		
Other:						
Setup #2						
S46-01			0.683	99.999	100.000	3/4" Pipe 2 m S of logger
S46-02	0.908	100.682		99.774	99.771	3/4" Pipe 6 m S of logger
S46-03			2.169	98.513	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.477	95.205		
Water Level:			5.467	95.215		
Other:						

Closing Error	0.001
WL Check	0.004

Average WL	95.217
Transducer Elevation Before	94.063
Transducer Elevation After	-

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	11-Jan-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	11-Jan-13
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	13-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: February 9, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	1.80	0.00	0.00	0.000	0.000	0.000	1.0	1.80	4.65	2.85	0.64	0.050	0.050	1.82	0.091	0%
LB	412.20	0.00	0.00	0.00	0.00	0.00	1.0	404.35	412.20	7.85	0.25	0.050	0.050	1.96	0.098	0%
<b>Total Flow</b>															<b>231</b>	

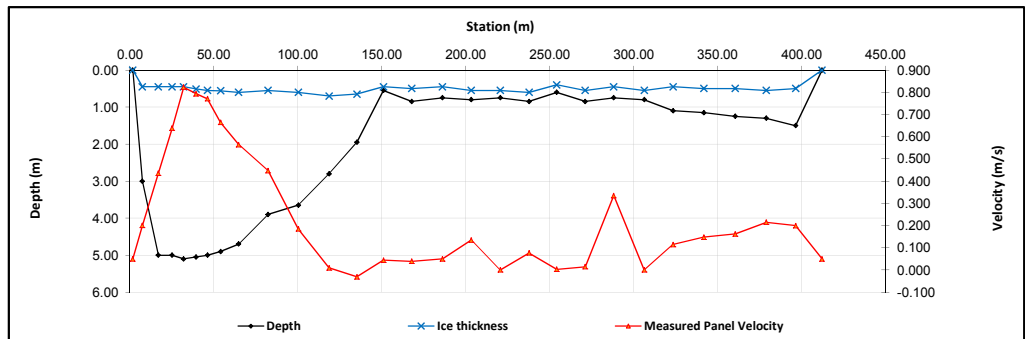
Measurement Details:	
Start Time (MST):	9:40
End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow, very windy, -8°C

Flow characteristics:	
Total Flow:	231 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	577.29 (m <sup>2</sup> )
Wetted Width:	410.40 (m)
Hydraulic Depth:	1.407 (m)
Mean Velocity:	0.400 (m/s)
Froude Number:	0.108

Logger Details:	Before	After
Transducer Reading (m):	1.117	-
Transducer Reading (m):	5.304	-
Water (°C):	0.1	-
Battery (Main):	13.0	-
Datalogger Clock:	9:53	-
Laptop Clock:	9:52	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:
- Flow measurement was conducted 30 m downstream of the usual station in an attempt to avoid a sand bar.

General Notes:
- Very windy conditions, best achieved WL error was 0.005



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S46-01	0.908	100.908		100.000	100.000	3/4" Pipe 2 m S of logger
S46-02			1.134	99.774	99.771	3/4" Pipe 6 m S of logger
S46-03			2.394	98.514	98.503	3/4" Pipe on Lower Bench
Ice/PT:			5.773	95.135		
Water Level:			5.733	95.175		
Other:						
<b>Setup #2</b>						
S46-01			0.897	100.001	100.000	3/4" Pipe 2 m S of logger
S46-02			1.123	99.775	99.771	3/4" Pipe 6 m S of logger
S46-03	2.384	100.898		98.514	98.503	3/4" Pipe on Lower Bench
Ice/PT:			5.763	95.135		
Water Level:			5.718	95.180		
Other:						

Closing Error	-0.001
WL Check	0.005
Average WL	95.178
Transducer Elevation Before	94.0605
Transducer Elevation After	-

Field Personnel:	TR AND SM	Trip Date:	9-Feb-13
Data Entry Personnel:	TR	Date:	9-Feb-13
Data Check Personnel:	SM	Date:	13-Mar-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta

UTM Location: 470235 E, 6463205 N

Site Visit Date:

March 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	5.30	4.80	0.79	0.059	0.059	3.78	0.223	0%
1	10.10	3.70	0.55	0.226	0.246		1.0	5.30	12.30	7.00	3.15	0.236	0.236	22.05	5.204	3%
2	14.50	5.00	0.50	0.518	0.523		1.0	10.10	16.63	6.53	4.50	0.521	0.521	29.36	15.283	7%
3	18.75	5.00	0.50	0.644	0.551		1.0	16.63	21.83	5.20	4.50	0.598	0.598	23.40	13.982	7%
4	24.90	5.00	0.55	0.612	0.804		1.0	21.83	27.45	5.63	4.45	0.708	0.708	25.03	17.722	9%
5	30.00	5.00	0.55	0.819	0.616		1.0	27.45	32.40	4.95	4.45	0.718	0.718	22.03	15.805	8%
6	34.80	5.00	0.55	0.613	0.697		1.0	32.40	38.05	5.65	4.45	0.655	0.655	25.14	16.468	8%
7	41.30	5.00	0.55	0.652	0.700		1.0	38.05	44.40	6.35	4.45	0.676	0.676	28.26	19.102	9%
8	47.50	5.00	0.55	0.714	0.615		1.0	44.40	51.20	6.80	4.45	0.665	0.665	30.26	20.108	10%
9	54.90	4.90	0.55	0.528	0.547		1.0	51.20	62.63	11.43	4.35	0.538	0.538	49.70	26.713	13%
10	70.35	4.60	0.65	0.472	0.485		1.0	62.63	78.30	15.68	3.95	0.479	0.479	61.92	29.627	14%
11	86.25	3.90	0.65	0.227	0.343		1.0	78.30	96.10	17.80	3.25	0.285	0.285	57.85	16.487	8%
12	105.95	3.60	0.75	0.157	0.071		1.0	96.10	119.78	23.68	2.85	0.114	0.114	67.47	7.692	4%
13	133.60	2.30	0.80	-0.065	0.036		1.0	119.78	142.70	22.93	1.50	-0.015	-0.015	34.39	-0.499	0%
14	151.80	0.75	0.65	-0.098			0.9	142.70	161.15	18.45	0.10	-0.098	-0.088	1.85	-0.163	0%
15	170.50	0.75	0.55	-0.097			0.9	161.15	180.05	18.90	0.20	-0.097	-0.087	3.78	-0.330	0%
16	189.60	0.70	0.55	-0.155			0.9	180.05	203.63	23.58	0.15	-0.155	-0.140	3.54	-0.493	0%
17	217.65	0.85	0.65	-0.030			0.9	203.63	229.43	25.80	0.20	-0.030	-0.027	5.16	-0.139	0%
18	241.20	0.85	0.65	0.013			0.9	229.43	255.88	26.45	0.20	0.013	0.012	5.29	0.062	0%
19	270.55	0.90	0.65	-0.063			0.9	255.88	282.45	26.58	0.25	-0.063	-0.057	6.64	-0.377	0%
20	294.35	1.15	0.65	-0.038			0.9	282.45	310.63	28.18	0.50	-0.038	-0.034	14.09	-0.482	0%
21	326.90	1.40	0.65	0.033			0.9	310.63	338.35	27.73	0.75	0.033	0.030	20.79	0.618	0%
22	349.80	1.20	0.65	0.064			0.9	338.35	364.00	25.65	0.55	0.064	0.058	14.11	0.813	0%
23	378.20	1.60	0.75	0.103			0.9	364.00	391.50	27.50	0.85	0.103	0.093	23.38	2.167	1%
24	404.80	1.60	0.75	0.142			0.9	391.50	410.00	18.50	0.85	0.142	0.128	15.73	2.010	1%
LB	415.20	0.00	0.00	0.00	0.00	0.00	1.0	410.00	415.20	5.20	0.21	0.036	0.036	1.11	0.039	0%
<b>Total Flow</b>														<b>208</b>		

Measurement Details:	
Start Time (MST):	9:15
End Time (MST):	12:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light snow, Calm, -4°C

Flow characteristics:	
Total Flow:	208 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	596.09 (m <sup>2</sup> )
Wetted Width:	414.70 (m)
Hydraulic Depth:	1.437 (m)
Mean Velocity:	0.349 (m/s)
Froude Number:	0.093

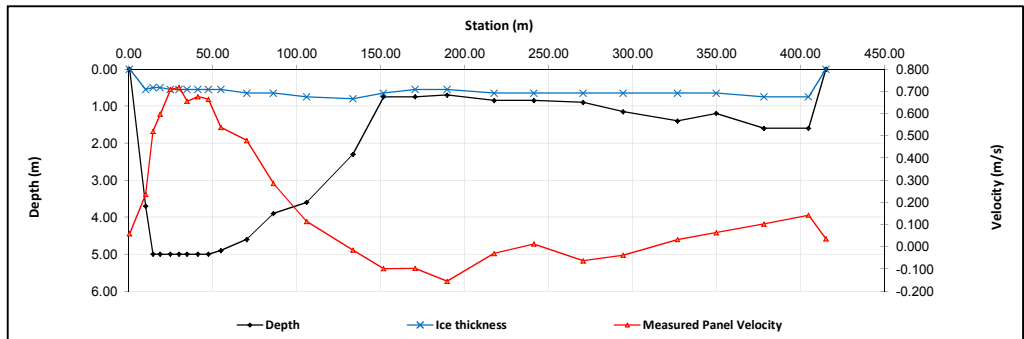
Logger Details:		Before	After
Transducer Reading (m):		1.220	-
Transducer Reading (m):		5.405	-
Water (°C):		0.1	-
Battery (Main):		14.5	-
Datalogger Clock:		11:36	-
Laptop Clock:		11:35	-
Enclosure Dessoricant:		Good	-
Logger# (if Δ):		21256	-
PT# (if Δ):		-	-
Vent Tube Dessoricant:		Good	-

**Datalogger / Station Notes:**

- Data logger serial number was recorded from the wiring panel.

**General Notes:**

- RAN ADV test, All good



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S46-01	1.024	101.024		100.000	100.000	3/4" Pipe 2 m S of logger
S46-02			1.247	99.777	99.771	3/4" Pipe 6 m S of logger
S46-03			2.507	98.517	98.503	3/4" Pipe on Lower Bench
Ice/PT:			5.725	95.299		
Water Level:			5.737	95.287		
Other:						
<b>Setup #2</b>						
S46-01			1.01	100.002	100.000	3/4" Pipe 2 m S of logger
S46-02			1.235	99.777	99.771	3/4" Pipe 6 m S of logger
S46-03	2.495	101.012		98.517	98.503	3/4" Pipe on Lower Bench
Ice/PT:			5.712	95.300		
Water Level:			5.721	95.291		
Other:						

Closing Error	-0.002
WL Check	0.004

Average WL	95.289
Transducer Elevation Before	94.069
Transducer Elevation After	-

Field Personnel:	TR AND SM	Trip Date:	10-Mar-13
Data Entry Personnel:	TR	Date:	10-Mar-13
Data Check Personnel:	SM	Date:	13-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta

UTM Location: 470235 E, 6463205 N

Site Visit Date:

March 28, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	3.00	3.00	0.93	0.080	0.080	2.80	0.223	0%
1	6.00	4.25	0.52	0.317	0.320		1.0	3.00	11.50	8.50	3.73	0.319	0.319	31.71	10.098	5%
2	17.00	4.85	0.55	0.704	0.663		1.0	11.50	20.00	8.50	4.30	0.684	0.684	36.55	24.982	13%
3	23.00	5.20	0.55	0.710	0.702		1.0	20.00	25.75	5.75	4.65	0.706	0.706	26.74	18.877	10%
4	28.50	5.45	0.60	0.693	0.746		1.0	25.75	32.00	6.25	4.85	0.720	0.720	30.31	21.810	11%
5	35.50	5.50	0.60	0.654	0.689		1.0	32.00	38.25	6.25	4.90	0.672	0.672	30.63	20.565	11%
6	41.00	5.45	0.60	0.626	0.647		1.0	38.25	44.00	5.75	4.85	0.637	0.637	27.89	17.750	9%
7	47.00	5.40	0.62	0.416	0.554		1.0	44.00	50.50	6.50	4.78	0.485	0.485	31.07	15.069	8%
8	54.00	5.25	0.70	0.146	0.460		1.0	50.50	59.25	8.75	4.55	0.303	0.303	39.81	12.063	6%
9	64.50	4.50	0.66	0.190	0.424		1.0	59.25	71.25	12.00	3.84	0.307	0.307	46.08	14.147	7%
10	78.00	3.20	0.60	0.336	0.222		1.0	71.25	87.75	16.50	2.60	0.279	0.279	42.90	11.969	6%
11	97.50	3.28	0.80	0.290	0.258		1.0	87.75	110.75	23.00	2.48	0.274	0.274	57.04	15.629	8%
12	124.00	1.00	0.70	0.105			0.9	110.75	133.25	22.50	0.30	0.105	0.095	6.75	0.638	0%
13	142.50	0.95	0.75	0.151			0.9	133.25	152.50	19.25	0.20	0.151	0.136	3.85	0.523	0%
14	162.50	0.84	0.70	0.457			0.9	152.50	171.75	19.25	0.14	0.457	0.411	2.70	1.108	1%
15	181.00	0.95	0.62	-0.008			0.9	171.75	185.50	13.75	0.33	-0.008	-0.007	4.54	-0.033	0%
16	190.00	0.92	0.62	-0.071			0.9	185.50	199.40	13.90	0.30	-0.071	-0.064	4.17	-0.266	0%
17	208.80	0.80	0.60	-0.106			0.9	199.40	215.15	15.75	0.20	-0.106	-0.095	3.15	-0.301	0%
18	221.50	1.00	0.65	-0.071			0.9	215.15	228.85	13.70	0.35	-0.071	-0.064	4.80	-0.306	0%
19	236.20	0.90	0.70	-0.102			0.9	228.85	243.35	14.50	0.20	-0.102	-0.092	2.90	-0.266	0%
20	250.50	1.20	0.70	0.031			0.9	243.35	256.75	13.40	0.50	0.031	0.028	6.70	0.187	0%
21	263.00	1.00	0.65	-0.034			0.9	256.75	270.10	13.35	0.35	-0.034	-0.031	4.67	-0.143	0%
22	277.20	1.00	0.65	0.098			0.9	270.10	284.45	14.35	0.35	0.098	0.088	5.02	0.443	0%
23	291.70	0.98	0.70	-0.025			0.9	284.45	298.70	14.25	0.28	-0.025	-0.023	3.99	-0.090	0%
24	305.70	1.00	0.68	0.082			0.9	298.70	313.10	14.40	0.32	0.082	0.074	4.61	0.340	0%
25	320.50	1.30	0.70	0.062			0.9	313.10	327.10	14.00	0.60	0.062	0.056	8.40	0.469	0%
26	333.70	1.35	0.70	0.073			0.9	327.10	340.95	13.85	0.65	0.073	0.066	9.00	0.591	0%
27	348.20	1.40	0.70	0.137			0.9	340.95	355.55	14.60	0.70	0.137	0.123	10.22	1.260	1%
28	362.90	1.50	0.70	0.146			0.9	355.55	369.55	14.00	0.80	0.146	0.131	11.20	1.472	1%
29	376.20	1.78	0.78	0.142	0.130		0.9	369.55	380.45	10.90	1.00	0.142	0.128	10.90	1.393	1%
LB	384.70	0.00	0.00	0.00	0.00	0.00	1.0	380.45	373.80	6.65	0.25	0.036	0.036	1.66	0.059	0%
<b>Total Flow</b>														<b>190</b>		

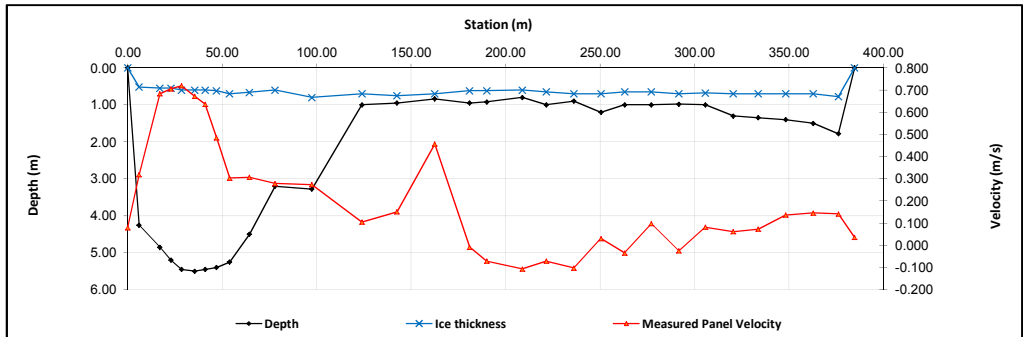
<b>Measurement Details:</b>	
Start Time (MST):	13:00
End Time (MST):	15:58
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	-

<b>Flow characteristics:</b>		
Total Flow:	190	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	512.74	(m <sup>2</sup> )
Wetted Width:	380.45	(m)
Hydraulic Depth:	1.348	(m)
Mean Velocity:	0.371	(m/s)
Froude Number:	0.102	

<b>Logger Details:</b>		
1. Transducer Reading (m):	1.262	-
2. Transducer Reading (m):	5.446	-
1. Water (°C):	0.1	-
2. Water (°C):	0.9	-
Battery (Main):	14.2	-
Datalogger Clock:	3:45	-
Laptop Clock:	3:46	-
Enclosure Dessoricant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessoricant:	Good	-

Datalogger / Station Notes:

General Notes:



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S46-01	1.054	101.054		100.000	100.000	3/4" Pipe 2 m S of logger
S46-02					99.771	3/4" Pipe 6 m S of logger
S46-03			2.538	98.516	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.71	95.344		
Water Level:			5.738	95.316		
Other:						
<b>Setup #2</b>						
S46-01			1.044	100.000	100.000	3/4" Pipe 2 m S of logger
S46-02					99.771	3/4" Pipe 6 m S of logger
S46-03	2.528	101.044		98.516	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.7	95.344		
Water Level:			5.725	95.319		
Other:						

Closing Error	0.000
WL Check	0.003
Average WL	95.318
Transducer Elevation Before	94.0555
Transducer Elevation After	-

<b>Field Personnel:</b>	CJ, XP	Trip Date:	28-Mar-13
<b>Data Entry Personnel:</b>	CJ	Date:	28-Mar-13
<b>Data Check Personnel:</b>	SM	Date:	16-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S46 Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: May 23, 2013  
 Site Visit Time (MST): 14:10



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	11.00	0.00	0.000	0.00	0.000	
1	22.00	4.69			3.75	0.820	0.94	1.210	1.00	20.50	4.69	1.015	96.15	97.587	4%	
2	41.00	3.99			3.19	1.150	0.80	1.330	1.00	20.50	3.99	1.240	81.80	101.426	5%	
3	63.00	3.87			3.10	1.020	0.77	1.500	1.00	22.00	3.87	1.260	85.14	107.276	5%	
4	85.00	3.68			2.94	1.220	0.74	1.520	1.00	20.00	3.68	1.370	73.60	100.832	5%	
5	103.00	3.83			3.06	1.010	0.77	1.440	1.00	16.00	3.83	1.225	61.28	75.068	3%	
6	117.00	3.63			2.90	1.250	0.73	1.470	1.00	21.50	3.63	1.360	78.05	106.141	5%	
7	146.00	3.38			2.70	1.000	0.68	1.390	1.00	23.50	3.38	1.195	79.43	94.919	4%	
8	164.00	3.78			3.02	1.110	0.76	1.580	1.00	17.50	3.78	1.345	66.15	88.972	4%	
9	181.00	3.74			2.99	0.870	0.75	1.250	1.00	21.50	3.74	1.060	80.41	85.235	4%	
10	207.00	3.83			3.06	1.210	0.77	1.590	1.00	21.50	3.63	1.400	82.35	115.263	5%	
11	224.00	4.39			3.51	1.030	0.88	1.270	1.00	18.50	4.39	1.150	81.22	93.397	4%	
12	244.00	4.40			3.52	1.110	0.88	1.360	1.00	17.50	4.40	1.235	77.00	95.095	4%	
13	259.00	4.49			3.59	1.117	0.90	1.147	1.00	20.00	4.49	1.132	89.80	101.654	5%	
14	284.00	5.25			4.20	0.940	1.05	1.440	1.00	20.00	5.25	1.190	105.00	124.950	6%	
15	299.00	5.30			4.24	0.930	1.06	1.370	1.00	17.00	5.30	1.150	90.10	103.615	5%	
16	318.00	5.31			4.25	1.010	1.06	1.510	1.00	20.00	5.31	1.260	106.20	133.812	6%	
17	339.00	6.37			5.10	0.900	1.27	1.580	1.00	19.00	6.37	1.240	121.03	150.077	7%	
18	356.00	7.56			6.05	0.810	1.51	1.140	1.00	18.00	7.56	0.975	136.08	132.678	6%	
19	375.00	7.07			5.66	1.080	1.41	1.370	1.00	14.00	7.07	1.225	98.98	121.251	5%	
20	384.00	7.22			5.78	0.890	1.44	1.170	1.00	10.00	7.22	1.030	72.20	74.366	3%	
21	395.00	5.91			4.73	0.190	1.18	1.160	1.00	28.00	5.91	0.675	165.48	111.699	5%	
RB	440.00	0.00	0.00		0.00					1.00	22.50	0.00	0.000	0.000		
<b>Total Flow</b>														<b>2220</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
Measurement conducted directly across from station

Meas. Start Time (MST):	12:00
Meas. End Time (MST):	13:40
Equipment:	ADC
Method:	Boat
River Condition:	Fast, WL Dropping
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 24°C

## Flow characteristics:

Total Flow:	2220	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1927.43	(m <sup>2</sup> )
Wetted Width:	440.00	(m)
Hydraulic Depth:	4.38	(m)
Mean Velocity:	1.15	(m/s)
Froude Number:	0.18	

## Logger Details:

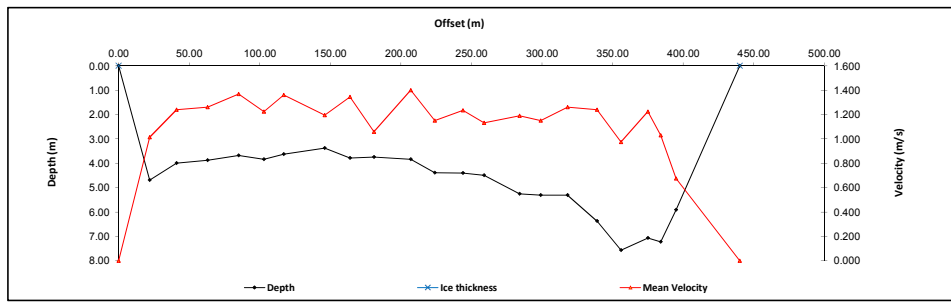
	Before	After
1. Transducer (0-4m) Reading (m):	-	-
2. Transducer (0-10m) Reading (m):	3.810	3.792
1. Water Temp. (°C):	-	-
2. Water Temp. (°C):	16.3	16.7
Datalogger Clock:	11:15	-
Laptop Clock:	11:16	-
Battery (Main):	13.7	-
Battery Condition:	New	-
Battery Serial #:	-	-
Enclosure Dessiccant:	New	-
Vent. Tube Dessiccant:	New	-
PT# (if replaced):	304013	262383
Logger# (if replaced):	-	39976

## Datalogger / Station Notes:

- A new monitoring station was installed and deployed.
- 3 new benchmarks were installed to replace damaged ones.
- Old solar panel was still functional, so was not replaced.

## General Notes:

- Water has receded from heli landing area leaving the area very muddy.
- Padlock for John boat is full of silt and will need to be cut off and replaced.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Station</b>							
<b>Setup #1</b>							
S46-04	1.123	100.871		99.748	99.748	3/4" Pipe 2 m S of logger	S46-5
S46-05			1.206	99.665	99.665	3/4" Pipe 6 m S of logger	S46-4
S46-06			2.265	98.606	98.606	3/4" Pipe on Lower Bench	S46-6
Ice/PT:							WL
Water Level:			2.923	97.948	Time WL Surveyed:	11:24	WL
Other:							S46-6
<b>Setup #2</b>							
S46-04			1.066	99.748	99.748	3/4" Pipe 2 m S of logger	S46-5
S46-05	1.149	100.814		99.665	99.665	3/4" Pipe 6 m S of logger	S46-4
S46-06			2.209	98.605	98.606	3/4" Pipe on Lower Bench	S46-6
Ice/PT:							WL
Water Level:			2.863	97.951	Time WL Surveyed:	11:26	WL
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S46-05	1.085	100.750	99.665			
Water Level:			2.817	97.933	Time WL Surveyed:	13:45	
Water Level:			2.757	97.930	Time WL Surveyed:	13:47	
BM	S46-05	1.022	100.687	99.665			

WL Survey Summary	Before	After
Average WL:	97.950	97.932
Transducer Elevation:	94.140	94.140
Closing Error:	0.000	-
WL Check:	0.003	0.003

Site Rating Information	
Measured Discharge:	2220
Expected Discharge:	2194.01
Shift from Existing Rating (m <sup>3</sup> /s):	-25.99
Shift from Existing Rating (%):	-1%

Field Personnel:	TR, JVR	Trip Date:	23-May-13
Data Entry Personnel:	TR	Date:	23-May-13
Data Check Personnel:	CJ	Date:	25-Oct-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N



Site Visit Date: June 16, 2013  
 Site Visit Time (MST): 08:20

Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)					
RB		0.00	0.00		0.000		0.000		0.000	1.00											
1										1.00											
2										1.00											
3										1.00											
4										1.00											
5										1.00											
6										1.00											
7										1.00											
8										1.00											
9										1.00											
10										1.00											
11										1.00											
12										1.00											
13										1.00											
14										1.00											
15										1.00											
16										1.00											
17										1.00											
18										1.00											
19										1.00											
20										1.00											
LB		0.00	0.00		0.000		0.000		0.000	1.00	0.00	0.00	0.000	0.00	0.000						
<b>Total Flow</b>																					

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):

Meas. End Time (MST):

Equipment:

Method:

River Condition:

Channel Edges:

Quality/Error (see reverse):

Weather:

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

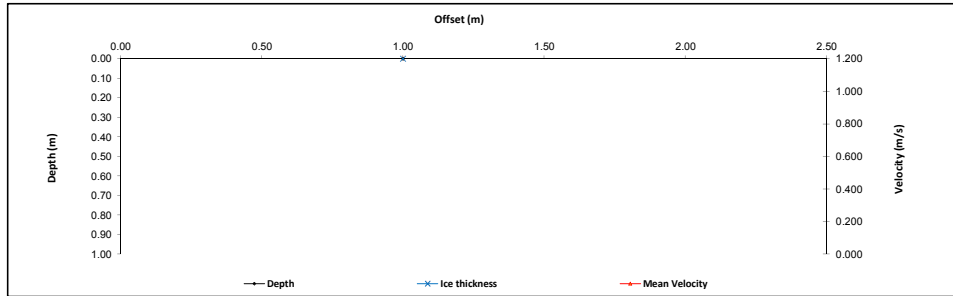
**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):		
Transducer #2 (0-10m) Reading (m):		
Water Temperature #1 (°C):		
Water Temperature #2 (°C):		
Datalogger Clock:		
Laptop Clock:		
Battery (Main):		
Battery Condition:		
Battery Serial #:		
Enclosure Dessicant:		
Vent Tube Dessicant:		
PTF# (if replaced):		
Logger# (if replaced):		

**Datalogger / Station Notes:**

**General Notes:**

- Station area was flooded upon arrival. Water level was 0.5 m below the logger enclosure. Helicopter could not land at the site.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S46-04					99.748	3/4" Pipe 2 m S of logger	
S46-05					99.665	3/4" Pipe 6 m S of logger	
S46-06					98.606	3/4" Pipe on Lower Bench	
Ice/PT:							
Water Level:						Time WL Surveyed:	
Other:							
<b>Setup #2</b>							
S46-04					99.748	3/4" Pipe 2 m S of logger	
S46-05					99.665	3/4" Pipe 6 m S of logger	
S46-06					98.606	3/4" Pipe on Lower Bench	
Ice/PT:							
Water Level:						Time WL Surveyed:	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM							

**WL Survey Summary**

	Before	After
Average WL:	-	-
Transducer Elevation:	-	-
Closing Error:	-	-
WL Check:	-	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Data Entry Personnel:	SG	Trip Date:	16-Jun-13
Data Check Personnel:	SM	Date:	10-Mar-14
Entered Digitally in the Field:	No		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N



Site Visit Date: August 10, 2013  
 Site Visit Time (MST): 08:15

Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	5.50	0.00	0.000	0.00	0.000	
1	11.00	4.60			3.68	0.500	0.92	0.660		1.00	9.50	4.60	0.580	43.70	25.346	2%
2	19.00	5.20			4.16	0.550	1.04	0.760		1.00	8.50	5.20	0.655	44.20	28.951	3%
3	28.00	4.98			3.98	0.740	1.00	0.800		1.00	10.50	4.98	0.770	52.29	40.263	4%
4	40.00	5.64			4.51	0.670	1.13	0.830		1.00	15.00	5.64	0.750	84.60	63.450	6%
5	58.00	5.63			4.50	0.590	1.13	0.860		1.00	19.00	5.63	0.725	106.97	77.553	7%
6	78.00	2.44			1.95	0.590	0.49	0.850		1.00	20.00	2.44	0.720	48.80	35.136	3%
7	98.00	2.07			1.66	0.670	0.41	0.930		1.00	18.50	2.07	0.800	38.30	30.636	3%
8	115.00	2.17			1.74	0.750	0.43	0.930		1.00	19.50	2.17	0.840	42.32	35.545	3%
9	137.00	2.23			1.78	0.740	0.45	0.900		1.00	20.00	2.23	0.820	44.60	36.572	3%
10	155.00	2.47			1.98	0.730	0.49	0.920		1.00	22.50	2.47	0.825	55.58	45.949	4%
11	182.00	2.42			1.94	0.660	0.48	1.010		1.00	21.00	2.42	0.835	50.82	42.435	4%
12	197.00	2.59			2.07	0.780	0.52	1.050		1.00	17.50	2.59	0.905	45.33	41.019	4%
13	217.00	2.91			2.33	0.740	0.58	0.950		1.00	21.50	2.91	0.845	62.57	52.967	5%
14	240.00	2.91			2.33	0.840	0.58	0.980		1.00	20.00	2.91	0.910	58.20	52.962	5%
15	257.00	3.12			2.50	0.550	0.62	1.030		1.00	20.00	3.12	0.790	62.40	49.296	4%
16	280.00	3.06			2.45	0.990	0.61	1.060		1.00	20.50	3.06	1.025	62.73	64.298	6%
17	298.00	3.35			2.68	0.830	0.67	1.010		1.00	23.00	3.35	0.920	77.05	70.886	6%
18	326.00	5.28			4.22	0.630	1.06	0.930		1.00	21.50	5.28	0.780	113.52	88.546	8%
19	341.00	5.01			4.01	0.690	1.00	0.870		1.00	16.50	5.01	0.780	82.67	64.479	6%
20	359.00	5.15			4.12	0.630	1.03	0.950		1.00	19.00	5.15	0.790	97.85	77.302	7%
21	379.00	4.92			3.94	0.650	0.98	0.820		1.00	20.50	4.92	0.735	100.86	74.132	7%
LB	400.00		0.00		0.00					1.00	10.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1100</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	9:20
Meas. End Time (MST):	11:10
Equipment:	ADC
Method:	Boat
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, Calm 20°C

**Flow characteristics:**

Total Flow:	1100	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1375.33	(m <sup>2</sup> )
Wetted Width:	400.00	(m)
Hydraulic Depth:	3.44	(m)
Mean Velocity:	0.80	(m/s)
Froude Number:	0.14	

**Logger Details:**

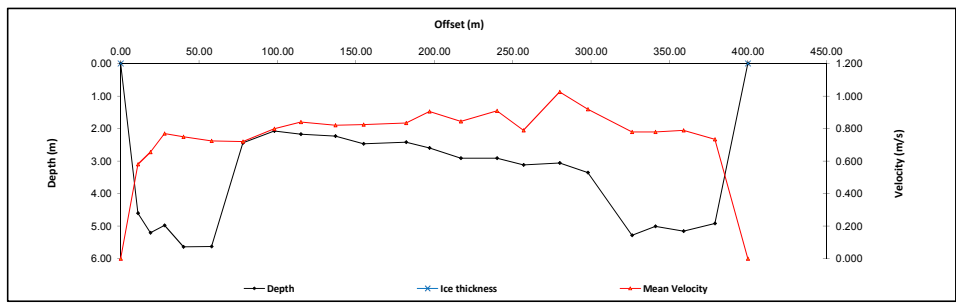
	Before	After
Transducer #1 (0-4m) Reading (m):	-	-
Transducer #2 (0-10m) Reading (m):	2.392	2.387
Water Temperature #1 (°C):	-	-
Water Temperature #2 (°C):	20.0	20.7
Datalogger Clock:	08:15	11:37
Laptop Clock:	08:16	11:36
Battery (Main):	13.9	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- BM 1 height from ground 0.482 m
- BM 2 height from ground 0.289 m

**General Notes:**

- GPS was used for offset position during flow measurement because the rangefinder would not work.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S46-04	1.217	100.965		99.748	99.748	3/4" Pipe 2 m S of logger	S46-4
S46-05			1.302	99.663	99.865	3/4" Pipe 6 m S of logger	S46-5
S46-06			2.359	98.606	98.606	3/4" Pipe on Lower Bench	Other
BM1 (damaged)			1.084	99.881		3/4" Pipe 2 m S of logger (bent)	Other
TBM A			1.458			2" Pipe with boat chain	WL
Water Level:			4.491	96.474		<b>Time WL Surveyed:</b> 8:51	WL
BM 2 (damaged)			1.319	99.646		3/4" Pipe 6 m S of logger	S46-6
<b>Setup #2</b>							
S46-04			1.206	99.747	99.748	3/4" Pipe 2 m S of logger	S46-4
S46-05			1.289	99.664	99.665	3/4" Pipe 6 m S of logger	Other
S46-06	2.347	100.953		98.606	98.606	3/4" Pipe on Lower Bench	Other
TBM A			1.447			2" Pipe with boat chain	WL
BM 1			1.073	99.880		3/4" Pipe 2 m S of logger (bent)	Other
Water Level:			4.479	96.474		<b>Time WL Surveyed:</b> 8:53	WL
BM 2			1.308	99.645		3/4" Pipe 6 m S of logger	S46-5
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S46-06	2.347	100.953		98.606		
Water Level:			4.482	96.471		<b>Time WL Surveyed:</b> 11:32	
Water Level:			4.470	96.472		<b>Time WL Surveyed:</b> 11:34	
BM:	S46-06	2.336	100.942		98.606		

**WL Survey Summary**

	Before	After
Average WL:	96.474	96.472
Transducer Elevation:	94.082	94.085
Closing Error:	0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	1100
Expected Discharge:	1124.55
Shift from Existing Rating (m <sup>3</sup> /s):	24.55
Shift from Existing Rating (%):	2%

**Field Personnel:**

SM, TR	Trip Date:	10-Aug-13
SM	Date:	10-Aug-13
SM	Date:	29-Aug-13
Yes	Entered Digitally in the Field:	

START  
 ↓  
 END

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
UTM Location: 470235 E, 6463205 N



Site Visit Date: September 14, 2013  
Site Visit Time (MST): 09:55

Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mnet #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	1.00	6.50	0.00	0.000	0.00	0.000	
1	16.00	2.94			2.35	0.410	0.59	0.510	0.510	1.00	10.00	2.94	0.460	29.40	13.524	2%
2	23.00	3.63			2.90	0.530	0.73	0.620	0.620	1.00	8.00	3.63	0.575	29.04	16.698	2%
3	32.00	4.16			3.33	0.620	0.83	0.610	0.610	1.00	10.00	4.16	0.615	41.60	25.584	4%
4	43.00	4.33			3.46	0.580	0.87	0.760	0.760	1.00	15.50	4.33	0.670	67.12	44.967	6%
5	63.00	3.91			3.13	0.640	0.78	0.750	0.750	1.00	23.50	3.91	0.695	91.89	63.860	9%
6	90.00	2.61			2.09	0.690	0.52	0.890	0.890	1.00	26.50	2.61	0.790	69.17	54.640	8%
7	116.00	2.64			2.11	0.620	0.53	0.700	0.700	1.00	24.50	2.64	0.660	64.68	42.689	6%
8	139.00	2.67			2.14	0.490	0.53	0.760	0.760	1.00	23.00	2.67	0.625	61.41	38.381	6%
9	162.00	2.24			1.79	0.260	0.45	0.590	0.590	1.00	21.50	2.24	0.425	48.16	20.468	3%
10	182.00	2.38			1.90	0.230	0.48	0.660	0.660	1.00	19.00	2.38	0.445	45.22	20.123	3%
11	200.00	2.01			1.61	0.600	0.40	0.890	0.890	1.00	18.00	2.01	0.745	36.18	26.854	4%
12	218.00	1.70			1.36	0.680	0.34	0.830	0.830	1.00	22.50	1.70	0.755	38.25	28.879	4%
13	245.00	1.57			1.26	0.700	0.31	0.860	0.860	1.00	22.00	1.57	0.780	34.54	26.941	4%
14	262.00	1.39			1.11	0.660	0.28	0.940	0.940	1.00	18.50	1.39	0.800	25.72	20.572	3%
15	282.00	1.52			1.22	0.730	0.30	0.910	0.910	1.00	23.50	1.52	0.820	35.72	29.290	4%
16	309.00	1.46			1.17	0.760	0.29	0.830	0.830	1.00	32.50	1.46	0.795	47.45	37.723	5%
17	347.00	1.65			1.32	0.750	0.33	0.900	0.900	1.00	21.50	1.65	0.825	35.48	29.267	4%
18	352.00	4.10			3.28	0.640	0.82	0.760	0.760	1.00	7.50	4.10	0.700	30.75	21.525	3%
19	362.00	5.21			4.17	0.540	1.04	0.750	0.750	1.00	10.50	5.21	0.645	54.71	35.285	5%
20	373.00	4.72			3.78	0.540	0.94	0.570	0.570	1.00	10.50	4.72	0.555	49.56	27.506	4%
21	383.00	4.63			3.70	0.630	0.93	0.630	0.630	1.00	10.00	4.63	0.630	46.30	29.169	4%
22	393.00	4.78			3.62	0.610	0.96	0.670	0.670	1.00	12.50	4.78	0.640	59.75	38.240	6%
RB	408.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	7.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>692</b>	<b>100%</b>

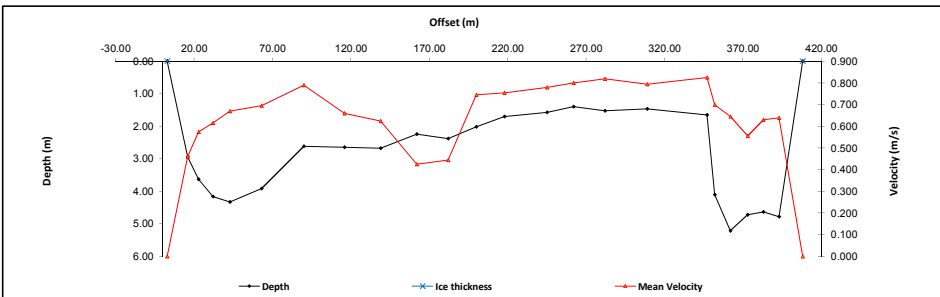
Flow Measurement Details:	
Metering Section Location (describe):	
-	
Meas. Start Time (MST):	11:05
Meas. End Time (MST):	12:55
Equipment:	ADC
Method:	Boat
River Condition:	Good
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 15°C

Flow characteristics:		
Total Flow:	692	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1042.07	(m <sup>2</sup> )
Wetted Width:	405.00	(m)
Hydraulic Depth:	2.57	(m)
Mean Velocity:	0.66	(m/s)
Froude Number:	0.13	

Logger Details:		
Transducer #1 (0-4m) Reading (m):	-	-
Transducer #2 (0-10m) Reading (m):	1.605	1.604
Water Temperature #1 (°C):	-	-
Water Temperature #2 (°C):	16.9	17.1
Datalogger Clock:	10:05	13:17
Laptop Clock:	10:05	13:18
Battery (Main):	14.3	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S46-04	1.191	100.939		99.748	99.748	3/4" Pipe 2 m S of logger	S46-6
S46-05			1.275	99.684	99.665	3/4" Pipe 6 m S of logger	S46-5
S46-06			2.333	98.606	98.606	3/4" Pipe on Lower Bench	WL
Ice/PT:							WL
Water Level:			5.242	95.697		Time WL Surveyed: 10:21	S46-5
Other:							S46-4
<b>Setup #2</b>							
S46-04			1.158	99.749	99.748	3/4" Pipe 2 m S of logger	S46-6
S46-05	1.243	100.907		99.664	99.665	3/4" Pipe 6 m S of logger	S46-5
S46-06			2.299	98.608	98.606	3/4" Pipe on Lower Bench	WL
Ice/PT:							WL
Water Level:			5.213	95.694		Time WL Surveyed: 10:24	S46-5
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S46-06	2.248	100.854		98.606			
Water Level:			5.171	95.683		Time WL Surveyed: 13:02	
Water Level:			5.207	95.673		Time WL Surveyed: 13:09	
BM: S46-06	2.274	100.880		98.606			

WL Survey Summary		Site Rating Information	
Average WL:	95.696	Measured Discharge:	692
Transducer Elevation:	94.091	Expected Discharge:	696.57
Closing Error:	-0.001	Shift from Existing Rating (m <sup>3</sup> /s):	4.57
WL Check:	0.003	Shift from Existing Rating (%):	1%

Field Personnel:		Trip Date:	
Data Entry Personnel:	TR, CB, JP	Date:	14-Sep-13
Data Check Personnel:	CJ	Date:	14-Sep-13
Entered Digitally in the Field:	Yes	Date:	24-Oct-13

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: October 16, 2013  
 Site Visit Time (MST): 08:30



Flow Measurement:												Measured Data												Calculated Data											
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)																			
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	5.00	0.00	0.000	0.00	0.000																				
1	10.00	2.92				2.34	0.390	0.58	0.570	1.00	11.00	2.92	0.480	32.12	15.418	3%																			
2	22.00	4.32				3.46	0.470	0.86	0.570	1.00	13.45	4.32	0.520	58.10	30.214	6%																			
3	36.90	4.58				3.66	0.440	0.92	0.560	1.00	16.70	4.58	0.500	76.49	38.243	7%																			
4	55.40	1.19				0.95	0.540	0.24	0.620	1.00	18.15	1.19	0.580	21.60	12.527	2%																			
5	73.20	1.31				1.05	0.610	0.26	0.660	1.00	18.15	1.31	0.635	23.78	15.098	3%																			
6	91.00	1.97				1.58	0.410	0.39	0.640	1.00	18.00	1.97	0.525	35.46	18.617	3%																			
7	109.20	1.43				1.14	0.550	0.29	0.690	1.00	20.50	1.43	0.620	29.32	18.175	3%																			
8	132.00	1.30				1.04	0.630	0.26	0.800	1.00	20.15	1.30	0.715	26.20	18.729	3%																			
9	149.50	1.30				1.04	0.620	0.26	0.790	1.00	20.50	1.30	0.705	26.65	18.788	3%																			
10	173.00	1.38				1.10	0.570	0.28	0.750	1.00	22.25	1.38	0.660	30.71	20.265	4%																			
11	194.00	1.36				1.09	0.600	0.27	0.780	1.00	23.50	1.36	0.690	31.96	22.052	4%																			
12	220.00	1.48				1.18	0.640	0.30	0.750	1.00	24.50	1.48	0.695	36.26	25.201	5%																			
13	243.00	2.14				1.71	0.580	0.43	0.760	1.00	24.00	2.14	0.670	51.36	34.411	6%																			
14	268.00	1.97				1.58	0.660	0.39	0.840	1.00	24.00	1.97	0.750	47.28	35.460	6%																			
15	291.00	2.52				2.02	0.500	0.50	0.770	1.00	22.50	2.52	0.635	56.70	36.055	7%																			
16	313.00	2.37				1.90	0.760	0.47	0.820	1.00	23.00	2.37	0.790	54.51	43.063	8%																			
17	337.00	3.55				2.84	0.520	0.71	0.820	1.00	20.00	3.55	0.670	71.00	47.570	9%																			
18	353.00	3.45				2.76	0.680	0.69	0.790	1.00	12.00	3.45	0.735	41.40	30.429	6%																			
19	361.00	3.81				3.05	0.630	0.76	0.830	1.00	14.00	3.81	0.730	53.34	38.938	7%																			
20	381.00	2.51				2.01	0.510	0.50	0.550	1.00	18.00	2.51	0.530	45.18	23.945	4%																			
21	397.00	1.96				1.57	0.280	0.39	0.260	1.00	11.50	1.96	0.270	22.54	6.086	1%																			
LB	404.00	0.00	0.00		0.00					1.00	3.50	0.00	0.000	0.00	0.000																				
<b>Total Flow</b>														<b>549</b>	<b>100%</b>																				

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	14:50
Equipment:	ADC
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, +9°C

**Flow characteristics:**

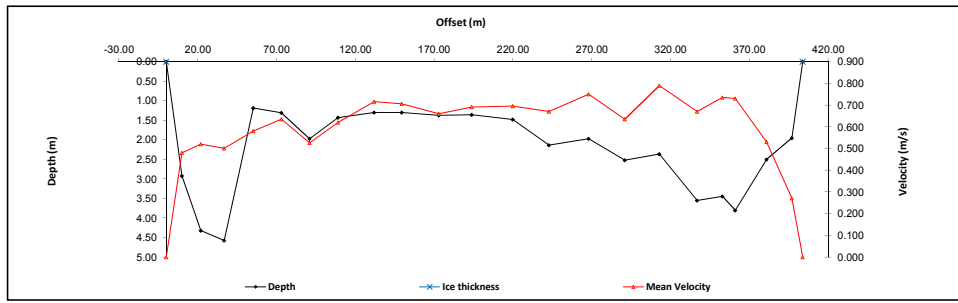
Total Flow:	549	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	871.94	(m <sup>2</sup> )
Wetted Width:	404.00	(m)
Hydraulic Depth:	2.16	(m)
Mean Velocity:	0.63	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	-	-
Transducer #2 (0-10m) Reading (m):	1.251	1.246
Water Temperature #1 (°C):	-	-
Water Temperature #2 (°C):	6.7	7.0
Datalogger Clock:	08:37	15:08
Laptop Clock:	08:35	15:06
Battery (Main):	12.9	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S46-4
S46-04	1.224	100.972		99.748	99.748	3/4" Pipe 2 m S of logger	S46-5
S46-05			1.307	99.665	99.665	3/4" Pipe 6 m S of logger	S46-6
S46-06			2.365	98.607	98.606	3/4" Pipe on Lower Bench	WL
Ice/PT:							WL
Water Level:			5.635	95.337		Time WL Surveyed: 9:19	S46-6
Other:							S46-5
<b>Setup #2</b>							S46-4
S46-04			1.203	99.748	99.748	3/4" Pipe 2 m S of logger	
S46-05			1.286	99.665	99.665	3/4" Pipe 6 m S of logger	
S46-06	2.344	100.951		98.607	98.606	3/4" Pipe on Lower Bench	
Ice/PT:							
Water Level:			5.615	95.336		Time WL Surveyed: 9:19	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S46-06	2.314	100.921		98.607			
Water Level:			6.372	94.549		Time WL Surveyed: 15:17	
Water Level:			6.359	94.545		Time WL Surveyed: 15:20	
BM: S46-06	2.297	100.904		98.607			

**WL Survey Summary**

	Before	After
Average WL:	95.337	94.547
Transducer Elevation:	94.086	93.301
Closing Error:	0.000	-
WL Check:	0.001	0.004

**Site Rating Information**

Measured Discharge:	549
Expected Discharge:	531.87
Shift from Existing Rating (m <sup>3</sup> /s):	-17.13
Shift from Existing Rating (%):	-3%

**Field Personnel:**

SM, DW	Trip Date:	16-Oct-13
SM, DW	Date:	16-Oct-13
CJ	Date:	25-Oct-13
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N



Site Visit Date: December 5, 2013  
 Site Visit Time (MST): 11:05

Flow Measurement:											Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)								
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	3.90	0.00	0.000	0.00	0.000									
1	7.80	2.36	0.43			1.97	0.231	0.82	0.424	1.00	9.90	1.93	0.328	19.11	6.258	2%								
2	19.80	4.92	0.31			4.00	0.639	1.23	0.633	1.00	14.10	4.61	0.636	65.00	41.341	16%								
3	36.00	5.00	0.34			4.07	0.538	1.27	0.455	1.00	15.70	4.66	0.497	73.16	36.325	14%								
4	51.20	2.38	0.40			1.98	0.218	0.80	0.097	1.00	12.00	1.98	0.158	23.76	3.742	1%								
5	60.00	2.19	0.33			1.82	0.108	0.70	0.080	1.00	9.50	1.86	0.094	17.67	1.661	1%								
6	70.20	2.20	0.34		0.348	1.83	0.108	0.71		0.88	13.40	1.86	0.306	24.92	7.633	3%								
7	86.80	2.50	0.35		0.214	2.07	0.214	0.78		0.88	17.15	2.15	0.188	36.87	6.944	3%								
8	104.50	1.82	0.44		0.054	1.54	0.72	0.72		0.88	17.35	1.38	0.048	23.94	1.138	0%								
9	121.50	1.69	0.35		0.670	1.42	0.62	0.62		0.88	17.00	1.34	0.590	22.78	13.431	5%								
10	136.50	1.70	0.35		0.099	1.43	0.62	0.62		0.88	16.75	1.35	0.067	22.61	1.970	1%								
11	155.00	1.85	0.36		0.120	1.55	0.66	0.66		0.88	13.80	1.49	0.106	20.56	2.171	1%								
12	166.10	1.85	0.33		0.061	1.55	0.63	0.63		0.88	25.00	1.52	0.054	38.00	2.040	1%								
13	205.00	1.92	0.45		0.208	1.63	0.74	0.74		0.88	28.20	1.47	0.183	41.45	7.588	3%								
14	222.50	2.41	0.38		0.104	2.00	0.79	0.79		0.88	26.50	2.03	0.092	53.80	4.923	2%								
15	258.00	2.77	0.57		0.150	2.33	1.01	1.01		0.88	42.75	2.20	0.132	94.05	12.415	5%								
16	308.00	2.84	0.32		0.354	2.34	0.82	0.82		0.88	37.00	2.52	0.312	93.24	29.046	11%								
17	332.00	5.00	0.25		0.369	4.05	1.20	1.20		0.88	24.50	4.75	0.325	116.38	37.789	15%								
18	357.00	4.57	0.48		0.424	3.75	1.30	1.30		0.88	20.50	4.09	0.373	83.85	31.284	12%								
19	373.00	2.48	0.48		0.238	2.08	0.88	0.88		0.88	15.50	2.00	0.209	31.00	6.493	3%								
20	388.00	2.29	0.25		0.063	1.88	0.66	0.66		0.88	15.45	2.04	0.055	31.52	1.747	1%								
LB	403.90	0.00	0.00		0.00		0.00		0.00	0.88	7.95	0.00	0.000	0.00	0.000									
<b>Total Flow</b>														<b>256</b>	<b>100%</b>									

**Flow Measurement Details:**

Metering Section Location (describe):  
Measurement conducted 30 m downstream from station

Meas. Start Time (MST):	13:10
Meas. End Time (MST):	14:25
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Snowing, windy, -30°C

**Flow characteristics:**

Total Flow:	256	(m³/s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	933.67	(m²)
Wetted Width:	403.90	(m)
Hydraulic Depth:	2.31	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.06	

**Logger Details:**

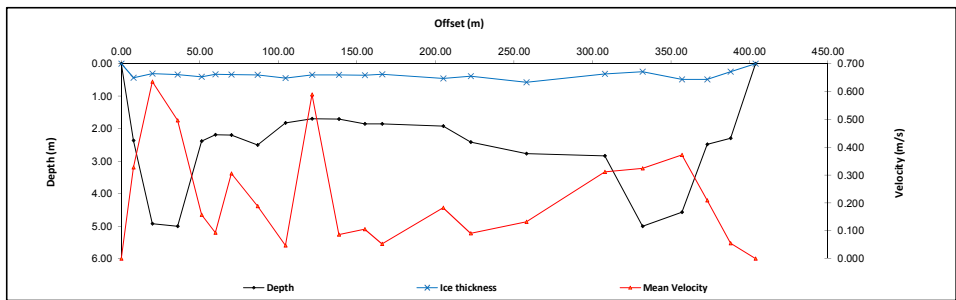
	Before	After
Transducer #1 (0-4m) Reading (m):	1.749	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.4	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	12:37	-
Laptop Clock:	12:36	-
Battery (Main):	14.9	-
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PTF (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Uploaded new data logger program
- Replaced both batteries.

**General Notes:**

- There was a layer of slush under the ice.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S46-5
S46-04	1.137	100.885		99.748	99.748	3/4" Pipe 2 m S of logger	S46-4
S46-05			1.221	99.664	99.665	3/4" Pipe 6 m S of logger	S46-6
S46-06			2.279	98.606	98.606	3/4" Pipe on Lower Bench	WL
Ice/PT:			5.041	95.844			Ice
Water Level:			5.051	95.834			Ice
Other:							WL
<b>Setup #2</b>							S46-6
S46-04			1.098	99.749	99.748	3/4" Pipe 2 m S of logger	S46-4
S46-05			1.183	99.664	99.665	3/4" Pipe 6 m S of logger	S46-5
S46-06	2.241	100.847		98.606	98.606	3/4" Pipe on Lower Bench	S46-5
Ice/PT:			5.003	95.844			
Water Level:			5.015	95.832			
Other:							0
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:							Time WL Surveyed:
Water Level:							Time WL Surveyed:
BM:							

WL Survey Summary	Before	After
Average WL:	95.833	-
Transducer Elevation:	94.084	-
Closing Error:	-0.001	-
WL Check:	0.002	-

Site Rating Information	
Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m³/s):	-
Shift from Existing Rating (%):	-

Field Personnel:	TR AND RM	Trip Date:	5-Dec-13
Data Entry Personnel:	RM	Date:	5-Dec-13
Data Check Personnel:	SM	Date:	10-Mar-14
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

January 8, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	3.50	0.00	0.00	0.000	0.000	0.000	0.9	3.50	7.00	3.50	0.26	0.000	0.000	0.92	0.000	0%
1	10.50	1.20	0.15	0.001			0.9	7.00	14.95	7.95	1.05	0.001	0.001	8.35	0.008	0%
2	19.40	1.40	0.15	0.000			1.0	14.95	21.75	6.80	1.25	0.000	0.000	8.50	0.000	0%
3	24.10	1.40	0.25	0.000			1.0	21.75	25.35	3.60	1.15	0.000	0.000	4.14	0.000	0%
4	26.60	1.50	0.30	0.004			0.9	25.35	27.20	1.85	1.20	0.004	0.004	2.22	0.008	0%
5	27.80	1.50	0.30		0.046	-0.002	1.0	27.20	28.30	1.10	1.20	0.022	0.022	1.32	0.029	0%
6	28.80	1.45	0.35		0.383	0.005	1.0	28.30	29.15	0.85	1.10	0.194	0.194	0.93	0.181	1%
7	29.50	1.50	0.40		0.529	0.002	1.0	29.15	30.25	1.10	1.10	0.266	0.266	1.21	0.321	2%
8	31.00	1.60	0.40		0.712	0.812	1.0	30.25	31.60	1.35	1.20	0.762	0.762	1.62	1.234	8%
9	32.20	1.55	0.30		0.631	0.811	1.0	31.60	32.70	1.10	1.25	0.721	0.721	1.38	0.991	7%
10	33.20	1.55	0.35		0.697	0.872	1.0	32.70	33.80	1.10	1.20	0.785	0.785	1.32	1.036	7%
11	34.40	1.55	0.35		0.648	0.902	1.0	33.80	34.95	1.15	1.20	0.775	0.775	1.38	1.070	7%
12	35.50	1.50	0.35		0.599	0.861	1.0	34.95	36.05	1.10	1.15	0.730	0.730	1.26	0.923	6%
13	36.60	1.50	0.30		0.519	0.829	1.0	36.05	37.05	1.00	1.20	0.674	0.674	1.20	0.809	5%
14	37.50	1.50	0.30		0.537	0.874	1.0	37.05	38.05	1.00	1.20	0.706	0.706	1.20	0.847	6%
15	38.60	1.50	0.35		0.633	0.924	1.0	38.05	39.05	1.00	1.15	0.779	0.779	1.15	0.895	6%
16	39.50	1.50	0.45		0.527	0.928	1.0	39.05	40.15	1.10	1.05	0.728	0.728	1.16	0.840	6%
17	40.80	1.50	0.50		0.692	0.914	1.0	40.15	41.45	1.30	1.00	0.803	0.803	1.30	1.044	7%
18	42.10	1.50	0.55		0.545	0.807	1.0	41.45	43.15	1.70	0.95	0.676	0.676	1.62	1.092	7%
19	44.20	1.50	0.60		0.632	0.931	1.0	43.15	44.95	1.80	0.90	0.782	0.782	1.62	1.266	9%
20	45.70	1.50	0.40		0.695	0.904	1.0	44.95	46.40	1.45	1.10	0.800	0.800	1.60	1.275	9%
21	47.10	1.50	0.25		0.591	0.565	1.0	46.40	47.70	1.30	1.25	0.578	0.578	1.63	0.939	6%
22	48.30	1.50	0.50		0.001	0.000	1.0	47.70	51.10	3.40	1.00	0.001	0.001	3.40	0.002	0%
23	53.90	1.45	0.30	0.000			1.0	51.10	57.45	6.35	1.15	0.000	0.000	7.30	0.000	0%
LB	61.00	0.00	0.00	0.00	0.00	0.00	1.0	57.45	61.00	3.55	0.29	0.000	0.000	1.02	0.000	0%
														<b>Total Flow</b>	<b>14.8</b>	

**Measurement Details:**

Start Time (MST):	10:30
End Time (MST):	12:55
Equipment:	ADV
Method:	Ice
River Condition:	Slush under ice
Quality/Error (see reverse):	Fair
Weather:	Snowing, -12°C

**Flow characteristics:**

Total Flow:	14.8	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Fair	
Cross Section Area:	58.73	(m <sup>2</sup> )
Wetted Width:	57.50	(m)
Hydraulic Depth:	1.021	(m)
Mean Velocity:	0.252	(m/s)
Froude Number:	0.080	

**Logger Details:**

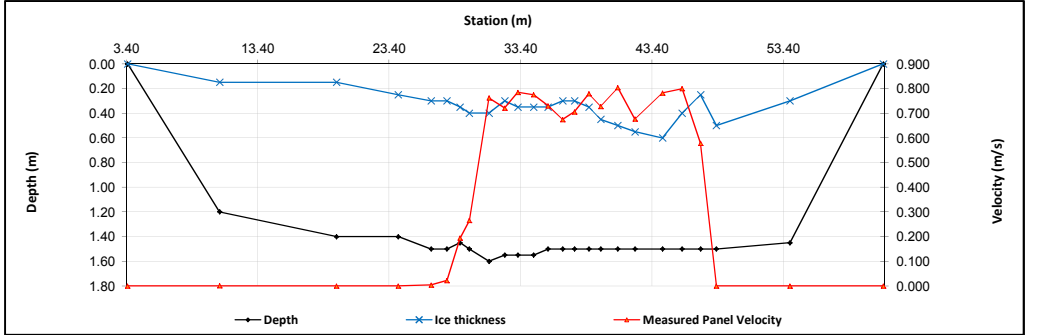
	Before	After
Transducer Reading (m):	1.295	-
Water (°C):	0.1	-
Battery (Main):	11.9	12.61
Datalogger Clock:	12:11	-
Laptop Clock:	12:11	-
Enclosure Dessiccant:	Good	-
Logger# (if Δ):	21898	-
PT# (if Δ):	-	-
Vent Tube Dessiccant:	Good	-

**Datalogger / Station Notes:**

- Installed 2nd battery

**General Notes:**

- Channel is effected by slush from 3.5 to 31 m and from 48.3 to 61 m  
 - Water level was fluctuating by 2 cm during survey



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S47A-01			0.137	100.100	100.095	3/4" Pipe 6 m SE of station
S47A-02	0.353	100.237		99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.662	99.575	99.579	3/4" Pipe 7 m S of station
Ice/PT:			2.788	97.449		
Water Level:			2.793	97.444		
Other:						
<b>Setup #2</b>						
S47A-01	0.153	100.253		100.100	100.095	3/4" Pipe 6 m SE of station
S47A-02			0.369	99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.678	99.575	99.579	3/4" Pipe 7 m S of station
Ice/PT:			2.811	97.442		
Water Level:			2.815	97.438		
Other:						

Closing Error	0.000	Average WL	97.441
WL Check	0.006	Transducer Elevation Before	96.146
		Transducer Elevation After	-

**Field Personnel:**

JG, SM, DW	Trip Date:	8-Jan-13
DW	Date:	8-Jan-13
TR	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO



# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

February 5, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.80	0.80	0.22	0.072	0.072	0.18	0.013	0%
1	5.60	1.32	0.43	0.209	0.194	0.364	1.0	4.80	6.30	1.50	0.89	0.287	0.287	1.34	0.382	4%
2	7.00	1.31	0.48	0.179	0.194	0.194	1.0	6.30	7.75	1.45	0.83	0.187	0.187	1.20	0.224	2%
3	8.50	1.40	0.49	0.213	0.10	0.10	1.0	7.75	9.25	1.50	0.91	0.112	0.112	1.37	0.152	1%
4	10.00	1.45	0.52	0.299	-0.004	-0.004	1.0	9.25	10.65	1.40	0.93	0.148	0.148	1.30	0.192	2%
5	11.30	1.37	0.51	0.465	0.477	0.477	1.0	10.65	11.95	1.30	0.86	0.471	0.471	1.12	0.527	5%
6	12.60	1.41	0.40	0.259	0.503	0.503	1.0	11.95	13.30	1.35	1.01	0.381	0.381	1.36	0.519	5%
7	14.00	1.42	0.44	0.394	0.400	0.400	1.0	13.30	14.60	1.30	0.98	0.397	0.397	1.27	0.506	5%
8	15.20	1.45	0.45	0.433	0.461	0.461	1.0	14.60	15.70	1.10	1.00	0.447	0.447	1.10	0.492	5%
9	16.20	1.43	0.40	0.464	0.516	0.516	1.0	15.70	16.60	0.90	1.03	0.490	0.490	0.93	0.454	4%
10	17.00	1.47	0.36	0.516	0.585	0.585	1.0	16.60	17.50	0.90	1.11	0.551	0.551	1.00	0.550	5%
11	18.00	1.49	0.37	0.461	0.748	0.748	1.0	17.50	18.60	1.10	1.12	0.605	0.605	1.23	0.745	7%
12	19.20	1.50	0.42	0.579	0.725	0.725	1.0	18.60	19.70	1.10	1.08	0.652	0.652	1.19	0.775	7%
13	20.20	1.50	0.43	0.536	0.670	0.670	1.0	19.70	20.65	0.95	1.07	0.603	0.603	1.02	0.613	6%
14	21.10	1.48	0.42	0.556	0.671	0.671	1.0	20.65	21.55	0.90	1.06	0.614	0.614	0.95	0.585	5%
15	22.00	1.45	0.43	0.476	0.573	0.573	1.0	21.55	22.55	1.00	1.02	0.525	0.525	1.02	0.535	5%
16	23.10	1.42	0.52	0.486	0.602	0.602	1.0	22.55	23.65	1.10	0.90	0.544	0.544	0.99	0.539	5%
17	24.20	1.39	0.45	0.455	0.527	0.527	1.0	23.65	24.60	0.95	0.94	0.491	0.491	0.89	0.438	4%
18	25.00	1.43	0.43	0.400	0.494	0.494	1.0	24.60	25.50	0.90	1.00	0.447	0.447	0.90	0.402	4%
19	26.00	1.39	0.41	0.358	0.524	0.524	1.0	25.50	26.60	1.10	0.98	0.441	0.441	1.08	0.475	4%
20	27.20	1.33	0.45	0.523	0.579	0.579	1.0	26.60	27.85	1.25	0.88	0.551	0.551	1.10	0.606	6%
21	28.50	1.30	0.37	0.450	0.624	0.624	1.0	27.85	29.35	1.50	0.93	0.537	0.537	1.40	0.749	7%
22	30.20	1.22	0.38	0.355	0.006	0.006	1.0	29.35	32.10	2.75	0.84	0.181	0.181	2.31	0.417	4%
LB	34.00	0.00	0.00	0.00	0.00	0.00	1.0	32.10	34.00	1.90	0.21	0.045	0.045	0.40	0.018	0%
<b>Total Flow</b>															<b>10.9</b>	

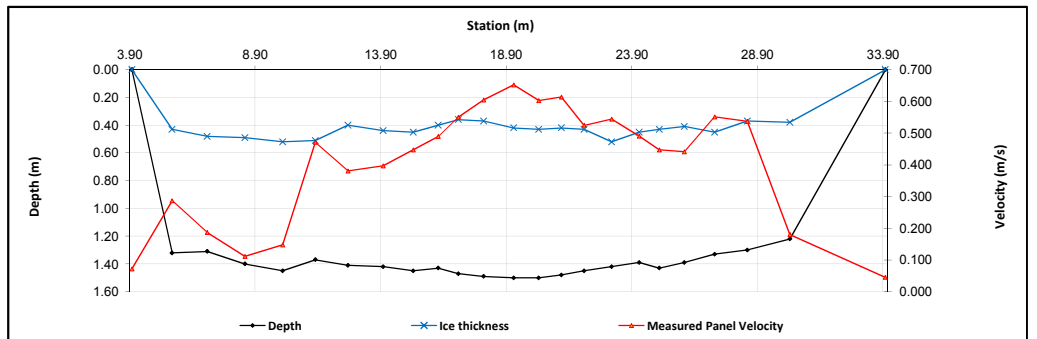
Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	12:52
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Light snow, -15°C

Flow characteristics:	
Total Flow:	10.9 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	26.64 (m <sup>2</sup> )
Wetted Width:	30.00 (m)
Hydraulic Depth:	0.888 (m)
Mean Velocity:	0.409 (m/s)
Froude Number:	0.139

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.893	-
Battery (Main):	12.9	13.04
Datalogger Clock:	12:27	-
Laptop Clock:	12:28	-
Enclosure Dessorant:	-	Replaced
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessorant:	-	Good

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	
-	Raised ice shelves well into channel confining flow to middle
-	A lot of slush under ice



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S47A-01			0.257	100.099	100.095	3/4" Pipe 6 m SE of station
S47A-02	0.472	100.356		99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.779	99.577	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.033	97.323		
Water Level:			3.317	97.039		
Other:						
<b>Setup #2</b>						
S47A-01	0.248	100.347		100.099	100.095	3/4" Pipe 6 m SE of station
S47A-02			0.463	99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.771	99.576	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.027	97.320		
Water Level:			3.309	97.038		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	97.039
Transducer Elevation Before	96.146
Transducer Elevation After	-

Field Personnel:	TR, CJ, JG	Trip Date:	5-Feb-13
Data Entry Personnel:	CJ	Date:	5-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

Site Visit Date:

March 2, 2013

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.20	0.00	0.00	0.000	0.000	0.000	0.9	4.20	7.00	2.80	0.02	0.001	0.001	0.06	0.000	0%
1	9.80	1.18	1.10	0.003			0.9	7.00	14.13	7.13	0.08	0.003	0.003	0.57	0.002	0%
2	18.45	1.37	1.05	0.021			0.9	14.13	19.98	5.85	0.32	0.021	0.019	1.87	0.035	0%
3	21.50	1.45	1.17	0.245			0.9	19.98	23.30	3.33	0.28	0.245	0.221	0.93	0.205	2%
4	25.10	1.50	0.83	0.271			0.9	23.30	26.43	3.13	0.67	0.271	0.244	2.09	0.511	4%
5	27.75	1.68	0.80		0.347	0.048	1.0	26.43	28.43	2.00	0.88	0.198	0.198	1.76	0.348	3%
6	29.10	1.68	0.78		0.397	0.048	1.0	28.43	29.75	1.33	0.90	0.223	0.223	1.19	0.265	2%
7	30.40	1.68	0.75		0.413	0.493	1.0	29.75	31.28	1.53	0.93	0.453	0.453	1.42	0.642	5%
8	32.15	1.62	0.65		0.497	0.472	1.0	31.28	33.03	1.75	0.97	0.485	0.485	1.70	0.822	6%
9	33.90	1.64	0.70		0.615	0.654	1.0	33.03	34.85	1.83	0.94	0.635	0.635	1.72	1.088	8%
10	35.80	1.65	0.63		0.488	0.673	1.0	34.85	36.50	1.65	1.02	0.581	0.581	1.68	0.977	7%
11	37.20	1.65	0.55		0.688	0.693	1.0	36.50	37.75	1.25	1.10	0.691	0.691	1.38	0.949	7%
12	38.30	1.60	0.55		0.614	0.702	1.0	37.75	38.90	1.15	1.05	0.658	0.658	1.21	0.795	6%
13	39.50	1.65	0.55		0.534	0.720	1.0	38.90	39.80	0.90	1.10	0.627	0.627	0.99	0.621	5%
14	40.10	1.63	0.58		0.651	0.673	1.0	39.80	40.50	0.70	1.05	0.662	0.662	0.74	0.487	4%
15	40.90	1.56	0.57		0.579	0.666	1.0	40.50	41.30	0.80	0.99	0.623	0.623	0.79	0.493	4%
16	41.70	1.70	0.64		0.613	0.581	1.0	41.30	42.48	1.18	1.06	0.597	0.597	1.25	0.744	6%
17	43.25	1.60	0.63		0.556	0.564	1.0	42.48	44.23	1.75	0.97	0.560	0.560	1.70	0.951	7%
18	45.20	1.65	0.65		0.526	0.473	1.0	44.23	46.10	1.88	1.00	0.500	0.500	1.88	0.937	7%
19	47.00	1.60	0.65		0.454	0.561	1.0	46.10	47.95	1.85	0.95	0.508	0.508	1.76	0.892	7%
20	48.90	1.60	0.65		0.369	0.535	1.0	47.95	49.48	1.52	0.95	0.452	0.452	1.45	0.655	5%
21	50.05	1.55	0.60		0.446	0.601	1.0	49.48	51.20	1.73	0.95	0.524	0.524	1.64	0.858	6%
22	52.35	1.45	1.20	0.095			0.9	51.20	53.53	2.33	0.25	0.095	0.086	0.58	0.050	0%
LB	54.70	0.00	0.00	0.00	0.00	0.00	1.0	53.53	54.70	1.18	0.06	0.024	0.024	0.07	0.002	0%
<b>Total Flow</b>														<b>13.3</b>		

Measurement Details:	
Start Time (MST):	10:40
End Time (MST):	12:24
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -2°C

Flow characteristics:	
Total Flow:	13.3 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good
Cross Section Area:	30.41 (m <sup>2</sup> )
Wetted Width:	50.50 (m)
Hydraulic Depth:	0.602 (m)
Mean Velocity:	0.437 (m/s)
Froude Number:	0.180

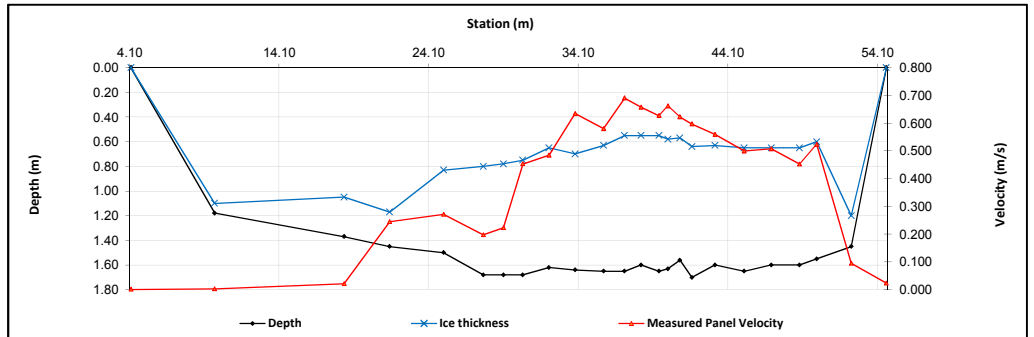
Logger Details:		
	Before	After
Transducer Reading (m):	0.938	-
Water (°C):	0.1	-
Battery (Main):	14.2	-
Datalogger Clock:	12:08	-
Laptop Clock:	12:08	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	21898	-
PI# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

- Measurements 1-3 and 21 have slush on bottom
- 2 layers of ice present with slush in between
- Slush below ice near banks, ice has been pushed up on banks
- Frozen overflow in middle

**General Notes:**

- Ran ADV test, all good



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S47A-01			0.194	100.098	100.095	3/4" Pipe 6 m SE of station
S47A-02	0.408	100.292		99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.717	99.575	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.067	97.225		
Water Level:			3.203	97.089		
Other:						
<b>Setup #2</b>						
S47A-01	0.182	100.280		100.098	100.095	3/4" Pipe 6 m SE of station
S47A-02			0.396	99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.703	99.577	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.053	97.227		
Water Level:			3.192	97.088		
Other:						

Closing Error	0.000	Average WL	97.089
WL Check	0.001	Transducer Elevation Before	96.151
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	2-Mar-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	2-Mar-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Mar-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

March 31, 2013



Measured Data							Calculated Data									
Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	3.40	1.40	0.10	0.000	0.000	0.14	0.000	0%
1	4.80	1.00	0.60	0.000			1.0	3.40	5.80	2.40	0.40	0.000	0.000	0.96	0.000	0%
2	6.80	1.35	0.63	0.700			0.9	5.80	7.90	2.10	0.72	0.700	0.630	1.51	0.953	9%
3	9.00	1.40	0.55		0.477	0.625	1.0	7.90	10.00	2.10	0.85	0.551	0.551	1.79	0.984	10%
4	11.00	1.43	0.60		0.583	0.634	1.0	10.00	11.75	1.75	0.83	0.609	0.609	1.45	0.884	9%
5	12.50	1.46	0.60		0.543	0.706	1.0	11.75	13.20	1.45	0.86	0.625	0.625	1.25	0.779	8%
6	13.90	1.50	0.57		0.462	0.871	1.0	13.20	14.65	1.45	0.93	0.567	0.567	1.35	0.764	7%
7	15.40	1.46	0.55		0.549	0.698	1.0	14.65	15.95	1.30	0.91	0.624	0.624	1.18	0.738	7%
8	16.50	1.48	0.54		0.420	0.703	1.0	15.95	17.00	1.05	0.94	0.562	0.562	0.99	0.554	5%
9	17.50	1.43	0.55		0.345	0.695	1.0	17.00	18.25	1.25	0.88	0.520	0.520	1.10	0.572	6%
10	19.00	1.40	0.55		0.545	0.732	1.0	18.25	19.50	1.25	0.85	0.639	0.639	1.06	0.678	7%
11	20.00	1.44	0.60		0.410	0.591	1.0	19.50	20.50	1.00	0.84	0.501	0.501	0.84	0.420	4%
12	21.00	1.40	0.60		0.322	0.613	1.0	20.50	21.75	1.25	0.80	0.468	0.468	1.00	0.468	5%
13	22.50	1.45	0.65		0.389	0.506	1.0	21.75	23.40	1.65	0.80	0.448	0.448	1.32	0.591	6%
14	24.30	1.40	0.65		0.423	0.728	1.0	23.40	25.20	1.80	0.75	0.576	0.576	1.35	0.777	8%
15	26.10	1.30	0.65		0.372	0.661	1.0	25.20	26.95	1.75	0.65	0.517	0.517	1.14	0.588	6%
16	27.80	1.35	0.78	0.520			0.9	26.95	28.65	1.70	0.57	0.520	0.468	0.97	0.453	4%
17	29.50	1.35	0.53		-0.009	-0.082	1.0	28.65	30.40	1.75	0.82	-0.046	-0.046	1.44	-0.065	-1%
18	31.30	1.33	0.45		0.067	0.053	1.0	30.40	32.15	1.75	0.88	0.060	0.060	1.54	0.092	1%
19	33.00	1.30	0.47		-0.004	-0.030	1.0	32.15	34.00	1.85	0.83	-0.017	-0.017	1.54	-0.026	0%
LB	35.00	0.00	0.00	0.00	0.00	0.00	1.0	34.00	35.00	1.00	0.21	-0.004	-0.004	0.21	-0.001	0%
<b>Total Flow</b>															<b>10.2</b>	

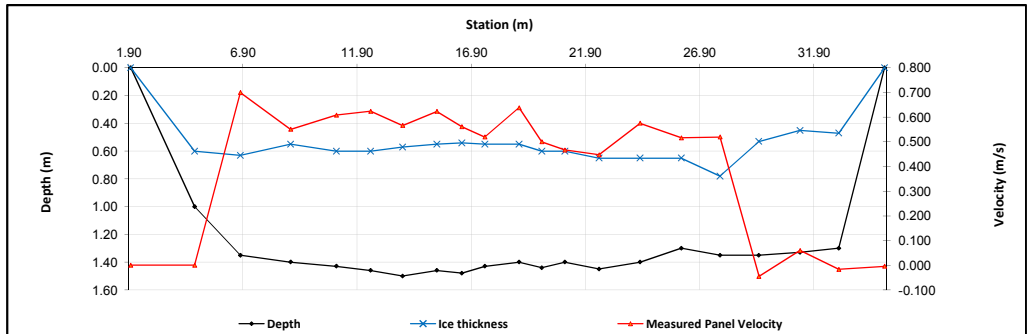
Measurement Details:	
Start Time (MST):	9:15
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	P. cloudy, breezy, -1°C

Flow characteristics:		
Total Flow:	10.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	24.11	(m <sup>2</sup> )
Wetted Width:	33.00	(m)
Hydraulic Depth:	0.731	(m)
Mean Velocity:	0.423	(m/s)
Froude Number:	0.158	

Logger Details:		
Transducer Reading (m):	0.760	-
Water (°C):	0.1	-
Battery (Main):	14.2	-
Datalogger Clock:	11:52	-
Laptop Clock:	11:52	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S47A-01			0.322	100.097	100.095	3/4" Pipe 6 m SE of station
S47A-02	0.535	100.419		99.884	99.884	3/4" Pipe 5 m S of station
S47A-03			0.844	99.575	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.320	97.099		
Water Level:			3.501	96.918		
Other:						
<b>Setup #2</b>						
S47A-01	0.309	100.406		100.097	100.095	3/4" Pipe 6 m SE of station
S47A-02			0.524	99.882	99.884	3/4" Pipe 5 m S of station
S47A-03			0.832	99.574	99.579	3/4" Pipe 7 m S of station
Ice/PT:			3.309	97.097		
Water Level:			3.487	96.919		
Other:						

Closing Error	0.002	Average WL	96.919
WL Check	0.001	Transducer Elevation Before	96.159
		Transducer Elevation After	-

Field Personnel:	CJ, XP	Trip Date:	31-Mar-13
Data Entry Personnel:	CJ	Date:	31-Mar-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the Mouth

UTM Location:

499624 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

May 9, 2013

Site Visit Time (MST):

08:05



Flow Measurement: Measured Data										Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	1.00	0.63	0.00	0.00	0.000	
1	4.25	0.49		0.29	0.610					1.00	2.50	0.49	0.610	1.23	0.747
2	8.00	1.12			1.250	0.90		0.22		1.00	3.88	1.12	1.250	4.34	5.425
3	12.00	1.40				1.12	1.509	0.28	2.150	1.00	4.00	1.40	1.830	5.60	10.245
4	16.00	1.60				1.28	0.375	0.32		1.00	8.50	1.60	0.188	13.60	2.550
7	29.00	1.90				1.52	1.871	0.38	2.464	1.00	8.50	1.90	2.168	16.15	35.005
8	33.00	1.80				1.44	2.232	0.36	2.494	1.00	4.00	1.80	2.363	7.20	17.014
9	37.00	2.00				1.60	2.022	0.40	2.445	1.00	4.00	2.00	2.234	8.00	17.868
10	41.00	2.20				1.76	1.837	0.44	2.627	1.00	4.00	2.20	2.232	8.80	19.642
11	45.00	2.30				1.84	2.099	0.46	2.615	1.00	4.00	2.30	2.257	9.20	21.684
12	49.00	2.10				1.68	2.025	0.42	2.549	1.00	4.00	2.10	2.287	8.40	19.211
13	53.00	2.20				1.76	1.932	0.44	2.400	1.00	4.00	2.20	2.166	8.80	19.061
14	57.00	2.20				1.76	1.861	0.44	2.563	1.00	4.00	2.20	2.112	8.80	18.586
15	61.00	2.00				1.60	2.038	0.40	2.579	1.00	4.00	2.00	2.309	8.00	18.468
16	65.00	2.00				1.60	1.818	0.40	2.459	1.00	4.00	2.00	2.139	8.00	17.108
17	69.00	2.00				1.60	2.032	0.40	2.345	1.00	4.00	2.00	2.189	8.00	17.508
18	73.00	2.00				1.60	1.824	0.40	2.324	1.00	4.00	2.00	2.074	8.00	16.592
19	77.00	1.75				1.40	1.554	0.35	2.068	1.00	4.00	1.75	1.811	7.00	12.977
20	81.00	1.75				1.40	1.438	0.35	1.916	1.00	4.00	1.75	1.677	7.00	11.730
21	85.00	0.50		0.30	0.995					1.00	3.25	0.50	0.995	1.63	1.617
LB	87.50	0.00	0.00		0.00		0.00		0.00	1.00	1.25	0.00	0.000	0.000	
<b>Total Flow</b>													<b>283</b>	<b>100%</b>	

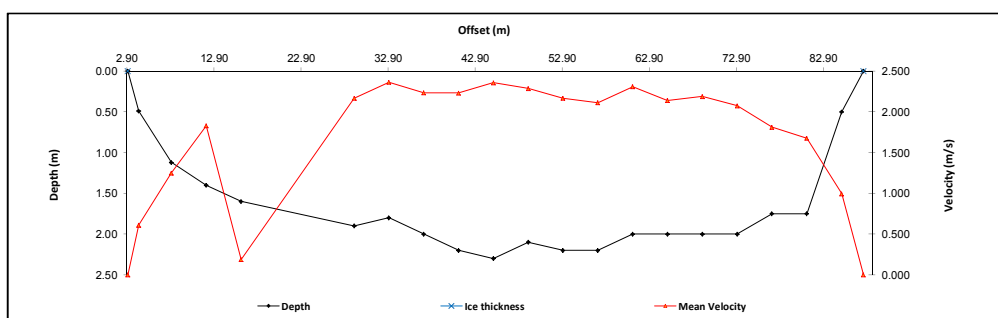
**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	13:00
Equipment:	ADC
Method:	Boat
River Condition:	Very high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 10°C

**Flow characteristics:**

Total Flow:	283	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	147.74	(m <sup>2</sup> )
Wetted Width:	84.50	(m)
Hydraulic Depth:	1.75	(m)
Mean Velocity:	1.92	(m/s)
Froude Number:	0.46	



**Logger Details:**

	Before	After
Transducer Reading (m):	NAN	1.573
Water (°C):	-	7.7
Datalogger Clock:	08:08	14:25
Laptop Clock:	08:08	14:25
Battery (Main):	14.1	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	-
PT# (if replaced):	-	276703
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was damaged by ice and lost, crew installed new PLS

**General Notes:**

- WL fluctuating by 5 cm during WL survey

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S47A-01
S47A-01			0.662	100.095	100.095	3/4" Pipe 6 m SE of station	S47A-02
S47A-02	0.873	100.757		99.884	99.884	3/4" Pipe 5 m S of station	S47A-03
S47A-03			1.176	99.581	99.579	3/4" Pipe 7 m S of station	WL
Ice/PT:							WL
Water Level:			2.567	98.190		Time WL Surveyed: 8:17	S47A-03
Other:							S47A-02
<b>Setup #2</b>							S47A-01
S47A-01			0.645	100.096	100.095	3/4" Pipe 6 m SE of station	
S47A-02			0.856	99.885	99.884	3/4" Pipe 5 m S of station	
S47A-03	1.160	100.741		99.581	99.579	3/4" Pipe 7 m S of station	
Ice/PT:							
Water Level:			2.553	98.188		Time WL Surveyed: 8:18	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S47A-01	0.845	100.740		100.095		
Water Level:			2.533	98.207		Time WL Surveyed: 14:08	
Water Level:			2.523	98.204		Time WL Surveyed: 14:10	
BM:	S47A-01	0.632	100.727		100.095		

**WL Survey Summary**

	Before	After
Average WL:	98.189	98.206
Transducer Elevation:	-	96.633
Closing Error:	-0.001	-
WL Check:	0.002	0.003

**Site Rating Information**

Measured Discharge:	283
Expected Discharge:	281
Shift from Existing Rating (m <sup>3</sup> /s):	-2.45
Shift from Existing Rating (%):	-1%

**Field Personnel:**

	SM, DW	Trip Date:	9-May-13
Data Entry Personnel:	SM	Date:	9-May-13
Data Check Personnel:	TR	Date:	31-May-13
Entered Digitally in the Field:	Yes		

START  
END

# Hydrometric Measurement / Site Visit Record



Site: S47A Christina River near the Mouth

UTM Location:

499624 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

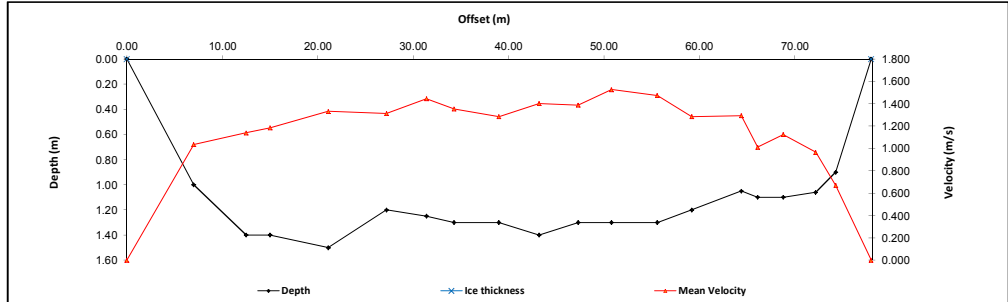
June 6, 2013

Site Visit Time (MST):

08:10

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.00		0.00		0.00	1.00	3.50	0.00	0.000	0.00	0.000	
1	7.00	1.00			0.80		0.927	0.20	1.145	1.00	6.25	1.00	1.036	6.25	6.475	6%
2	12.50	1.40			1.12		1.035	0.28	1.245	1.00	4.00	1.40	1.140	5.60	6.384	6%
3	15.00	1.40			1.12		1.018	0.28	1.352	1.00	4.30	1.40	1.185	6.02	7.134	6%
4	21.10	1.50			1.20		1.179	0.30	1.484	1.00	6.10	1.50	1.332	9.15	12.183	11%
5	27.20	1.20			0.96		1.115	0.24	1.509	1.00	5.15	1.20	1.312	6.18	8.108	7%
6	31.40	1.25			1.00		1.254	0.25	1.635	1.00	3.55	1.25	1.445	4.44	6.410	6%
7	34.30	1.30			1.04		1.161	0.26	1.545	1.00	3.80	1.30	1.353	4.94	6.684	6%
8	39.00	1.30			1.04		1.072	0.26	1.498	1.00	4.45	1.30	1.285	5.79	7.434	7%
9	43.20	1.40			1.12		1.103	0.28	1.702	1.00	4.15	1.40	1.403	5.81	8.149	7%
10	47.30	1.30			1.04		1.181	0.26	1.592	1.00	3.80	1.30	1.387	4.94	6.849	6%
11	50.80	1.30			1.04		1.409	0.26	1.643	1.00	4.15	1.30	1.526	5.40	8.233	7%
12	55.60	1.30			1.04		1.256	0.26	1.690	1.00	4.20	1.30	1.473	5.46	8.043	7%
13	59.20	1.20			0.96		1.112	0.24	1.456	1.00	4.40	1.20	1.284	5.28	6.780	6%
14	64.40	1.05			0.84		1.169	0.21	1.418	1.00	3.45	1.05	1.294	3.62	4.686	4%
15	66.10	1.10			0.88		0.883	0.22	1.138	1.00	2.20	1.10	1.011	2.42	2.445	2%
16	68.80	1.10			0.88		0.996	0.22	1.253	1.00	3.05	1.10	1.125	3.36	3.773	3%
17	72.20	1.06			0.85		0.792	0.21	1.139	1.00	2.75	1.06	0.966	2.92	2.814	2%
18	74.30	0.90			0.72		0.534	0.18	0.805	1.00	2.90	0.90	0.670	2.61	1.747	2%
LB	76.00	0.00	0.00		0.00		0.00	0.18	0.00	1.00	1.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>114</b>	<b>100%</b>	

Flow Measurement Details:	
Metering Section Location (describe):	
Meas. Start Time (MST):	10:16
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 15°C



Flow characteristics:	
Total Flow:	114 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	90.17 (m <sup>2</sup> )
Wetted Width:	78.00 (m)
Hydraulic Depth:	1.16 (m)
Mean Velocity:	1.26 (m/s)
Froude Number:	0.38

Logger Details:		
Transducer Reading (m):	Before: 0.454	After: 1.170
Water (°C):	17.8	18.7
Datalogger Clock:	08:18	13:25
Laptop Clock:	08:18	13:25
Battery (Main):	13.0	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
- PT moved deeper at ~ 8:30

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S47A-01			0.731	100.095	100.095	3/4" Pipe 6 m SE of station	S47A-01
S47A-02	0.942	100.826		99.884	99.884	3/4" Pipe 5 m S of station	S47A-02
S47A-03			1.247	99.579	99.579	3/4" Pipe 7 m S of station	S47A-03
Ice/PT:							WL
Water Level:			3.567	97.259		Time WL Surveyed: 8:28	S47A-03
Other:							S47A-02
<b>Setup #2</b>							
S47A-01			0.718	100.095	100.095	3/4" Pipe 6 m SE of station	S47A-01
S47A-02	0.929	100.813		99.884	99.884	3/4" Pipe 5 m S of station	
S47A-03			1.234	99.579	99.579	3/4" Pipe 7 m S of station	
Ice/PT:							
Water Level:			3.555	97.258		Time WL Surveyed: 8:29	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S47A-03	1.234	100.813	99.579			
Water Level:			3.558	97.255		Time WL Surveyed: 13:31	
Water Level:			3.549	97.254		Time WL Surveyed: 13:33	
BM:	S47A-03	1.224	100.803	99.579			

WL Survey Summary		
Average WL:	Before: 97.259	After: 97.255
Transducer Elevation:	96.505	96.085
Closing Error:	0.000	-
WL Check:	0.001	0.001

Site Rating Information	
Measured Discharge:	114
Expected Discharge:	115
Shift from Existing Rating (m <sup>3</sup> /s):	0.90
Shift from Existing Rating (%):	1%

Field Personnel:	SM, CJ	Trip Date:	6-Jun-13
Data Entry Personnel:	CJ	Date:	6-Jun-13
Data Check Personnel:	TR	Date:	17-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

August 9, 2013

Site Visit Time (MST):

10:15



Flow Measurement:																
Measured Data					Calculated Data											
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	16.00	0.00	0.00		0.00		0.00		0.00	1.00	1.50	0.00	0.000	0.00	0.000	
1	19.00	0.95				0.76	0.654	0.19	1.009	1.00	3.25	0.95	0.832	3.09	2.567	3%
2	22.50	1.00				0.80	0.915	0.20	1.130	1.00	3.50	1.00	1.023	3.50	3.579	4%
3	26.00	1.00				0.80	0.890	0.20	1.185	1.00	3.50	1.00	1.038	3.50	3.631	4%
4	29.50	1.10				0.88	0.911	0.22	1.296	1.00	3.50	1.10	1.104	3.85	4.248	5%
5	33.00	1.10				0.88	0.980	0.22	1.323	1.00	3.50	1.10	1.152	3.85	4.433	5%
6	36.50	1.20				0.96	1.139	0.24	1.395	1.00	3.50	1.20	1.267	4.20	5.321	6%
7	40.00	1.30				1.04	0.852	0.26	1.243	1.00	3.50	1.30	1.048	4.55	4.766	5%
8	43.50	1.30				1.04	1.047	0.26	1.320	1.00	3.50	1.30	1.184	4.55	5.385	6%
9	47.00	1.40				1.12	0.975	0.28	1.388	1.00	3.50	1.40	1.182	4.90	5.789	7%
10	50.50	1.40				1.12	0.934	0.28	1.407	1.00	3.50	1.40	1.171	4.90	5.735	7%
11	54.00	1.40				1.12	0.968	0.28	1.474	1.00	3.50	1.40	1.221	4.90	5.983	7%
12	57.50	1.45				1.16	1.006	0.29	1.418	1.00	3.50	1.45	1.212	5.08	6.151	7%
13	61.00	1.45				1.16	0.943	0.29	1.323	1.00	3.50	1.45	1.133	5.08	5.750	7%
14	64.50	1.30				1.04	0.899	0.26	1.260	1.00	3.50	1.30	1.080	4.55	4.912	6%
15	68.00	1.30				1.04	0.614	0.26	1.190	1.00	3.50	1.30	0.902	4.55	4.104	5%
16	71.50	1.20				0.96	0.808	0.24	1.147	1.00	3.50	1.20	0.978	4.20	4.106	5%
17	75.00	1.00				0.80	0.840	0.20	0.955	1.00	3.50	1.00	0.898	3.50	3.141	4%
18	78.50	1.00				0.80	0.729	0.20	0.844	1.00	3.50	1.00	0.837	3.50	2.928	3%
19	82.00	1.35				1.08	0.309	0.27	0.794	1.00	3.50	1.35	0.552	4.73	2.606	3%
20	85.50	0.85				0.68	0.449	0.17	0.678	1.00	3.25	0.85	0.564	2.76	1.557	2%
LB	88.50	0.00	0.00		0.00		0.00		0.00	1.00	1.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>86.7</b>	<b>100%</b>

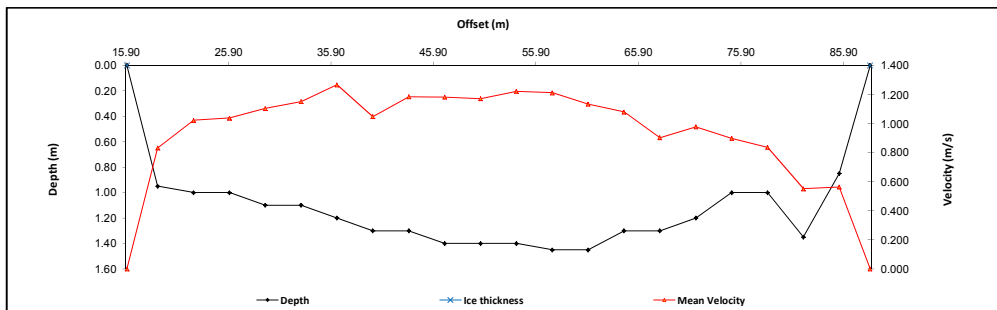
Flow Measurement Details:	
Metering Section Location (describe):	
Meas. Start Time (MST):	10:50
Meas. End Time (MST):	11:56
Equipment:	ADV
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 20°C

Flow characteristics:		
Total Flow:	86.7	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	83.73	(m <sup>2</sup> )
Wetted Width:	72.50	(m)
Hydraulic Depth:	1.15	(m)
Mean Velocity:	1.04	(m/s)
Froude Number:	0.31	

Logger Details:		
Transducer Reading (m):	Before -0.027	After 0.967
Water (°C):	19.6	18.9
Datalogger Clock:	12:50	13:17
Laptop Clock:	12:50	13:17
Battery (Main):	12.6	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	
- PLS was found out of water upon arrival	
- Crew reposition PLS	

General Notes:	



Level Survey:							Survey Loop
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Order
<b>Setup #1</b>							
S47A-01	0.204	100.300		100.096	100.096	3/4" Pipe 6 m SE of logger	S47A-01
S47A-02			0.416	99.884	99.884	3/4" Pipe 5 m S of logger	S47A-02
S47A-03			0.721	99.579	99.579	3/4" Pipe 7 m S of logger	S47A-03
Ice/PT:							WL
Water Level:			3.255	97.045		Time WL Surveyed:	13:12
Other:							
<b>Setup #2</b>							
S47A-01			0.193	100.095	100.096	3/4" Pipe 6 m SE of logger	S47A-01
S47A-02			0.405	99.883	99.884	3/4" Pipe 5 m S of logger	S47A-02
S47A-03	0.709	100.288		99.579	99.579	3/4" Pipe 7 m S of logger	S47A-03
Ice/PT:							WL
Water Level:			3.244	97.044		Time WL Surveyed:	13:13
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				99.579		Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				99.579		Time WL Surveyed:	

WL Survey Summary		
Average WL:	97.045	-
Transducer Elevation:	97.072	-
Closing Error:	0.001	-
WL Check:	0.001	-

Site Rating Information	
Measured Discharge:	86.7
Expected Discharge:	84.8
Shift from Existing Rating (m <sup>3</sup> /s):	-1.91
Shift from Existing Rating (%):	-2%

Field Personnel:	SM, TR	Trip Date:	9-Aug-13
Data Entry Personnel:	SM	Date:	9-Aug-13
Data Check Personnel:	TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

September 16, 2013

Site Visit Time (MST):

07:00



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	5.60	0.00	0.00		0.000		0.000		0.000	1.00	0.70	0.00	0.000	0.00	0.000	
1	7.00	0.42		0.25	0.003					1.00	2.70	0.42	0.003	1.13	0.003	0%
2	11.00	0.86				0.69	0.222	0.17	0.304	1.00	4.00	0.86	0.263	3.44	0.905	3%
3	15.00	0.70		0.42	0.358					1.00	4.00	0.70	0.358	2.80	1.002	3%
4	19.00	0.63		0.38	0.379					1.00	4.00	0.63	0.379	2.52	0.955	3%
5	23.00	0.94				0.75	0.250	0.19	0.553	1.00	3.50	0.94	0.402	3.29	1.321	4%
6	26.00	0.86				0.69	0.417	0.17	0.632	1.00	3.00	0.86	0.525	2.58	1.353	5%
7	29.00	0.99				0.79	0.444	0.20	0.683	1.00	3.00	0.99	0.564	2.97	1.674	6%
8	32.00	1.02				0.82	0.528	0.20	0.677	1.00	3.00	1.02	0.603	3.06	1.844	6%
9	35.00	1.06				0.85	0.487	0.21	0.758	1.00	3.00	1.06	0.623	3.18	1.980	7%
10	38.00	0.93				0.74	0.568	0.19	0.780	1.00	3.00	0.93	0.674	2.79	1.880	6%
11	41.00	0.96				0.77	0.633	0.19	0.736	1.00	3.00	0.96	0.685	2.88	1.971	7%
12	44.00	0.96				0.77	0.582	0.19	0.758	1.00	3.00	0.96	0.670	2.88	1.930	7%
13	47.00	0.97				0.78	0.319	0.19	0.660	1.00	3.00	0.97	0.490	2.91	1.424	5%
14	50.00	0.92				0.74	0.590	0.18	0.653	1.00	3.00	0.92	0.622	2.76	1.715	6%
15	53.00	0.96				0.77	0.402	0.19	0.650	1.00	3.00	0.96	0.526	2.88	1.515	5%
16	56.00	0.92				0.74	0.391	0.18	0.693	1.00	3.00	0.92	0.542	2.76	1.496	5%
17	59.00	0.85				0.68	0.434	0.17	0.690	1.00	3.00	0.85	0.562	2.55	1.433	5%
18	62.00	0.87				0.70	0.333	0.17	0.606	1.00	3.00	0.87	0.470	2.61	1.225	4%
19	65.00	0.84				0.74	0.351	0.17	0.599	1.00	3.00	0.84	0.475	2.52	1.197	4%
20	68.00	0.75	0.45		0.520					1.00	3.00	0.75	0.520	2.25	1.170	4%
21	71.00	0.70	0.42		0.480					1.00	3.00	0.70	0.480	2.10	1.008	3%
22	74.00	0.66	0.40		0.302					1.00	2.25	0.66	0.302	1.49	0.448	2%
LB	75.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>29.5</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	7:25
Meas. End Time (MST):	8:10
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10°C

**Flow characteristics:**

Total Flow:	29.5	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	58.35	(m²)
Wetted Width:	69.90	(m)
Hydraulic Depth:	0.83	(m)
Mean Velocity:	0.51	(m/s)
Froude Number:	0.18	

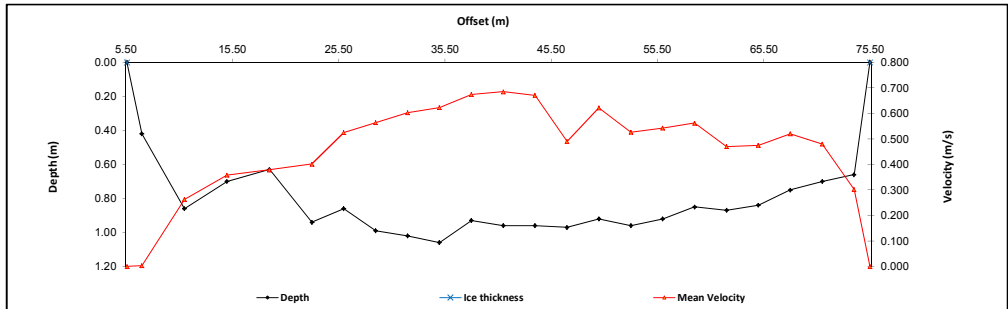
**Logger Details:**

	Before	After
Transducer Reading (m):	0.440	0.633
Water (°C):	14.4	14.6
Datalogger Clock:	09:15	09:54
Laptop Clock:	09:15	09:54
Battery (Main):	12:2	13:0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Wildlife disconnected solar panel
- PT was repositioned and buried

**General Notes:**



Level Survey:	BS (+) (m)	HI (m)	FS (-) (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S47A-01			0.692	100.095	100.096	3/4" Pipe 6 m SE of logger	S47A-03
S47A-02	0.903	100.787		99.884	99.884	3/4" Pipe 5 m S of logger	S47A-01
S47A-03			1.205	99.582	99.579	3/4" Pipe 7 m S of logger	WL
Ice/PT:							WL
Water Level:			4.275	96.512		Time WL Surveyed: 9:45	S47A-01
Other:							S47A-02
<b>Setup #2</b>							
S47A-01	0.679	100.774		100.095	100.096	3/4" Pipe 6 m SE of logger	S47A-03
S47A-02			0.892	99.882	99.884	3/4" Pipe 5 m S of logger	
S47A-03			1.195	99.579	99.579	3/4" Pipe 7 m S of logger	
Ice/PT:							
Water Level:			4.265	96.509		Time WL Surveyed: 9:46	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				99.582			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				99.582			

**WL Survey Summary**

	Before	After
Average WL:	96.511	-
Transducer Elevation:	96.071	-
Closing Error:	0.002	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	29.5
Expected Discharge:	25.7
Shift from Existing Rating (m³/s):	-3.79
Shift from Existing Rating (%):	-13%

**Field Personnel:**

Field Personnel:	TR, SG & CJ	Trip Date:	16-Sep-13
Data Entry Personnel:	CJ	Date:	16-Sep-13
Data Check Personnel:	TR	Date:	2-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

October 17, 2013

Site Visit Time (MST):

07:20



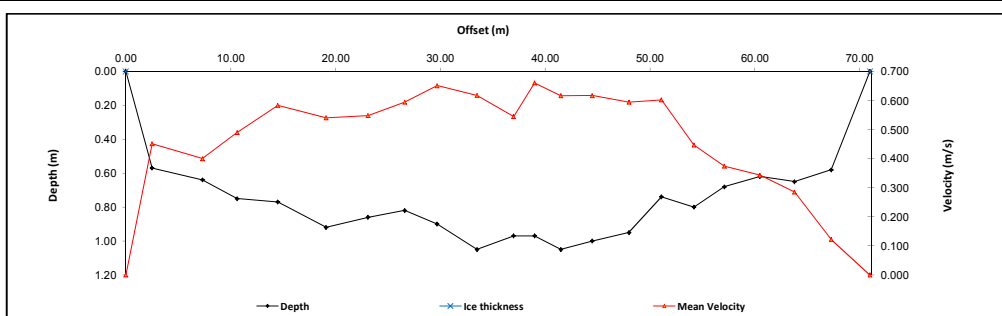
## Flow Measurement:

Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	1.25	0.00	0.000	0.00	0.000	
1	2.50	0.57		0.34	0.451					1.00	3.65	0.57	0.451	2.08	0.938	3%
2	7.30	0.64		0.38	0.400					1.00	4.05	0.64	0.400	2.59	1.037	4%
3	10.60	0.75		0.45	0.490					1.00	3.60	0.75	0.490	2.70	1.323	5%
4	14.50	0.77				0.62	0.489	0.15	0.678	1.00	4.25	0.77	0.584	3.27	1.910	7%
5	19.10	0.92				0.74	0.461	0.18	0.619	1.00	4.30	0.92	0.540	3.96	2.136	7%
6	23.10	0.86				0.69	0.447	0.17	0.649	1.00	3.75	0.86	0.548	3.23	1.767	6%
7	26.60	0.82				0.66	0.499	0.16	0.689	1.00	3.30	0.82	0.594	2.71	1.607	6%
8	29.70	0.90				0.72	0.537	0.18	0.765	1.00	3.45	0.90	0.651	3.11	2.021	7%
9	33.50	1.05				0.84	0.555	0.21	0.680	1.00	3.65	1.05	0.618	3.83	2.367	8%
10	37.00	0.97				0.78	0.363	0.19	0.726	1.00	2.75	0.97	0.545	2.67	1.452	5%
11	39.00	0.97				0.78	0.572	0.19	0.748	1.00	2.25	0.97	0.660	2.18	1.440	5%
12	41.50	1.05				0.84	0.495	0.21	0.737	1.00	2.75	1.05	0.616	2.89	1.779	6%
13	44.50	1.00				0.80	0.573	0.20	0.661	1.00	3.25	1.00	0.617	3.25	2.005	7%
14	48.00	0.95				0.76	0.505	0.19	0.684	1.00	3.30	0.95	0.595	3.14	1.864	7%
15	51.10	0.74	0.44		0.602					1.00	3.10	0.74	0.602	2.29	1.381	5%
16	54.20	0.80				0.64	0.348	0.16	0.546	1.00	3.00	0.80	0.447	2.40	1.073	4%
17	57.10	0.89		0.41	0.374					1.00	3.15	0.89	0.374	2.14	0.801	3%
18	60.50	0.62		0.37	0.343					1.00	3.35	0.62	0.343	2.08	0.712	2%
19	63.90	0.65		0.39	0.285					1.00	3.40	0.65	0.285	2.21	0.630	2%
20	67.30	0.58		0.35	0.122					1.00	3.60	0.58	0.122	2.09	0.255	1%
LB	71.00	0.00	0.00		0.00		0.00		0.00	1.00	1.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>28.5</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	7:50
Meas. End Time (MST):	8:19
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 5°C



## Flow characteristics:

Total Flow:	28.5	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	54.80	(m²)
Wetted Width:	71.00	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.52	(m/s)
Froude Number:	0.19	

## Logger Details:

	Before	After
Transducer Reading (m):	0.607	0.606
Water (°C):	4.9	5.2
Datalogger Clock:	07:36	11:47
Laptop Clock:	07:36	11:47
Battery (Main):	12.8	14.5
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S47A-01
S47A-01			0.743	100.095	100.096	3/4" Pipe 6 m SE of logger	S47A-02
S47A-02	0.954	100.838		99.884	99.884	3/4" Pipe 5 m S of logger	S47A-03
S47A-03			1.258	99.580	99.579	3/4" Pipe 7 m S of logger	WL
Ice/PT:							WL
Water Level:			4.346	96.492		Time WL Surveyed: 7:55	S47A-03
Other:							S47A-02
<b>Setup #2</b>							S47A-01
S47A-01			0.718	100.095	100.096	3/4" Pipe 6 m SE of logger	
S47A-02			0.929	99.884	99.884	3/4" Pipe 5 m S of logger	
S47A-03	1.233	100.813		99.580	99.579	3/4" Pipe 7 m S of logger	
Ice/PT:							
Water Level:			4.321	96.492		Time WL Surveyed: 7:57	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S47A-02	0.930	100.814		99.884		
Water Level:			4.320	96.494		Time WL Surveyed: 11:42	
Water Level:			4.299	96.493		Time WL Surveyed: 11:44	
BM:	S47A-02	0.908	100.792		99.580		

WL Survey Summary	Before	After
Average WL:	96.492	96.494
Transducer Elevation:	95.885	95.888
Closing Error:	0.000	-
WL Check:	0.000	0.001

Site Rating Information	
Measured Discharge:	28.5
Expected Discharge:	24.1
Shift from Existing Rating (m³/s):	-4.36
Shift from Existing Rating (%):	-15%

Field Personnel:	SM, DW	Trip Date:	17-Oct-13
Data Entry Personnel:	SM	Date:	17-Oct-13
Data Check Personnel:	TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

December 4, 2013

Site Visit Time (MST):

09:10



### Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	4.00	0.00	0.00		0.000					1.00	5.45	0.00	0.000	0.00	0.000	
1	14.90	1.19	0.28			1.01	0.124	0.46	0.075	1.00	8.55	0.91	0.062	7.78	0.482	3%
2	21.10	1.48	0.27			1.24	0.115	0.51	0.034	1.00	6.10	1.21	0.095	7.38	0.701	5%
3	27.10	1.37	0.30			1.16	0.026	0.51	0.050	1.00	5.55	1.07	0.038	5.94	0.226	1%
4	32.20	1.38	0.25			1.15	0.320	0.48	0.544	1.00	3.50	1.13	0.432	3.96	1.709	11%
5	34.10	1.39	0.26			1.16	0.518	0.49	0.452	1.00	1.95	1.13	0.485	2.20	1.069	7%
6	36.10	1.32	0.25			1.11	0.505	0.46	0.001	1.00	2.25	1.07	0.253	2.41	0.609	4%
7	38.60	1.27	0.15			1.05	0.447	0.37	0.643	1.00	2.85	1.12	0.545	3.19	1.740	11%
8	41.80	1.26	0.30			1.07	0.070	0.49	0.000	1.00	2.40	0.96	0.035	2.30	0.081	1%
9	43.40	1.30	0.26			1.09	0.025	0.47	0.000	1.00	1.60	1.04	0.013	1.66	0.021	0%
10	45.00	1.19	0.26			1.00	0.091	0.45	0.000	1.00	2.30	0.93	0.046	2.14	0.097	1%
11	48.00	1.30	0.27			1.09	0.527	0.48	0.580	1.00	2.85	1.03	0.554	2.94	1.625	11%
12	50.70	1.22	0.26			1.03	0.604	0.45	0.660	1.00	2.45	0.96	0.632	2.35	1.486	10%
13	52.90	1.20	0.23			1.01	0.504	0.42	0.551	1.00	2.35	0.97	0.528	2.28	1.202	8%
14	55.40	1.29	0.28			1.09	0.301	0.48	0.613	1.00	2.50	1.01	0.457	2.53	1.154	7%
15	57.90	1.22	0.26			1.03	0.558	0.45	0.489	1.00	2.85	0.96	0.524	2.74	1.432	9%
16	61.10	1.30	0.27			1.09	0.339	0.48	0.000	1.00	2.50	1.03	0.170	2.58	0.436	3%
17	62.90	1.29	0.25			1.08	0.344	0.46	-0.003	1.00	1.95	1.04	0.171	2.03	0.346	2%
18	65.00	1.37	0.23			1.14	0.126	0.46	0.000	1.00	3.50	1.14	0.063	3.99	0.251	2%
19	69.90	1.35	0.26			1.13	0.131	0.48	0.000	1.00	4.55	1.09	0.066	4.98	0.325	2%
20	74.10	1.37	0.27			1.15	0.071	0.49	0.000	1.00	4.35	1.10	0.036	4.78	0.170	1%
21	78.60	1.13	0.25			0.95	0.003	0.43	0.000	1.00	3.75	0.88	0.002	3.30	0.005	0%
22	81.60	1.06	0.29			0.91	0.086	0.44	0.114	1.00	2.65	0.77	0.100	2.04	0.204	1%
23	83.90	0.62	0.29	0.46	0.001					0.88	1.35	0.33	0.001	0.45	0.000	0%
LB	84.30	0.00	0.00		0.00				0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>15.4</b>	<b>100%</b>	

### Flow Measurement Details:

**Metering Section Location (describe):**  
100 m US of island

Meas. Start Time (MST):	12:05
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	clear, calm, -25°C

### Flow characteristics:

Total Flow:	15.4	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	75.92	(m²)
Wetted Width:	80.30	(m)
Hydraulic Depth:	0.95	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.07	

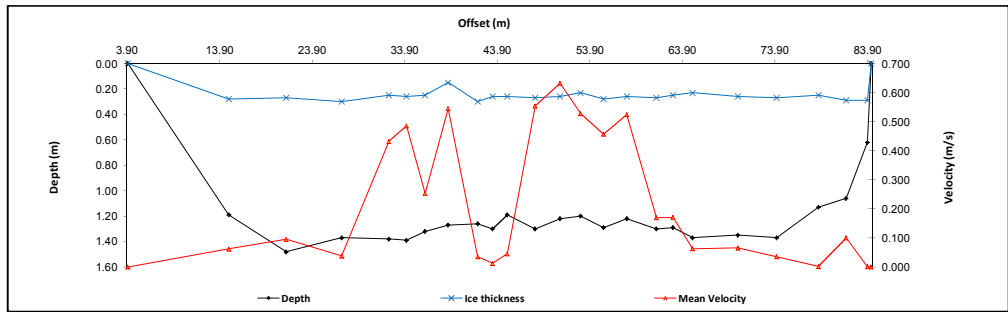
### Logger Details:

	Before	After
Transducer Reading (m):	1.023	1.026
Water (°C):	0.0	0.0
Datalogger Clock:	09:16	13:45
Laptop Clock:	09:16	13:45
Battery (Main):	12.5	12.8
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

### General Notes:

- Slush in water column  
- Large leads and pack ice at usual locations



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S47A-01
S47A-01	0.175	100.271		100.096	100.096	3/4" Pipe 6 m SE of logger	S47A-02
S47A-02			0.387	99.884	99.884	3/4" Pipe 5 m S of logger	S47A-03
S47A-03			0.693	99.578	99.579	3/4" Pipe 7 m S of logger	WL
Ice/PT:			3.249	97.022			Ice
Water Level:			3.362	96.909			Ice
Other:							WL
<b>Setup #2</b>							S47A-03
S47A-01			0.151	100.095	100.096	3/4" Pipe 6 m SE of logger	S47A-02
S47A-02	0.362	100.246		99.884	99.884	3/4" Pipe 5 m S of logger	S47A-01
S47A-03			0.669	99.577	99.579	3/4" Pipe 7 m S of logger	
Ice/PT:			3.224	97.022			
Water Level:			3.338	96.908			(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S47A-02	0.362	100.246		99.884		
Water Level:			3.338	96.908			Time WL Surveyed: 14:04
Water Level:			3.301	96.911			Time WL Surveyed: 14:06
BM:	S47A-02	0.328	100.212		99.884		

WL Survey Summary	Before	After
Average WL:	96.909	96.910
Transducer Elevation:	95.886	95.884
Closing Error:	0.001	-
WL Check:	0.001	-0.003

### Site Rating Information

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m³/s):	-
Shift from Existing Rating (%):	-

Field Personnel:	TR, RM	Trip Date:	4-Dec-13
Data Entry Personnel:	TR	Date:	4-Dec-13
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: May 1, 2013  
 Site Visit Time (MST): 10:30

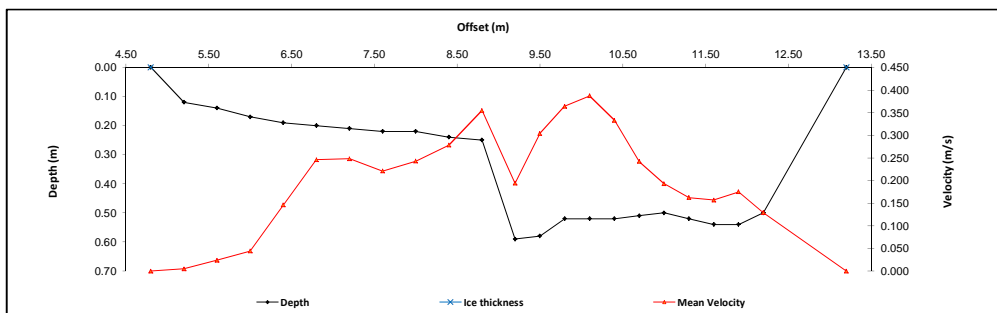


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.80	0.00	0.00	0.00	0.00				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	5.20	0.12		0.07	0.005					1.00	0.40	0.12	0.005	0.05	0.000	0%
2	5.60	0.14		0.08	0.024					1.00	0.40	0.14	0.024	0.06	0.001	0%
3	6.00	0.17		0.10	0.044					1.00	0.40	0.17	0.044	0.07	0.003	0%
4	6.40	0.19		0.11	0.146					1.00	0.40	0.19	0.146	0.08	0.011	2%
5	6.80	0.20		0.12	0.246					1.00	0.40	0.20	0.246	0.08	0.020	3%
6	7.20	0.21		0.13	0.248					1.00	0.40	0.21	0.248	0.08	0.021	3%
7	7.60	0.22		0.13	0.221					1.00	0.40	0.22	0.221	0.09	0.019	3%
8	8.00	0.22		0.13	0.243					1.00	0.40	0.22	0.243	0.09	0.021	4%
9	8.40	0.24		0.14	0.278					1.00	0.40	0.24	0.278	0.10	0.027	4%
10	8.80	0.25		0.15	0.355					1.00	0.40	0.25	0.355	0.10	0.035	6%
11	9.20	0.59		0.35	0.194					1.00	0.35	0.59	0.194	0.21	0.040	7%
12	9.50	0.58		0.35	0.304					1.00	0.30	0.58	0.304	0.17	0.053	9%
13	9.80	0.52		0.31	0.364					1.00	0.30	0.52	0.364	0.16	0.057	9%
14	10.10	0.52		0.31	0.387					1.00	0.30	0.52	0.387	0.16	0.060	10%
15	10.40	0.52		0.31	0.333					1.00	0.30	0.52	0.333	0.16	0.052	9%
16	10.70	0.51		0.31	0.242					1.00	0.30	0.51	0.242	0.15	0.037	6%
17	11.00	0.50		0.30	0.193					1.00	0.30	0.50	0.193	0.15	0.029	5%
18	11.30	0.52		0.31	0.162					1.00	0.30	0.52	0.162	0.16	0.025	4%
19	11.60	0.54		0.32	0.157					1.00	0.30	0.54	0.157	0.16	0.025	4%
20	11.90	0.54		0.32	0.175					1.00	0.30	0.54	0.175	0.16	0.028	5%
21	12.20	0.50		0.30	0.129					1.00	0.65	0.50	0.129	0.32	0.042	7%
LB	13.20	0.00	0.00	0.00	0.00	0.00				1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.608</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:12
Meas. End Time (MST):	11:33
Equipment:	ADV
Method:	Wading
River Condition:	Mostly open, some bed ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 1°C



**Flow characteristics:**

Total Flow:	0.608	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.74	(m <sup>2</sup> )
Wetted Width:	8.40	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.524	0.498
Water (°C):	0.3	0.3
Datalogger Clock:	10:47	11:41
Laptop Clock:	10:48	11:41
Battery (Main):	14.7	14.7
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	New
Vent Tube Dessiccant:	-	New
PT# (if replaced):	273450	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS installed
- radio operation is ok
- Modem operational
- '30' mast was installed
- RSSI -77

**General Notes:**

- 0.5 m ice along left bank of channel.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S48-01
S48-01			0.985	100.034	100.000	3/4" Pipe 2 m from datalogger	S48-03
S48-02			1.202	99.817	99.717	Nail in base of tree	S48-04
S48-03	1.221	101.019		99.798	99.798	3/4" Pipe 6 m NE of datalogger	WL
Ice/PT:							WL
Water Level:			2.358	98.661		Time WL Surveyed:	S48-04
Other:							S48-03
<b>Setup #2</b>							S48-01
S48-01	0.974	101.008		100.034	100.000	3/4" Pipe 2 m from data logger	
S48-02			1.192	99.816	99.717	Nail in base of tree	
S48-03			1.209	99.799	99.798	3/4" Pipe 5 m SE of datalogger	
Ice/PT:							
Water Level:			2.348	98.660		Time WL Surveyed:	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S48-03	1.202	101.019		99.817		
Water Level:			2.362	98.657		Time WL Surveyed:	11:37
Water Level:			2.344	98.660		Time WL Surveyed:	11:39
BM:	S48-03	1.187	101.004		99.817		

**WL Survey Summary**

	Before	After
Average WL:	98.661	98.659
Transducer Elevation:	98.137	98.161
Closing Error:	-0.001	-
WL Check:	0.001	-0.003

**Site Rating Information**

Measured Discharge:	0.608
Expected Discharge:	0.88
Shift from Existing Rating (m <sup>3</sup> /s):	0.27
Shift from Existing Rating (%):	45%

**Field Personnel:**

SM, TR	Trip Date:	1-May-13
SM	Date:	1-May-13
DW	Date:	28-May-13
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: June 13, 2013  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.00	0.00	0.00	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00						1.00	0.00	0.00	0.00	0.00	0.00	0%

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Very high
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

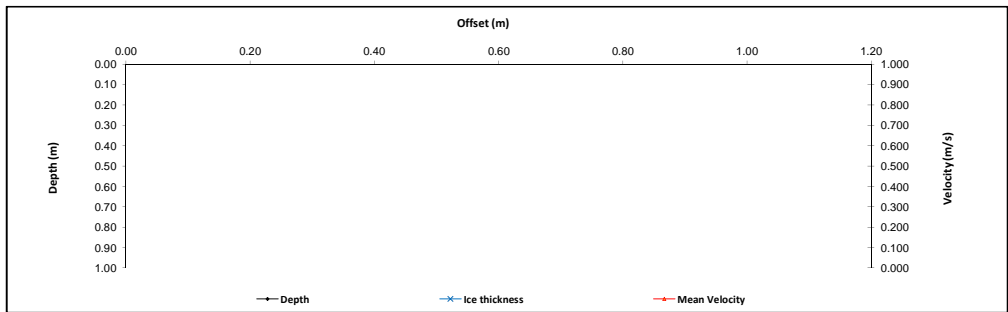
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Battery (Main):	-	-
Battery Condition:	-	-
Battery Serial #:	-	-
Enclosure Dessicant:	-	-
Vent Tube Dessicant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 - No station visit possible, station, landing sites are under water

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S48-01					100.000	3/4" Pipe 2 m from datalogger	
S48-02					99.717	Nail in base of tree	
S48-03					99.798	3/4" Pipe 6 m NE of datalogger	
Ice/PT:							
Water Level:							
Other:							
<b>Setup #2</b>							
S48-01					100.000	3/4" Pipe 2 m from data logger	
S48-02					99.717	Nail in base of tree	
S48-03					99.798	3/4" Pipe 5 m SE of datalogger	
Ice/PT:							
Water Level:							
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:							
Water Level:							
BM:							

**WL Survey Summary**

	Before	After
Average WL:	-	-
Transducer Elevation:	-	-
Closing Error:	-	-
WL Check:	-	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, SG	Trip Date:	13-Jun-13
<b>Data Entry Personnel:</b>	SG	Date:	13-Jun-13
<b>Data Check Personnel:</b>	DW	Date:	26-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

**Hydrometric Measurement / Site Visit Record**

**Site:** S48 Big Creek  
**UTM Location:** 470895 E, 6389207 N

**Site Visit Date:** August 10, 2013  
**Site Visit Time (MST):** 14:30



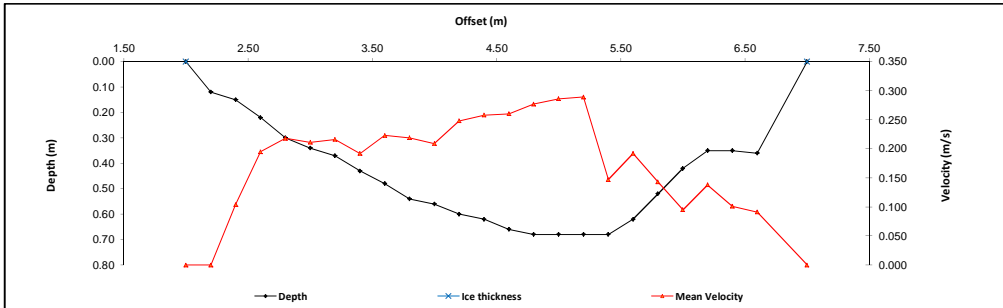
**Flow Measurement:**

Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.20	0.12		0.07	0.000					1.00	0.20	0.12	0.000	0.02	0.000	0%
2	2.40	0.15		0.09	0.104					1.00	0.20	0.15	0.104	0.03	0.003	1%
3	2.60	0.22		0.13	0.195					1.00	0.20	0.22	0.195	0.04	0.009	2%
4	2.80	0.30		0.18	0.218					1.00	0.20	0.30	0.218	0.06	0.013	3%
5	3.00	0.34		0.20	0.211					1.00	0.20	0.34	0.211	0.07	0.014	3%
6	3.20	0.37		0.22	0.216					1.00	0.20	0.37	0.216	0.07	0.016	4%
7	3.40	0.43		0.26	0.192					1.00	0.20	0.43	0.192	0.09	0.017	4%
8	3.60	0.48		0.29	0.223					1.00	0.20	0.48	0.223	0.10	0.021	5%
9	3.80	0.54		0.32	0.219					1.00	0.20	0.54	0.219	0.11	0.024	5%
10	4.00	0.56		0.34	0.209					1.00	0.20	0.56	0.209	0.11	0.023	5%
11	4.20	0.60		0.36	0.248					1.00	0.20	0.60	0.248	0.12	0.030	7%
12	4.40	0.62		0.37	0.258					1.00	0.20	0.62	0.258	0.12	0.032	7%
13	4.60	0.66		0.40	0.260					1.00	0.20	0.66	0.260	0.13	0.034	8%
14	4.80	0.68		0.41	0.277					1.00	0.20	0.68	0.277	0.14	0.038	8%
15	5.00	0.68		0.41	0.286					1.00	0.20	0.68	0.286	0.14	0.039	9%
16	5.20	0.68		0.41	0.289					1.00	0.20	0.68	0.289	0.14	0.039	9%
17	5.40	0.68		0.41	0.147					1.00	0.20	0.68	0.147	0.14	0.020	4%
18	5.60	0.62		0.37	0.192					1.00	0.20	0.62	0.192	0.12	0.024	5%
19	5.80	0.52		0.31	0.143					1.00	0.20	0.52	0.143	0.10	0.015	3%
20	6.00	0.42		0.25	0.095					1.00	0.20	0.42	0.095	0.08	0.008	2%
21	6.20	0.35		0.21	0.138					1.00	0.20	0.35	0.138	0.07	0.010	2%
22	6.40	0.35		0.21	0.101					1.00	0.20	0.35	0.101	0.07	0.007	2%
23	6.60	0.36		0.22	0.091					1.00	0.30	0.36	0.091	0.11	0.010	2%
LB	7.00	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.445</b>	<b>100%</b>

**Flow Measurement Details:**

**Metering Section Location (describe):**

Meas. Start Time (MST): 14:55  
 Meas. End Time (MST): 15:19  
 Equipment: ADV  
 Method: Wading  
 River Condition: Moderate Flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Clean, calm, 25°C



**Flow characteristics:**

Total Flow:	0.445	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.18	(m <sup>2</sup> )
Wetted Width:	5.90	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.035	1.036
Water (°C):	12.9	12.9
Datalogger Clock:	14:41	15:28
Laptop Clock:	14:40	15:27
Battery (Main):	13.7	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Logger tree is falling into creek. Enclosure should be mounted on to a mast next visit.
- BM 2 needs to be replaced- tree moved.

**General Notes:**

- Discharge measurement is a slight underestimate due to a small amount of flow outside of the channel that is not measurable.
- See photos
- Left bank slightly undercut

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S48-01			0.979	100.032	100.000	3/4" Pipe 2 m from datalogger	S48-01
S48-02			1.519	99.492	99.717	Nail in base of tree	S48-02
S48-03	1.213	101.011		99.798	99.798	3/4" Pipe 6 m NE of datalogger	S48-03
Water Level:			2.585	98.426			WL
Ice/PT:							WL
Other:							S48-03
<b>Setup #2</b>							
S48-01	0.967	100.999		100.032	100.000	3/4" Pipe 2 m from data logger	S48-01
S48-02			1.507	99.492	99.717	Nail in base of tree	S48-02
S48-03			1.202	99.797	99.798	3/4" Pipe 5 m SE of datalogger	S48-03
Water Level:			2.572	98.427			WL
Ice/PT:							WL
Other:							S48-01
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S48-01	0.968	101.000		100.032		
Water Level:			2.575	98.425			WL
Other:			2.562	98.423			WL
BM:	S48-01	0.953	100.985		100.032		
Water Level:							WL
Other:							WL

WL Survey Summary	Before	After
Average WL:	98.427	98.424
Transducer Elevation:	97.392	97.388
Closing Error:	0.001	-
WL Check:	0.001	0.002

**Site Rating Information**

Measured Discharge:	0.445
Expected Discharge:	0.46
Shift from Existing Rating (m <sup>3</sup> /s):	0.02
Shift from Existing Rating (%):	4%

Field Personnel:	SM, TR	Trip Date:	10-Aug-13
Data Entry Personnel:	SM	Date:	10-Aug-13
Data Check Personnel:	DW	Date:	27-Aug-13
Entered Digitally in the Field:	Yes		

START  
END

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: August 14, 2013  
 Site Visit Time (MST): 12:25



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00		0.00	0.00		0.00		0.00	1.00	0.00	0.00	0.00	0.00	0.00	
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00		0.00						1.00	0.00	0.00	0.00	0.00	0.00	0%
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	-
Weather:	Partly cloudy, 23°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

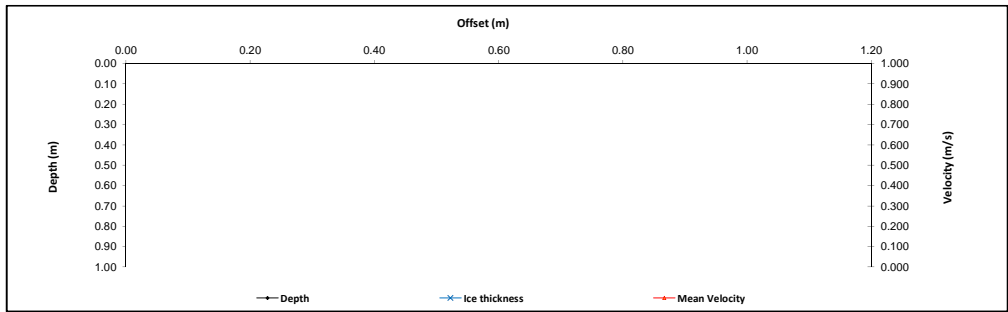
**Logger Details:**

	Before	After
Transducer Reading (m):	1.039	1.040
Water (°C):	13.6	13.6
Datalogger Clock:	12:35	13:17
Laptop Clock:	12:35	13:18
Battery (Main):	13.6	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved station to a 2" mast beside antenna
- Installed new BM 3 m from S48-01

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S48-01					100.000	3/4" Pipe 2 m SE of datalogger	
S48-03					99.798	3/4" Pipe 6 m NE of datalogger	
S48-04					99.632	3/4" Pipe 6 m E of datalogger	
Ice/PT:							
Water Level:							
Other:							
Time WL Surveyed:							
<b>Setup #2</b>							
S48-01					100.000	3/4" Pipe 2 m SE of datalogger	
S48-03					99.798	3/4" Pipe 6 m NE of datalogger	
S48-04					99.632	3/4" Pipe 6 m E of datalogger	
Ice/PT:							
Water Level:							
Other:							
Time WL Surveyed:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:							
Water Level:							
BM:							
Time WL Surveyed:							
Time WL Surveyed:							

**WL Survey Summary**

	Before	After
Average WL:	-	-
Transducer Elevation:	-	-
Closing Error:	-	-
WL Check:	-	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

Field Personnel:	TR, DW	Trip Date:	14-Aug-13
Data Entry Personnel:	DW	Date:	14-Aug-13
Data Check Personnel:	DW	Date:	27-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: 14-Sept. 2013  
 Site Visit Time (MST): 13:00

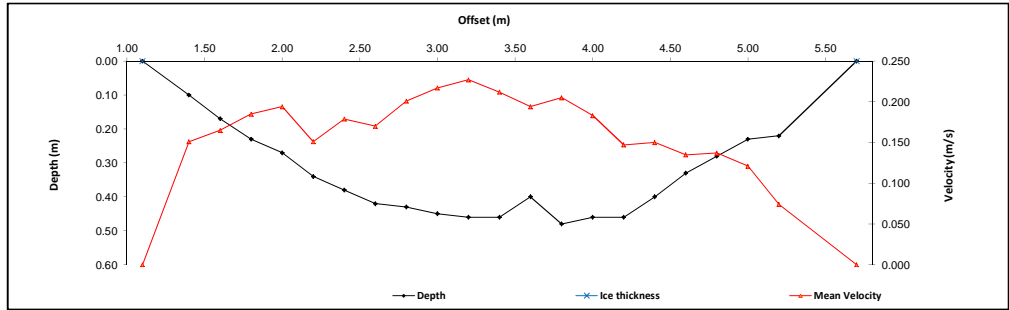


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.40	0.10		0.06	0.151					1.00	0.25	0.10	0.151	0.03	0.004	2%
2	1.60	0.17		0.10	0.165					1.00	0.20	0.17	0.165	0.03	0.006	2%
3	1.80	0.23		0.14	0.185					1.00	0.20	0.23	0.185	0.05	0.009	3%
4	2.00	0.27		0.16	0.194					1.00	0.20	0.27	0.194	0.05	0.010	4%
5	2.20	0.34		0.20	0.151					1.00	0.20	0.34	0.151	0.07	0.010	4%
6	2.40	0.38		0.23	0.179					1.00	0.20	0.38	0.179	0.08	0.014	5%
7	2.60	0.42		0.25	0.170					1.00	0.20	0.42	0.170	0.08	0.014	6%
8	2.80	0.43		0.26	0.201					1.00	0.20	0.43	0.201	0.09	0.017	7%
9	3.00	0.45		0.27	0.217					1.00	0.20	0.45	0.217	0.09	0.020	8%
10	3.20	0.46		0.28	0.227					1.00	0.20	0.46	0.227	0.09	0.021	8%
11	3.40	0.46		0.28	0.212					1.00	0.20	0.46	0.212	0.09	0.020	8%
12	3.60	0.40		0.24	0.194					1.00	0.20	0.40	0.194	0.08	0.016	6%
13	3.80	0.48		0.29	0.205					1.00	0.20	0.48	0.205	0.10	0.020	8%
14	4.00	0.46		0.28	0.183					1.00	0.20	0.46	0.183	0.09	0.017	7%
15	4.20	0.46		0.28	0.147					1.00	0.20	0.46	0.147	0.09	0.014	5%
16	4.40	0.40		0.24	0.150					1.00	0.20	0.40	0.150	0.08	0.012	5%
17	4.60	0.33		0.20	0.135					1.00	0.20	0.33	0.135	0.07	0.009	4%
18	4.80	0.28		0.17	0.137					1.00	0.20	0.28	0.137	0.06	0.008	3%
19	5.00	0.23		0.14	0.121					1.00	0.20	0.23	0.121	0.05	0.006	2%
20	5.20	0.22		0.13	0.074					1.00	0.35	0.22	0.074	0.08	0.006	2%
LB	5.70	0.00	0.00		0.00				0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.249</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5 m Ds of PLS

Meas. Start Time (MST):	13:35
Meas. End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 17°C



**Flow characteristics:**

Total Flow:	0.249	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.43	(m²)
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.919	0.921
Water (°C):	10.0	10.0
Datalogger Clock:	13:10	14:09
Laptop Clock:	13:11	14:10
Battery (Main):	13.8	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Telemetry cable has been chewed on, needs to be replaced
- Sep 23 returned to station, checked relay both antenna cables were severed.
- Replaced antenna cable at station.

**General Notes:**

- S48-04 needs a tag

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S48-01			0.826	100.030	100.000	3/4" Pipe 2 m SE of datalogger	S48-01
S48-03	1.058	100.856		99.798	99.798	3/4" Pipe 6 m NE of datalogger	S48-03
S48-04			1.194	99.662	99.662	3/4" Pipe 6 m E of datalogger	S48-04
Water Level:			2.552	98.304		Time WL Surveyed: 13:32	S48-04
Other:							S48-03
<b>Setup #2</b>							
S48-01	0.853	100.883		100.030	100.000	3/4" Pipe 2 m SE of datalogger	S48-01
S48-03			1.086	99.797	99.798	3/4" Pipe 6 m NE of datalogger	S48-03
S48-04			1.222	99.661	99.662	3/4" Pipe 6 m E of datalogger	S48-04
Water Level:			2.581	98.302		Time WL Surveyed: 13:24	S48-04
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S48-01	0.826	100.856	100.030		Time WL Surveyed: 14:05	
Water Level:			2.555	98.301		Time WL Surveyed: 14:06	
Water Level:			2.526	98.305			
BM:	S48-01	0.801	100.831	100.030			

**WL Survey Summary**

	Before	After
Average WL:	98.303	98.303
Transducer Elevation:	97.384	97.382
Closing Error:	0.001	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	0.249
Expected Discharge:	0.27
Shift from Existing Rating (m³/s):	0.02
Shift from Existing Rating (%):	9%

**Field Personnel:**

TR, CJ	Trip Date:	15-Sep-13
TR	Date:	15-Sep-13
DW	Date:	26-Sep-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: November 2, 2013  
 Site Visit Time (MST): 10:50



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	4.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.50	0.20		0.12	0.045					1.00	0.40	0.20	0.045	0.08	0.004	1%
2	5.00	0.16		0.10	0.230					1.00	0.50	0.16	0.230	0.08	0.018	3%
3	5.50	0.12		0.07	0.246					1.00	0.50	0.12	0.246	0.06	0.015	3%
4	6.00	0.11		0.07	0.152					1.00	0.50	0.11	0.152	0.06	0.008	2%
5	6.50	0.10		0.06	0.155					1.00	0.50	0.10	0.155	0.05	0.008	1%
6	7.00	0.32		0.19	0.177					1.00	0.45	0.32	0.177	0.14	0.025	5%
7	7.40	0.40		0.24	0.183					1.00	0.40	0.40	0.183	0.16	0.029	5%
8	7.80	0.50		0.30	0.164					1.00	0.40	0.50	0.164	0.20	0.033	6%
9	8.20	0.52		0.31	0.246					1.00	0.40	0.52	0.246	0.21	0.051	10%
10	8.60	0.54		0.32	0.241					1.00	0.30	0.54	0.241	0.16	0.039	7%
11	8.80	0.54		0.32	0.246					1.00	0.20	0.54	0.246	0.11	0.027	5%
12	9.00	0.56		0.34	0.265					1.00	0.20	0.56	0.265	0.11	0.030	6%
13	9.20	0.53		0.32	0.230					1.00	0.20	0.53	0.230	0.11	0.024	5%
14	9.40	0.52		0.31	0.286					1.00	0.20	0.52	0.286	0.10	0.030	6%
15	9.60	0.56		0.34	0.264					1.00	0.20	0.56	0.264	0.11	0.030	6%
16	9.90	0.57		0.34	0.285					1.00	0.20	0.57	0.285	0.11	0.032	6%
17	10.00	0.60		0.36	0.275					1.00	0.20	0.60	0.275	0.12	0.033	6%
18	10.20	0.60		0.36	0.218					1.00	0.30	0.60	0.218	0.18	0.039	7%
19	10.60	0.46		0.28	0.167					1.00	0.40	0.46	0.167	0.18	0.031	6%
20	11.00	0.36		0.22	0.133					1.00	0.40	0.36	0.133	0.14	0.019	4%
21	11.40	0.32		0.19	0.080					1.00	0.40	0.32	0.080	0.13	0.010	2%
LB	11.80	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.535</b>	<b>100%</b>	

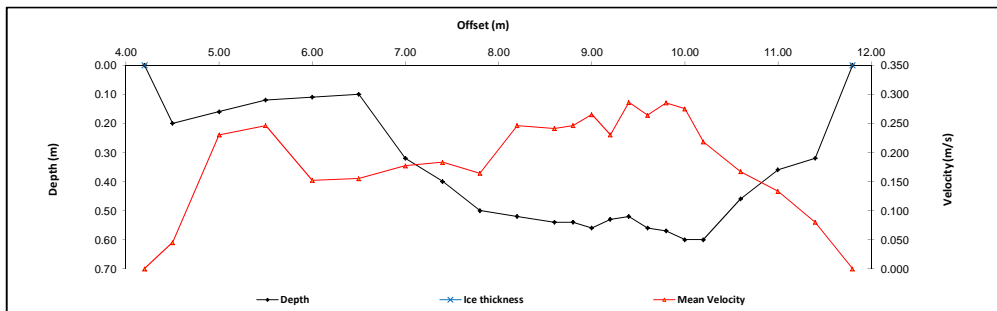
### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	11:16
Meas. End Time (MST):	11:39
Equipment:	ADV
Method:	Wading
River Condition:	Med flow, no ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 1°C

### Flow characteristics:

Total Flow:	0.535	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.61	(m²)
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.11	



### Logger Details:

	Before	After
Transducer Reading (m):	1.077	1.078
Water (°C):	3.3	3.3
Datalogger Clock:	10:58	11:45
Laptop Clock:	10:58	11:45
Battery (Main):	14.7	14.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	273450	-

### Datalogger / Station Notes:

- PLS could not be retrieved for winter

### General Notes:

- BM tags up to date  
 - Update BM descriptions

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S48-01			0.931	100.032	100.000	3/4" Pipe 2 m SE of datalogger	S48-01
S48-03	1.165	100.963		99.798	99.798	3/4" Pipe 6 m NE of datalogger	S48-03
S48-04			1.300	99.663	99.662	3/4" Pipe 6 m E of datalogger	S48-04
Ice/PT:							WL
Water Level:			2.491	98.472		Time WL Surveyed: 11:11	S48-04
Other:							S48-03
<b>Setup #2</b>							S48-01
S48-01	0.916	100.948		100.032	100.000	3/4" Pipe 2 m SE of datalogger	
S48-03			1.151	99.797	99.798	3/4" Pipe 6 m NE of datalogger	
S48-04			1.286	99.662	99.662	3/4" Pipe 6 m E of datalogger	
Ice/PT:							
Water Level:			2.477	98.471		Time WL Surveyed: 11:13	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S48-01	0.917	100.949		100.032		
Water Level:			2.476	98.473		Time WL Surveyed: 11:42	
Water Level:			2.461	98.471		Time WL Surveyed: 11:44	
BM:	S48-01	0.900	100.932		100.032		

WL Survey Summary	Before	After
Average WL:	98.472	98.472
Transducer Elevation:	97.395	97.394
Closing Error:	0.001	-
WL Check:	0.001	0.002

Site Rating Information	
Measured Discharge:	0.535
Expected Discharge:	0.54
Shift from Existing Rating (m³/s):	0.00
Shift from Existing Rating (%):	0%

Field Personnel:	SM, TR	Trip Date:	2-Nov-13
Data Entry Personnel:	SM	Date:	2-Nov-13
Data Check Personnel:	DW	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: May 1, 2013  
 Site Visit Time (MST): 12:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.80	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	4.00	0.42		0.25	-0.001					1.00	0.25	0.42	-0.001	0.11	0.000	0%
2	4.30	0.54		0.32	0.374					1.00	0.30	0.54	0.374	0.16	0.061	3%
3	4.60	0.61		0.37	0.427					1.00	0.30	0.61	0.427	0.18	0.078	4%
4	4.90	0.64		0.38	0.464					1.00	0.30	0.64	0.464	0.19	0.089	4%
5	5.20	0.71		0.43	0.495					1.00	0.30	0.71	0.495	0.21	0.105	5%
6	5.50	0.88				0.70	0.475	0.18	0.519	1.00	0.30	0.88	0.497	0.26	0.131	6%
7	5.80	0.75		0.45	0.496					1.00	0.30	0.75	0.496	0.22	0.112	5%
8	6.10	0.75		0.45	0.804					1.00	0.30	0.75	0.804	0.23	0.181	9%
9	6.40	0.74		0.44	0.844					1.00	0.30	0.74	0.844	0.22	0.187	9%
10	6.70	0.74		0.44	0.828					1.00	0.30	0.74	0.828	0.22	0.184	9%
11	7.00	0.74		0.44	0.685					1.00	0.30	0.74	0.685	0.22	0.152	7%
12	7.30	0.72		0.43	0.796					1.00	0.30	0.72	0.796	0.22	0.172	8%
13	7.60	0.69		0.41	0.711					1.00	0.30	0.69	0.711	0.21	0.147	7%
14	7.90	0.68		0.41	0.576					1.00	0.30	0.68	0.576	0.20	0.118	6%
15	8.20	0.65		0.39	0.466					1.00	0.35	0.65	0.466	0.23	0.106	5%
16	8.60	0.62		0.37	0.354					1.00	0.45	0.62	0.354	0.28	0.099	5%
17	9.10	0.54		0.32	0.230					1.00	0.50	0.54	0.230	0.27	0.062	3%
18	9.60	0.48		0.29	0.232					1.00	0.50	0.48	0.232	0.24	0.056	3%
19	10.10	0.40		0.24	0.187					1.00	0.50	0.40	0.187	0.20	0.037	2%
20	10.60	0.33		0.20	0.151					1.00	0.60	0.33	0.151	0.20	0.030	1%
21	11.30	0.23		0.14	0.067					1.00	0.90	0.23	0.067	0.21	0.014	1%
RB	12.40	0.00	0.00		0.00				0.00	1.00	0.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.12</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	13:33
Meas. End Time (MST):	13:58
Equipment:	ADV
Method:	Wading
River Condition:	High flow, ice along banks.
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 4°C

**Flow characteristics:**

Total Flow:	2.12	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.48	(m <sup>2</sup> )
Wetted Width:	8.60	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.47	(m/s)
Froude Number:	0.21	

**Logger Details:**

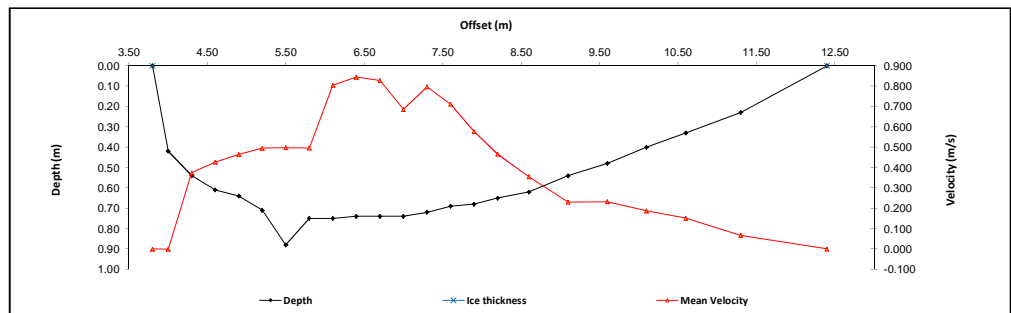
	Before	After
Transducer Reading (m):	0.393	0.390
Water (°C):	1.0	0.3
Datalogger Clock:	13:09	14:06
Laptop Clock:	13:09	14:06
Battery (Main):	14.6	14.6
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessoricant:	-	New
Vent Tube Dessoricant:	-	New
PT# (if replaced):	287963	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modern operational.
- RSSJ-94
- Installed PT
- PT is sitting on bed ice

**General Notes:**

- Bed ice and ice along banks



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-01
S49-01			1.360	100.000	100.000	3/4" Pipe 6 m N of data logger	S45-03
S49-03			1.444	99.916	99.916	3/4" Pipe 5 m NE of data logger	S45-04
S49-04	1.056	101.360		100.304	100.304	3/4" Pipe 7 m E of data logger	WL
Ice/PT:							WL
Water Level:			2.748	98.612	Time WL Surveyed:	13:24	S45-04
Other:							S45-03
<b>Setup #2</b>							S45-01
S49-01	1.343	101.343		100.000	100.000	3/4" Pipe 6 m N of data logger	
S49-03			1.427	99.916	99.916	3/4" Pipe 5 m NE of data logger	
S49-04			1.040	100.303	100.304	3/4" Pipe 7 m N of data logger	
Ice/PT:							
Water Level:			2.729	98.614	Time WL Surveyed:	13:26	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM	S45-01	1.337	101.337	100.000			
Water Level:			2.722	98.615	Time WL Surveyed:	14:02	
Water Level:			2.710	98.615	Time WL Surveyed:	14:04	
BM	S45-01	1.325	101.325	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.613	98.615
Transducer Elevation:	98.220	98.225
Closing Error:	0.001	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	2.12
Expected Discharge:	2.53
Shift from Existing Rating (m <sup>3</sup> /s):	0.41
Shift from Existing Rating (%):	19%

**Field Personnel:**

SM, TR	Trip Date:	1-May-13
SM	Date:	1-May-13
DW	Date:	28-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: June 13, 2013  
 Site Visit Time (MST): 10:20



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.40	0.00	0.00		0.000		0.000		0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	6.50	0.88			0.092	0.70		0.18		1.00	1.05	0.88	0.092	0.92	0.085	1%
2	7.50	2.00			0.128	1.60		0.40		1.00	0.75	2.00	0.128	1.50	0.192	2%
3	8.00	1.62			0.781	1.30		0.32		1.00	0.50	1.62	0.781	0.81	0.633	7%
4	8.50	1.72			0.636	1.38		0.34		1.00	0.50	1.72	0.636	0.86	0.547	6%
5	9.00	1.68			0.924	1.34		0.34		1.00	0.50	1.68	0.924	0.84	0.776	9%
6	9.50	1.69			1.118	1.35		0.34		1.00	0.50	1.69	1.118	0.85	0.945	11%
10	10.00	1.48			1.378	1.18		0.30		1.00	0.50	1.48	1.378	0.74	1.020	11%
11	10.50	1.30			1.300	1.04		0.26		1.00	1.25	1.30	1.300	1.63	2.113	24%
12	12.50	1.02			1.345	0.82		0.20		1.00	1.25	1.02	1.345	1.28	1.715	19%
13	13.00	0.78			0.949	0.62		0.16		1.00	0.50	0.78	0.949	0.39	0.370	4%
14	13.50	0.74		0.44	0.811					1.00	0.50	0.74	0.811	0.37	0.300	3%
15	14.00	0.68		0.41	0.508					1.00	0.50	0.68	0.508	0.34	0.173	2%
16	14.50	0.64		0.38	0.249					1.00	0.50	0.64	0.249	0.32	0.080	1%
17	15.00	0.27		0.16	-0.053					1.00	0.40	0.27	-0.053	0.11	-0.006	0%
RB	15.30	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>8.94</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:20
Equipment:	ADV
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear

**Flow characteristics:**

Total Flow:	8.94	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	10.95	(m <sup>2</sup> )
Wetted Width:	9.90	(m)
Hydraulic Depth:	1.11	(m)
Mean Velocity:	0.82	(m/s)
Froude Number:	0.25	

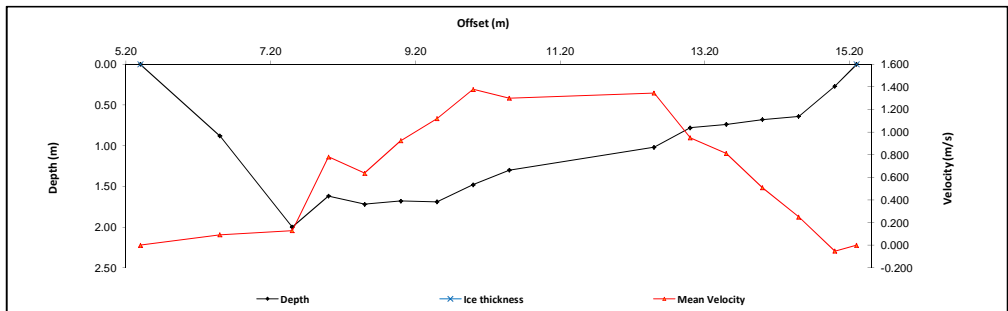
**Logger Details:**

	Before	After
Transducer Reading (m):	1.351	1.355
Water (°C):	11.8	12.1
Datalogger Clock:	10:22	11:40
Laptop Clock:	10:22	11:40
Battery (Main):	13.8	13.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Very high flow, only 60% depth measurements conducted, due to safety concerns



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-01
S49-01			1.105	99.999	100.000	3/4" Pipe 6 m N of data logger	S45-03
S49-03			1.186	99.918	99.918	3/4" Pipe 5 m NE of data logger	S45-04
S49-04	0.800	101.104		100.304	100.304	3/4" Pipe 7 m E of data logger	WL
Ice/PT:							WL
Water Level:			1.944	99.160		Time WL Surveyed: 10:29	S45-04
Other:							S45-03
<b>Setup #2</b>							S45-01
S49-01	1.095	101.094		99.999	100.000	3/4" Pipe 6 m N of data logger	
S49-03			1.178	99.916	99.918	3/4" Pipe 5 m NE of data logger	
S49-04			0.789	100.305	100.304	3/4" Pipe 7 m E of data logger	
Ice/PT:							
Water Level:			1.932	99.162		Time WL Surveyed: 10:32	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S45-01	1.097	101.096		99.999		
Water Level:			1.938	99.158		Time WL Surveyed: 11:35	
Water Level:			1.933	99.157		Time WL Surveyed: 11:37	
BM:	S45-01	1.091	101.090		99.999		

**WL Survey Summary**

	Before	After
Average WL:	99.161	99.158
Transducer Elevation:	97.810	97.803
Closing Error:	-0.001	-
WL Check:	0.002	0.001

**Site Rating Information**

Measured Discharge:	8.94
Expected Discharge:	8.40
Shift from Existing Rating (m <sup>3</sup> /s):	-0.54
Shift from Existing Rating (%):	-6%

**Field Personnel:**

TR, SG	Trip Date:	13-Jun-13
SG	Date:	13-Jun-13
DW	Date:	26-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: August 13, 2013  
 Site Visit Time (MST): 12:20

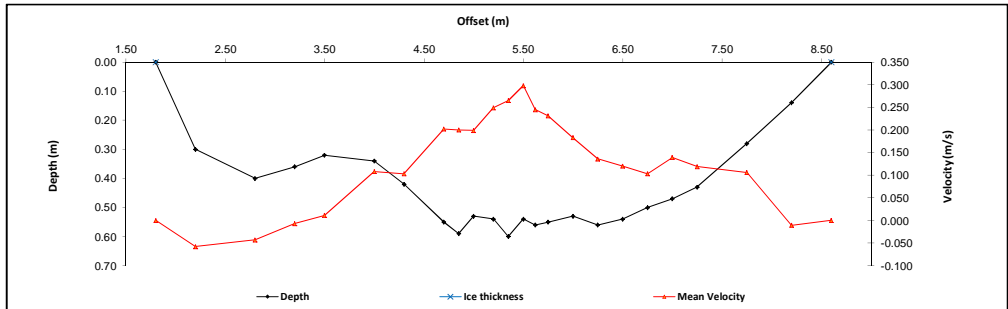


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.20	0.30		0.18	-0.058					1.00	0.50	0.30	-0.058	0.15	-0.009	-3%
2	2.80	0.40		0.24	-0.043					1.00	0.50	0.40	-0.043	0.20	-0.009	-3%
3	3.20	0.38		0.22	-0.007					1.00	0.35	0.36	-0.007	0.13	-0.001	0%
4	3.50	0.32		0.19	0.011					1.00	0.40	0.32	0.011	0.13	0.001	0%
5	4.00	0.34		0.20	0.108					1.00	0.40	0.34	0.108	0.14	0.015	5%
6	4.30	0.42		0.25	0.103					1.00	0.35	0.42	0.103	0.15	0.015	5%
7	4.70	0.55		0.33	0.202					1.00	0.28	0.55	0.202	0.15	0.031	10%
8	4.85	0.59		0.35	0.200					1.00	0.15	0.59	0.200	0.09	0.018	6%
9	5.00	0.53		0.32	0.199					1.00	0.18	0.53	0.199	0.09	0.018	6%
10	5.20	0.54		0.32	0.249					1.00	0.18	0.54	0.249	0.09	0.024	8%
11	5.35	0.60		0.36	0.265					1.00	0.15	0.60	0.265	0.09	0.024	8%
12	5.50	0.54		0.32	0.298					1.00	0.14	0.54	0.298	0.07	0.022	7%
13	5.62	0.56		0.34	0.245					1.00	0.13	0.56	0.245	0.07	0.017	6%
14	5.75	0.55		0.33	0.231					1.00	0.19	0.55	0.231	0.10	0.024	8%
15	6.00	0.53		0.32	0.183					1.00	0.25	0.53	0.183	0.13	0.024	8%
16	6.25	0.56		0.34	0.136					1.00	0.25	0.56	0.136	0.14	0.019	6%
17	6.50	0.54		0.32	0.120					1.00	0.25	0.54	0.120	0.14	0.016	5%
18	6.75	0.50		0.30	0.103					1.00	0.25	0.50	0.103	0.13	0.013	4%
19	7.00	0.47		0.28	0.139					1.00	0.25	0.47	0.139	0.12	0.016	5%
20	7.25	0.43		0.26	0.119					1.00	0.38	0.43	0.119	0.16	0.019	6%
21	7.75	0.28		0.17	0.106					1.00	0.48	0.28	0.106	0.13	0.014	5%
22	8.20	0.14		0.08	-0.011					1.00	0.42	0.14	-0.011	0.06	-0.001	0%
RB	8.60	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.311</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:25
Equipment:	ADC
Method:	Fishcat
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25°C



**Flow characteristics:**

Total Flow:	0.311	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.66	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.283	0.283
Water (°C):	16.9	17.3
Datalogger Clock:	13.3	12.75
Laptop Clock:	12:27	-
Battery (Main):	12:27	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Lots of wood debris washed DS, Pt relocated
- New PT Depth: 0.315 m

**General Notes:**

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>	S49-01			1.147	99.999	100.000	3/4" Pipe 6 m N of data logger	S45-01
	S49-03	1.228	101.146		99.918	99.918	3/4" Pipe 5 m NE of data logger	S45-03
	S49-04			0.842	100.304	100.304	3/4" Pipe 7 m E of data logger	S45-04
	Water Level:			3.092	98.054		Time WL Surveyed: 12:53	WL
<b>Setup #2</b>	S49-01			1.092	100.000	100.000	3/4" Pipe 6 m N of data logger	S45-01
	S49-03			1.175	99.917	99.918	3/4" Pipe 5 m NE of data logger	S45-03
	S49-04	0.788	101.092		100.304	100.304	3/4" Pipe 7 m E of data logger	S45-04
	Water Level:			3.035	98.057		Time WL Surveyed: 12:56	WL
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
BM:	S45-03	1.175	101.093		3.037	98.056	Time WL Surveyed: 13:32	
Water Level:				2.991	98.058		Time WL Surveyed: 13:33	
BM:	S45-03	1.131	101.049		99.918			

**WL Survey Summary**

	Before	After
Average WL:	98.056	98.057
Transducer Elevation:	97.773	97.774
Closing Error:	0.001	-
WL Check:	0.003	-0.002

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Field Personnel:	DW, TR	Trip Date:	13-Aug-13
Data Entry Personnel:	DW	Date:	13-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: September 12, 2013  
 Site Visit Time (MST): 11:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.30	0.04		0.02	0.000					1.00	0.30	0.04	0.000	0.01	0.000	0%
2	1.60	0.08		0.05	0.134					1.00	0.30	0.08	0.134	0.02	0.003	2%
3	1.90	0.12		0.07	0.208					1.00	0.30	0.12	0.208	0.04	0.007	4%
4	2.20	0.17		0.10	0.274					1.00	0.23	0.17	0.274	0.04	0.010	6%
5	2.35	0.18		0.11	0.371					1.00	0.15	0.18	0.371	0.03	0.010	6%
6	2.50	0.23		0.14	0.314					1.00	0.15	0.23	0.314	0.03	0.011	6%
7	2.65	0.25		0.15	0.337					1.00	0.15	0.25	0.337	0.04	0.013	7%
8	2.80	0.29		0.17	0.263					1.00	0.15	0.29	0.263	0.04	0.011	6%
9	2.95	0.31		0.19	0.088					1.00	0.15	0.31	0.088	0.05	0.004	2%
10	3.10	0.32		0.19	0.122					1.00	0.15	0.32	0.122	0.05	0.006	3%
11	3.25	0.35		0.21	0.176					1.00	0.15	0.35	0.176	0.05	0.009	5%
12	3.40	0.40		0.24	0.231					1.00	0.13	0.40	0.231	0.05	0.012	6%
13	3.50	0.40		0.24	0.282					1.00	0.07	0.40	0.282	0.03	0.008	5%
14	3.55	0.42		0.25	0.316					1.00	0.10	0.42	0.316	0.04	0.013	7%
15	3.70	0.42		0.25	0.200					1.00	0.15	0.42	0.200	0.06	0.013	7%
16	3.85	0.30		0.18	0.132					1.00	0.15	0.30	0.132	0.04	0.006	3%
17	4.00	0.33		0.20	0.212					1.00	0.18	0.33	0.212	0.06	0.012	7%
18	4.20	0.22		0.13	0.279					1.00	0.20	0.22	0.279	0.04	0.012	7%
19	4.40	0.17		0.10	0.172					1.00	0.20	0.17	0.172	0.03	0.006	3%
20	4.60	0.10		0.06	0.233					1.00	0.25	0.10	0.233	0.03	0.006	3%
21	4.90	0.09		0.05	0.217					1.00	0.35	0.09	0.217	0.03	0.007	4%
RB	5.30	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.180</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:11
Meas. End Time (MST):	12:36
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25°C

**Flow characteristics:**

Total Flow:	0.180	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.82	(m <sup>2</sup> )
Wetted Width:	4.30	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.16	

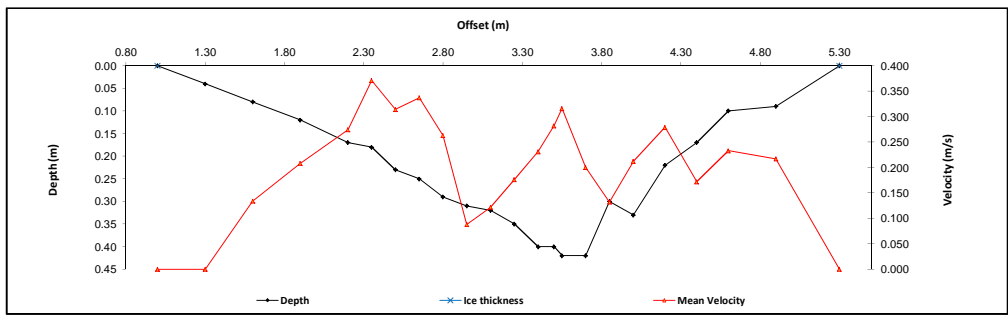
**Logger Details:**

	Before	After
Transducer Reading (m):	0.182	0.180
Water (°C):	11.0	11.7
Datalogger Clock:	11:37	12:45
Laptop Clock:	11:37	12:45
Battery (Main):	12.2	14.2
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Changed battery
- BM 3 and 4 tags need to be replaced
- PT moved deeper

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-01
S49-01	1.096	101.096		100.000	100.000	3/4" Pipe 6 m N of data logger	S45-03
S49-03			1.178	99.918	99.918	3/4" Pipe 5 m NE of data logger	S45-04
S49-04			0.793	100.303	100.304	3/4" Pipe 7 m E of data logger	WL
Ice/PT:							WL
Water Level:			3.178	97.918		Time WL Surveyed: 12:06	S45-04
Other:							S45-03
<b>Setup #2</b>							S45-01
S49-01			1.087	99.999	100.000	3/4" Pipe 6 m N of data logger	
S49-03	1.168	101.086		99.918	99.918	3/4" Pipe 5 m NE of data logger	
S49-04			0.783	100.303	100.304	3/4" Pipe 7 m E of data logger	
Ice/PT:							
Water Level:			3.168	97.918		Time WL Surveyed: 12:07	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S45-01	1.087	101.087		100.000		
Water Level:			3.168	97.919		Time WL Surveyed: 12:42	
Water Level:			3.158	97.919		Time WL Surveyed: 12:43	
BM:	S45-01	1.077	101.077		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.918	97.919
Transducer Elevation:	97.736	97.739
Closing Error:	0.001	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, CJ	Trip Date:	12-Sep-13
CJ	Date:	12-Sep-13
DW	Date:	28-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: November 2, 2013  
 Site Visit Time (MST): 12:50

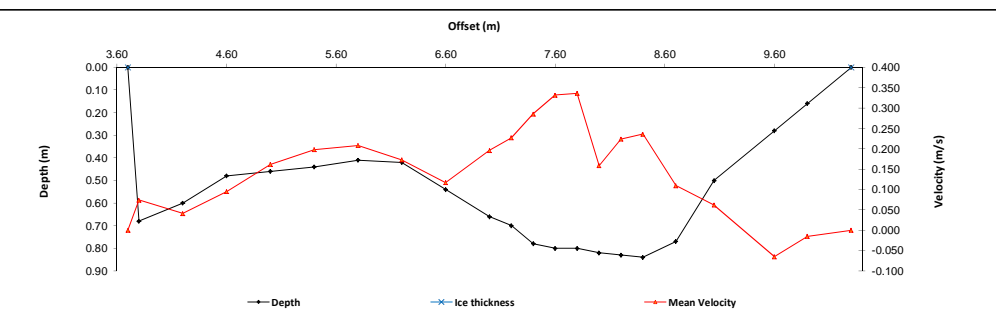


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	10.30	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	9.90	0.16		0.10	-0.015					1.00	0.35	0.16	-0.015	0.06	-0.001	0%
2	9.60	0.28		0.17	-0.065					1.00	0.43	0.28	-0.065	0.12	-0.008	-1%
3	9.05	0.50		0.30	0.062					1.00	0.45	0.50	0.062	0.23	0.014	2%
4	8.70	0.77				0.62	0.068	0.15	0.151	1.00	0.32	0.77	0.110	0.25	0.027	5%
5	8.40	0.84				0.67	0.238	0.17	0.234	1.00	0.25	0.84	0.236	0.21	0.050	9%
6	8.20	0.83				0.66	0.195	0.17	0.253	1.00	0.20	0.83	0.224	0.17	0.037	7%
7	8.00	0.82				0.66	0.000	0.16	0.317	1.00	0.20	0.82	0.159	0.16	0.026	5%
8	7.80	0.80				0.64	0.275	0.16	0.398	1.00	0.20	0.80	0.337	0.16	0.054	10%
9	7.60	0.80				0.64	0.266	0.16	0.398	1.00	0.20	0.80	0.332	0.16	0.053	9%
10	7.40	0.78				0.62	0.210	0.16	0.361	1.00	0.20	0.78	0.286	0.16	0.045	8%
11	7.20	0.70		0.42	0.227					1.00	0.20	0.70	0.227	0.14	0.032	6%
12	7.00	0.66		0.40	0.196					1.00	0.30	0.66	0.196	0.20	0.039	7%
13	6.60	0.54		0.32	0.117					1.00	0.40	0.54	0.117	0.22	0.025	5%
14	6.20	0.42		0.25	0.173					1.00	0.40	0.42	0.173	0.17	0.029	5%
15	5.80	0.41		0.25	0.208					1.00	0.40	0.41	0.208	0.16	0.034	6%
16	5.40	0.44		0.26	0.198					1.00	0.40	0.44	0.198	0.18	0.035	6%
17	5.00	0.46		0.28	0.162					1.00	0.40	0.46	0.162	0.18	0.030	5%
18	4.60	0.48		0.29	0.095					1.00	0.40	0.48	0.095	0.19	0.018	3%
19	4.20	0.60		0.36	0.041					1.00	0.40	0.60	0.041	0.24	0.010	2%
20	3.80	0.68		0.41	0.074					1.00	0.25	0.68	0.074	0.17	0.013	2%
LB	3.70	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.561</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from HELO PAD

Meas. Start Time (MST):	13:20
Meas. End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, Calm, 0°C



**Flow characteristics:**

Total Flow:	0.561	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.51	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.384	0.387
Water (°C):	0.8	0.8
Datalogger Clock:	13:02	14:05
Laptop Clock:	13:02	14:05
Battery (Main):	13.4	13.1
Battery Condition:	-	-
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	287963	-

**Datalogger / Station Notes:**

- Removed PLS for winter
- Anchor cable and weight left at base of logger mast

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S45-01
S49-01	1.122	101.122		100.000	100.000	3/4" Pipe 6 m N of data logger	S45-03
S49-03			1.203	99.919	99.918	3/4" Pipe 5 m NE of data logger	S45-04
S49-04			0.816	100.306	100.304	3/4" Pipe 7m E of data logger	WL
Ice/PT:							WL
Water Level:			2.987	98.135		Time WL Surveyed: 13:13	S45-04
Other:							S45-03
<b>Setup #2</b>							S45-01
S49-01			1.108	100.002	100.000	3/4" Pipe 6 m N of data logger	
S49-03			1.192	99.918	99.918	3/4" Pipe 5 m NE of data logger	
S49-04	0.804	101.110		100.306	100.304	3/4" Pipe 7m E of data logger	
Ice/PT:							
Water Level:			2.975	98.135		Time WL Surveyed: 13:14	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S45-01	1.108	101.108	100.000			
Water Level:			2.974	98.134		Time WL Surveyed: 14:02	
Water Level:			2.960	98.134		Time WL Surveyed: 14:04	
BM:	S45-01	1.094	101.094	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.135	98.134
Transducer Elevation:	97.751	97.747
Closing Error:	-0.002	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	2-Nov-13
SM	Date:	2-Nov-13
DW	Date:	6-Nov-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: May 1, 2013  
 Site Visit Time (MST): 08:05



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	4.35	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	4.60	0.58		0.35	0.036					1.00	0.33	0.58	0.036	0.19	0.007	1%
2	5.00	0.50		0.30	0.082					1.00	0.40	0.50	0.082	0.20	0.016	3%
3	5.40	0.50		0.30	0.132					1.00	0.40	0.50	0.132	0.20	0.026	5%
4	5.80	0.50		0.30	0.096					1.00	0.40	0.50	0.096	0.20	0.019	4%
5	6.20	0.48		0.29	0.129					1.00	0.40	0.48	0.129	0.19	0.025	5%
6	6.60	0.46		0.28	0.147					1.00	0.40	0.46	0.147	0.18	0.027	5%
7	7.00	0.45		0.27	0.087					1.00	0.40	0.45	0.087	0.18	0.016	3%
8	7.40	0.48		0.29	0.113					1.00	0.40	0.48	0.113	0.19	0.022	4%
9	7.80	0.50		0.30	0.220					1.00	0.40	0.50	0.220	0.20	0.044	8%
10	8.20	0.53		0.32	0.270					1.00	0.30	0.53	0.270	0.16	0.043	8%
11	8.40	0.54		0.32	0.323					1.00	0.20	0.54	0.323	0.11	0.035	7%
12	8.60	0.56		0.34	0.247					1.00	0.30	0.56	0.247	0.17	0.041	8%
13	9.00	0.60		0.36	-0.046					1.00	0.40	0.60	-0.046	0.24	-0.011	-2%
14	9.40	0.62		0.37	0.159					1.00	0.30	0.62	0.159	0.19	0.030	6%
15	9.60	0.52		0.31	0.316					1.00	0.20	0.52	0.316	0.10	0.033	6%
16	9.90	0.64		0.38	0.343					1.00	0.25	0.64	0.343	0.16	0.055	10%
17	10.10	0.64		0.38	0.296					1.00	0.25	0.64	0.296	0.16	0.046	9%
18	10.30	0.56		0.34	0.248					1.00	0.20	0.56	0.248	0.11	0.028	5%
19	10.50	0.52		0.31	0.220					1.00	0.20	0.52	0.220	0.10	0.023	4%
20	10.70	0.14		0.08	0.108					1.00	0.25	0.14	0.108	0.04	0.004	1%
21	11.00	0.20		0.12	0.000					1.00	0.25	0.20	0.000	0.05	0.000	0%
RB	11.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.528</b>	<b>100%</b>		

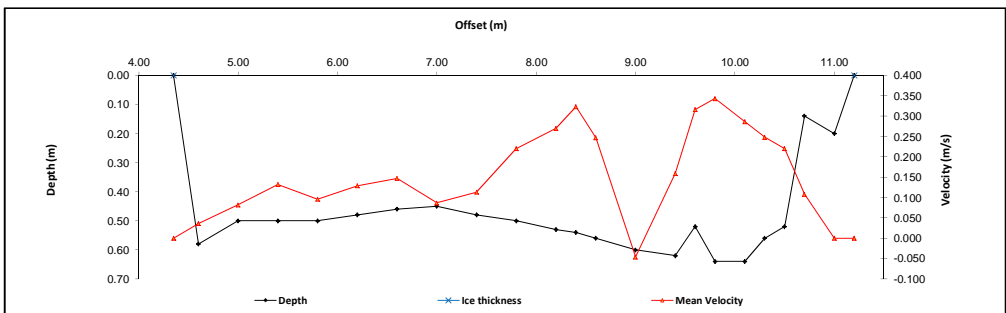
**Flow Measurement Details:**

Metering Section Location (describe):  
10 m us of PT

Meas. Start Time (MST):	9:05
Meas. End Time (MST):	9:30
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	-

**Flow characteristics:**

Total Flow:	0.528	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.32	(m²)
Wetted Width:	6.85	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.07	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.613	0.581
Water (°C):	0.3	0.3
Datalogger Clock:	08:30	09:44
Laptop Clock:	08:30	9:44
Battery (Main):	12.8	14.6
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	New
Vent Tube Desiccant:	-	New
PT# (if replaced):	304019	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Relay modem and radio operational
- RSSI -99
- PLS installed at depth of 64.5 cm.
- PLS installed 5 m upstream from last year location due to ice cover. See photos.
- LB slightly undercut

**General Notes:**

- Ran ADV test

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S50A-02	1.247	101.407		100.160	100.160	Pipe 4 m N of logger	S50A-02
S50A-03			1.443	99.964	99.969	Pipe 6 m N of logger	S50A-03
S50A-04			0.428	100.979	100.979	Pipe 5 m E of logger	S50A-04
Ice/PT:							WL
Water Level:			2.790	98.617		Time WL Surveyed: 8:35	WL
Other:							S50A-04
<b>Setup #2</b>							S50A-03
S50A-02			1.236	100.158	100.160	Pipe 4 m N of logger	S50A-02
S50A-03	1.430	101.394		99.964	99.969	Pipe 6 m N of logger	S50A-03
S50A-04			0.416	100.978	100.979	Pipe 5 m E of logger	S50A-04
Ice/PT:							WL
Water Level:			2.773	98.621		Time WL Surveyed: 8:36	WL
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S50A-03	1.402	101.366		99.964			
Water Level:			2.743	98.623		Time WL Surveyed: 9:37	
Water Level:			2.760	98.621		Time WL Surveyed: 9:35	
BM: S50A-03	1.417	101.381		99.964			

**WL Survey Summary**

	Before	After
Average WL:	98.619	98.622
Transducer Elevation:	98.006	98.041
Closing Error:	0.002	-
WL Check:	0.004	0.002

**Site Rating Information**

Measured Discharge:	0.528
Expected Discharge:	1.32
Shift from Existing Rating (m³/s):	0.79
Shift from Existing Rating (%):	150%

Field Personnel:	SM, TR	Trip Date:	1-May-13
Data Entry Personnel:	SM	Date:	1-May-13
Data Check Personnel:	DW	Date:	28-May-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: June 13, 2013  
 Site Visit Time (MST): 07:50



Flow Measurement: Measured Data											Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.50	0.00	0.00		0.000				0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	5.00	0.28		0.17	-0.002					1.00	1.25	0.28	-0.002	0.35	-0.001	0%
2	6.00	0.50		0.30	0.332					1.00	1.00	0.50	0.332	0.50	0.166	2%
3	7.00	0.88				0.70	0.596	0.18	0.904	1.00	1.00	0.88	0.750	0.88	0.660	9%
4	8.00	0.88				0.70	0.415	0.18	1.022	1.00	1.00	0.88	0.719	0.88	0.632	9%
5	9.00	0.89				0.71	0.741	0.18	0.267	1.00	0.88	0.89	0.504	0.78	0.392	5%
6	9.75	1.05				0.84	0.479	0.21	1.099	1.00	0.75	1.05	0.789	0.79	0.621	9%
7	10.50	1.18				0.94	0.191	0.24	1.094	1.00	0.75	1.18	0.643	0.89	0.569	8%
8	11.25	1.38				1.10	0.191	0.28	0.994	1.00	0.75	1.38	0.593	1.04	0.613	8%
9	12.00	1.72				1.38	0.507	0.34	1.076	1.00	0.57	1.72	0.792	0.99	0.783	11%
10	12.40	1.95				1.56	0.569	0.39	1.012	1.00	0.38	1.95	0.791	0.73	0.578	8%
11	12.75	2.05				1.64	0.667	0.41	0.783	1.00	0.35	2.05	0.725	0.72	0.520	7%
12	13.10	2.05				1.64	0.775	0.41	0.752	1.00	0.38	2.05	0.764	0.77	0.587	7%
13	13.50	1.90				1.52	0.623	0.38	0.746	1.00	0.57	1.90	0.685	1.09	0.748	10%
14	14.25	1.34				1.07	0.330	0.27	0.371	1.00	0.75	1.34	0.351	1.01	0.352	5%
15	15.00	0.31		0.19	0.077					1.00	0.57	0.31	0.077	0.18	0.014	0%
LB	15.40	0.00	0.00		0.00				0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>7.24</b>	<b>100%</b>

Flow Measurement Details:	
Metering Section Location (describe): 10 m us of PT	
Meas. Start Time (MST):	8:20
Meas. End Time (MST):	9:10
Equipment:	ADV
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Overcast

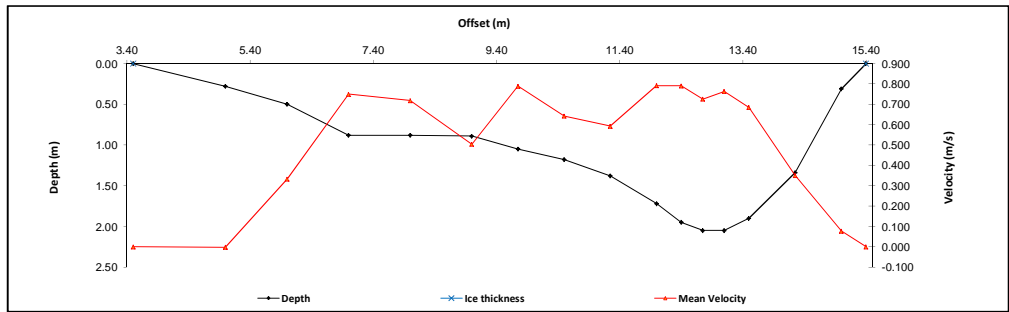
Flow characteristics:	
Total Flow:	7.24 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	11.58 (m <sup>2</sup> )
Wetted Width:	11.90 (m)
Hydraulic Depth:	0.97 (m)
Mean Velocity:	0.63 (m/s)
Froude Number:	0.20

Logger Details:		
Transducer Reading (m):	Before	After
	2.183	2.183
Water (°C):	13.0	13.0
Datalogger Clock:	07:58	09:12
Laptop Clock:	07:58	09:12
Battery (Main):	13.1	13.1
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Very high flow, some overland flow on RB
- Flow is an under estimate



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S50A-02	1.187	101.347		100.160	100.160	Pipe 4 m N of logger	S50A-03
S50A-03			1.381	99.966	99.969	Pipe 6 m N of logger	S50A-04
S50A-04			0.368	100.979	100.979	Pipe 5 m E of logger	WL
Ice/PT:							
Water Level:			2.113	99.234		Time WL Surveyed: 8:05	S50A-04
Other:							S50A-02
<b>Setup #2</b>							S50A-03
S50A-02			1.116	100.159	100.160	Pipe 4 m N of logger	
S50A-03	1.309	101.275		99.966	99.969	Pipe 6 m N of logger	
S50A-04			0.299	100.976	100.979	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			2.045	99.230		Time WL Surveyed: 8:07	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S50A-03	1.308	101.274		99.966		
Water Level:			2.043		99.231	Time WL Surveyed: 9:15	
Water Level:			2.030		99.235	Time WL Surveyed: 9:17	
BM:	S50A-03	1.299	101.265		99.966		

WL Survey Summary	Before	After
Average WL:	99.232	99.233
Transducer Elevation:	97.049	97.050
Closing Error:	0.001	-
WL Check:	0.004	-0.004

Site Rating Information	
Measured Discharge:	7.24
Expected Discharge:	5.16
Shift from Existing Rating (m <sup>3</sup> /s):	-2.08
Shift from Existing Rating (%):	-29%

<b>Field Personnel:</b>	TR, SG	Trip Date:	13-Jun-13
<b>Data Entry Personnel:</b>	SG	Date:	13-Jun-13
<b>Data Check Personnel:</b>	DW	Date:	25-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: August 10, 2013  
 Site Visit Time (MST): 12:45

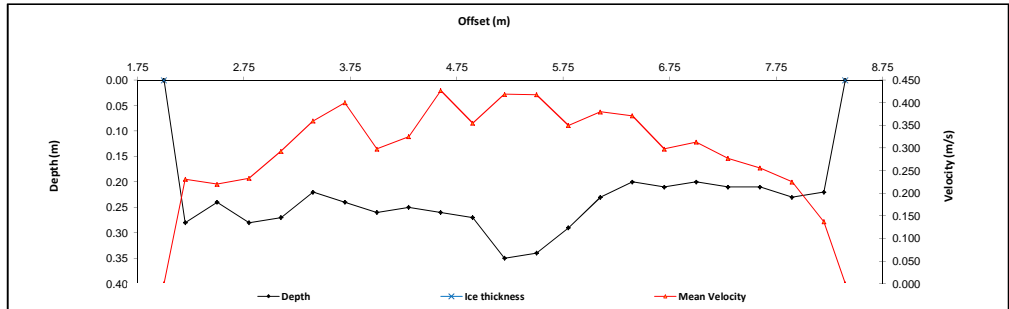


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.20	0.28		0.17	0.231					1.00	0.25	0.28	0.231	0.07	0.016	3%
2	2.50	0.24		0.14	0.220					1.00	0.30	0.24	0.220	0.07	0.016	3%
3	2.80	0.28		0.17	0.233					1.00	0.30	0.28	0.233	0.08	0.020	4%
4	3.10	0.27		0.16	0.293					1.00	0.30	0.27	0.293	0.08	0.024	5%
5	3.40	0.22		0.13	0.360					1.00	0.30	0.22	0.360	0.07	0.024	5%
6	3.70	0.24		0.14	0.400					1.00	0.30	0.24	0.400	0.07	0.029	6%
7	4.00	0.26		0.16	0.298					1.00	0.30	0.26	0.298	0.08	0.023	5%
8	4.30	0.25		0.15	0.325					1.00	0.30	0.25	0.325	0.07	0.024	5%
9	4.60	0.26		0.16	0.427					1.00	0.30	0.26	0.427	0.08	0.033	7%
10	4.90	0.27		0.16	0.355					1.00	0.30	0.27	0.355	0.08	0.029	6%
11	5.20	0.35		0.21	0.419					1.00	0.30	0.35	0.419	0.11	0.044	9%
12	5.50	0.34		0.20	0.418					1.00	0.30	0.34	0.418	0.10	0.043	9%
13	5.80	0.29		0.17	0.350					1.00	0.30	0.29	0.350	0.09	0.030	6%
14	6.10	0.23		0.14	0.380					1.00	0.30	0.23	0.380	0.07	0.026	5%
15	6.40	0.20		0.12	0.371					1.00	0.30	0.20	0.371	0.06	0.022	4%
16	6.70	0.21		0.13	0.298					1.00	0.30	0.21	0.298	0.06	0.019	4%
17	7.00	0.20		0.12	0.313					1.00	0.30	0.20	0.313	0.06	0.019	4%
18	7.30	0.21		0.13	0.277					1.00	0.30	0.21	0.277	0.06	0.017	4%
19	7.60	0.21		0.13	0.256					1.00	0.30	0.21	0.256	0.06	0.016	3%
20	7.90	0.23		0.14	0.225					1.00	0.30	0.23	0.225	0.07	0.016	3%
21	8.20	0.22		0.13	0.137					1.00	0.25	0.22	0.137	0.06	0.008	2%
LB	8.40	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.497</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m us of PT

Meas. Start Time (MST):	13:13
Meas. End Time (MST):	13:33
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, Breezy, 20°C



**Flow characteristics:**

Total Flow:	0.497	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.55	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.21	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.183	1.183
Water (°C):	11.0	11.1
Datalogger Clock:	12:55	13:42
Laptop Clock:	12:54	13:41
Battery (Main):	14.1	14.1
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Station was damaged by wildlife and not operating upon arrival
- Station was reinstated
- Replaced antenna cable and battery
- Needs new enclosure and mast

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S50A-02	1.553	101.713		100.160	100.160	Pipe 4 m N of logger	S50A-02
S50A-03			1.747	99.966	99.969	Pipe 6 m N of logger	S50A-03
S50A-04			0.734	100.979	100.979	Pipe 5 m E of logger	S50A-04
Ice/PT:							WL
Water Level:			3.528	98.185		Time WL Surveyed: 13:03	WL
Other:							S50A-04
<b>Setup #2</b>							S50A-03
S50A-02			1.542	100.158	100.160	Pipe 4 m N of logger	S50A-02
S50A-03	1.734	101.700		99.966	99.969	Pipe 6 m N of logger	
S50A-04			0.722	100.978	100.979	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			3.517	98.183		Time WL Surveyed: 13:04	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S50A-03	1.733	101.689		99.966		
Water Level:			3.512	98.187		Time WL Surveyed: 13:38	
Water Level:			3.505	98.184		Time WL Surveyed: 13:39	
BM:	S50A-03	1.723	101.689		99.966		

**WL Survey Summary**

	Before	After
Average WL:	98.184	98.186
Transducer Elevation:	97.001	97.003
Closing Error:	0.002	-
WL Check:	0.002	0.003

**Site Rating Information**

Measured Discharge:	0.497
Expected Discharge:	0.12
Shift from Existing Rating (m <sup>3</sup> /s):	-0.38
Shift from Existing Rating (%):	-76%

**Field Personnel:**

Data Entry Personnel:	SM	Trip Date:	10-Aug-13
Data Check Personnel:	SM	Date:	10-Aug-13
Entered Digitally in the Field:	DW	Date:	27-Aug-13

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: September 23, 2013  
 Site Visit Time (MST): 09:20

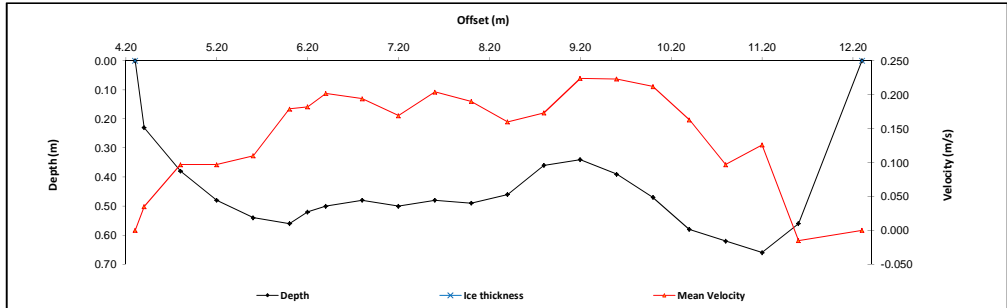


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.30	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	4.40	0.23		0.14	0.035					1.00	0.25	0.23	0.035	0.06	0.002	0%
2	4.80	0.38		0.23	0.097					1.00	0.40	0.38	0.097	0.15	0.015	3%
3	5.20	0.48		0.29	0.097					1.00	0.40	0.48	0.097	0.19	0.019	3%
4	5.60	0.54		0.32	0.110					1.00	0.40	0.54	0.110	0.22	0.024	4%
5	6.00	0.56		0.34	0.179					1.00	0.30	0.56	0.179	0.17	0.030	6%
6	6.20	0.52		0.31	0.182					1.00	0.20	0.52	0.182	0.10	0.019	4%
7	6.40	0.50		0.30	0.202					1.00	0.30	0.50	0.202	0.15	0.030	6%
8	6.80	0.48		0.29	0.194					1.00	0.40	0.48	0.194	0.19	0.037	7%
9	7.20	0.50		0.30	0.169					1.00	0.40	0.50	0.169	0.20	0.034	6%
10	7.60	0.48		0.29	0.204					1.00	0.40	0.48	0.204	0.19	0.039	7%
11	8.00	0.49		0.29	0.190					1.00	0.40	0.49	0.190	0.20	0.037	7%
12	8.40	0.46		0.28	0.160					1.00	0.40	0.46	0.160	0.18	0.029	5%
13	8.80	0.36		0.22	0.173					1.00	0.40	0.36	0.173	0.14	0.025	5%
14	9.20	0.34		0.20	0.224					1.00	0.40	0.34	0.224	0.14	0.030	6%
15	9.60	0.39		0.23	0.223					1.00	0.40	0.39	0.223	0.16	0.035	6%
16	10.00	0.47		0.28	0.212					1.00	0.40	0.47	0.212	0.19	0.040	7%
17	10.40	0.58		0.35	0.163					1.00	0.40	0.58	0.163	0.23	0.038	7%
18	10.80	0.62		0.37	0.097					1.00	0.40	0.62	0.097	0.25	0.024	4%
19	11.20	0.66		0.40	0.126					1.00	0.40	0.66	0.126	0.26	0.033	6%
20	11.60	0.56		0.34	-0.015					1.00	0.55	0.56	-0.015	0.31	-0.005	-1%
LB	12.30	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.536</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m us of PT

Meas. Start Time (MST):	11:27
Meas. End Time (MST):	11:48
Equipment:	ADV
Method:	Wading
River Condition:	High water level
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, Breezy, 15°C



**Flow characteristics:**

Total Flow:	0.536	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.68	(m <sup>2</sup> )
Wetted Width:	8.00	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.503	0.485
Water (°C):	8.9	8.9
Datalogger Clock:	09:42	11:55
Laptop Clock:	09:41	11:54
Battery (Main):	12.8	13.0
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	333044
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Bite marks in relay coil antenna cable
- Cable may still function so it was left in place.
- Installed new PLS because old one could not be recovered from Channel

**General Notes:**

- Moved station to mast 15 m upstream of original location.
- Completed ADV test
- Station needs tag for S50A-04
- Second survey done at new station location

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S50A-02
S50A-02			1.469	100.162	100.160	Pipe 8 m S of logger	S50A-03
S50A-03	1.662	101.631		99.969	99.969	Pipe 7 m SW of logger	S50A-04
S50A-04			0.650	100.981	99.979	Pipe 10 m SE of logger	WL
Ice/PT:							WL
Water Level:			3.123	98.508		Time WL Surveyed: 11:19	S50A-04
Other:							S50A-03
<b>Setup #2</b>							S50A-02
S50A-02			1.450	100.162	100.995	Pipe 8 m S of logger	
S50A-03			1.643	99.969	99.969	Pipe 7 m SW of logger	
S50A-04	0.631	101.612		100.981	99.979	Pipe 10 m SE of logger	
Ice/PT:							
Water Level:			3.103	98.509		Time WL Surveyed: 11:21	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S50A-02	1.449	101.611	100.162			
Water Level:			3.107	98.504		Time WL Surveyed: 11:50	
Water Level:			3.081	98.505		Time WL Surveyed: 11:52	
BM:	S50A-02	1.424	101.586	100.162			

**WL Survey Summary**

	Before	After
Average WL:	98.509	98.505
Transducer Elevation:	97.006	98.020
Closing Error:	0.000	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	0.536
Expected Discharge:	0.89
Shift from Existing Rating (m <sup>3</sup> /s):	0.36
Shift from Existing Rating (%):	67%

**Field Personnel:**

SM, TR	Trip Date:	23-Sep-13
SM, TR	Date:	23-Sep-13
DW	Date:	28-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: November 2, 2013  
 Site Visit Time (MST): 09:15

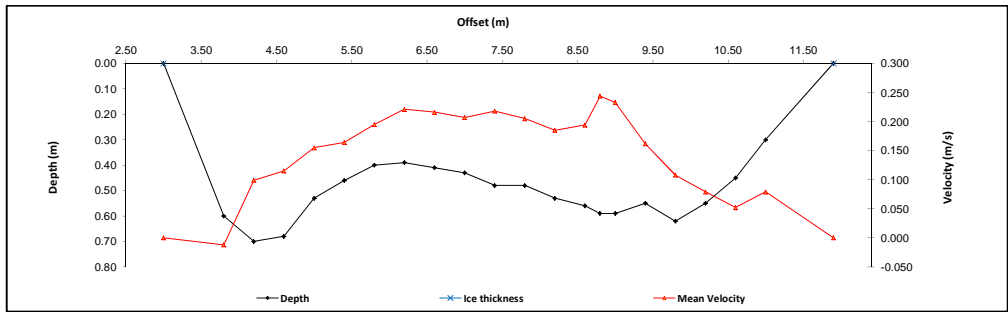


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.00				0.00	1.00	0.40	0.00	0.000	0.00	0.000	
1	3.80	0.60		0.36	-0.012					1.00	0.60	0.60	-0.012	0.36	-0.004	-1%
2	4.20	0.70		0.42	0.099					1.00	0.40	0.70	0.099	0.28	0.028	5%
3	4.60	0.68		0.41	0.115					1.00	0.40	0.68	0.115	0.27	0.031	5%
4	5.00	0.53		0.32	0.155					1.00	0.40	0.53	0.155	0.21	0.033	6%
5	5.40	0.46		0.28	0.164					1.00	0.40	0.46	0.164	0.18	0.030	5%
6	5.80	0.40		0.24	0.195					1.00	0.40	0.40	0.195	0.16	0.031	5%
7	6.20	0.39		0.23	0.221					1.00	0.40	0.39	0.221	0.16	0.034	6%
8	6.60	0.41		0.25	0.216					1.00	0.40	0.41	0.216	0.16	0.035	6%
9	7.00	0.43		0.26	0.207					1.00	0.40	0.43	0.207	0.17	0.036	6%
10	7.40	0.48		0.29	0.218					1.00	0.40	0.48	0.218	0.19	0.042	7%
11	7.80	0.48		0.29	0.205					1.00	0.40	0.48	0.205	0.19	0.039	7%
12	8.20	0.53		0.32	0.185					1.00	0.40	0.53	0.185	0.21	0.039	7%
13	8.60	0.56		0.34	0.194					1.00	0.30	0.56	0.194	0.17	0.033	6%
14	8.80	0.59		0.35	0.244					1.00	0.20	0.59	0.244	0.12	0.029	5%
15	9.00	0.59		0.35	0.233					1.00	0.30	0.59	0.233	0.18	0.041	7%
16	9.40	0.55		0.33	0.162					1.00	0.40	0.55	0.162	0.22	0.036	6%
17	9.80	0.62		0.37	0.108					1.00	0.40	0.62	0.108	0.25	0.027	5%
18	10.20	0.55		0.33	0.079					1.00	0.40	0.55	0.079	0.22	0.017	3%
19	10.60	0.45		0.27	0.052					1.00	0.40	0.45	0.052	0.18	0.009	2%
20	11.00	0.30		0.18	0.079					1.00	0.65	0.30	0.079	0.20	0.015	3%
RB	11.90	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.582</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10 m us of PT

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:10
Equipment:	ADV
Method:	Wading
River Condition:	High water level, no ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 0°C



**Flow characteristics:**

Total Flow:	0.582	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.08	(m <sup>2</sup> )
Wetted Width:	8.90	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.554	0.554
Water (°C):	2.3	2.2
Datalogger Clock:	09:16	10:19
Laptop Clock:	09:16	10:19
Battery (Main):	12.8	12.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	333044	-

**Datalogger / Station Notes:**

- Removed PLS for winter
- One PLS left at site and running because it could not be retrieved depth: 1.573
- Relay station damaged by wildlife
- Radio, modern damaged, needs all new cables

**General Notes:**

- Updated BM descriptions
- Installed BM tags
- Drew site sketch

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S50A-02	1.487	101.647		100.160	100.160	Pipe 8 m S of logger	S50A-02
S50A-03			1.680	99.967	99.969	Pipe 7 m SW of logger	S50A-03
S50A-04			0.667	100.980	99.979	Pipe 10 m SE of logger	S50A-04
Ice/PT:							WL
Water Level:			3.075	98.572		Time WL Surveyed: 9:44	S50A-04
Other:							S50A-03
Setup #2							S50A-02
S50A-02			1.470	100.162	100.160	Pipe 8 m S of logger	
S50A-03			1.663	99.969	99.969	Pipe 7 m SW of logger	
S50A-04	0.652	101.632		100.980	99.979	Pipe 10 m SE of logger	
Ice/PT:							
Water Level:			3.054	98.578		Time WL Surveyed: 9:46	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S50A-02	1.470	101.630		100.160		
Water Level:			3.055	98.575		Time WL Surveyed: 10:15	
Water Level:			3.043	98.575		Time WL Surveyed: 10:17	
BM:	S50A-02	1.458	101.618		100.160		

**WL Survey Summary**

	Before	After
Average WL:	98.575	98.575
Transducer Elevation:	98.021	98.021
Closing Error:	-0.002	-
WL Check:	0.006	0.000

**Site Rating Information**

Measured Discharge:	0.582
Expected Discharge:	1.14
Shift from Existing Rating (m <sup>3</sup> /s):	0.56
Shift from Existing Rating (%):	96%

**Field Personnel:**

Field Personnel:	TR, SM	Trip Date:	2-Nov-13
Data Entry Personnel:	TR	Date:	2-Nov-13
Data Check Personnel:	DW	Date:	6-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

January 8, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	5.05	1.05	0.04	0.092	0.083	0.04	0.003	0%
1	6.10	0.40	0.25	0.367			0.9	5.05	6.70	1.65	0.15	0.367	0.330	0.25	0.082	4%
2	7.30	0.40	0.25	0.758			0.9	6.70	8.75	2.05	0.15	0.758	0.682	0.31	0.210	11%
3	10.20	0.55	0.20	1.189			0.9	8.75	10.55	1.80	0.35	1.189	1.070	0.63	0.674	34%
4	10.90	0.55	0.25	1.100			0.9	10.55	11.20	0.65	0.30	1.100	0.990	0.20	0.193	10%
5	11.50	0.50	0.30	0.853			0.9	11.20	11.75	0.55	0.20	0.853	0.768	0.11	0.084	4%
6	12.00	0.60	0.30	0.651			0.9	11.75	12.10	0.35	0.30	0.651	0.586	0.11	0.062	3%
7	12.20	0.60	0.30	0.690			0.9	12.10	12.35	0.25	0.30	0.690	0.621	0.08	0.047	2%
8	12.50	0.50	0.40	0.606			0.9	12.35	12.75	0.40	0.10	0.606	0.545	0.04	0.022	1%
9	13.00	0.50	0.35	0.746			0.9	12.75	13.25	0.50	0.15	0.746	0.671	0.08	0.050	3%
10	13.50	0.55	0.35	0.312			0.9	13.25	13.70	0.45	0.20	0.312	0.281	0.09	0.025	1%
11	13.90	0.55	0.35	0.843			0.9	13.70	14.10	0.40	0.20	0.843	0.759	0.08	0.061	3%
12	14.30	0.55	0.35	0.495			0.9	14.10	14.55	0.45	0.20	0.495	0.446	0.09	0.040	2%
13	14.80	0.55	0.35	0.876			0.9	14.55	14.95	0.40	0.20	0.876	0.788	0.08	0.063	3%
14	15.10	0.50	0.30	0.912			0.9	14.95	15.35	0.40	0.20	0.912	0.821	0.08	0.066	3%
15	15.60	0.35	0.25	1.491			0.9	15.35	15.85	0.50	0.10	1.491	1.342	0.05	0.067	3%
16	16.10	0.50	0.25	1.114			0.9	15.85	16.50	0.65	0.25	1.114	1.003	0.16	0.163	8%
17	16.90	0.50	0.30	0.961			0.9	16.50	16.95	0.45	0.20	0.961	0.865	0.09	0.078	4%
LB	17.00	0.00	0.00	0.00	0.00	0.00	1.0	16.95	17.00	0.05	0.05	0.240	0.240	0.00	0.001	0%
<b>Total Flow</b>														<b>1.99</b>		

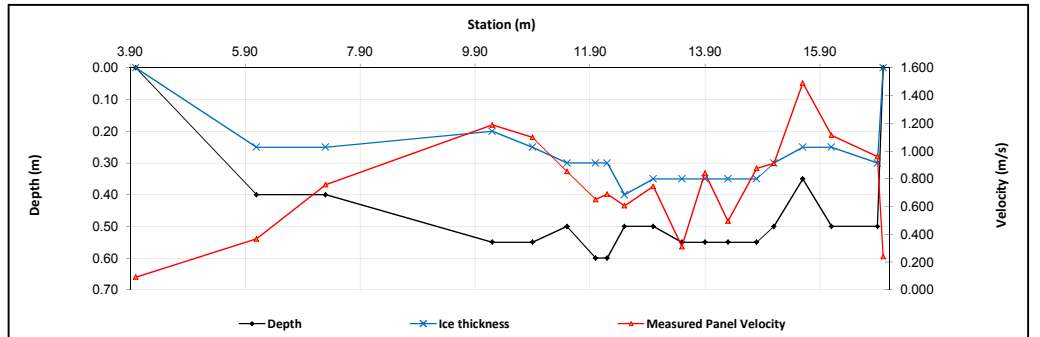
Measurement Details:	
Start Time (MST):	13:30
End Time (MST):	15:10
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Poor
Weather:	Overcast, calm, -10°C

Flow characteristics:	
Total Flow:	1.99 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	2.55 (m <sup>2</sup> )
Wetted Width:	13.00 (m)
Hydraulic Depth:	0.196 (m)
Mean Velocity:	0.781 (m/s)
Froude Number:	0.563

Logger Details:		
	Before	After
Transducer Reading (m):	0.396	-
Water (°C):	0.3	-
Battery (Main):	12.8	-
Datalogger Clock:	13:43	-
Laptop Clock:	13:43	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	20958	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	GOES diagnostic button - red light
-	Re-oriented GOES antenna

General Notes:	
-	Sand bar found in channel



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S51-01	1.038	101.038		100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			0.968	100.070	100.058	3/4" Pipe 3 m S of logger
S51-03			0.564	100.474	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.829	98.209		
Water Level:			3.000	98.038		
Other:						
<b>Setup #2</b>						
S51-01			1.023	100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02	0.953	101.023		100.070	100.058	3/4" Pipe 3 m S of logger
S51-03			0.546	100.477	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.813	98.210		
Water Level:			2.988	98.035		
Other:						

Closing Error	0.000	Average WL	98.037
WL Check	0.003	Transducer Elevation Before	97.641
		Transducer Elevation After	-

Field Personnel:	SM, DW, JG	Trip Date:	8-Jan-13
Data Entry Personnel:	JG	Date:	8-Jan-13
Data Check Personnel:	TR	Date:	25-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

February 5, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.00	0.00	0.00	0.000	0.000	0.000	0.9	5.00	5.50	0.50	0.05	0.110	0.099	0.02	0.002	0%
1	6.00	0.48	0.30	0.441			0.9	5.50	6.25	0.75	0.18	0.441	0.397	0.14	0.054	3%
2	6.50	0.45	0.25	0.582			0.9	6.25	6.80	0.55	0.20	0.582	0.524	0.11	0.058	4%
3	7.10	0.50	0.20	0.643			0.9	6.80	7.58	0.78	0.30	0.643	0.579	0.23	0.135	8%
4	8.05	0.45	0.20	0.498			0.9	7.58	8.48	0.90	0.25	0.498	0.448	0.23	0.101	6%
5	8.90	0.57	0.20	0.700			0.9	8.48	9.25	0.77	0.37	0.700	0.630	0.29	0.181	11%
6	9.60	0.60	0.22	0.671			0.9	9.25	9.78	0.52	0.38	0.671	0.604	0.20	0.120	7%
7	9.95	0.50	0.25	0.750			0.9	9.78	10.10	0.33	0.25	0.750	0.675	0.08	0.055	3%
8	10.25	0.60	0.25	0.520			0.9	10.10	10.53	0.43	0.35	0.520	0.468	0.15	0.070	4%
9	10.80	0.50	0.25	0.491			0.9	10.53	10.93	0.40	0.25	0.491	0.442	0.10	0.044	3%
10	11.05	0.55	0.35	0.441			0.9	10.93	11.25	0.32	0.20	0.441	0.397	0.06	0.026	2%
11	11.45	0.60	0.35	0.442			0.9	11.25	11.68	0.43	0.25	0.442	0.398	0.11	0.042	3%
12	11.90	0.60	0.45	0.297			0.9	11.68	12.30	0.63	0.15	0.297	0.267	0.09	0.025	2%
13	12.70	0.58	0.38	0.000			1.0	12.30	13.05	0.75	0.20	0.000	0.000	0.15	0.000	0%
14	13.40	0.62	0.45	0.662			0.9	13.05	13.68	0.63	0.17	0.662	0.596	0.11	0.063	4%
15	13.95	0.55	0.35	0.663			0.9	13.68	14.28	0.60	0.20	0.663	0.597	0.12	0.072	4%
16	14.60	0.55	0.30	0.957			0.9	14.28	14.85	0.58	0.25	0.957	0.861	0.14	0.124	8%
17	15.10	0.50	0.25	0.855			0.9	14.85	15.45	0.60	0.25	0.855	0.770	0.15	0.115	7%
18	15.80	0.52	0.25	0.832			0.9	15.45	16.15	0.70	0.27	0.832	0.749	0.19	0.142	9%
19	16.50	0.50	0.25	0.832			0.9	16.15	17.20	1.05	0.25	0.832	0.749	0.26	0.197	12%
20	17.90	0.49	0.27	0.001			0.9	17.20	18.45	1.25	0.22	0.001	0.001	0.28	0.000	0%
LB	18.00	0.00	0.00	0.00	0.00	0.00	1.0	18.45	19.00	0.55	0.06	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>															<b>1.62</b>	

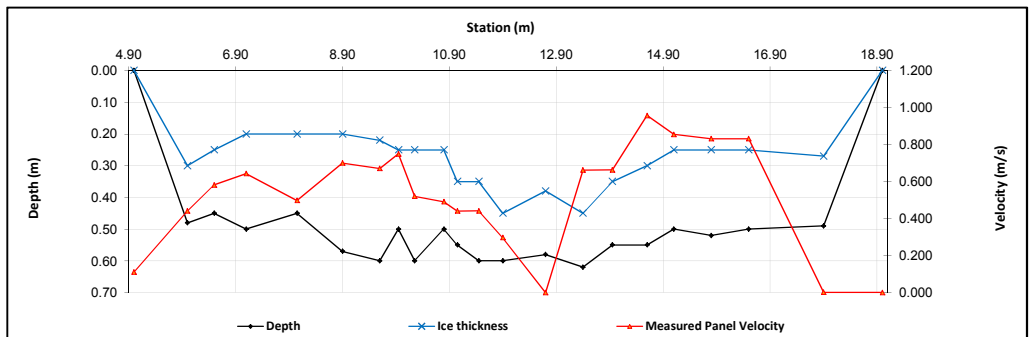
Measurement Details:	
Start Time (MST):	13:30
End Time (MST):	16:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	P. Cloud, -15°C

Flow characteristics:		
Total Flow:	1.62	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.23	(m <sup>2</sup> )
Wetted Width:	14.00	(m)
Hydraulic Depth:	0.231	(m)
Mean Velocity:	0.501	(m/s)
Froude Number:	0.333	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.405	-
Battery (Main):	0.4	-
Datalogger Clock:	12.6	13.1
Laptop Clock:	1:37	1:49
Enclosure Dessicant:	1:37	1:49
Logger# (if Δ):	Replaced	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	Good

Datalogger / Station Notes:	
-	Opens leads visible DS

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S51-01	1.055	101.055		100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			0.982	100.073	100.058	3/4" Pipe 3 m S of logger
S51-03			0.575	100.480	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.855	98.200		
Water Level:			3.050	98.005		
Other:						
<b>Setup #2</b>						
S51-01			0.969	100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02	0.896	100.969		100.073	100.058	3/4" Pipe 3 m S of logger
S51-03			0.490	100.479	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.772	98.197		
Water Level:			2.965	98.004		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	98.005
Transducer Elevation Before	97.600
Transducer Elevation After	-

Field Personnel:	TR, JG, CJ	Trip Date:	5-Feb-13
Data Entry Personnel:	CJ	Date:	5-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

March 2, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.30	0.00	0.00	0.000	0.000	0.000	0.9	4.30	4.55	0.25	0.07	0.193	0.173	0.02	0.003	0%
1	4.80	0.26		0.770			0.9	4.55	5.35	0.80	0.26	0.770	0.693	0.21	0.144	7%
2	5.90	0.22	0.01	0.764			0.9	5.35	6.45	1.10	0.21	0.764	0.688	0.23	0.159	7%
3	7.00	0.23	0.12	0.325			0.9	6.45	7.50	1.05	0.11	0.325	0.293	0.12	0.034	2%
4	8.00	0.37	0.21	0.424			0.9	7.50	8.50	1.00	0.16	0.424	0.382	0.16	0.061	3%
5	9.00	0.40	0.27	0.422			0.9	8.50	9.50	1.00	0.13	0.422	0.380	0.13	0.049	2%
6	10.00	0.47	0.28	0.449			0.9	9.50	10.60	1.10	0.21	0.449	0.404	0.23	0.093	4%
7	11.20	0.49	0.23	0.743			0.9	10.60	11.50	0.90	0.26	0.743	0.669	0.23	0.156	7%
8	11.80	0.53	0.25	0.445			0.9	11.50	12.10	0.60	0.28	0.445	0.401	0.17	0.067	3%
9	12.40	0.57	0.22	0.431			0.9	12.10	12.65	0.55	0.35	0.431	0.388	0.19	0.075	3%
10	12.90	0.57	0.23	0.415			0.9	12.65	13.30	0.65	0.34	0.415	0.374	0.22	0.083	4%
11	13.70	0.61	0.25	0.466			0.9	13.30	13.95	0.65	0.36	0.466	0.419	0.23	0.098	5%
12	14.20	0.61	0.28	0.492			0.9	13.95	14.45	0.50	0.33	0.492	0.443	0.17	0.073	3%
13	14.70	0.49	0.35	0.223			0.9	14.45	14.90	0.45	0.14	0.223	0.201	0.06	0.013	1%
14	15.10	0.51	0.27	0.170			0.9	14.90	15.35	0.45	0.24	0.170	0.153	0.11	0.017	1%
15	15.60	0.55	0.45	0.294			0.9	15.35	15.80	0.45	0.10	0.294	0.265	0.05	0.012	1%
16	16.00	0.53	0.45	0.344			0.9	15.80	16.30	0.50	0.08	0.344	0.310	0.04	0.012	1%
17	16.60	0.62	0.46	0.297			0.9	16.30	16.90	0.60	0.16	0.297	0.267	0.10	0.026	1%
18	17.20	0.59	0.44	0.688			0.9	16.90	17.45	0.55	0.15	0.688	0.619	0.08	0.051	2%
19	17.70	0.58	0.42	0.682			0.9	17.45	18.05	0.60	0.16	0.682	0.614	0.10	0.059	3%
20	18.40	0.56	0.30	0.657			0.9	18.05	18.90	0.85	0.26	0.657	0.591	0.22	0.131	6%
21	19.40	0.53	0.16	1.062			0.9	18.90	19.70	0.80	0.37	1.062	0.974	0.30	0.288	13%
22	20.00	0.57	0.25	0.913			0.9	19.70	20.10	0.40	0.32	0.913	0.822	0.13	0.105	5%
23	20.20	0.53	0.25	0.908			0.9	20.10	21.35	1.25	0.28	0.908	0.817	0.35	0.286	13%
24	22.50	0.36	0.22	0.341			0.9	21.35	23.25	1.90	0.14	0.341	0.307	0.27	0.082	4%
RB	24.00	0.00	0.00	0.00	0.00	0.00	1.0	23.25	24.00	0.75	0.04	0.085	0.085	0.03	0.002	0%

**Total Flow 2.18**

Measurement Details:	
Start Time (MST):	12:50
End Time (MST):	14:34
Equipment:	ADV
Method:	Ice
River Condition:	Over flow
Quality/Error (see reverse):	Poor
Weather:	Sunny, calm, 6°C

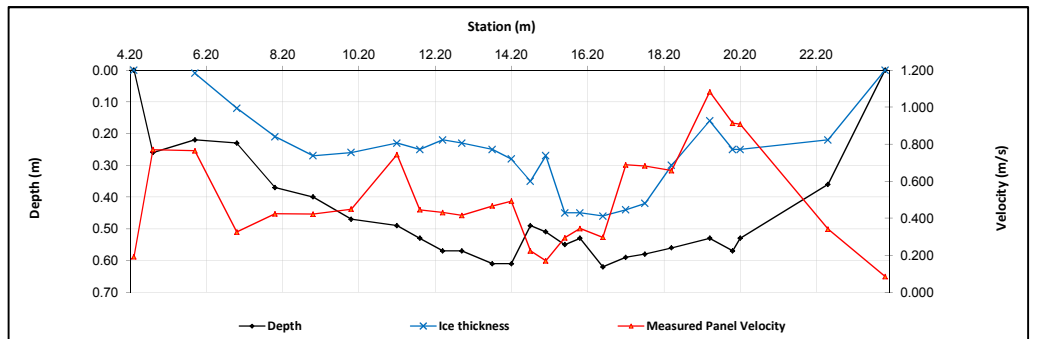
Flow characteristics:	
Total Flow:	2.18 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	4.12 (m <sup>2</sup> )
Wetted Width:	19.70 (m)
Hydraulic Depth:	0.209 (m)
Mean Velocity:	0.529 (m/s)
Froude Number:	0.369

Logger Details:		
Transducer Reading (m):	Before	After
	0.380	-
Water (°C):	0.3	-
Battery (Main):	14.5	-
Datalogger Clock:	12:56	-
Laptop Clock:	12:56	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	20958	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:

**General Notes:**

- There are two layers of ice with water stored in between, once holes were drilled it drained into main flow completely before measurement began
- 3 holes were drilled for WL survey, water fluctuating in all



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S51-01	1.077	101.077		100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			0.997	100.080	100.058	3/4" Pipe 3 m S of logger
S51-03			0.599	100.478	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.925	98.152		
Water Level:			3.150	97.927		
Other:						
<b>Setup #2</b>						
S51-01			1.056	100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			0.982	100.074	100.058	3/4" Pipe 3 m S of logger
S51-03	0.578	101.056		100.478	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			2.906	98.150		
Water Level:			3.122	97.934		
Other:						

Closing Error	0.000
WL Check	0.007

Average WL	97.931
Transducer Elevation Before	97.551
Transducer Elevation After	-

Field Personnel:	DW, TR	Trip Date:	2-Mar-13
Data Entry Personnel:	DW	Date:	2-Mar-13
Data Check Personnel:	TR	Date:	14-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

March 31, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB		0.00	0.00	0.000	0.000	0.000	1.0									
1							1.0									
2							1.0									
3							1.0									
4							1.0									
5							1.0									
6							1.0									
7							1.0									
8							1.0									
9							1.0									
10							1.0									
11							1.0									
12							1.0									
13							1.0									
14							1.0									
15							1.0									
16							1.0									
17							1.0									
18							1.0									
19							1.0									
20							1.0									
21							1.0									
22							1.0									
23							1.0									
24							1.0									
25							1.0									
26							1.0									
27							1.0									
28							1.0									
29							1.0									
30							1.0									
LB		0.00	0.00	0.00	0.00	0.00	1.0									
No Flow Measurement Conducted																
<b>Total Flow</b>																

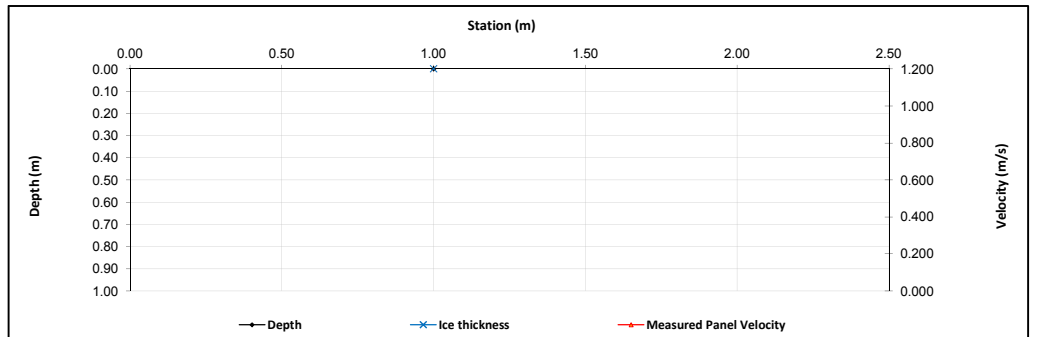
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:12
Equipment:	-
Method:	-
River Condition:	Partly open
Quality/Error (see reverse):	-
Weather:	Overcast, 2°C

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.403	-
Battery (Main):	14.7	-
Datalogger Clock:	12:57	-
Laptop Clock:	12:57	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

**General Notes:**  
- No flow measurement conducted due to thin ice and open spots



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S51-01	1.802	101.802		100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			1.726	100.076	100.058	3/4" Pipe 3 m S of logger
S51-03			1.318	100.484	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			3.858	97.944		
Water Level:			3.864	97.938		
Other:						
<b>Setup #2</b>						
S51-01			1.793	100.000	100.000	3/4" Pipe 3 m SE of logger
S51-02			1.717	100.076	100.058	3/4" Pipe 3 m S of logger
S51-03	1.309	101.793		100.484	100.474	3/4" Pipe 2 m W of logger
Ice/PT:			3.849	97.944		
Water Level:			3.851	97.942		
Other:						

Closing Error	0.000
WL Check	0.004

Average WL	97.940
Transducer Elevation Before	97.537
Transducer Elevation After	-

Field Personnel:		Trip Date:	
Data Entry Personnel:	CJ, XP	Date:	31-Mar-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: 9-May-2013  
 Site Visit Time (MST): 15:05



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB		0.00	0.00	0.000	0.000	0.000	1.0									
1							1.0									
2							1.0									
3							1.0									
4							1.0									
5							1.0									
6							1.0									
7							1.0									
8							1.0									
9							1.0									
10							1.0									
11							1.0									
12							1.0									
13							1.0									
14							1.0									
15							1.0									
16							1.0									
17							1.0									
18							1.0									
19							1.0									
20							1.0									
21							1.0									
22							1.0									
23							1.0									
24							1.0									
25							1.0									
26							1.0									
27							1.0									
28							1.0									
29							1.0									
30							1.0									
LB		0.00	0.00	0.00	0.00	0.00	1.0									

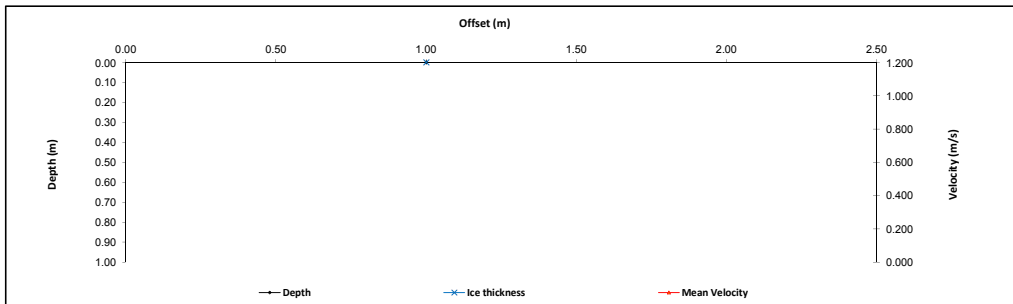
No Flow Measurement Conducted

Total Flow

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.452	-
Water (°C):	3.1	-
Datalogger Clock:	03:12	-
Laptop Clock:	03:12	-
Battery (Main):	13.9	-
Battery Condition:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement not conducted due to safety concerns.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S51-01	0.950	100.950		100.000	100.000	3/4" Pipe 3 m SE of logger	S51-01
S51-02			0.877	100.073	100.058	3/4" Pipe 3 m S of logger	S51-02
S51-03			0.469	100.481	100.474	3/4" Pipe 2 m W of logger	S51-03
Ice/PT:							WL
Water Level:			2.054	98.896		Time WL Surveyed: 15:25	S51-03
Other:							S51-02
<b>Setup #2</b>							
S51-01			0.935	99.999	100.000	3/4" Pipe 3 m SE of logger	S51-01
S51-02			0.862	100.072	100.058	3/4" Pipe 3 m S of logger	S51-02
S51-03	0.453	100.934		100.481	100.474	3/4" Pipe 2 m W of logger	S51-03
Ice/PT:							WL
Water Level:			2.037	98.897		Time WL Surveyed: 15:27	S51-03
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.481			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM				100.481			

**WL Survey Summary**

	Before	After
Average WL:	98.897	-
Transducer Elevation:	97.445	-
Closing Error:	0.001	-
WL Check:	0.001	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, DW	Trip Date:	9-May-13
SM	Date:	9-May-13
TR	Date:	31-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: June 15, 2013  
 Site Visit Time (MST): 09:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000	1.00						
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00			0.00		0.00		0.00	1.00						
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	High and fast
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Overcast, calm, 17°C

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

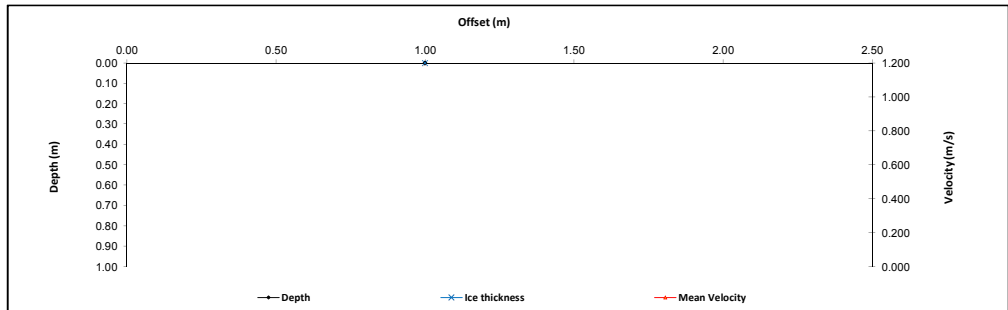
**Logger Details:**

	Before	After
Transducer Reading (m):	1.288	-
Water (°C):	13.4	-
Datalogger Clock:	09:09	-
Laptop Clock:	09:09	-
Battery (Main):	13.5	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed a lag bolt into tree
- No flow possible due to extremely high and fast flow

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Station</b>							
<b>Setup #1</b>							S51-01
S51-01	0.922	100.922		100.000	100.000	3/4" Pipe 3 m SE of logger	Other
S51-02			0.849	100.073	100.058	3/4" Pipe 3 m S of logger	S51-02
S51-03			0.441	100.481	100.474	3/4" Pipe 2 m W of logger	S51-03
Ice/PT:							WL
Water Level:		2.202		98.720		Time WL Surveyed: 9:19	WL
Other:		0.897		100.025	100.025	Lag bolt 7 m SE of logger	S51-03
<b>Setup #2</b>							S51-02
S51-01			0.899	99.997	100.000	3/4" Pipe 3 m SE of logger	Other
S51-02			0.824	100.072	100.058	3/4" Pipe 3 m S of logger	S51-01
S51-03	0.415	100.896		100.481	100.474	3/4" Pipe 2 m W of logger	
Ice/PT:							
Water Level:		2.179		98.717		Time WL Surveyed: 9:21	(must close survey loop on survey starting point)
Other:		0.869		100.027	100.025	Lag bolt 7 m SE of logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.481			
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:				100.481			

**WL Survey Summary**

	Before	After
Average WL:	98.719	-
Transducer Elevation:	97.431	-
Closing Error:	0.003	-
WL Check:	0.003	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	TR, SG	Trip Date:	15-Jun-13
<b>Data Entry Personnel:</b>	SG	Date:	15-Jun-13
<b>Data Check Personnel:</b>	TR	Date:	17-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 07:20

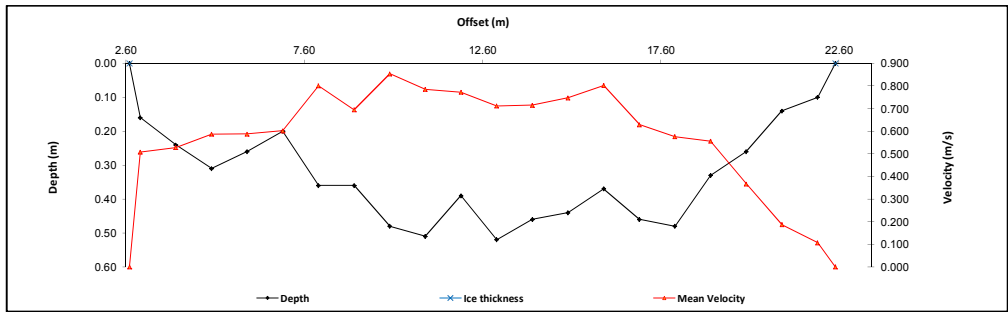


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.00	0.16		0.10	0.508					1.00	0.65	0.16	0.508	0.10	0.053	1%
2	4.00	0.24		0.14	0.528					1.00	1.00	0.24	0.528	0.24	0.127	3%
3	5.00	0.31		0.19	0.587					1.00	1.00	0.31	0.587	0.31	0.182	4%
4	6.00	0.26		0.16	0.588					1.00	1.00	0.26	0.588	0.26	0.153	3%
5	7.00	0.20		0.12	0.602					1.00	1.00	0.20	0.602	0.20	0.120	3%
6	8.00	0.36		0.22	0.801					1.00	1.00	0.36	0.801	0.36	0.288	6%
7	9.00	0.36		0.22	0.695					1.00	1.00	0.36	0.695	0.36	0.250	6%
8	10.00	0.48		0.29	0.854					1.00	1.00	0.48	0.854	0.48	0.410	9%
9	11.00	0.51		0.31	0.785					1.00	1.00	0.51	0.785	0.51	0.400	9%
10	12.00	0.39		0.23	0.773					1.00	1.00	0.39	0.773	0.39	0.301	7%
11	13.00	0.52		0.31	0.712					1.00	1.00	0.52	0.712	0.52	0.370	8%
12	14.00	0.46		0.28	0.715					1.00	1.00	0.46	0.715	0.46	0.329	7%
13	15.00	0.44		0.26	0.748					1.00	1.00	0.44	0.748	0.44	0.329	7%
14	16.00	0.37		0.22	0.802					1.00	1.00	0.37	0.802	0.37	0.297	7%
15	17.00	0.46		0.28	0.629					1.00	1.00	0.46	0.629	0.46	0.289	6%
16	18.00	0.48		0.29	0.576					1.00	1.00	0.48	0.576	0.48	0.276	6%
17	19.00	0.33		0.20	0.556					1.00	1.00	0.33	0.556	0.33	0.183	4%
18	20.00	0.26		0.16	0.367					1.00	1.00	0.26	0.367	0.26	0.095	2%
19	21.00	0.14		0.08	0.187					1.00	1.00	0.14	0.187	0.14	0.026	1%
20	22.00	0.10		0.06	0.107					1.00	0.75	0.10	0.107	0.08	0.008	0%
LB	22.50	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>4.49</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	7:45
Meas. End Time (MST):	8:04
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15°C



**Flow characteristics:**

Total Flow:	4.49	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.75	(m <sup>2</sup> )
Wetted Width:	19.80	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.67	(m/s)
Froude Number:	0.36	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.396	0.395
Water (°C):	15.1	15.2
Datalogger Clock:	07:21	08:12
Laptop Clock:	07:21	08:12
Battery (Main):	13.3	13.5
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Antenna Cable damaged by wildlife needs to be replaced

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S51-01	1.002	101.002		100.000	100.000	3/4" Pipe 3 m SE of logger	S51-01
S51-02			0.928	100.074	100.058	3/4" Pipe 3 m S of logger	Other
S51-03			0.522	100.480	100.474	3/4" Pipe 2 m W of logger	S51-03
Ice/PT:							S51-02
Water Level:		3.104		97.898			WL
Other:			0.977	100.025	100.025	Lag bolt 7 m SE of logger	Time WL Surveyed: 7:38
<b>Setup #2</b>							
S51-01			1.012	100.001	100.000	3/4" Pipe 3 m SE of logger	S51-02
S51-02	0.939	101.013		100.074	100.058	3/4" Pipe 3 m S of logger	Other
S51-03			0.532	100.481	100.474	3/4" Pipe 2 m W of logger	S51-01
Ice/PT:							
Water Level:		3.115		97.898			Time WL Surveyed: 7:32
Other:		0.987		100.026	100.025	Lag bolt 7 m SE of logger	Time WL Surveyed: 8:09
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S51-03	0.522	101.002	100.480			Time WL Surveyed: 8:11
Water Level:			3.104	97.898			
Water Level:			3.091	97.898			
BM:	S51-03	0.509	100.989	100.480			

**WL Survey Summary**

	Before	After
Average WL:	97.898	97.898
Transducer Elevation:	97.502	97.503
Closing Error:	-0.001	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	4.49
Expected Discharge:	5.08
Shift from Existing Rating (m <sup>3</sup> /s):	0.59
Shift from Existing Rating (%):	13%

**Field Personnel:**

SM & TR	Trip Date:	11-Aug-13
SM	Date:	11-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: September 14, 2013  
 Site Visit Time (MST): 14:18

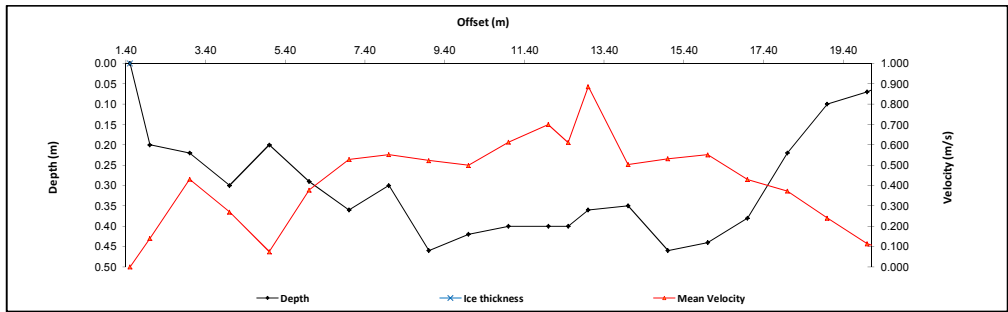


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.00	0.20		0.12	0.140					1.00	0.75	0.20	0.140	0.15	0.021	1%
2	3.00	0.22		0.13	0.431					1.00	1.00	0.22	0.431	0.22	0.095	3%
3	4.00	0.30		0.18	0.270					1.00	1.00	0.30	0.270	0.30	0.081	3%
4	5.00	0.20		0.12	0.075					1.00	1.00	0.20	0.075	0.20	0.015	1%
5	6.00	0.29		0.17	0.378					1.00	1.00	0.29	0.378	0.29	0.110	4%
6	7.00	0.36		0.22	0.528					1.00	1.00	0.36	0.528	0.36	0.190	7%
7	8.00	0.30		0.18	0.552					1.00	1.00	0.30	0.552	0.30	0.166	6%
8	9.00	0.46		0.28	0.523					1.00	1.00	0.46	0.523	0.46	0.241	8%
9	10.00	0.42		0.25	0.499					1.00	1.00	0.42	0.499	0.42	0.210	7%
10	11.00	0.40		0.24	0.613					1.00	1.00	0.40	0.613	0.40	0.245	8%
11	12.00	0.40		0.24	0.700					1.00	0.75	0.40	0.700	0.30	0.210	7%
12	12.50	0.40		0.24	0.612					1.00	0.50	0.40	0.612	0.20	0.122	4%
13	13.00	0.36		0.22	0.886					1.00	0.75	0.36	0.886	0.27	0.239	8%
14	14.00	0.35		0.21	0.503					1.00	1.00	0.35	0.503	0.35	0.176	6%
15	15.00	0.46		0.28	0.531					1.00	1.00	0.46	0.531	0.46	0.244	8%
16	16.00	0.44		0.26	0.551					1.00	1.00	0.44	0.551	0.44	0.242	8%
17	17.00	0.38		0.23	0.429					1.00	1.00	0.38	0.429	0.38	0.163	6%
18	18.00	0.22		0.13	0.373					1.00	1.00	0.22	0.373	0.22	0.082	3%
19	19.00	0.10		0.06	0.240					1.00	1.00	0.10	0.240	0.10	0.024	1%
20	20.00	0.07		0.04	0.114					1.00	1.35	0.07	0.114	0.09	0.011	0%
LB	21.70	0.00	0.00		0.00		0.00		0.00	1.00	0.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.89</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20 m US of station

Meas. Start Time (MST):	14:36
Meas. End Time (MST):	14:59
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 20°C



**Flow characteristics:**

Total Flow:	2.89	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.91	(m <sup>2</sup> )
Wetted Width:	20.20	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.49	(m/s)
Froude Number:	0.29	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.356	0.357
Water (°C):	11.7	11.9
Datalogger Clock:	14:20	15:10
Laptop Clock:	14:20	15:10
Battery (Main):	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- WL Fluctuating 4-5 mm during WL survey

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Station</b>							
<b>Setup #1</b>							
S51-01	1.096	101.096		100.000	100.000	3/4" Pipe 3 m SE of logger	S51-01
S51-02			1.024	100.072	100.058	3/4" Pipe 3 m S of logger	S51-02
S51-03			0.616	100.480	100.474	3/4" Pipe 2 m W of logger	S51-03
Ice/PT:							WL
Water Level:			3.283	97.813		Time WL Surveyed: 14:27	S51-03
Other:					100.025	Lag bolt 7 m SE of logger	S51-02
<b>Setup #2</b>							S51-01
S51-01			1.064	100.000	100.000	3/4" Pipe 3 m SE of logger	
S51-02			0.993	100.071	100.058	3/4" Pipe 3 m S of logger	
S51-03	0.584	101.064		100.480	100.474	3/4" Pipe 2 m W of logger	
Ice/PT:							
Water Level:			3.248	97.816		Time WL Surveyed: 14:29	
Other:					100.025	Lag bolt 7 m SE of logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S51-01	1.064	101.064	3.252	97.812	Time WL Surveyed: 15:04	
Water Level:				3.244	97.809	Time WL Surveyed: 15:06	
BM:	S51-01	1.053	101.053		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.815	97.811
Transducer Elevation:	97.459	97.454
Closing Error:	0.000	-
WL Check:	0.003	0.003

**Site Rating Information**

Measured Discharge:	2.89
Expected Discharge:	3.36
Shift from Existing Rating (m <sup>3</sup> /s):	0.47
Shift from Existing Rating (%):	16%

**Field Personnel:**

Field Personnel:	DW & CJ	Trip Date:	14-Sep-13
Data Entry Personnel:	CJ	Date:	14-Sep-13
Data Check Personnel:	TR	Date:	18-Oct-03
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: October 18, 2013  
 Site Visit Time (MST): 08:00

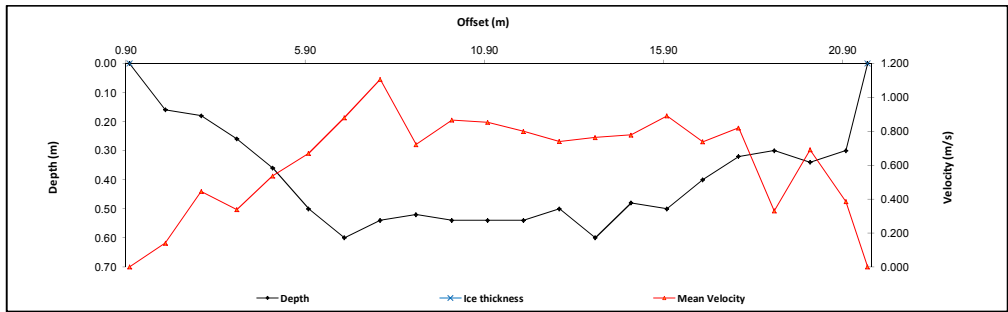


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	2.00	0.16		0.10	0.141					1.00	1.00	0.16	0.141	0.16	0.023	0%
2	3.00	0.18		0.11	0.445					1.00	1.00	0.18	0.445	0.18	0.080	1%
3	4.00	0.26		0.16	0.338					1.00	1.00	0.26	0.338	0.26	0.088	1%
4	5.00	0.36		0.22	0.537					1.00	1.00	0.36	0.537	0.36	0.193	3%
5	6.00	0.50		0.30	0.670					1.00	1.00	0.50	0.670	0.50	0.335	5%
6	7.00	0.60		0.36	0.880					1.00	1.00	0.60	0.880	0.60	0.528	9%
7	8.00	0.54		0.32	1.106					1.00	1.00	0.54	1.106	0.54	0.597	10%
8	9.00	0.52		0.31	0.722					1.00	1.00	0.52	0.722	0.52	0.375	6%
9	10.00	0.54		0.32	0.866					1.00	1.00	0.54	0.866	0.54	0.468	8%
10	11.00	0.54		0.32	0.853					1.00	1.00	0.54	0.853	0.54	0.461	7%
11	12.00	0.54		0.32	0.799					1.00	1.00	0.54	0.799	0.54	0.431	7%
12	13.00	0.50		0.30	0.739					1.00	1.00	0.50	0.739	0.50	0.370	6%
13	14.00	0.60		0.36	0.763					1.00	1.00	0.60	0.763	0.60	0.458	7%
14	15.00	0.48		0.29	0.778					1.00	1.00	0.48	0.778	0.48	0.373	6%
15	16.00	0.50		0.30	0.890					1.00	1.00	0.50	0.890	0.50	0.445	7%
16	17.00	0.40		0.24	0.738					1.00	1.00	0.40	0.738	0.40	0.295	5%
17	18.00	0.32		0.19	0.820					1.00	1.00	0.32	0.820	0.32	0.262	4%
18	19.00	0.30		0.18	0.330					1.00	1.00	0.30	0.330	0.30	0.099	2%
19	20.00	0.34		0.20	0.690					1.00	1.00	0.34	0.690	0.34	0.235	4%
20	21.00	0.30		0.18	0.385					1.00	0.80	0.30	0.385	0.24	0.092	1%
RB	21.60	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.21</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:31
Meas. End Time (MST):	8:55
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 5°C



**Flow characteristics:**

Total Flow:	6.21	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.42	(m <sup>2</sup> )
Wetted Width:	20.60	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.74	(m/s)
Froude Number:	0.37	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.489	0.496
Water (°C):	3.4	3.4
Datalogger Clock:	08:08	09:07
Laptop Clock:	08:08	09:07
Battery (Main):	12.9	13.1
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- GOES Antenna case was damaged by wildlife and needs to be replaced,
- Corrected damaged power connector

**General Notes:**

- Water level fluctuating 8 mm
- ADV test good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S51-01	1.024	101.024		100.000	100.000	Pipe 3 m SE of logger	S51-01
S51-02			0.951	100.073	100.058	Pipe 3 m S of logger	S51-02
S51-03			0.541	100.483	100.474	Pipe 2 m W of logger	WL
Ice/PT:							WL
Water Level:			3.068	97.956	Time WL Surveyed: 8:23		S51-03
Other:					100.025	Lag bolt 7 m SE of logger	S51-02
<b>Setup #2</b>							
S51-01			1.001	100.000	100.000	Pipe 3 m SE of logger	
S51-02			0.926	100.075	100.058	Pipe 3 m S of logger	
S51-03	0.518	101.001		100.483	100.474	Pipe 2 m W of logger	
Ice/PT:							
Water Level:			3.040	97.961	Time WL Surveyed: 8:25		(must close survey loop on survey starting point)
Other:					100.025	Lag bolt 7 m SE of logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S51-03	0.518	101.001	100.483	Time WL Surveyed: 9:00		
Water Level:			3.039	97.962	Time WL Surveyed: 9:03		
Water Level:			3.021	97.962			
BM	S51-03	0.500	100.983	100.483			

**WL Survey Summary**

	Before	After
Average WL:	97.959	97.962
Transducer Elevation:	97.470	97.467
Closing Error:	0.000	-
WL Check:	0.005	0.000

**Site Rating Information**

Measured Discharge:	6.21
Expected Discharge:	6.57
Shift from Existing Rating (m <sup>3</sup> /s):	0.36
Shift from Existing Rating (%):	6%

**Field Personnel:**

SM & DW	Trip Date:	18-Oct-13
SM	Date:	18-Oct-13
TR	Date:	25-Oct-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

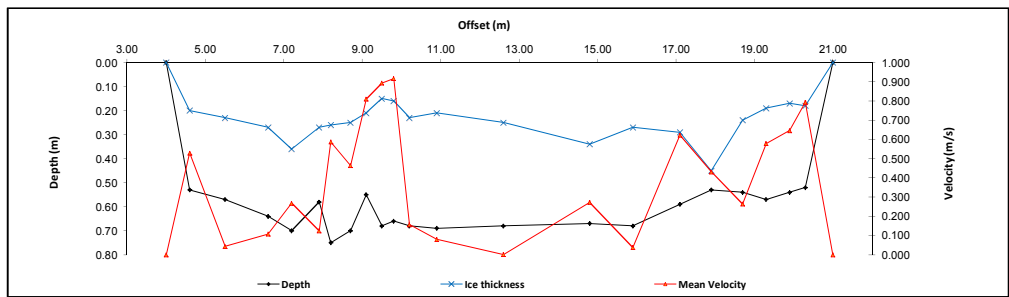
Site Visit Date: December 9, 2013  
 Site Visit Time (MST): 14:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	4.60	0.53	0.20	0.37	0.602				0.88	0.75	0.33	0.530	0.25	0.131	7%	
2	5.50	0.57	0.23	0.40	0.050				0.88	1.00	0.34	0.044	0.34	0.015	1%	
3	6.60	0.64	0.27	0.46	0.122				0.88	0.85	0.37	0.107	0.31	0.034	2%	
4	7.20	0.70	0.36	0.53	0.305				0.88	0.65	0.34	0.268	0.22	0.059	3%	
5	7.90	0.58	0.27	0.43	0.141				0.88	0.50	0.31	0.124	0.16	0.019	1%	
6	8.20	0.75	0.26	0.51	0.667				0.88	0.40	0.49	0.587	0.20	0.115	6%	
7	8.70	0.70	0.25	0.48	0.527				0.88	0.45	0.45	0.464	0.20	0.094	5%	
8	9.10	0.55	0.21	0.38	0.920				0.88	0.40	0.34	0.810	0.14	0.110	6%	
9	9.50	0.68	0.15	0.42	1.015				0.88	0.35	0.53	0.893	0.19	0.166	9%	
10	9.80	0.66	0.16	0.41	1.041				0.88	0.35	0.50	0.916	0.18	0.160	9%	
11	10.20	0.68	0.23	0.46	0.178				0.88	0.55	0.45	0.157	0.25	0.039	2%	
12	10.90	0.69	0.21	0.45	0.091				0.88	1.20	0.48	0.080	0.58	0.046	3%	
13	12.60	0.88	0.25	0.47	0.001				0.88	1.95	0.43	0.001	0.84	0.001	0%	
14	14.80	0.67	0.34	0.51	0.310				0.88	1.65	0.33	0.273	0.54	0.149	8%	
15	15.90	0.68	0.27	0.48	0.043				0.88	1.15	0.41	0.038	0.47	0.018	1%	
16	17.10	0.59	0.29	0.44	0.707				0.88	1.00	0.30	0.522	0.30	0.187	10%	
17	17.90	0.53	0.45	0.49	0.490				0.88	0.90	0.06	0.431	0.06	0.028	2%	
18	18.70	0.54	0.24	0.39	0.300				0.88	0.70	0.30	0.264	0.21	0.055	3%	
19	19.30	0.57	0.19	0.38	0.658				0.88	0.60	0.38	0.579	0.23	0.132	7%	
20	19.90	0.54	0.17	0.36	0.734				0.88	0.50	0.37	0.646	0.19	0.119	7%	
21	20.30	0.52	0.18	0.35	0.902				0.88	0.55	0.34	0.794	0.19	0.148	8%	
RB	21.00	0.00	0.00		0.00				0.88	0.35	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.83</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	15:29
Meas. End Time (MST):	15:46
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -15°C



**Flow characteristics:**

Total Flow:	1.83	(m <sup>3</sup> /s)
Cross Section Area:	6.03	(m <sup>2</sup> )
Wetted Width:	17.00	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.418	0.421
Water (°C):	0.2	0.2
Datalogger Clock:	14:29	15:49
Laptop Clock:	14:29	15:49
Battery (Main):	14.0	13.1
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 - Large amount of overflow present, may have caused WL spike in early Dec

**General Notes:**  
 - Slush present throughout channel  
 - WL fluctuating in holes

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S51-01	1.082	101.082		100.000	100.000	3/4" Pipe 3 m SE of logger	S51-01
S51-02			1.007	100.075	100.058	3/4" Pipe 3 m S of logger	Other
S51-03			0.600	100.482	100.474	3/4" Pipe 2 m W of logger	S51-02
Ice/PT:			2.839	98.243			S51-03
Water Level:			3.032	98.050			WL
Other:			1.056	100.026	100.025	Lag bolt 7 m SE of logger	WL
<b>Setup #2</b>							
S51-01			1.063	100.000	100.000	3/4" Pipe 3 m SE of logger	Other
S51-02			0.988	100.075	100.058	3/4" Pipe 3 m S of logger	Other
S51-03	0.581	101.063		100.482	100.474	3/4" Pipe 2 m W of logger	S51-01
Ice/PT:			2.822	98.241			
Water Level:			3.013	98.050			
Other:			1.038	100.025	100.025	Lag bolt 7 m SE of logger	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:				100.482			
Water Level:							Time WL Surveyed:
Water Level:							Time WL Surveyed:
BM:				100.482			

**WL Survey Summary**

	Before	After
Average WL:	98.050	-
Transducer Elevation:	97.632	-
Closing Error:	0.000	-
WL Check:	0.000	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, CJ	Trip Date:	9-Dec-13
TR	Date:	9-Dec-13
SG	Date:	28-Jan-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

January 9, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.00	0.00	0.00	0.000	0.000	0.000	0.9	0.00	0.70	0.70	0.05	0.001	0.001	0.03	0.000	0%
1	1.40	0.20	0.01	0.004			0.9	0.70	1.70	1.00	0.19	0.004	0.004	0.19	0.001	0%
2	2.00	0.25	0.01	0.119			0.9	1.70	2.30	0.60	0.24	0.119	0.107	0.14	0.015	4%
3	2.60	0.35	0.12	0.132			0.9	2.30	2.85	0.55	0.23	0.132	0.119	0.13	0.015	4%
4	3.10	0.23	0.10	0.102			0.9	2.85	3.30	0.45	0.13	0.102	0.092	0.06	0.005	1%
5	3.50	0.40	0.15	0.245			0.9	3.30	3.70	0.40	0.25	0.245	0.221	0.10	0.022	5%
6	3.90	0.40	0.14	0.261			0.9	3.70	4.15	0.45	0.26	0.261	0.235	0.12	0.027	7%
7	4.40	0.45	0.14	0.075			0.9	4.15	4.60	0.45	0.31	0.075	0.068	0.14	0.009	2%
8	4.80	0.50	0.17	0.345			0.9	4.60	5.03	0.43	0.33	0.345	0.311	0.14	0.044	10%
9	5.25	0.51	0.17	0.038			0.9	5.03	5.38	0.35	0.34	0.038	0.034	0.12	0.004	1%
10	5.50	0.42	0.18	0.445			0.9	5.38	5.55	0.18	0.24	0.445	0.401	0.04	0.017	4%
11	5.60	0.50	0.20	0.490			0.9	5.55	5.73	0.18	0.30	0.490	0.441	0.05	0.023	5%
12	5.85	0.50	0.22	0.518			0.9	5.73	5.95	0.23	0.28	0.518	0.466	0.06	0.029	7%
13	6.05	0.50	0.18	0.442			0.9	5.95	6.28	0.33	0.32	0.442	0.398	0.10	0.041	10%
14	6.50	0.48	0.24	0.225			0.9	6.28	6.70	0.43	0.24	0.225	0.203	0.10	0.021	5%
15	6.90	0.40	0.28	0.415			0.9	6.70	7.20	0.50	0.12	0.415	0.374	0.06	0.022	5%
16	7.50	0.44	0.29	0.403			0.9	7.20	7.83	0.63	0.15	0.403	0.363	0.09	0.034	8%
17	8.15	0.40	0.25	0.392			0.9	7.83	8.45	0.62	0.15	0.392	0.353	0.09	0.033	8%
18	8.75	0.40	0.29	0.104			0.9	8.45	9.08	0.63	0.11	0.104	0.094	0.07	0.006	2%
19	9.40	0.35	0.20	0.133			0.9	9.08	9.80	0.73	0.15	0.133	0.120	0.11	0.013	3%
20	10.20	0.25	0.15	0.343			0.9	9.80	10.55	0.75	0.10	0.343	0.309	0.08	0.023	5%
21	10.90	0.25	0.15	0.170			0.9	10.55	11.45	0.90	0.10	0.170	0.153	0.09	0.014	3%
RB	12.00	0.00	0.00	0.00	0.00	0.00	1.0	11.45	12.00	0.55	0.03	0.043	0.043	0.01	0.001	0%
<b>Total Flow</b>														<b>0.421</b>		

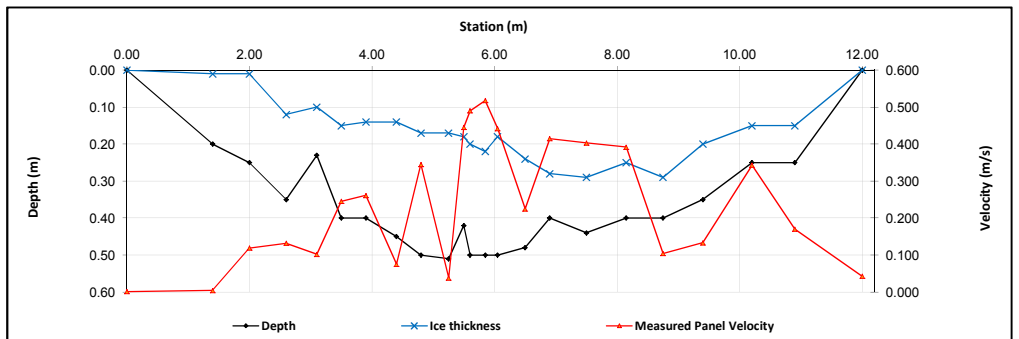
Measurement Details:	
Start Time (MST):	10:20
End Time (MST):	11:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover, low flow
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -10°C

Flow characteristics:	
Total Flow:	0.421 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.14 (m <sup>2</sup> )
Wetted Width:	12.00 (m)
Hydraulic Depth:	0.178 (m)
Mean Velocity:	0.197 (m/s)
Froude Number:	0.149

Logger Details:		
Transducer Reading (m):	Before	After
	0.464	-
Water (°C):	0.1	-
Battery (Main):	12.1	12.9
Datalogger Clock:	10:22	-
Laptop Clock:	10:21	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	16568	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

Datalogger / Station Notes:	
-	Replaced battery

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S53-03			1.042	100.360	100.361	Pipe 5 m N of logger
S53-04	1.237	101.402		100.165	100.165	Pipe 2 m SE of logger
S53-05			1.013	100.389	100.388	Pipe 5 m E of logger
Ice/PT:			3.756	97.646		
Water Level:			3.81	97.592		
Other:						
<b>Setup #2</b>						
S53-03	1.031	101.391		100.360	100.361	Pipe 5 m N of logger
S53-04			1.226	100.165	100.165	Pipe 2 m SE of logger
S53-05			1.003	100.388	100.388	Pipe 5 m E of logger
Ice/PT:			3.748	97.643		
Water Level:			3.800	97.591		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	97.592
Transducer Elevation Before	97.128
Transducer Elevation After	-

Field Personnel:	SM, DW	Trip Date:	9-Jan-13
Data Entry Personnel:	SM	Date:	9-Jan-13
Data Check Personnel:	DW	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

February 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.50	0.00	0.00	0.000	0.000	0.000	0.9	5.50	5.63	0.13	0.03	0.017	0.015	0.00	0.000	0%
1	5.75	0.21	0.10	0.068			0.9	5.63	6.03	0.40	0.11	0.068	0.061	0.04	0.003	1%
2	6.30	0.26	0.13	-0.062			0.9	6.03	6.58	0.55	0.13	-0.062	-0.056	0.07	-0.004	-2%
3	6.85	0.30	0.21	-0.001			0.9	6.58	7.08	0.50	0.09	-0.001	-0.001	0.05	0.000	0%
4	7.30	0.32	0.21	0.000			1.0	7.08	7.55	0.48	0.11	0.000	0.000	0.05	0.000	0%
5	7.80	0.40	0.23	0.141			0.9	7.55	8.05	0.50	0.17	0.141	0.127	0.09	0.011	4%
6	8.30	0.40	0.27	0.155			0.9	8.05	8.55	0.50	0.13	0.155	0.140	0.07	0.009	4%
7	8.80	0.49	0.26	0.200			0.9	8.55	9.00	0.45	0.23	0.200	0.180	0.10	0.019	7%
8	9.20	0.53	0.26	0.205			0.9	9.00	9.43	0.43	0.27	0.205	0.185	0.11	0.021	8%
9	9.65	0.50	0.26	0.029			0.9	9.43	9.88	0.45	0.24	0.029	0.026	0.11	0.003	1%
10	10.10	0.55	0.25	0.331			0.9	9.88	10.15	0.27	0.30	0.331	0.298	0.08	0.025	10%
11	10.20	0.52	0.25	0.259			0.9	10.15	10.35	0.20	0.27	0.259	0.233	0.05	0.013	5%
12	10.50	0.49	0.24	0.417			0.9	10.35	10.60	0.25	0.25	0.417	0.375	0.06	0.023	9%
13	10.70	0.50	0.22	0.398			0.9	10.60	10.90	0.30	0.28	0.398	0.358	0.08	0.030	12%
14	11.10	0.50	0.23	0.330			0.9	10.90	11.33	0.43	0.27	0.330	0.297	0.11	0.034	13%
15	11.55	0.50	0.23	0.215			0.9	11.33	11.80	0.48	0.27	0.215	0.194	0.13	0.025	10%
16	12.05	0.49	0.24	0.188			0.9	11.80	12.28	0.48	0.25	0.188	0.169	0.12	0.020	8%
17	12.50	0.41	0.23	0.112			0.9	12.28	12.80	0.53	0.18	0.112	0.101	0.09	0.010	4%
18	13.10	0.38	0.18	0.096			0.9	12.80	13.65	0.85	0.20	0.096	0.086	0.17	0.015	6%
19	14.20	0.32	0.12	0.000			1.0	13.65	14.45	0.80	0.20	0.000	0.000	0.16	0.000	0%
20	14.70	0.21	0.11	0.042			0.9	14.45	15.00	0.55	0.10	0.042	0.038	0.06	0.002	1%
21	15.30	0.20	0.07	-0.002			0.9	15.00	15.65	0.65	0.13	-0.002	-0.002	0.08	0.000	0%
LB	16.00	0.00	0.00	0.00	0.00	0.00	1.0	15.65	16.00	0.35	0.03	-0.001	-0.001	0.01	0.000	0%
<b>Total Flow</b>														<b>0.257</b>		

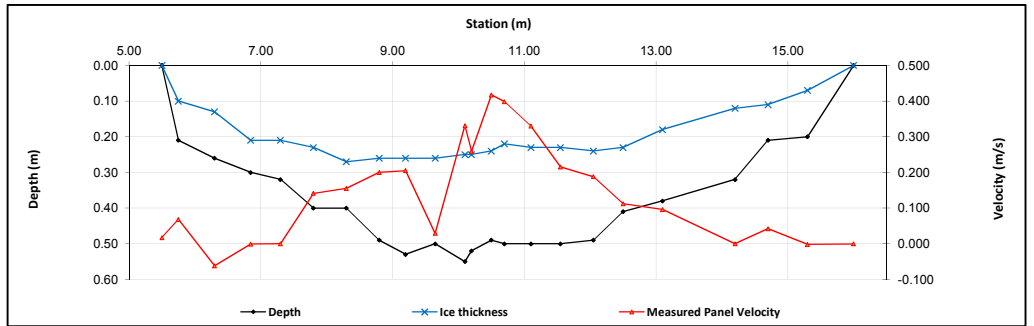
Measurement Details:	
Start Time (MST):	10:35
End Time (MST):	11:58
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover, deep snow
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -9°C

Flow characteristics:	
Total Flow:	0.257 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.91 (m <sup>2</sup> )
Wetted Width:	10.50 (m)
Hydraulic Depth:	0.182 (m)
Mean Velocity:	0.134 (m/s)
Froude Number:	0.101

Logger Details:		
	Before	After
Transducer Reading (m):	0.445	-
Water (°C):	0.1	-
Battery (Main):	13.2	12.88
Datalogger Clock:	10:44	-
Laptop Clock:	10:44	-
Enclosure Dessoricant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessoricant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S53-03			0.876	100.358	100.361	Pipe 5 m N of logger
S53-04	1.069	101.234		100.165	100.165	Pipe 2 m SE of logger
S53-05			0.847	100.387	100.388	Pipe 5 m E of logger
Ice/PT:			3.469	97.765		
Water Level:			3.681	97.553		
Other:						
<b>Setup #2</b>						
S53-03	0.864	101.222		100.358	100.361	Pipe 5m N of logger
S53-04			1.057	100.165	100.165	Pipe 2 m SE of logger
S53-05			0.835	100.387	100.388	Pipe 5 m E of logger
Ice/PT:			3.458	97.764		
Water Level:			3.665	97.557		
Other:						

Closing Error	0.000	Average WL	97.555
WL Check	0.004	Transducer Elevation Before	97.110
		Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	10-Feb-13
Data Entry Personnel:	SM	Date:	10-Feb-13
Data Check Personnel:	DW	Date:	4-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

March 2, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.05	0.00	0.00	0.000	0.000	0.000	0.9	5.05	5.28	0.23	0.05	0.024	0.022	0.01	0.000	0%
1	5.50	0.20		0.096			0.9	5.28	5.68	0.40	0.20	0.096	0.086	0.08	0.007	2%
2	5.85	0.22	0.05	0.001			0.9	5.68	6.10	0.43	0.17	0.001	0.001	0.07	0.000	0%
3	6.35	0.23	0.12	0.002			0.9	6.10	6.60	0.50	0.11	0.002	0.002	0.06	0.000	0%
4	6.85	0.28	0.13	-0.002			0.9	6.60	7.43	0.83	0.15	-0.002	-0.002	0.12	0.000	0%
5	8.00	0.30	0.15	0.087			0.9	7.43	8.35	0.93	0.15	0.087	0.078	0.14	0.011	4%
6	8.70	0.48	0.20	0.109			0.9	8.35	9.05	0.70	0.28	0.109	0.098	0.20	0.019	6%
7	9.40	0.30	0.20	0.001			0.9	9.05	9.68	0.63	0.10	0.001	0.001	0.06	0.000	0%
8	9.95	0.58	0.20	0.085			0.9	9.68	10.00	0.32	0.38	0.085	0.077	0.12	0.009	3%
9	10.05	0.60	0.25	0.136			0.9	10.00	10.33	0.32	0.35	0.136	0.122	0.11	0.014	5%
10	10.60	0.60	0.20	0.277			0.9	10.33	10.68	0.35	0.40	0.277	0.249	0.14	0.035	12%
11	10.75	0.78	0.20	0.336			0.9	10.68	11.03	0.35	0.58	0.336	0.302	0.20	0.061	21%
12	11.30	0.61	0.30	0.294			0.9	11.03	11.38	0.35	0.31	0.294	0.265	0.11	0.029	10%
13	11.45	0.60	0.29	0.223			0.9	11.38	11.73	0.35	0.31	0.223	0.201	0.11	0.022	7%
14	12.00	0.61	0.35	0.222			0.9	11.73	12.05	0.33	0.26	0.222	0.200	0.08	0.017	6%
15	12.10	0.60	0.35	0.235			0.9	12.05	12.43	0.38	0.25	0.235	0.212	0.09	0.020	7%
16	12.75	0.58	0.35	0.180			0.9	12.43	13.10	0.67	0.23	0.180	0.162	0.16	0.025	8%
17	13.45	0.48	0.32	0.148			0.9	13.10	13.78	0.67	0.16	0.148	0.133	0.11	0.014	5%
18	14.10	0.48	0.40	0.037			0.9	13.78	14.40	0.63	0.08	0.037	0.033	0.05	0.002	1%
19	14.70	0.40	0.25	0.162			0.9	14.40	15.03	0.63	0.15	0.162	0.146	0.09	0.014	5%
20	15.35	0.32	0.15	-0.001			0.9	15.03	15.63	0.60	0.17	-0.001	-0.001	0.10	0.000	0%
21	15.90	0.28	0.13	0.001			0.9	15.63	16.18	0.55	0.15	0.001	0.001	0.08	0.000	0%
22	16.45	0.20	0.05	0.002			0.9	16.18	16.65	0.47	0.15	0.002	0.002	0.07	0.000	0%
LB	16.85	0.00	0.00	0.00	0.00	0.00	1.0	16.65	16.85	0.20	0.04	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>															<b>0.299</b>	

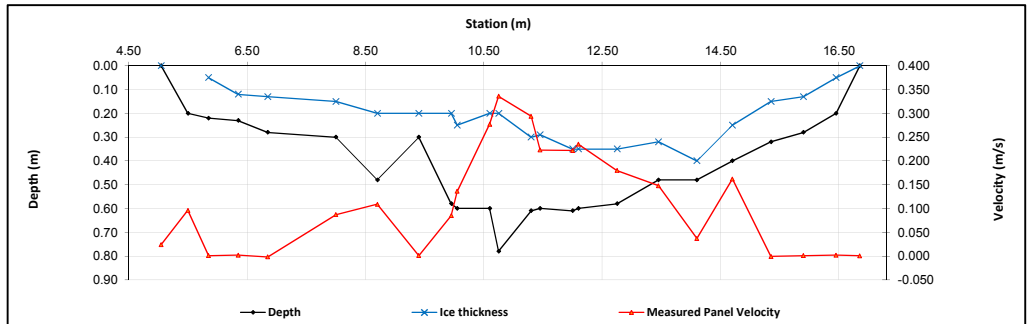
Measurement Details:	
Start Time (MST):	15:55
End Time (MST):	17:05
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Sunny, 6°C

Flow characteristics:		
Total Flow:	0.299	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.39	(m <sup>2</sup> )
Wetted Width:	11.80	(m)
Hydraulic Depth:	0.202	(m)
Mean Velocity:	0.125	(m/s)
Froude Number:	0.089	

Logger Details:		
Transducer Reading (m):	Before	After
	0.427	-
Water (°C):	0.1	-
Battery (Main):	14.2	-
Datalogger Clock:	15:57	-
Laptop Clock:	15:57	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	
-	First measurement has WL below ice

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S53-03			0.976	100.358	100.361	Pipe 5 m N of logger
S53-04	1.169	101.334		100.165	100.165	Pipe 2 m SE of logger
S53-05			0.948	100.386	100.388	Pipe 5 m E of logger
Ice/PT:			3.645	97.689		
Water Level:			3.767	97.567		
Other:						
<b>Setup #2</b>						
S53-03	0.913	101.271		100.358	100.361	Pipe 5 m N of logger
S53-04			1.109	100.162	100.165	Pipe 2 m SE of logger
S53-05			0.887	100.384	100.388	Pipe 5 m E of logger
Ice/PT:			3.583	97.688		
Water Level:			3.701	97.570		
Other:						

Closing Error	0.003
WL Check	0.003

Average WL	97.569
Transducer Elevation Before	97.142
Transducer Elevation After	-

Field Personnel:	DW, TR	Trip Date:	2-Mar-13
Data Entry Personnel:	DW	Date:	2-Mar-13
Data Check Personnel:	DW	Date:	4-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

April 8, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	6.00	0.00	0.00	0.000	0.000	0.000	0.9	6.00	6.15	0.15	0.03	0.022	0.019	0.00	0.000	0%
1	6.30	0.35	0.25	0.086			0.9	6.15	6.70	0.55	0.10	0.086	0.077	0.05	0.004	1%
2	7.10	0.40	0.25	0.120			0.9	6.70	7.60	0.90	0.15	0.120	0.108	0.14	0.015	5%
3	8.10	0.45	0.35	0.110			0.9	7.60	8.35	0.75	0.10	0.110	0.099	0.08	0.007	2%
4	8.60	0.45	0.35	0.030			0.9	8.35	8.85	0.50	0.10	0.030	0.027	0.05	0.001	0%
5	9.10	0.50	0.30	0.140			0.9	8.85	9.30	0.45	0.20	0.140	0.126	0.09	0.011	4%
6	9.50	0.50	0.35	0.218			0.9	9.30	9.73	0.42	0.15	0.218	0.196	0.06	0.013	4%
7	9.95	0.60	0.35	0.222			0.9	9.73	10.15	0.42	0.25	0.222	0.200	0.11	0.021	7%
8	10.35	0.50	0.35	0.220			0.9	10.15	10.53	0.38	0.15	0.220	0.198	0.06	0.011	4%
9	10.70	0.60	0.35	0.278			0.9	10.53	10.88	0.35	0.25	0.278	0.250	0.09	0.022	7%
10	11.05	0.70	0.35	0.396			0.9	10.88	11.13	0.25	0.35	0.396	0.356	0.09	0.031	10%
11	11.20	0.70	0.27	0.393			0.9	11.13	11.33	0.20	0.43	0.393	0.354	0.09	0.030	10%
12	11.45	0.70	0.35	0.368			0.9	11.33	11.53	0.20	0.35	0.368	0.331	0.07	0.023	8%
13	11.60	0.67	0.29	0.308			0.9	11.53	11.70	0.18	0.38	0.308	0.277	0.07	0.018	6%
14	11.80	0.60	0.25	0.311			0.9	11.70	11.90	0.20	0.35	0.311	0.280	0.07	0.020	7%
15	12.00	0.58	0.28	0.274			0.9	11.90	12.10	0.20	0.30	0.274	0.247	0.06	0.015	5%
16	12.20	0.55	0.30	0.222			0.9	12.10	12.33	0.23	0.25	0.222	0.200	0.06	0.011	4%
17	12.45	0.45	0.35	0.256			0.9	12.33	12.55	0.23	0.10	0.256	0.230	0.02	0.005	2%
18	12.65	0.50	0.25	0.193			0.9	12.55	12.83	0.27	0.25	0.193	0.174	0.07	0.012	4%
19	13.00	0.50	0.30	0.112			0.9	12.83	13.20	0.38	0.20	0.112	0.101	0.08	0.008	3%
20	13.40	0.38	0.25	0.000			1.0	13.20	13.60	0.40	0.13	0.000	0.000	0.05	0.000	0%
21	13.80	0.30	0.24	-0.001			0.9	13.60	14.08	0.47	0.06	-0.001	-0.001	0.03	0.000	0%
22	14.35	0.30	0.15	0.183			0.9	14.08	14.85	0.78	0.15	0.183	0.165	0.12	0.019	6%
23	15.35	0.22	0.15	0.000			1.0	14.85	15.43	0.58	0.07	0.000	0.000	0.04	0.000	0%
LB	15.50	0.00	0.00	0.00	0.00	0.00	1.0	15.43	15.50	0.07	0.02	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.298</b>	

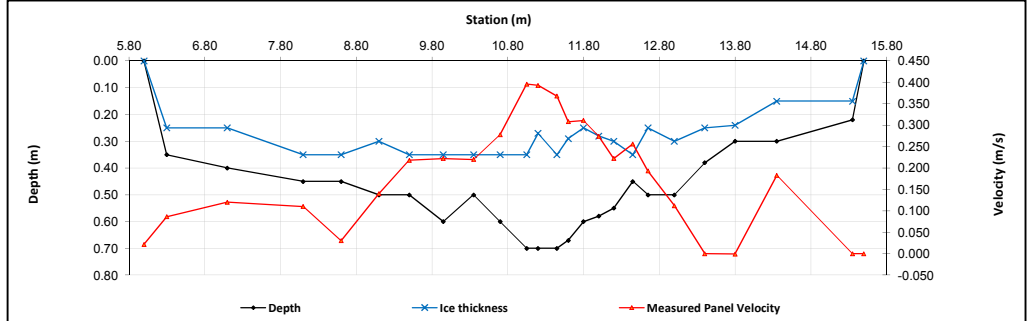
Measurement Details:	
Start Time (MST):	11:54
End Time (MST):	12:56
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 0°C

Flow characteristics:	
Total Flow:	0.298 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.62 (m <sup>2</sup> )
Wetted Width:	9.50 (m)
Hydraulic Depth:	0.171 (m)
Mean Velocity:	0.184 (m/s)
Froude Number:	0.142

Logger Details:		
	Before	After
Transducer Reading (m):	0.439	-
Water (°C):	0.1	-
Battery (Main):	14.3	-
Datalogger Clock:	11:56	-
Laptop Clock:	11:56	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	16568	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S53-03			1.086	100.361	100.361	Pipe 5 m N of logger
S53-04	1.282	101.447		100.165	100.165	Pipe 2 m SE of logger
S53-05			1.058	100.389	100.388	Pipe 5 m E of logger
Ice/PT:			3.548	97.899		
Water Level:			3.864	97.583		
Other:						
<b>Setup #2</b>						
S53-03	1.072	101.433		100.361	100.361	Pipe 5 m N of logger
S53-04			1.267	100.166	100.165	Pipe 2 m SE of logger
S53-05			1.046	100.387	100.388	Pipe 5 m E of logger
Ice/PT:			3.54	97.893		
Water Level:			3.851	97.582		
Other:						

Closing Error	-0.001	Average WL	97.583
WL Check	0.001	Transducer Elevation Before	97.144
		Transducer Elevation After	-

Field Personnel:	SM, BL	Trip Date:	8-Apr-13
Data Entry Personnel:	SM	Date:	8-Apr-13
Data Check Personnel:	DW	Date:	16-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: May 11, 2013  
 Site Visit Time (MST): 10:00

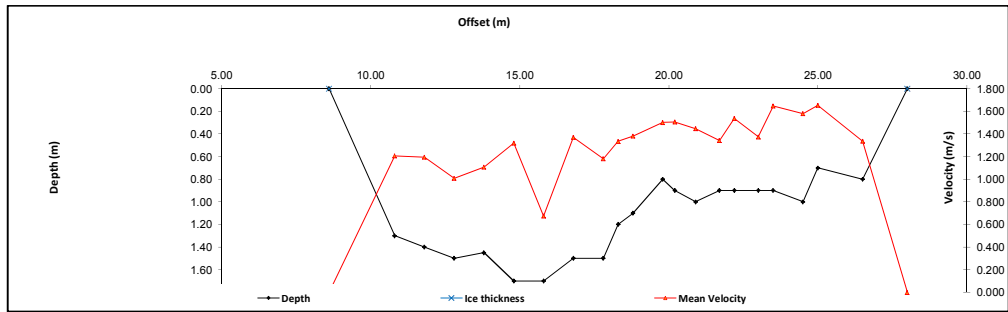


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	8.60	0.00	0.00		0.000		0.000		0.000	1.00	1.10	0.00	0.000	0.00	0.000	
1	10.80	1.30				1.04	1.046	0.26	1.367	1.00	1.60	1.30	1.207	2.08	2.510	10%
2	11.80	1.40				1.12	1.062	0.28	1.327	1.00	1.00	1.40	1.195	1.40	1.672	6%
3	12.80	1.50				1.20	0.670	0.30	1.346	1.00	1.00	1.50	1.008	1.50	1.512	6%
4	13.80	1.45				1.16	0.875	0.29	1.338	1.00	1.00	1.45	1.107	1.45	1.604	6%
5	14.80	1.70				1.36	1.244	0.34	1.395	1.00	1.00	1.70	1.320	1.70	2.243	9%
6	15.80	1.70				1.36	0.943	0.34	1.407	1.00	1.00	1.70	0.675	1.70	1.148	4%
7	16.80	1.50				1.20	1.209	0.30	1.532	1.00	1.00	1.50	1.371	1.50	2.056	8%
8	17.80	1.50				1.20	0.793	0.30	1.567	1.00	0.75	1.50	1.180	1.13	1.328	5%
9	18.30	1.20				0.96	1.110	0.24	1.560	1.00	0.50	1.20	1.335	0.60	0.801	3%
10	18.80	1.10				0.88	1.085	0.22	1.678	1.00	0.75	1.10	1.382	0.83	1.140	4%
11	19.80	0.80				0.64	1.310	0.16	1.694	1.00	0.70	0.80	1.502	0.56	0.841	3%
12	20.20	0.90				0.72	1.326	0.18	1.688	1.00	0.55	0.90	1.507	0.49	0.746	3%
13	20.90	1.00				0.80	1.184	0.20	1.710	1.00	0.75	1.00	1.447	0.75	1.085	4%
14	21.70	0.90				0.72	0.872	0.18	1.811	1.00	0.65	0.90	1.342	0.59	0.785	3%
15	22.20	0.90				0.72	1.296	0.18	1.778	1.00	0.65	0.90	1.537	0.59	0.899	3%
16	23.00	0.90				0.72	0.903	0.18	1.846	1.00	0.65	0.90	1.375	0.58	0.804	3%
17	23.50	0.90				0.72	1.453	0.18	1.843	1.00	0.75	0.90	1.646	0.68	1.112	4%
18	24.50	1.00				0.80	1.320	0.20	1.840	1.00	0.75	1.00	1.580	0.75	1.185	5%
19	25.00	0.70		0.42	1.653					1.00	1.00	0.70	1.653	0.70	1.157	4%
20	26.50	0.80				0.64	1.369	0.16	1.303	1.00	1.50	0.80	1.336	1.20	1.603	6%
RB	28.00	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>26.2</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:09
Meas. End Time (MST):	13:05
Equipment:	ADV
Method:	Boat
River Condition:	Very high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 20°C



**Flow characteristics:**

Total Flow:	26.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	20.77	(m <sup>2</sup> )
Wetted Width:	19.40	(m)
Hydraulic Depth:	1.07	(m)
Mean Velocity:	1.26	(m/s)
Froude Number:	0.39	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.310	1.297
Water (°C):	5.3	7.2
Datalogger Clock:	10:05	13:39
Laptop Clock:	10:05	13:39
Battery (Main):	13.6	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S53-03	0.930	101.291		100.361	100.361	Pipe 5 m N of logger	S53-03
S53-04			1.124	100.167	100.165	Pipe 2 m SE of logger	S53-05
S53-05			0.902	100.389	100.388	Pipe 5 m E of logger	WL
Ice/PT:							WL
Water Level:			2.782	98.509		Time WL Surveyed: 11:38	S53-05
Other:							S53-04
Setup #2							S53-03
S53-03			0.913	100.361	100.361	Pipe 5 m N of logger	
S53-04	1.107	101.274		100.167	100.165	Pipe 2 m SE of logger	
S53-05			0.886	100.388	100.388	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			2.765	98.509		Time WL Surveyed: 11:40	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S53-04	1.107	101.274		100.167		
Water Level:			2.773	98.501		Time WL Surveyed: 13:35	
Water Level:			2.755	98.502		Time WL Surveyed: 13:36	
BM:	S53-04	1.090	101.257		100.167		

**WL Survey Summary**

	Before	After
Average WL:	98.509	98.502
Transducer Elevation:	97.199	97.205
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	26.2
Expected Discharge:	19.09
Shift from Existing Rating (m <sup>3</sup> /s):	-7.11
Shift from Existing Rating (%):	-27%

**Field Personnel:**

SM, DW	Trip Date:	11-May-13
SM	Date:	11-May-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: June 16, 2013  
 Site Visit Time (MST): 11:40

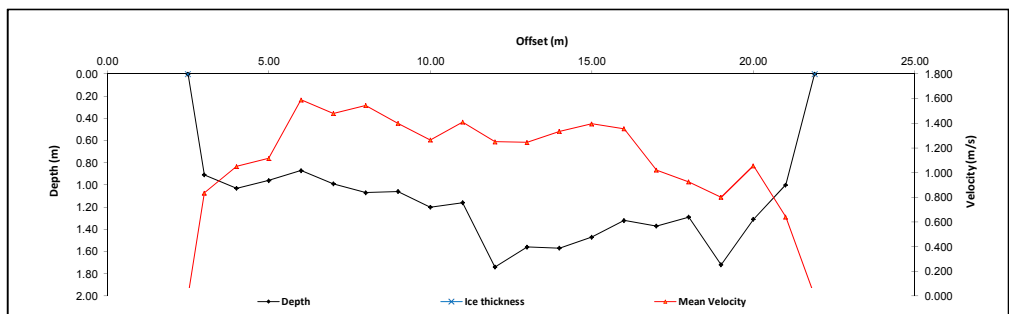


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.00	0.91			0.73	0.700	0.18	0.970	1.00	0.75	0.91	0.835	0.68	0.570	2%	
2	4.00	1.03			0.82	0.780	0.21	1.320	1.00	1.00	1.03	1.050	1.03	1.082	4%	
3	5.00	0.96			0.77	0.980	0.19	1.250	1.00	1.00	0.96	1.115	0.96	1.070	4%	
4	6.00	0.87			0.70	1.470	0.17	1.710	1.00	1.00	0.87	1.590	0.87	1.383	5%	
5	7.00	0.99			0.79	1.260	0.20	1.700	1.00	1.00	0.99	1.480	0.99	1.465	5%	
6	8.00	1.07			0.86	1.400	0.21	1.690	1.00	1.00	1.07	1.545	1.07	1.653	6%	
7	9.00	1.06			0.85	1.040	0.21	1.760	1.00	1.00	1.06	1.400	1.06	1.484	5%	
8	10.00	1.20			0.96	0.860	0.24	1.670	1.00	1.00	1.20	1.265	1.20	1.518	5%	
9	11.00	1.16			0.93	1.310	0.23	1.510	1.00	1.00	1.16	1.410	1.16	1.636	6%	
10	12.00	1.74			1.39	1.020	0.35	1.480	1.00	1.00	1.74	1.250	1.74	2.175	8%	
11	13.00	1.56			1.25	0.970	0.31	1.520	1.00	1.00	1.56	1.245	1.56	1.942	7%	
12	14.00	1.57			1.26	1.190	0.31	1.480	1.00	1.00	1.57	1.335	1.57	2.096	8%	
13	15.00	1.47			1.18	1.290	0.29	1.500	1.00	1.00	1.47	1.395	1.47	2.051	7%	
14	16.00	1.32			1.06	1.310	0.26	1.400	1.00	1.00	1.32	1.355	1.32	1.789	6%	
15	17.00	1.37			1.10	0.840	0.27	1.200	1.00	1.00	1.37	1.020	1.37	1.397	5%	
16	18.00	1.29			1.03	0.520	0.26	1.330	1.00	1.00	1.29	0.925	1.29	1.193	4%	
17	19.00	1.72			1.38	0.410	0.34	1.190	1.00	1.00	1.72	0.800	1.72	1.376	5%	
18	20.00	1.31			1.05	0.880	0.26	1.230	1.00	1.00	1.31	1.055	1.31	1.362	5%	
19	21.00	1.00			0.80	0.600	0.20	0.880	1.00	0.95	1.00	0.640	0.95	0.608	2%	
RB	21.90	0.00	0.00		0.000	0.000	0.000	0.000	1.00	0.45	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>27.9</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from the new heli landing

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:25
Equipment:	Marsh McBirney
Method:	Boat
River Condition:	High, fast
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, Calm, 21°C



**Flow characteristics:**

Total Flow:	27.9	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.32	(m <sup>2</sup> )
Wetted Width:	19.40	(m)
Hydraulic Depth:	1.20	(m)
Mean Velocity:	1.20	(m/s)
Froude Number:	0.35	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.052	1.024
Water (°C):	15.2	15.5
Datalogger Clock:	11:52	-
Laptop Clock:	11:52	-
Battery (Main):	14.1	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Added a new anchor cable and reset the PT

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S53-03	0.880	101.241		100.361	100.361	Pipe 5 m N of logger	S53-03
S53-04			1.076	100.165	100.165	Pipe 2 m SE of logger	S53-05
S53-05			0.853	100.388	100.388	Pipe 5 m E of logger	WL
Ice/PT:							WL
Water Level:			2.675	98.566	Time WL Surveyed:	11:56	S53-05
Other:							S53-04
<b>Setup #2</b>							S53-03
S53-03			0.851	100.362	100.361	Pipe 5 m N of logger	
S53-04	1.048	101.213		100.165	100.165	Pipe 2 m SE of logger	
S53-05			0.825	100.388	100.388	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			2.650	98.563	Time WL Surveyed:	11:57	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S53-04	1.047	101.212	100.165	Time WL Surveyed:	13:35	
Water Level:			2.656	98.556	Time WL Surveyed:	13:36	
Water Level:			2.639	98.557	Time WL Surveyed:		
BM:	S53-04	1.031	101.196	100.165			

**WL Survey Summary**

	Before	After
Average WL:	98.565	98.557
Transducer Elevation:	97.513	97.533
Closing Error:	-0.001	-
WL Check:	0.003	-0.001

**Site Rating Information**

Measured Discharge:	27.9
Expected Discharge:	20.68
Shift from Existing Rating (m <sup>3</sup> /s):	-7.22
Shift from Existing Rating (%):	-26%

**Field Personnel:**

TR, SG	Trip Date:	16-Jun-13
SG	Date:	16-Jun-13
DW	Date:	25-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 11:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.50	0.24		0.14	0.103					1.00	0.58	0.24	0.103	0.14	0.014	1%
2	3.15	0.17		0.10	0.153					1.00	0.65	0.17	0.153	0.11	0.017	1%
3	3.80	0.34		0.20	0.179					1.00	0.65	0.34	0.179	0.22	0.040	3%
4	4.45	0.30		0.18	0.253					1.00	0.65	0.30	0.253	0.20	0.049	3%
5	5.10	0.40		0.24	0.216					1.00	0.65	0.40	0.216	0.26	0.056	4%
6	5.75	0.45		0.27	0.262					1.00	0.65	0.45	0.262	0.29	0.077	5%
7	6.40	0.50		0.30	0.272					1.00	0.65	0.50	0.272	0.33	0.088	6%
8	7.05	0.56		0.34	0.320					1.00	0.65	0.56	0.320	0.36	0.116	8%
9	7.70	0.64		0.38	0.327					1.00	0.65	0.64	0.327	0.42	0.136	9%
10	8.35	0.69		0.41	0.335					1.00	0.65	0.69	0.335	0.45	0.150	10%
11	9.00	0.64		0.38	0.336					1.00	0.65	0.64	0.336	0.42	0.140	9%
12	9.65	0.69		0.41	0.246					1.00	0.65	0.69	0.246	0.45	0.110	7%
13	10.30	0.72		0.43	0.280					1.00	0.65	0.72	0.280	0.47	0.131	9%
14	10.95	0.64		0.38	0.153					1.00	0.65	0.64	0.153	0.42	0.064	4%
15	11.60	0.48		0.29	0.261					1.00	0.65	0.48	0.261	0.31	0.081	5%
16	12.25	0.42		0.25	0.237					1.00	0.65	0.42	0.237	0.27	0.065	4%
17	12.90	0.39		0.23	0.197					1.00	0.65	0.39	0.197	0.25	0.050	3%
18	13.55	0.36		0.22	0.188					1.00	0.65	0.36	0.188	0.23	0.044	3%
19	14.20	0.40		0.24	0.173					1.00	0.65	0.40	0.173	0.26	0.045	3%
20	14.85	0.24		0.14	0.209					1.00	0.65	0.24	0.209	0.16	0.033	2%
LB	15.50	0.00	0.00		0.00		0.00		0.00	1.00	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.51</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:34
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 22°C

**Flow characteristics:**

Total Flow:	1.51	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.01	(m <sup>2</sup> )
Wetted Width:	13.50	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.12	

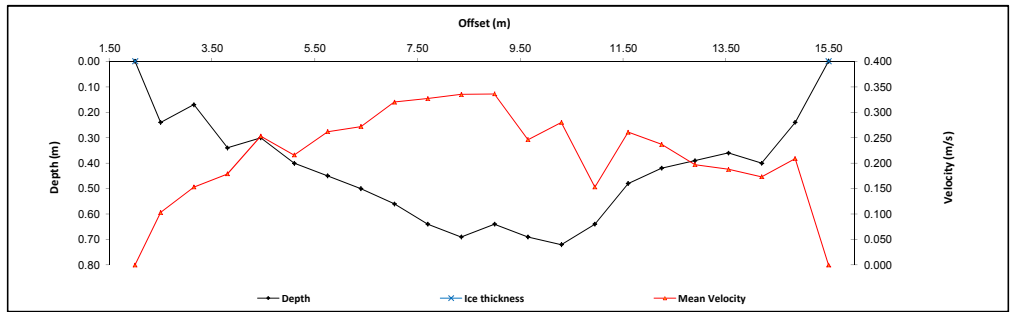
**Logger Details:**

	Before	After
Transducer Reading (m):	0.181	0.576
Water (°C):	19.5	19.7
Datalogger Clock:	11:53	12:42
Laptop Clock:	11:52	12:42
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PT

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S53-03			0.910	100.360	100.361	Pipe 5 m N of logger	S53-03
S53-04	1.105	101.270		100.165	100.165	Pipe 2 m SE of logger	S53-04
S53-05			0.883	100.387	100.388	Pipe 5 m E of logger	WL
Ice/PT:							WL
Water Level:			3.548	97.722		Time WL Surveyed: 12:06	S53-05
Other:							S53-04
<b>Setup #2</b>							S53-03
S53-03	0.899	101.259		100.360	100.361	Pipe 5 m N of logger	
S53-04			1.094	100.165	100.165	Pipe 2 m SE of logger	
S53-05			0.872	100.387	100.388	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			3.538	97.721		Time WL Surveyed: 12:08	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S53-04	1.094	101.259		100.165		
Water Level:			3.537	97.722		Time WL Surveyed: 12:39	
Water Level:			3.527	97.721		Time WL Surveyed: 12:41	
BM:	S53-04	1.083	101.248		100.165		

**WL Survey Summary**

	Before	After
Average WL:	97.722	97.722
Transducer Elevation:	97.541	97.146
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	1.51
Expected Discharge:	1.71
Shift from Existing Rating (m <sup>3</sup> /s):	0.20
Shift from Existing Rating (%):	13%

**Field Personnel:**

SM, TR	Trip Date:	11-Aug-13
SM	Date:	11-Aug-13
DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: September 14, 2013  
 Site Visit Time (MST): 12:15

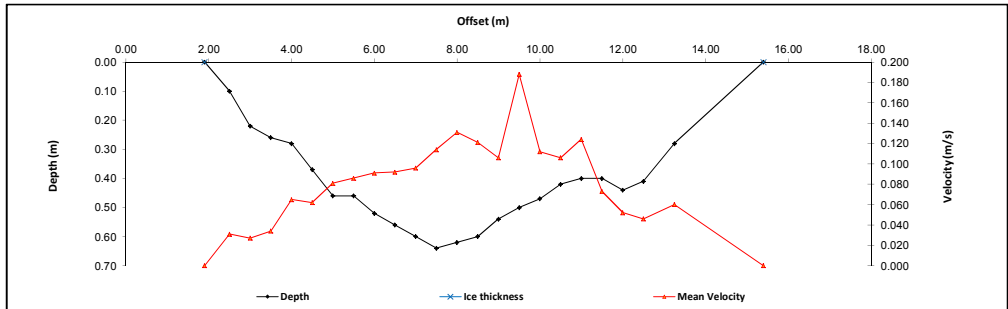


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	2.50	0.10		0.06	0.031					1.00	0.55	0.10	0.031	0.06	0.002	0%
2	3.00	0.22		0.13	0.027					1.00	0.50	0.22	0.027	0.11	0.003	1%
3	3.50	0.26		0.16	0.034					1.00	0.50	0.26	0.034	0.13	0.004	1%
4	4.00	0.28		0.17	0.065					1.00	0.50	0.28	0.065	0.14	0.009	2%
5	4.50	0.37		0.22	0.062					1.00	0.50	0.37	0.062	0.19	0.011	2%
6	5.00	0.46		0.28	0.081					1.00	0.50	0.46	0.081	0.23	0.019	4%
7	5.50	0.46		0.28	0.086					1.00	0.50	0.46	0.086	0.23	0.020	4%
8	6.00	0.52		0.31	0.091					1.00	0.50	0.52	0.091	0.26	0.024	5%
9	6.50	0.56		0.34	0.092					1.00	0.50	0.56	0.092	0.28	0.026	5%
10	7.00	0.60		0.36	0.096					1.00	0.50	0.60	0.096	0.30	0.029	6%
11	7.50	0.64		0.38	0.114					1.00	0.50	0.64	0.114	0.32	0.036	8%
12	8.00	0.62		0.37	0.131					1.00	0.50	0.62	0.131	0.31	0.041	9%
13	8.50	0.60		0.36	0.121					1.00	0.50	0.60	0.121	0.30	0.036	8%
14	9.00	0.54		0.32	0.106					1.00	0.50	0.54	0.106	0.27	0.029	6%
15	9.50	0.50		0.30	0.188					1.00	0.50	0.50	0.188	0.25	0.047	10%
16	10.00	0.47		0.28	0.112					1.00	0.50	0.47	0.112	0.24	0.028	6%
17	10.50	0.42		0.25	0.106					1.00	0.50	0.42	0.106	0.21	0.022	5%
18	11.00	0.40		0.24	0.124					1.00	0.50	0.40	0.124	0.20	0.025	5%
19	11.50	0.40		0.24	0.073					1.00	0.50	0.40	0.073	0.20	0.015	3%
20	12.00	0.44		0.26	0.052					1.00	0.50	0.44	0.052	0.22	0.011	2%
21	12.50	0.41		0.25	0.046					1.00	0.63	0.41	0.046	0.26	0.012	3%
22	13.25	0.28		0.17	0.060					1.00	1.45	0.28	0.060	0.41	0.024	5%
LB	15.40	0.00	0.00		0.00		0.00		0.00	1.00	1.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.471</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:42
Meas. End Time (MST):	13:09
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 20°C



**Flow characteristics:**

Total Flow:	0.471	m <sup>3</sup> /s
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.10	m <sup>2</sup>
Wetted Width:	13.50	m
Hydraulic Depth:	0.38	m
Mean Velocity:	0.09	m/s
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.437	0.436
Water (°C):	14.0	14.3
Datalogger Clock:	12:24	13:20
Laptop Clock:	12:24	13:19
Battery (Main):	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Needs BM labels

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S53-03
S53-03			0.903	100.361	100.361	Pipe 5 m N of logger	S53-04
S53-04	1.098	101.264		100.165	100.165	Pipe 2 m SE of logger	S53-05
S53-05			0.876	100.388	100.388	Pipe 5 m E of logger	WL
Ice/PT:							WL
Water Level:			3.688	97.576		Time WL Surveyed:	12:34
Other:							S53-05
<b>Setup #2</b>							S53-04
S53-03	0.896	101.257		100.361	100.361	Pipe 5 m N of logger	S53-03
S53-04			1.092	100.165	100.165	Pipe 2 m SE of logger	
S53-05			0.868	100.389	100.388	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			3.680	97.577		Time WL Surveyed:	12:36
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S53-04	1.092	101.257	3.682	100.165	Time WL Surveyed:	13:15
Water Level:				97.575		Time WL Surveyed:	13:16
Water Level:				3.675	97.574	Time WL Surveyed:	13:16
BM:	S53-04	1.084	101.249	100.165			

**WL Survey Summary**

	Before	After
Average WL:	97.577	97.575
Transducer Elevation:	97.140	97.139
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.471
Expected Discharge:	0.26
Shift from Existing Rating (m <sup>3</sup> /s):	-0.21
Shift from Existing Rating (%):	-45%

**Field Personnel:**

Field Personnel:	DW, CJ	Trip Date:	14-Sep-13
Data Entry Personnel:	CJ	Date:	14-Sep-13
Data Check Personnel:	XP	Date:	17-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: October 18, 2013  
 Site Visit Time (MST): 15:10

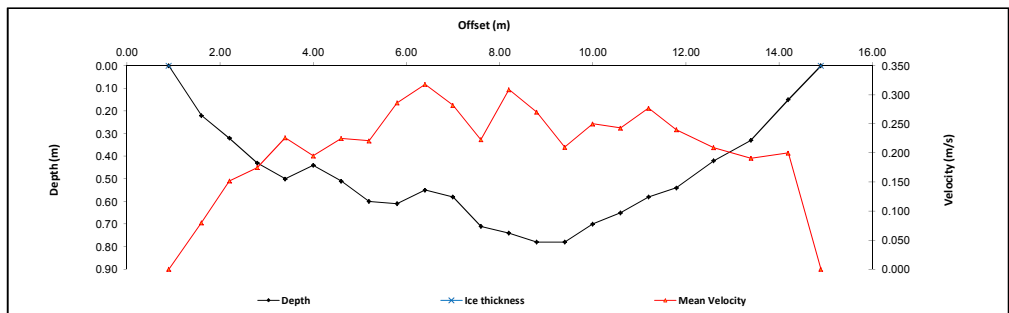


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	14.90	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	14.20	0.15		0.09	0.200					1.00	0.75	0.15	0.200	0.11	0.023	1%
2	13.40	0.33		0.20	0.191					1.00	0.80	0.33	0.191	0.26	0.050	3%
3	12.60	0.42		0.25	0.209					1.00	0.80	0.42	0.209	0.34	0.070	4%
4	11.80	0.54		0.32	0.240					1.00	0.70	0.54	0.240	0.38	0.091	5%
5	11.20	0.58		0.35	0.277					1.00	0.60	0.58	0.277	0.35	0.096	6%
6	10.60	0.65		0.39	0.243					1.00	0.60	0.65	0.243	0.39	0.095	6%
7	10.00	0.70		0.42	0.250					1.00	0.60	0.70	0.250	0.42	0.105	6%
8	9.40	0.78				0.62	0.175	0.16	0.245	1.00	0.60	0.78	0.210	0.47	0.098	6%
9	8.80	0.78				0.62	0.210	0.16	0.330	1.00	0.60	0.78	0.270	0.47	0.126	8%
10	8.20	0.74		0.44	0.309					1.00	0.60	0.74	0.309	0.44	0.137	8%
11	7.60	0.71		0.43	0.223					1.00	0.60	0.71	0.223	0.43	0.095	6%
12	7.00	0.58		0.35	0.282					1.00	0.60	0.58	0.282	0.35	0.098	6%
13	6.40	0.55		0.33	0.318					1.00	0.60	0.55	0.318	0.33	0.105	6%
14	5.80	0.61		0.37	0.286					1.00	0.60	0.61	0.286	0.37	0.105	6%
15	5.20	0.60		0.36	0.221					1.00	0.60	0.60	0.221	0.36	0.080	5%
16	4.60	0.51		0.31	0.225					1.00	0.60	0.51	0.225	0.31	0.069	4%
17	4.00	0.44		0.26	0.195					1.00	0.60	0.44	0.195	0.26	0.051	3%
18	3.40	0.50		0.30	0.226					1.00	0.60	0.50	0.226	0.30	0.068	4%
19	2.80	0.43		0.26	0.175					1.00	0.60	0.43	0.175	0.26	0.045	3%
20	2.20	0.32		0.19	0.152					1.00	0.60	0.32	0.152	0.19	0.029	2%
21	1.60	0.22		0.13	0.080					1.00	0.65	0.22	0.080	0.14	0.011	1%
RB	0.90	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.65</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:55
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 6°C



**Flow characteristics:**

Total Flow:	1.65	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.92	(m <sup>2</sup> )
Wetted Width:	14.00	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.598	0.610
Water (°C):	4.8	4.9
Datalogger Clock:	14:57	15:58
Laptop Clock:	14:56	15:58
Battery (Main):	13.8	13.5
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Updated BM labels

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S53-03	0.945	101.306		100.361	100.361	Pipe 5 m N of logger	S53-03
S53-04			1.139	100.167	100.165	Pipe 2 m SE of logger	S53-04
S53-05			0.916	100.390	100.388	Pipe 5 m E of logger	S53-05
Ice/PT:							WL
Water Level:			3.573	97.733		Time WL Surveyed: 15:04	S53-05
Other:							S53-04
<b>Setup #2</b>							S53-03
S53-03			0.929	100.363	100.361	Pipe 5 m N of logger	
S53-04	1.125	101.292		100.167	100.165	Pipe 2 m SE of logger	
S53-05			0.902	100.390	100.388	Pipe 5 m E of logger	
Ice/PT:							
Water Level:			3.556	97.736		Time WL Surveyed: 15:06	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S53-03	0.929	101.290		100.361		
Water Level:			3.560	97.730		Time WL Surveyed: 16:01	
Water Level:			3.543	97.731		Time WL Surveyed: 16:03	
BM:	S53-03	0.913	101.274		100.361		

**WL Survey Summary**

	Before	After
Average WL:	97.735	97.731
Transducer Elevation:	97.137	97.121
Closing Error:	-0.002	-
WL Check:	0.003	-0.001

**Site Rating Information**

Measured Discharge:	1.65
Expected Discharge:	117.62
Shift from Existing Rating (m <sup>3</sup> /s):	115.97
Shift from Existing Rating (%):	7028%

**Field Personnel:**

Data Entry Personnel:	DW, SM	Trip Date:	18-Oct-13
Data Check Personnel:	DW	Date:	18-Oct-13
Entered Digitally in the Field:	CJ	Date:	24-Oct-13

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: December 6, 2013  
 Site Visit Time (MST): 10:00

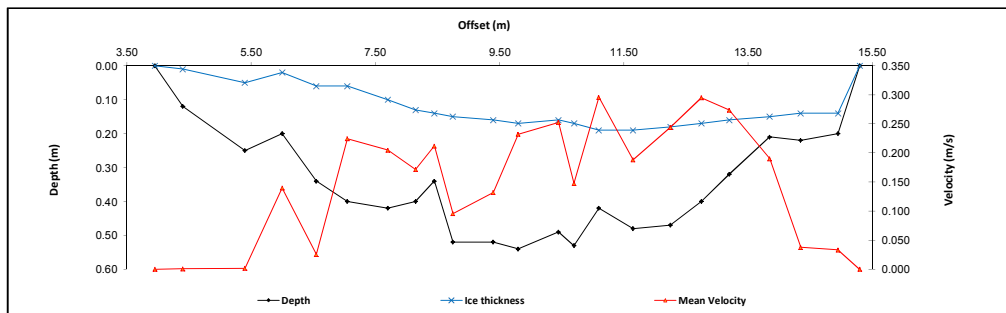


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.95	0.00	0.00		0.000				0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	4.40	0.12	0.01	0.07	0.001				0.88	0.73	0.11	0.001	0.08	0.000	0%	
2	5.40	0.25	0.05	0.15	0.002				0.88	0.80	0.20	0.002	0.16	0.000	0%	
3	6.00	0.20	0.02	0.11	0.159				0.88	0.58	0.18	0.140	0.10	0.014	3%	
4	6.55	0.34	0.06	0.20	0.029				0.88	0.52	0.28	0.026	0.15	0.004	1%	
5	7.05	0.40	0.06	0.23	0.255				0.88	0.58	0.34	0.224	0.20	0.044	10%	
6	7.70	0.42	0.10	0.26	0.233				0.88	0.55	0.32	0.205	0.18	0.036	8%	
7	8.15	0.40	0.13	0.27	0.195				0.88	0.38	0.27	0.172	0.10	0.017	4%	
8	8.45	0.34	0.14	0.24	0.241				0.88	0.30	0.20	0.212	0.06	0.013	3%	
9	8.75	0.52	0.15	0.34	0.109				0.88	0.48	0.37	0.096	0.18	0.017	4%	
10	9.40	0.52	0.16	0.34	0.150				0.88	0.53	0.36	0.132	0.19	0.025	6%	
11	9.80	0.54	0.17	0.36	0.264				0.88	0.52	0.37	0.232	0.19	0.045	10%	
12	10.45	0.49	0.16	0.33	0.287				0.88	0.45	0.33	0.253	0.15	0.038	9%	
13	10.70	0.53	0.17	0.35	0.168				0.88	0.32	0.36	0.148	0.12	0.017	4%	
14	11.10	0.42	0.19	0.31	0.336				0.88	0.48	0.236	0.296	0.11	0.032	7%	
15	11.65	0.48	0.19	0.34	0.214				0.88	0.57	0.29	0.188	0.17	0.031	7%	
16	12.25	0.47	0.18	0.33	0.277				0.88	0.55	0.29	0.244	0.16	0.039	9%	
17	12.75	0.40	0.17	0.29	0.335				0.88	0.48	0.23	0.295	0.11	0.032	7%	
18	13.20	0.32	0.16	0.24	0.311				0.88	0.55	0.16	0.274	0.09	0.024	5%	
19	13.85	0.21	0.15	0.18	0.216				0.88	0.58	0.06	0.190	0.03	0.007	1%	
20	14.35	0.22	0.14	0.18	0.043				0.88	0.55	0.08	0.038	0.04	0.002	0%	
21	14.95	0.20	0.14	0.17	0.038				0.88	0.48	0.06	0.033	0.03	0.001	0%	
RB	15.30	0.00	0.00		0.00	0.00	0.00		0.88	0.18	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.438</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5 m DS of station

Meas. Start Time (MST):	11:00
Meas. End Time (MST):	11:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm -25°C



**Flow characteristics:**

Total Flow:	0.438	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.59	(m <sup>2</sup> )
Wetted Width:	11.35	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.527	0.526
Water (°C):	0.1	0.1
Datalogger Clock:	10:11	11:40
Laptop Clock:	10:10	11:39
Battery (Main):	12.4	14.0
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S53-03			0.977	100.362	100.361	Pipe 5m N of logger	S53-05
S53-04			1.173	100.166	100.165	Pipe 2 m SE of logger	S53-03
S53-05	0.951	101.339		100.388	100.388	Pipe 5 m E of logger	WL
Ice/PT:			3.667	97.672			Ice
Water Level:			3.701	97.638		Time WL Surveyed: 10:56	Ice
Other:							WL
<b>Setup #2</b>							S53-03
S53-03	0.948	101.310		100.362	100.361	Pipe 5 m N of logger	S53-04
S53-04			1.143	100.167	100.165	Pipe 2 m SE of logger	S53-05
S53-05			0.921	100.389	100.388	Pipe 5 m E of logger	
Ice/PT:			3.638	97.672			
Water Level:			3.671	97.639		Time WL Surveyed: 10:59	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S53-05	0.921	101.309		100.388		
Water Level:			3.669	97.640		Time WL Surveyed: 11:34	
Water Level:			3.645	97.641		Time WL Surveyed: 11:36	
BM:	S53-05	0.898	101.286		100.388		

**WL Survey Summary**

	Before	After
Average WL:	97.639	97.641
Transducer Elevation:	97.112	97.115
Closing Error:	-0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, RM	Trip Date:	6-Dec-13
TR, RM	Date:	6-Dec-13
DW	Date:	29-Jan-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

January 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	2.20	0.00	0.00	0.000	0.000	0.000	0.9	2.20	2.60	0.40	0.10	0.015	0.014	0.04	0.001	0%
1	3.00	0.70	0.30	0.061			0.9	2.60	3.60	1.00	0.40	0.061	0.055	0.40	0.022	4%
2	4.20	0.76	0.43	0.100			0.9	3.60	4.85	1.25	0.33	0.100	0.090	0.41	0.037	6%
3	5.50	0.84	0.46	0.100			0.9	4.85	6.25	1.40	0.38	0.100	0.090	0.53	0.048	8%
4	7.00	0.81	0.46	0.089			0.9	6.25	7.65	1.40	0.35	0.089	0.080	0.49	0.039	7%
5	8.30	0.77	0.38	0.143			0.9	7.65	8.85	1.20	0.39	0.143	0.129	0.47	0.060	10%
6	9.40	0.73	0.31	0.151			0.9	8.85	9.55	0.70	0.42	0.151	0.136	0.29	0.040	7%
7	9.70	0.71	0.33	0.103			0.9	9.55	9.90	0.35	0.38	0.103	0.093	0.13	0.012	2%
8	10.10	0.77	0.29	0.096			0.9	9.90	10.45	0.55	0.48	0.096	0.086	0.26	0.023	4%
9	10.80	0.69	0.30	0.046			0.9	10.45	11.35	0.90	0.39	0.046	0.041	0.35	0.015	2%
10	11.90	0.63	0.34	0.110			0.9	11.35	12.40	1.05	0.29	0.110	0.099	0.30	0.030	5%
11	12.90	0.68	0.34	0.104			0.9	12.40	13.35	0.95	0.34	0.104	0.094	0.32	0.030	5%
12	13.80	0.70	0.35	0.092			0.9	13.35	14.25	0.90	0.35	0.092	0.083	0.32	0.026	4%
13	14.70	0.72	0.37	0.117			0.9	14.25	15.05	0.80	0.35	0.117	0.105	0.28	0.029	5%
14	15.40	0.78	0.41	0.031			0.9	15.05	15.75	0.70	0.37	0.031	0.028	0.26	0.007	1%
15	16.10	0.81	0.44	0.029			0.9	15.75	16.60	0.85	0.37	0.029	0.026	0.31	0.008	1%
16	17.10	0.78	0.49	0.029			0.9	16.60	17.60	1.00	0.29	0.029	0.026	0.29	0.008	1%
17	18.10	0.72	0.50	0.060			0.9	17.60	18.65	1.05	0.22	0.060	0.054	0.23	0.012	2%
18	19.20	0.70	0.50	0.079			0.9	18.65	19.90	1.25	0.20	0.079	0.071	0.25	0.018	3%
19	20.60	0.74	0.48	0.080			0.9	19.90	21.40	1.50	0.26	0.080	0.072	0.39	0.028	5%
20	22.20	0.70	0.38	0.118			0.9	21.40	22.95	1.55	0.32	0.118	0.106	0.50	0.053	9%
21	23.70	0.59	0.33	0.139			0.9	22.95	24.30	1.35	0.26	0.139	0.125	0.35	0.044	7%
22	24.90	0.40	0.29	0.054			0.9	24.30	25.45	1.15	0.11	0.054	0.049	0.13	0.006	1%
RB	26.00	0.00	0.00	0.00	0.00	0.00	1.0	25.45	26.00	0.55	0.03	0.014	0.014	0.02	0.000	0%
<b>Total Flow</b>															<b>0.597</b>	

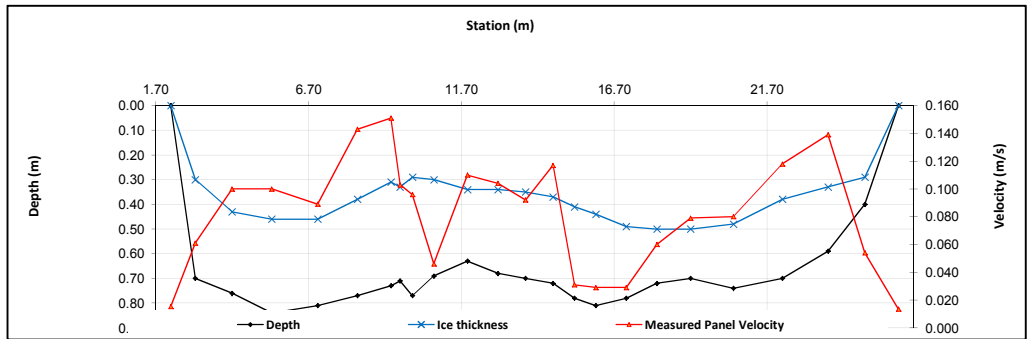
Measurement Details:	
Start Time (MST):	9:30
End Time (MST):	11:00
Equipment:	ADV
Method:	Ice
River Condition:	Ice Covered
Quality/Error (see reverse):	Good
Weather:	P. cloudy, -22°C

Flow characteristics:	
Total Flow:	0.597 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	7.33 (m <sup>2</sup> )
Wetted Width:	23.80 (m)
Hydraulic Depth:	0.308 (m)
Mean Velocity:	0.081 (m/s)
Froude Number:	0.047

Logger Details:		
	Before	After
Transducer Reading (m):	0.686	-
Water (°C):	0.2	-
Battery (Main):	12.0	12.8
Datalogger Clock:	9:31	10:01
Laptop Clock:	9:30	10:00
Enclosure Dessicant:	-	Good
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	Good

Datalogger / Station Notes:	
-	Batteries were replaced

General Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S54-01			0.891	99.674	99.674	Pipe 3 m SW of logger
S54-02			0.866	99.699	99.699	Pipe 2 m SE of logger
S54-03	0.657	100.565		99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:			2.938	97.627		
Water Level:			2.997	97.568		
Other:						
<b>Setup #2</b>						
S54-01			0.833	99.675	99.674	Pipe 3 m SW of logger
S54-02			0.808	99.700	99.699	Pipe 2 m SE of logger
S54-03	0.600	100.508		99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:			2.881	97.627		
Water Level:			2.937	97.571		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	97.570
Transducer Elevation Before	96.884
Transducer Elevation After	-

Field Personnel:	TR And DW	Trip Date:	10-Jan-13
Data Entry Personnel:	TR	Date:	10-Jan-13
Data Check Personnel:	DW	Date:	23-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: February 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.30	0.00	0.00	0.00	0.00	0.00	1.0	2.85	5.60	2.95	0.00	0.000	0.000	0.00	0.000	0%
1	5.90	0.50	0.30	0.017			0.9	5.60	6.63	1.03	0.20	0.017	0.015	0.21	0.003	1%
2	7.35	0.60	0.35	0.108			0.9	6.63	8.08	1.45	0.25	0.108	0.097	0.36	0.035	10%
3	8.80	0.50	0.45	0.059			0.9	8.08	9.53	1.45	0.05	0.059	0.053	0.07	0.004	1%
4	10.25	0.75	0.55	0.028			0.9	9.53	10.88	1.35	0.20	0.028	0.025	0.27	0.007	2%
5	11.50	0.70	0.55	0.014			0.9	10.88	12.10	1.23	0.15	0.014	0.013	0.18	0.002	1%
6	12.70	0.75	0.55	0.017			0.9	12.10	13.15	1.05	0.20	0.017	0.015	0.21	0.003	1%
7	13.60	0.80	0.50	0.039			0.9	13.15	14.08	0.93	0.30	0.039	0.035	0.28	0.010	3%
8	14.55	0.80	0.50	0.044			0.9	14.08	14.93	0.85	0.30	0.044	0.040	0.26	0.010	3%
9	15.30	0.80	0.45	0.063			0.9	14.93	15.80	0.88	0.35	0.063	0.057	0.31	0.017	5%
10	16.30	0.70	0.45	0.063			0.9	15.80	16.78	0.97	0.25	0.063	0.057	0.24	0.014	4%
11	17.25	0.65	0.45	0.060			0.9	16.78	17.78	1.00	0.20	0.060	0.054	0.20	0.011	3%
12	18.30	0.65	0.45	0.081			0.9	17.78	18.75	0.98	0.20	0.081	0.073	0.20	0.014	4%
13	19.20	0.65	0.40	0.146			0.9	18.75	19.88	0.92	0.25	0.146	0.131	0.23	0.030	8%
14	20.15	0.43	0.35	0.147			0.9	19.88	20.63	0.95	0.08	0.147	0.132	0.08	0.010	3%
15	21.10	0.70	0.40	0.175			0.9	20.63	21.55	0.93	0.30	0.175	0.158	0.28	0.044	12%
16	22.00	0.70	0.45	0.179			0.9	21.55	22.40	0.85	0.25	0.179	0.161	0.21	0.034	9%
17	22.80	0.75	0.45	0.111			0.9	22.40	23.40	1.00	0.30	0.111	0.100	0.30	0.030	8%
18	24.00	0.55	0.45	0.026			0.9	23.40	24.75	1.35	0.10	0.026	0.023	0.14	0.003	1%
19	25.50	0.75	0.45	0.138			0.9	24.75	26.28	1.53	0.30	0.138	0.124	0.46	0.057	16%
20	27.05	0.60	0.35	0.084			0.9	26.28	27.45	1.18	0.25	0.084	0.076	0.29	0.022	6%
LB	27.85	0.00	0.00	0.000	0.000	0.000	0.0	27.85	27.85	0.00	0.00	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.361</b>	

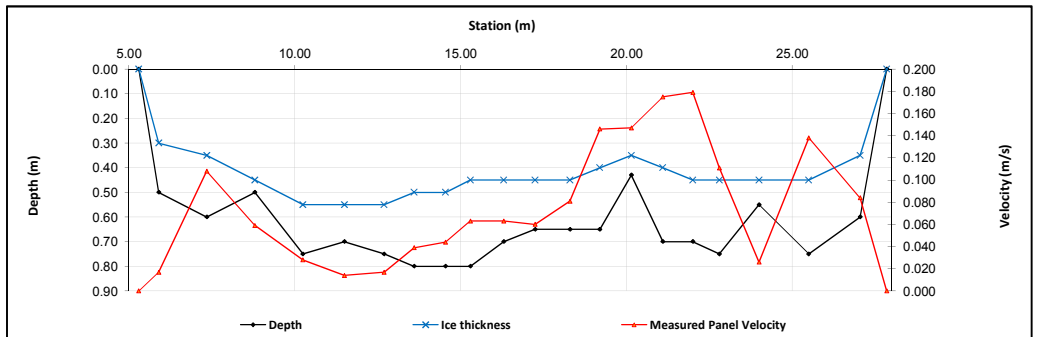
Measurement Details:	
Start Time (MST):	12:50
End Time (MST):	13:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, -7°C

Flow characteristics:		
Total Flow:	0.361	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.76	(m <sup>2</sup> )
Wetted Width:	25.20	(m)
Hydraulic Depth:	0.189	(m)
Mean Velocity:	0.076	(m/s)
Froude Number:	0.056	

Logger Details:		
Transducer Reading (m):	Before	After
	0.661	-
Water (°C):	0.2	-
Battery (Main):	12.6	13.14
Datalogger Clock:	12:56	-
Laptop Clock:	12:56	-
Enclosure Dessicant:	Good	
Logger# (if Δ):	13899	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

**Datalogger / Station Notes:**  
 - Replaced battery

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S54-01			0.875	99.679	99.674	Pipe 3 m SW of logger
S54-02			0.855	99.699	99.699	Pipe 2 m SE of logger
S54-03	0.646	100.554	0.646	99.908	99.908	Pipe 6 m SE of logger
Ice/PT:			2.948	97.606		
Water Level:			3.007	97.547		
Other:						
<b>Setup #2</b>						
S54-01			0.864	99.680	99.674	Pipe 3 m SW of logger
S54-02	0.845	100.544		99.699	99.699	Pipe 2 m SE of logger
S54-03			0.635	99.909	99.908	Pipe 6 m SE of logger
Ice/PT:			2.936	97.608		
Water Level:			2.997	97.547		
Other:						

Closing Error	-0.001	Average WL	97.547
WL Check	0.000	Transducer Elevation Before	96.886
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	10-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	10-Feb-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	5-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: March 3, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	3.20	0.00	0.00	0.000	0.000	0.000	0.9	3.20	3.58	0.38	0.06	0.002	0.002	0.02	0.000	0%
1	3.95	0.50	0.25	0.008			0.9	3.58	4.43	0.85	0.25	0.008	0.007	0.21	0.002	0%
2	4.90	0.50	0.25	0.139			0.9	4.43	5.38	0.95	0.25	0.139	0.125	0.24	0.030	6%
3	5.85	0.60	0.35	0.117			0.9	5.38	6.33	1.05	0.25	0.117	0.105	0.24	0.025	5%
4	6.80	0.60	0.35	0.133			0.9	6.33	7.38	1.05	0.25	0.133	0.120	0.26	0.031	7%
5	7.95	0.70	0.45	0.069			0.9	7.38	8.53	1.15	0.25	0.069	0.062	0.29	0.018	4%
6	9.10	0.70	0.55	0.027			0.9	8.53	9.70	1.18	0.15	0.027	0.024	0.18	0.004	1%
7	10.30	0.73	0.67	0.007			0.9	9.70	11.10	1.40	0.06	0.007	0.006	0.08	0.001	0%
8	11.90	0.75	0.55	0.037			0.9	11.10	12.43	1.33	0.20	0.037	0.033	0.27	0.009	2%
9	12.95	0.88	0.55	0.047			0.9	12.43	13.50	1.08	0.33	0.047	0.042	0.35	0.015	3%
10	14.05	0.78	0.45	0.085			0.9	13.50	14.63	1.13	0.33	0.085	0.077	0.37	0.028	6%
11	15.20	0.70	0.45	0.051			0.9	14.63	15.85	1.23	0.25	0.051	0.046	0.31	0.014	3%
12	16.50	0.65	0.45	0.046			0.9	15.85	17.20	1.35	0.20	0.046	0.041	0.27	0.011	2%
13	17.90	0.70	0.40	0.158			0.9	17.20	18.38	1.18	0.30	0.158	0.142	0.35	0.050	11%
14	18.85	0.58	0.35	0.197			0.9	18.38	19.33	0.95	0.23	0.197	0.177	0.22	0.039	8%
15	19.80	0.60	0.35	0.154			0.9	19.33	20.25	0.92	0.25	0.154	0.139	0.23	0.032	7%
16	20.70	0.62	0.39	0.171			0.9	20.25	21.23	0.98	0.23	0.171	0.154	0.22	0.035	7%
17	21.75	0.67	0.43	0.141			0.9	21.23	22.28	1.05	0.24	0.141	0.127	0.25	0.032	7%
18	22.80	0.73	0.45	0.036			0.9	22.28	23.25	0.98	0.28	0.036	0.032	0.27	0.009	2%
19	23.70	0.70	0.43	0.127			0.9	23.25	24.13	0.88	0.27	0.127	0.114	0.24	0.027	6%
20	24.55	0.70	0.40	0.122			0.9	24.13	25.18	1.05	0.30	0.122	0.110	0.32	0.035	7%
21	25.80	0.60	0.40	0.093			0.9	25.18	26.20	1.03	0.20	0.093	0.084	0.21	0.017	4%
LB	26.60	0.00	0.00	0.00	0.00	0.00	1.0	26.20	26.60	0.40	0.05	0.023	0.023	0.02	0.000	0%
<b>Total Flow</b>														<b>0.463</b>		

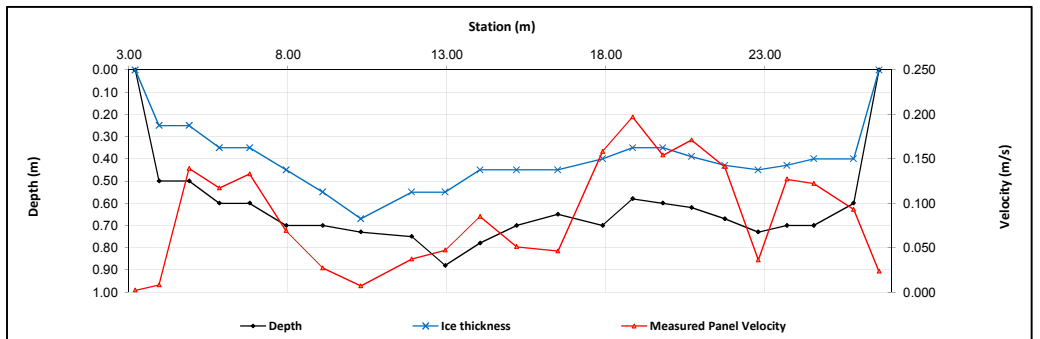
Measurement Details:	
Start Time (MST):	15:50
End Time (MST):	16:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, -5°C

Flow characteristics:	
Total Flow:	0.463 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	5.42 (m <sup>2</sup> )
Wetted Width:	23.40 (m)
Hydraulic Depth:	0.231 (m)
Mean Velocity:	0.085 (m/s)
Froude Number:	0.057

Logger Details:		
	Before	After
Transducer Reading (m):	0.686	-
Water (°C):	0.2	-
Battery (Main):	13.3	-
Datalogger Clock:	15:52	-
Laptop Clock:	15:52	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S54-01			0.999	99.680	99.674	Pipe 3 m SW of logger
S54-02	0.980	100.679		99.699	99.699	Pipe 2 m SE of logger
S54-03			0.770	99.909	99.908	Pipe 6 m SE of logger
Ice/PT:			3.074	97.605		
Water Level:			3.105	97.574		
Other:						
<b>Setup #2</b>						
S54-01			0.946	99.681	99.674	Pipe 3 m SW of logger
S54-02			0.928	99.699	99.699	Pipe 2 m SE of logger
S54-03	0.718	100.627		99.909	99.908	Pipe 6 m SE of logger
Ice/PT:			3.022	97.605		
Water Level:			3.049	97.578		
Other:						

Closing Error	0.000	Average WL	97.576
WL Check	0.004	Transducer Elevation Before	96.890
		Transducer Elevation After	-

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	3-Mar-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	3-Mar-13
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	5-Apr-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

April 8, 2013



Measured Data							Calculated Data									
Bank/	Offset	Depth	Ice	Velocity	Velocity	Velocity	Velocity	Pannel	Pannel	Pannel	Effective	Measured	Effective	Pannel	Pannel	Percent of
Mmt #	(m)	(m)	Thickness	@ 0.5	@ 0.8	@ 0.2	Correction	Start	End	Width	Pannel	Pannel	Average	Area	Discharge	total flow
			(m)	Depth	Depth	Depth	Factor	(m)	(m)	(m)	Depth	Velocity	Pannel	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
LB	0.50	0.00	0.00	0.000	0.000	0.000	0.9	0.50	1.00	0.50	0.03	0.000	0.000	0.01	0.000	0%
1	1.50	0.35	0.25	0.001			0.9	1.00	1.90	0.90	0.10	0.001	0.001	0.09	0.000	0%
2	2.30	0.45	0.30	0.056			0.9	1.90	2.70	0.80	0.15	0.056	0.050	0.12	0.006	2%
3	3.10	0.55	0.35	0.079			0.9	2.70	3.50	0.80	0.20	0.079	0.071	0.16	0.011	3%
4	3.90	0.50	0.35	0.128			0.9	3.50	4.20	0.70	0.15	0.128	0.115	0.11	0.012	4%
5	4.50	0.58	0.38	0.155			0.9	4.20	4.80	0.60	0.20	0.155	0.140	0.12	0.017	5%
6	5.10	0.59	0.35	0.016			0.9	4.80	5.95	1.15	0.24	0.016	0.014	0.28	0.004	1%
7	6.80	0.50	0.37	0.063			0.9	5.95	7.15	1.20	0.13	0.063	0.057	0.16	0.009	3%
8	7.50	0.60	0.35	0.093			0.9	7.15	7.80	0.65	0.25	0.093	0.084	0.16	0.014	4%
9	8.10	0.60	0.02	0.150			0.9	7.80	8.55	0.75	0.58	0.150	0.135	0.43	0.058	17%
10	9.00	0.55	0.34	0.153			0.9	8.55	9.45	0.90	0.21	0.153	0.138	0.19	0.026	8%
11	9.90	0.60	0.30	0.165			0.9	9.45	10.40	0.95	0.30	0.165	0.149	0.29	0.042	13%
12	10.90	0.58	0.40	0.104			0.9	10.40	11.45	1.05	0.18	0.104	0.094	0.19	0.018	5%
13	12.00	0.55	0.45	0.076			0.9	11.45	12.50	1.05	0.10	0.076	0.068	0.11	0.007	2%
14	13.00	0.60	0.45	0.037			0.9	12.50	13.55	1.05	0.15	0.037	0.033	0.16	0.005	2%
15	14.10	0.71	0.46	0.044			0.9	13.55	14.55	1.00	0.25	0.044	0.040	0.25	0.010	3%
16	15.00	0.80	0.50	0.076			0.9	14.55	15.25	0.70	0.30	0.076	0.068	0.21	0.014	4%
17	15.50	0.80	0.55	0.046			0.9	15.25	16.00	0.75	0.25	0.046	0.041	0.19	0.008	2%
18	16.50	0.80	0.55	0.004			0.9	16.00	17.50	1.50	0.25	0.004	0.004	0.38	0.001	0%
19	18.50	0.70	0.55	0.004			0.9	17.50	19.45	1.95	0.15	0.004	0.004	0.29	0.001	0%
20	20.40	0.60	0.35	0.085			0.9	19.45	20.95	1.50	0.25	0.085	0.077	0.38	0.029	9%
21	21.50	0.50	0.30	0.093			0.9	20.95	22.00	1.05	0.20	0.093	0.084	0.21	0.018	5%
22	22.50	0.50	0.25	0.115			0.9	22.00	23.00	1.00	0.25	0.115	0.104	0.25	0.026	8%
23	23.50	0.35	0.25	0.001			0.9	23.00	24.75	1.75	0.10	0.001	0.001	0.18	0.000	0%
RB	26.00	0.00	0.00	0.00	0.00	0.00	1.0	24.75	26.00	1.25	0.03	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>															<b>0.336</b>	

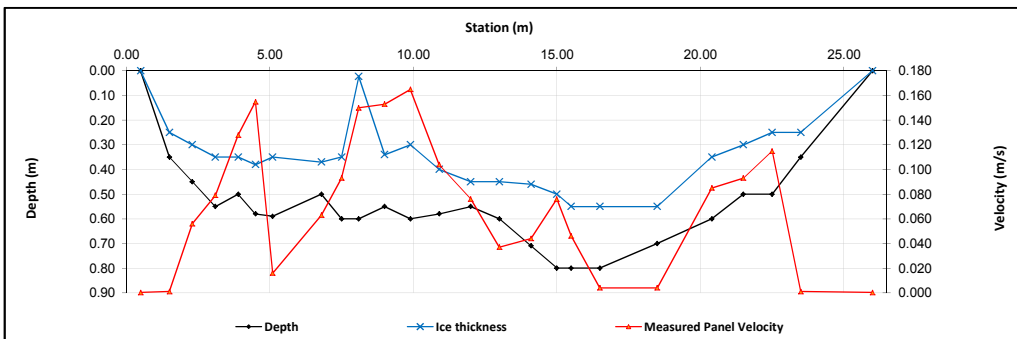
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	15:11
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Fair
Weather:	Clear, breezes, 2°C

Flow characteristics:		
Total Flow:	0.336	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.92	(m <sup>2</sup> )
Wetted Width:	25.50	(m)
Hydraulic Depth:	0.193	(m)
Mean Velocity:	0.068	(m/s)
Froude Number:	0.050	

Logger Details:		
Transducer Reading (m):	0.613	-
Water (°C):	0.2	-
Battery (Main):	14.4	-
Datalogger Clock:	13:46	-
Laptop Clock:	13:46	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	13899	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S54-01			1.232	99.683	99.674	Pipe 3 m SW of logger
S54-02	1.216	100.915		99.699	99.699	Pipe 2 m SE of logger
S54-03			1.007	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:			3.312	97.603		
Water Level:			3.416	97.499		
Other:						
<b>Setup #2</b>						
S54-01	1.219	100.902		99.683	99.674	Pipe 3 m SW of logger
S54-02			1.203	99.699	99.699	Pipe 2 m SE of logger
S54-03			0.994	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:			3.298	97.604		
Water Level:			3.406	97.496		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	97.498
Transducer Elevation Before	96.885
Transducer Elevation After	-

<b>Field Personnel:</b>	SM, BL	Trip Date:	8-Apr-13
<b>Data Entry Personnel:</b>	SM	Date:	8-Apr-13
<b>Data Check Personnel:</b>	DW	Date:	16-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: May 10, 2013  
 Site Visit Time (MST): 14:15

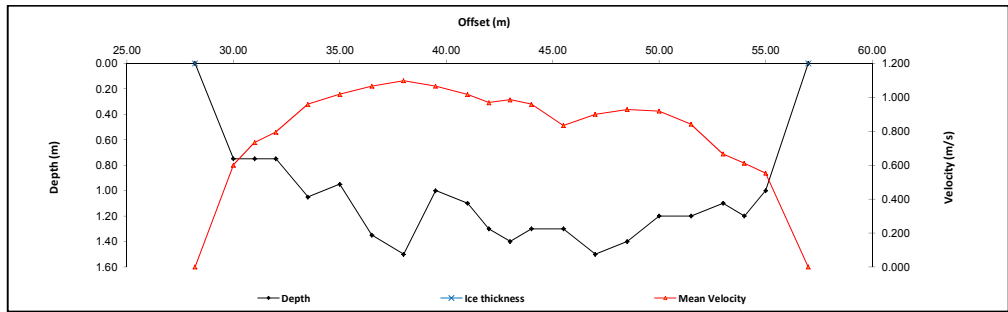


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	28.20	0.00	0.00		0.000		0.000		0.000	1.00	0.90	0.00	0.000	0.00	0.000	
1	30.00	0.75		0.45	0.601					1.00	1.40	0.75	0.601	1.05	0.631	2%
2	31.00	0.75		0.45	0.734					1.00	1.00	0.75	0.734	0.75	0.551	2%
3	32.00	0.75		0.45	0.795					1.00	1.25	0.75	0.795	0.94	0.745	3%
4	33.50	1.05				0.84	0.892	0.21	1.026	1.00	1.50	1.05	0.959	1.58	1.510	5%
5	35.00	0.95			0.76	0.895	0.19	1.141	1.00	1.50	0.95	1.018	1.018	1.43	1.451	5%
6	36.50	1.35			1.08	1.004	0.27	1.129	1.00	1.50	1.35	1.067	2.03	2.160	8%	
7	38.00	1.50			1.20	1.004	0.30	1.193	1.00	1.50	1.50	1.099	2.25	2.472	9%	
8	39.50	1.00			0.80	0.989	0.20	1.143	1.00	1.50	1.00	1.066	1.50	1.599	6%	
9	41.00	1.10			0.88	0.904	0.22	1.129	1.00	1.25	1.10	1.017	1.38	1.398	5%	
10	42.00	1.30			1.04	0.801	0.26	1.137	1.00	1.00	1.30	0.969	1.30	1.260	4%	
11	43.00	1.40			1.12	0.818	0.28	1.153	1.00	1.00	1.40	0.986	1.40	1.380	5%	
12	44.00	1.30			1.04	0.772	0.26	1.146	1.00	1.25	1.30	0.959	1.63	1.558	6%	
13	45.50	1.30			1.04	0.624	0.26	1.044	1.00	1.50	1.30	0.834	1.95	1.626	6%	
14	47.00	1.50			1.20	0.708	0.30	1.093	1.00	1.50	1.50	0.901	2.25	2.026	7%	
15	48.50	1.40			1.12	0.728	0.28	1.129	1.00	1.50	1.40	0.929	2.10	1.950	7%	
16	50.00	1.20			0.96	0.772	0.24	1.065	1.00	1.50	1.20	0.919	1.80	1.653	6%	
17	51.50	1.20			0.96	0.734	0.24	0.948	1.00	1.50	1.20	0.841	1.80	1.514	5%	
18	53.00	1.10			0.98	0.486	0.22	0.845	1.00	1.25	1.10	0.666	1.38	0.915	3%	
19	54.00	1.20			0.96	0.513	0.24	0.710	1.00	1.00	1.20	0.612	1.20	0.734	3%	
20	55.00	1.00			0.80	0.520	0.20	0.585	1.00	1.50	1.00	0.553	1.50	0.829	3%	
RB'	57.00	0.00	0.00		0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>28.0</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:44
Equipment:	ADV
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10°C



**Flow characteristics:**

Total Flow:	28.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	31.19	(m <sup>2</sup> )
Wetted Width:	28.80	(m)
Hydraulic Depth:	1.08	(m)
Mean Velocity:	0.90	(m/s)
Froude Number:	0.28	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.697	1.702
Water (°C):	3.8	4.2
Datalogger Clock:	14:12	16:13
Laptop Clock:	14:13	16:13
Battery (Main):	14.1	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							S54-01
S54-01			0.772	99.682	99.674	Pipe 3 m SW of logger	S54-02
S54-02			0.755	99.699	99.699	Pipe 2 m SE of logger	S54-03
S54-03	0.546	100.454		99.908	99.908	Pipe 6 m SE of Logger	WL
Ice/PT:							WL
Water Level:			1.942	98.512		Time WL Surveyed: 14:35	S54-03
Other:							S54-02
Setup #2							S54-01
S54-01			0.757	99.683	99.674	Pipe 3 m SW of logger	
S54-02			0.740	99.700	99.699	Pipe 2 m SE of logger	
S54-03	0.532	100.440		99.908	99.908	Pipe 6 m SE of Logger	
Ice/PT:							
Water Level:			1.925	98.515		Time WL Surveyed: 14:37	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S54-01	0.757	100.439	99.682			
Water Level:			1.921	98.518		Time WL Surveyed: 16:10	
Water Level:			1.907	98.518		Time WL Surveyed: 16:11	
BM:	S54-01	0.743	100.425	99.682			

**WL Survey Summary**

	Before	After
Average WL:	98.514	98.518
Transducer Elevation:	96.817	96.816
Closing Error:	0.000	-
WL Check:	0.003	0.000

**Site Rating Information**

Measured Discharge:	28
Expected Discharge:	29.71
Shift from Existing Rating (m <sup>3</sup> /s):	1.71
Shift from Existing Rating (%):	6%

**Field Personnel:**

SM, DW	Trip Date:	10-May-13
SM	Date:	10-May-13
DW	Date:	26-May-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: June 7, 2013  
 Site Visit Time (MST): 08:45

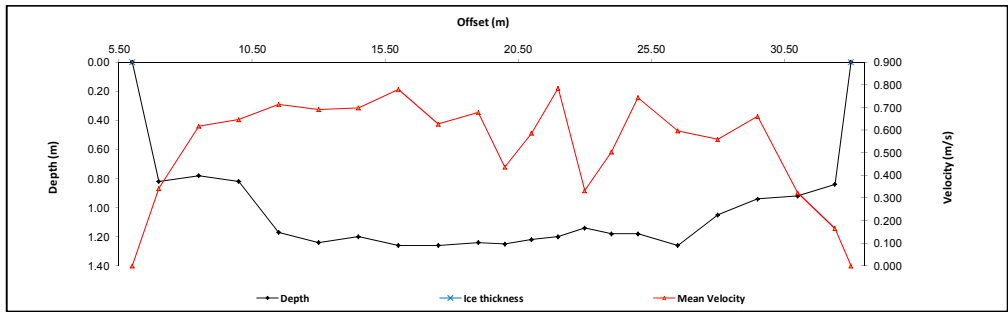


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
1	7.00	0.82			0.66	0.358	0.16	0.327	1.00	1.25	0.82	0.343	1.03	0.351	2%	
2	8.50	0.78			0.62	0.647	0.16	0.588	1.00	1.50	0.78	0.618	1.17	0.722	4%	
3	10.00	0.82			0.66	0.570	0.16	0.723	1.00	1.50	0.82	0.647	1.23	0.795	5%	
4	11.50	1.17			0.94	0.616	0.23	0.811	1.00	1.50	1.17	0.714	1.76	1.252	7%	
5	13.00	1.24			0.99	0.623	0.25	0.760	1.00	1.50	1.24	0.692	1.86	1.286	7%	
6	14.50	1.20			0.96	0.615	0.24	0.781	1.00	1.50	1.20	0.698	1.80	1.256	7%	
7	16.00	1.26			1.01	0.733	0.25	0.828	1.00	1.50	1.26	0.781	1.89	1.475	9%	
8	17.50	1.26			1.01	0.527	0.25	0.726	1.00	1.50	1.26	0.627	1.89	1.184	7%	
9	19.00	1.24			0.99	0.577	0.25	0.779	1.00	1.25	1.24	0.678	1.55	1.051	6%	
10	20.00	1.25			1.00	0.062	0.25	0.811	1.00	1.00	1.25	0.437	1.25	0.546	3%	
11	21.00	1.22			0.98	0.408	0.24	0.765	1.00	1.00	1.22	0.587	1.22	0.716	4%	
12	22.00	1.20			0.96	0.698	0.24	0.872	1.00	1.00	1.20	0.785	1.20	0.942	5%	
13	23.00	1.14			0.91	0.246	0.23	0.419	1.00	1.00	1.14	0.333	1.14	0.379	2%	
14	24.00	1.18			0.94	0.215	0.24	0.790	1.00	1.00	1.18	0.503	1.18	0.593	3%	
15	25.00	1.18			0.94	0.465	0.24	1.021	1.00	1.25	1.18	0.743	1.48	1.096	6%	
16	26.50	1.26			1.01	0.702	0.25	0.491	1.00	1.50	1.26	0.597	1.89	1.127	7%	
17	28.00	1.05			0.84	0.602	0.21	0.516	1.00	1.50	1.05	0.559	1.58	0.880	5%	
18	29.50	0.94			0.75	0.499	0.19	0.822	1.00	1.50	0.94	0.661	1.41	0.931	5%	
19	31.00	0.92			0.74	0.289	0.18	0.356	1.00	1.45	0.92	0.323	1.33	0.430	3%	
20	32.40	0.84			0.67	0.235	0.17	0.094	1.00	1.00	0.84	0.165	0.84	0.138	1%	
LB	33.00	0.00	0.00		0.00	0.00	0.00	0.00	1.00	0.30	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>17.2</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:00
Meas. End Time (MST):	10:16
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 14°C



**Flow characteristics:**

Total Flow:	17.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	28.68	(m <sup>2</sup> )
Wetted Width:	27.00	(m)
Hydraulic Depth:	1.06	(m)
Mean Velocity:	0.60	(m/s)
Froude Number:	0.19	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.628	1.623
Water (°C):	15.8	16.3
Datalogger Clock:	08:02	10:32
Laptop Clock:	08:02	10:32
Battery (Main):	13.3	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S54-01			0.786	99.683	99.674	Pipe 3 m SW of logger	S54-01
S54-02	0.770	100.469		99.699	99.699	Pipe 2 m SE of logger	S54-02
S54-03			0.561	99.908	99.908	Pipe 6 m SE of Logger	WL
Ice/PT:							WL
Water Level:			2.118	98.351		Time WL Surveyed: 8:51	S54-03
Other:							S54-02
<b>Setup #2</b>							
S54-01			0.770	99.681	99.674	Pipe 3 m SW of logger	S54-01
S54-02			0.753	99.698	99.699	Pipe 2 m SE of logger	
S54-03	0.543	100.451		99.908	99.908	Pipe 6 m SE of Logger	
Ice/PT:							
Water Level:			2.101	98.350		Time WL Surveyed: 8:52	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S54-01	0.770	100.453	99.683		Time WL Surveyed: 10:29	
Water Level:			2.103	98.350		Time WL Surveyed: 10:30	
Water Level:			2.086	98.351			
BM:	S54-01	0.754	100.437	99.683			

**WL Survey Summary**

	Before	After
Average WL:	98.351	98.351
Transducer Elevation:	96.723	96.728
Closing Error:	0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	17.2
Expected Discharge:	23.29
Shift from Existing Rating (m <sup>3</sup> /s):	6.09
Shift from Existing Rating (%):	35%

**Field Personnel:**

SM, CJ	Trip Date:	7-Jun-13
SM, CJ	Date:	7-Jun-13
DW	Date:	13-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

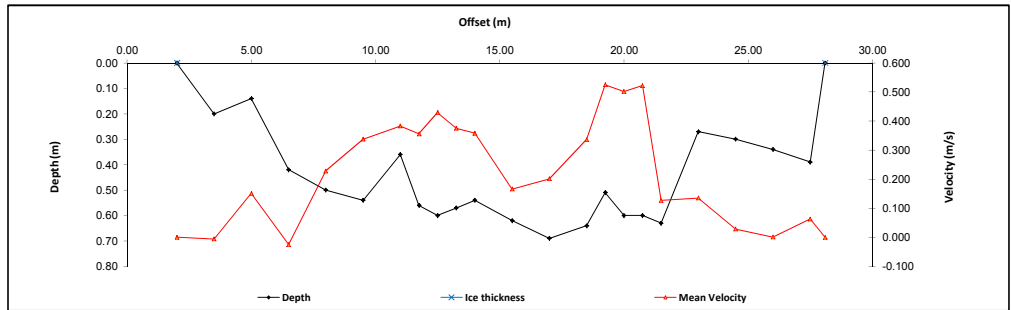
Site Visit Date: August 14, 2013  
 Site Visit Time (MST): 17:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
10	3.50	0.20		0.12	-0.006					1.00	1.50	0.20	-0.006	0.30	-0.002	0%
11	5.00	0.14		0.08	0.151					1.00	1.50	0.14	0.151	0.21	0.032	1%
12	6.50	0.42		0.25	-0.025					1.00	1.50	0.42	-0.025	0.63	-0.016	-1%
13	8.00	0.50		0.30	0.228					1.00	1.50	0.50	0.228	0.75	0.171	6%
14	9.50	0.54		0.32	0.338					1.00	1.50	0.54	0.338	0.81	0.274	10%
15	11.00	0.36		0.22	0.383					1.00	1.13	0.36	0.383	0.41	0.155	6%
16	11.75	0.56		0.34	0.356					1.00	0.75	0.56	0.356	0.42	0.150	5%
17	12.50	0.60		0.36	0.429					1.00	0.75	0.60	0.429	0.45	0.193	7%
18	13.25	0.57		0.34	0.375					1.00	0.75	0.57	0.375	0.43	0.160	6%
19	14.00	0.54		0.32	0.358					1.00	1.13	0.54	0.358	0.61	0.217	8%
20	15.50	0.62		0.37	0.166					1.00	1.50	0.62	0.166	0.93	0.154	6%
21	17.00	0.69		0.41	0.201					1.00	1.50	0.69	0.201	1.04	0.208	7%
22	18.50	0.64		0.38	0.336					1.00	1.13	0.64	0.336	0.72	0.242	9%
23	19.25	0.51		0.31	0.525					1.00	0.75	0.51	0.525	0.38	0.201	7%
24	20.00	0.60		0.36	0.502					1.00	0.75	0.60	0.502	0.45	0.226	8%
25	20.75	0.60		0.36	0.522					1.00	0.75	0.60	0.522	0.45	0.235	8%
26	21.50	0.63		0.38	0.127					1.00	1.13	0.63	0.127	0.71	0.099	3%
27	23.00	0.27		0.16	0.135					1.00	1.50	0.27	0.135	0.41	0.055	2%
28	24.50	0.30		0.18	0.028					1.00	1.50	0.30	0.028	0.45	0.013	0%
29	26.00	0.34		0.20	0.001					1.00	1.50	0.34	0.001	0.51	0.001	0%
30	27.50	0.39		0.23	0.063					1.00	1.05	0.39	0.063	0.41	0.026	1%
LB	28.10	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.78</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	18:15
Meas. End Time (MST):	18:38
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 23°C



**Flow characteristics:**

Total Flow:	2.78	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.46	(m <sup>2</sup> )
Wetted Width:	26.10	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.933	0.934
Water (°C):	19.4	19.5
Datalogger Clock:	18:04	18:45
Laptop Clock:	18:04	18:45
Battery (Main):	13.6	13.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Vegetation on RB to 23.25 m
- 6.5 m - Eddie affected

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S54-01			0.937	99.681	99.674	Pipe 3 m SW of logger	S54-01
S54-02	0.919	100.618		99.699	99.699	Pipe 2 m SE of logger	S54-02
S54-03			0.709	99.909	99.908	Pipe 6 m SE of Logger	S54-03
Ice/PT:							WL
Water Level:			2.955	97.663		Time WL Surveyed: 18:11	S54-03
Other:							S54-02
<b>Setup #2</b>							S54-01
S54-01			0.919	99.683	99.674	Pipe 3 m SW of logger	
S54-02			0.902	99.700	99.699	Pipe 2 m SE of logger	
S54-03	0.693	100.602		99.909	99.908	Pipe 6 m SE of Logger	
Ice/PT:							
Water Level:			2.942	97.660		Time WL Surveyed: 18:13	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S54-01	0.919	100.600		99.681		
Water Level:			2.942	97.658		Time WL Surveyed: 18:40	
Water Level:			2.927	97.661		Time WL Surveyed: 18:40	
BM:	S54-01	0.907	100.588		99.681		

**WL Survey Summary**

	Before	After
Average WL:	97.662	97.660
Transducer Elevation:	96.729	96.726
Closing Error:	-0.001	-
WL Check:	0.003	-0.003

**Site Rating Information**

Measured Discharge:	2.78
Expected Discharge:	3.20
Shift from Existing Rating (m <sup>3</sup> /s):	0.42
Shift from Existing Rating (%):	15%

**Field Personnel:**

	DW, TR	Trip Date:	14-Aug-13
Data Entry Personnel:	DW	Date:	14-Aug-13
Data Check Personnel:	DW	Date:	23-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: September 14, 2013  
 Site Visit Time (MST): 10:25

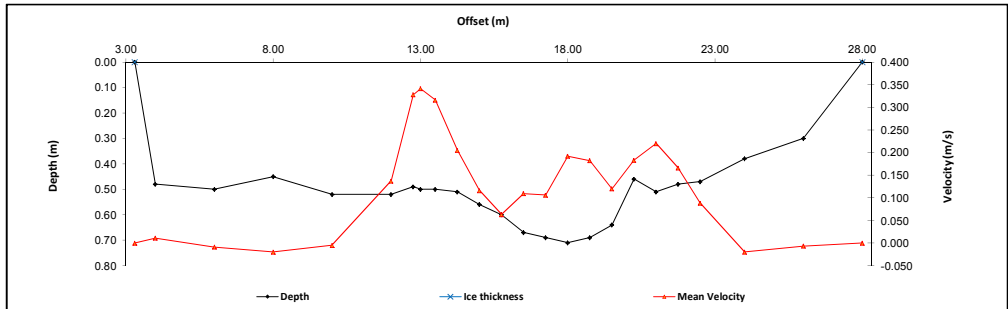


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.30	0.00	0.00		0.000				0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	4.00	0.48		0.29	0.011					1.00	1.35	0.48	0.011	0.65	0.007	1%
2	6.00	0.50		0.30	-0.009					1.00	2.00	0.50	-0.009	1.00	-0.009	-1%
3	8.00	0.45		0.27	-0.020					1.00	2.00	0.45	-0.020	0.90	-0.018	-2%
4	10.00	0.52		0.31	-0.005					1.00	2.00	0.52	-0.005	1.04	-0.005	0%
5	12.00	0.52		0.31	0.137					1.00	1.38	0.52	0.137	0.72	0.098	9%
6	12.75	0.49		0.29	0.328					1.00	0.50	0.49	0.328	0.25	0.080	8%
7	13.00	0.50		0.30	0.341					1.00	0.38	0.50	0.341	0.19	0.064	6%
8	13.50	0.50		0.30	0.316					1.00	0.63	0.50	0.316	0.31	0.099	9%
9	14.25	0.51		0.31	0.205					1.00	0.75	0.51	0.205	0.38	0.078	7%
10	15.00	0.56		0.34	0.116					1.00	0.75	0.56	0.116	0.42	0.049	5%
11	15.75	0.60		0.36	0.063					1.00	0.75	0.60	0.063	0.45	0.028	3%
12	16.50	0.67		0.40	0.109					1.00	0.75	0.67	0.109	0.50	0.055	5%
13	17.25	0.69		0.41	0.106					1.00	0.75	0.69	0.106	0.52	0.055	5%
14	18.00	0.71		0.43	0.192					1.00	0.75	0.71	0.192	0.53	0.102	10%
15	18.75	0.69		0.41	0.182					1.00	0.75	0.69	0.182	0.52	0.094	9%
16	19.50	0.64		0.38	0.120					1.00	0.75	0.64	0.120	0.48	0.058	5%
17	20.25	0.46		0.28	0.183					1.00	0.75	0.46	0.183	0.35	0.063	6%
18	21.00	0.51		0.31	0.220					1.00	0.75	0.51	0.220	0.38	0.084	8%
19	21.75	0.48		0.29	0.166					1.00	0.75	0.48	0.166	0.36	0.060	6%
20	22.50	0.47		0.28	0.088					1.00	1.13	0.47	0.088	0.53	0.047	4%
21	24.00	0.38		0.23	-0.020					1.00	1.75	0.38	-0.020	0.67	-0.013	-1%
22	26.00	0.30		0.18	-0.007					1.00	2.00	0.30	-0.007	0.60	-0.004	0%
RB	28.00	0.00	0.00		0.00				0.00	1.00	1.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.07</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:05
Meas. End Time (MST):	11:27
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	1.07	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.73	(m <sup>2</sup> )
Wetted Width:	24.70	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.730	0.730
Water (°C):	13.0	13.1
Datalogger Clock:	10:30	11:37
Laptop Clock:	10:30	11:37
Battery (Main):	13.0	13.4
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1	S54-01			0.883	99.682	99.674	Pipe 3 m SW of logger	S54-01
	S54-02	0.866	100.565		99.699	99.699	Pipe 2 m SE of logger	S54-02
	S54-03			0.656	99.909	99.908	Pipe 6 m SE of Logger	S54-03
	Water Level:			3.106	97.459		Time WL Surveyed: 10:54	WL
	Other:							S54-02
Setup #2	S54-01			0.870	99.684	99.674	Pipe 3 m SW of logger	S54-01
	S54-02			0.853	99.701	99.699	Pipe 2 m SE of logger	S54-02
	S54-03	0.645	100.554		99.909	99.908	Pipe 6 m SE of Logger	S54-03
	Water Level:			3.097	97.457		Time WL Surveyed: 10:56	WL
	Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
	BM: S54-01	0.870	100.552		99.682			
	Water Level:			3.098	97.454		Time WL Surveyed: 11:32	
	Water Level:			3.084	97.455		Time WL Surveyed: 11:33	
	BM: S54-01	0.857	100.539		99.682			

**WL Survey Summary**

	Before	After
Average WL:	97.458	97.455
Transducer Elevation:	96.728	96.725
Closing Error:	-0.002	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	1.07
Expected Discharge:	0.32
Shift from Existing Rating (m <sup>3</sup> /s):	-0.75
Shift from Existing Rating (%):	-70%

**Field Personnel:**

Field Personnel:	DW, CJ	Trip Date:	14-Sep-13
Data Entry Personnel:	CJ	Date:	14-Sep-13
Data Check Personnel:	DW	Date:	26-Sep-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: October 20, 2013  
 Site Visit Time (MST): 08:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.60	0.00	0.00		0.000				0.000	1.00	0.70	0.00	0.000	0.00	0.000	
1	3.00	0.34		0.20	0.208					1.00	1.70	0.34	0.208	0.58	0.120	3%
2	5.00	0.52		0.31	0.047					1.00	2.00	0.52	0.047	1.04	0.049	1%
3	7.00	0.60		0.36	0.337					1.00	2.00	0.60	0.337	1.20	0.404	9%
4	9.00	0.59		0.35	0.393					1.00	1.50	0.59	0.393	0.89	0.348	7%
5	10.00	0.57		0.34	0.471					1.00	1.00	0.57	0.471	0.57	0.268	6%
6	11.00	0.69		0.41	0.365					1.00	1.00	0.69	0.365	0.69	0.252	5%
7	12.00	0.71		0.43	0.478					1.00	1.00	0.71	0.478	0.71	0.339	7%
8	13.00	0.74		0.44	0.354					1.00	1.00	0.74	0.354	0.74	0.262	6%
9	14.00	0.75		0.45	0.365					1.00	1.00	0.75	0.365	0.75	0.274	6%
10	15.00	0.78				0.62	0.082	0.16	0.512	1.00	1.00	0.78	0.297	0.78	0.232	5%
11	16.00	0.85				0.68	0.159	0.17	0.572	1.00	1.00	0.85	0.366	0.85	0.311	7%
12	17.00	0.85				0.68	0.126	0.17	0.491	1.00	1.00	0.85	0.309	0.85	0.262	6%
13	18.00	0.80				0.64	0.163	0.16	0.643	1.00	1.00	0.80	0.403	0.80	0.322	7%
14	19.00	0.74		0.44	0.402					1.00	1.00	0.74	0.402	0.74	0.297	6%
15	20.00	0.76				0.61	0.166	0.15	0.580	1.00	1.00	0.76	0.373	0.76	0.283	6%
16	21.00	0.81				0.65	0.247	0.16	0.287	1.00	1.00	0.81	0.287	0.81	0.232	5%
17	22.00	0.87		0.40	0.247					1.00	1.00	0.67	0.247	0.67	0.165	4%
18	23.00	0.52		0.31	0.232					1.00	1.00	0.52	0.232	0.52	0.121	3%
19	24.00	0.40		0.24	0.148					1.00	1.00	0.40	0.148	0.40	0.059	1%
20	25.00	0.50		0.30	0.044					1.00	1.50	0.50	0.044	0.75	0.033	1%
21	27.00	0.48		0.29	0.045					1.00	1.40	0.48	0.045	0.67	0.030	1%
RB	27.80	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>4.67</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	8:36
Meas. End Time (MST):	9:10
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast

**Flow characteristics:**

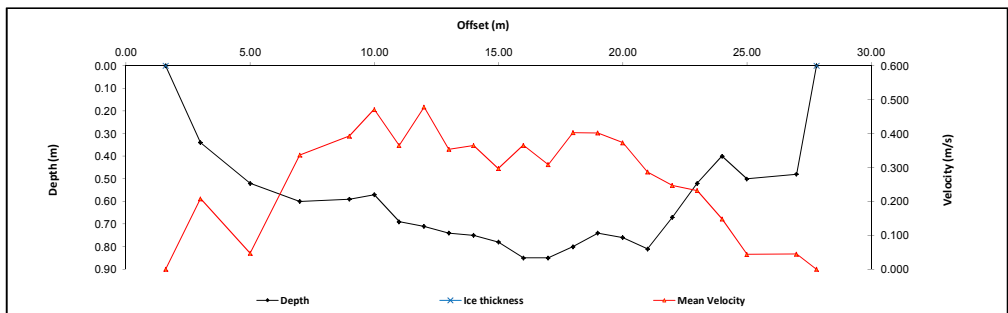
Total Flow:	4.67	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	15.77	(m <sup>2</sup> )
Wetted Width:	26.20	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.058	1.058
Water (°C):	3.7	3.7
Datalogger Clock:	08:08	09:12
Laptop Clock:	08:07	09:11
Battery (Main):	12.9	13.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S54-01			0.999	99.682	99.674	Pipe 3 m SW of logger	S54-01
S54-02	0.982	100.681		99.699	99.699	Pipe 2 m SE of logger	S54-02
S54-03			0.772	99.909	99.908	Pipe 6 m SE of Logger	S54-03
Ice/PT:							WL
Water Level:			2.898	97.783		Time WL Surveyed: 8:23	S54-03
Other:							S54-02
<b>Setup #2</b>							S54-01
S54-01			1.012	99.682	99.674	Pipe 3 m SW of logger	
S54-02			0.994	99.700	99.699	Pipe 2 m SE of logger	
S54-03	0.785	100.694		99.909	99.908	Pipe 6 m SE of Logger	
Ice/PT:							
Water Level:			2.913	97.781		Time WL Surveyed: 8:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S54-01	0.998	100.680		99.682		
Water Level:			2.899	97.781		Time WL Surveyed: 9:13	
Water Level:			2.893	97.782		Time WL Surveyed: 9:14	
BM:	S54-01	0.993	100.675		99.682		

**WL Survey Summary**

	Before	After
Average WL:	97.782	97.782
Transducer Elevation:	96.724	96.724
Closing Error:	-0.001	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	4.67
Expected Discharge:	5.73
Shift from Existing Rating (m <sup>3</sup> /s):	1.06
Shift from Existing Rating (%):	23%

**Field Personnel:**

Data Entry Personnel:	DW, TR	Trip Date:	20-Oct-13
Data Check Personnel:	DW	Date:	20-Oct-13
Entered Digitally in the Field:	CJ	Date:	24-Oct-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: December 7, 2013  
 Site Visit Time (MST): 12:00

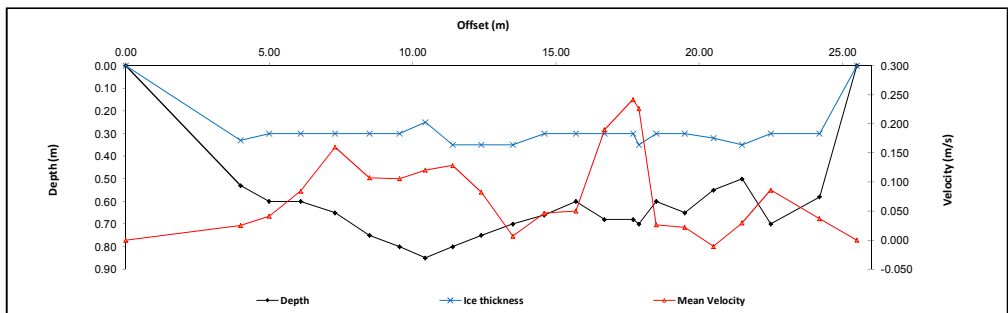


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	25.50	0.00	0.00		0.000				0.000	0.88	0.65	0.00	0.000	0.00	0.000	
1	24.20	0.58	0.30	0.44	0.042				0.88	1.50	0.28	0.037	0.42	0.016	2%	
2	22.50	0.70	0.30	0.50	0.098				0.88	1.35	0.40	0.086	0.54	0.047	7%	
3	21.50	0.50	0.35	0.43	0.034				0.88	1.00	0.15	0.030	0.15	0.004	1%	
4	20.50	0.55	0.32	0.44	-0.012				0.88	1.00	0.23	-0.011	0.23	-0.002	0%	
5	19.50	0.65	0.30	0.48	0.025				0.88	1.00	0.35	0.022	0.35	0.008	1%	
6	18.50	0.60	0.30	0.45	0.030				0.88	0.80	0.30	0.026	0.24	0.006	1%	
7	17.90	0.70	0.35	0.53	0.257				0.88	0.40	0.35	0.226	0.14	0.032	5%	
8	17.70	0.68	0.30	0.49	0.275				0.88	0.60	0.38	0.242	0.23	0.055	8%	
9	16.70	0.68	0.30	0.49	0.216				0.88	1.00	0.38	0.190	0.38	0.072	11%	
10	15.70	0.60	0.30	0.45	0.057				0.88	1.05	0.30	0.050	0.32	0.016	2%	
11	14.60	0.66	0.30	0.48	0.053				0.88	1.10	0.36	0.047	0.40	0.018	3%	
12	13.50	0.70	0.35	0.53	0.008				0.88	1.10	0.35	0.007	0.39	0.003	0%	
13	12.40	0.75	0.35	0.55	0.094				0.88	1.05	0.40	0.083	0.42	0.035	5%	
14	11.40	0.80	0.35	0.58	0.146				0.88	0.98	0.45	0.128	0.44	0.056	9%	
15	10.45	0.85	0.25	0.55	0.137				0.88	0.93	0.60	0.121	0.56	0.067	10%	
16	9.55	0.80	0.30	0.55	0.120				0.88	0.98	0.50	0.106	0.49	0.051	8%	
17	8.50	0.75	0.30	0.53	0.122				0.88	1.13	0.45	0.107	0.51	0.054	8%	
18	7.30	0.65	0.30	0.48	0.182				0.88	1.20	0.35	0.160	0.42	0.067	10%	
19	6.10	0.60	0.30	0.45	0.096				0.88	1.15	0.30	0.084	0.35	0.029	4%	
20	5.00	0.60	0.30	0.45	0.047				0.88	1.05	0.30	0.041	0.32	0.013	2%	
21	4.00	0.53	0.33	0.43	0.029				0.88	2.50	0.20	0.026	0.50	0.013	2%	
LB	0.00	0.00	0.00		0.00				0.88	2.00	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.660</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:30
Meas. End Time (MST):	14:10
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partially Frozen, -20°C



**Flow characteristics:**

Total Flow:	0.660	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.76	(m <sup>2</sup> )
Wetted Width:	25.50	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.846	0.846
Water (°C):	0.5	0.5
Datalogger Clock:	12:18	14:24
Laptop Clock:	12:18	14:24
Battery (Main):	12.6	12.6
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	Replaced
Vent Tube Dessicant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S54-01			1.026	99.684	99.674	Pipe 3 m SW of logger	S54-02
S54-02	1.011	100.710		99.699	99.699	Pipe 2 m SE of logger	S54-03
S54-03			0.803	99.907	99.908	Pipe 6 m SE of Logger	WL
Ice/PT:			3.096	97.614			Ice
Water Level:			3.139	97.571		Time WL Surveyed: 12:53	Ice
Other:							WL
<b>Setup #2</b>							S54-03
S54-01			1.017	99.684	99.674	Pipe 3 m SW of logger	S54-01
S54-02			1.003	99.698	99.699	Pipe 2 m SE of logger	S54-02
S54-03	0.794	100.701		99.907	99.908	Pipe 6 m SE of Logger	
Ice/PT:			3.087	97.614			
Water Level:			3.130	97.571		Time WL Surveyed: 12:56	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S54-01	1.030	100.714		99.684		
Water Level:			3.150	97.564		Time WL Surveyed: 14:13	
Water Level:			3.136	97.565		Time WL Surveyed: 3:50	
BM:	S54-01	1.017	100.701		99.684		

**WL Survey Summary**

	Before	After
Average WL:	97.571	97.565
Transducer Elevation:	96.725	96.719
Closing Error:	0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

DB, CJ	Trip Date:	7-Dec-13
DB	Date:	7-Dec-13
DW	Date:	24-Jan-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

January 9, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	0.50	0.50	0.02	0.000	0.000	0.01	0.000	0%
1	1.00	0.40	0.33	0.000			1.0	0.50	1.55	1.05	0.07	0.000	0.000	0.07	0.000	0%
2	2.10	0.56	0.37	0.418			0.9	1.55	2.55	1.00	0.19	0.418	0.376	0.19	0.071	4%
3	3.00	0.62	0.40	0.441			0.9	2.55	3.35	0.80	0.22	0.441	0.397	0.18	0.070	4%
4	3.70	0.65	0.45	0.527			0.9	3.35	4.05	0.70	0.20	0.527	0.474	0.14	0.066	4%
5	4.40	0.74	0.43	0.638			0.9	4.05	4.70	0.65	0.31	0.638	0.574	0.20	0.116	7%
6	5.00	0.70	0.42	0.633			0.9	4.70	5.30	0.60	0.28	0.633	0.570	0.17	0.096	6%
7	5.60	0.73	0.40	0.536			0.9	5.30	5.80	0.50	0.33	0.536	0.482	0.17	0.080	5%
8	6.00	0.65	0.35	0.431			0.9	5.80	6.35	0.55	0.30	0.431	0.388	0.17	0.064	4%
9	6.70	0.66	0.32	0.265			0.9	6.35	6.90	0.55	0.34	0.265	0.239	0.19	0.045	3%
10	7.10	0.66	0.35	0.353			0.9	6.90	7.45	0.55	0.31	0.353	0.318	0.17	0.054	3%
11	7.80	0.60	0.35	0.333			0.9	7.45	8.00	0.55	0.25	0.333	0.300	0.14	0.041	2%
12	8.20	0.66	0.31	0.461			0.9	8.00	8.45	0.45	0.35	0.461	0.415	0.16	0.065	4%
13	8.70	0.72	0.32	0.524			0.9	8.45	8.95	0.50	0.40	0.524	0.472	0.20	0.094	6%
14	9.20	0.78	0.33	0.642			0.9	8.95	9.45	0.50	0.45	0.642	0.578	0.23	0.130	8%
15	9.70	0.70	0.36	0.510			0.9	9.45	10.00	0.55	0.34	0.510	0.459	0.19	0.086	5%
16	10.30	0.60	0.32	0.600			0.9	10.00	10.70	0.70	0.28	0.600	0.540	0.20	0.106	6%
17	11.10	0.62	0.30	0.640			0.9	10.70	11.45	0.75	0.32	0.640	0.576	0.24	0.138	8%
18	11.80	0.50	0.30	0.529			0.9	11.45	12.10	0.65	0.20	0.529	0.476	0.13	0.062	4%
19	12.40	0.60	0.32	0.689			0.9	12.10	12.75	0.65	0.28	0.689	0.620	0.18	0.113	7%
20	13.10	0.55	0.35	0.470			0.9	12.75	13.50	0.75	0.20	0.470	0.423	0.15	0.063	4%
21	13.90	0.47	0.30	0.450			0.9	13.50	14.25	0.75	0.17	0.450	0.405	0.13	0.052	3%
22	14.60	0.40	0.25	0.301			0.9	14.25	15.05	0.80	0.15	0.301	0.271	0.12	0.033	2%
RB	15.50	0.00	0.00	0.00	0.00	0.00	1.0	15.05	15.50	0.45	0.04	0.075	0.075	0.02	0.001	0%
<b>Total Flow</b>														<b>1.65</b>		

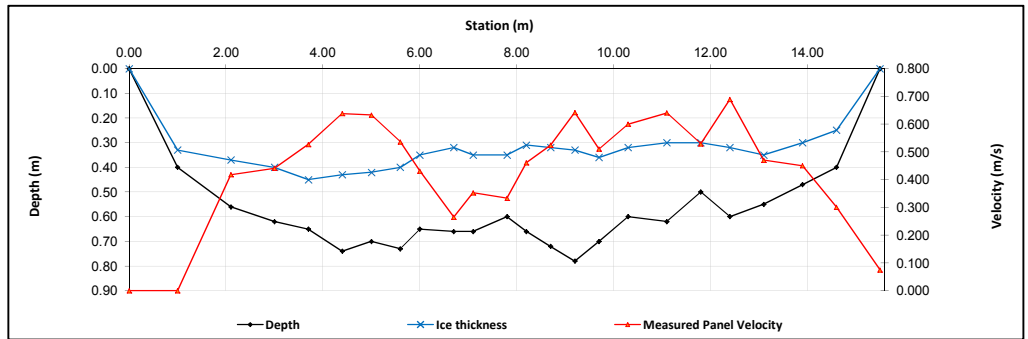
Measurement Details:	
Start Time (MST):	14:20
End Time (MST):	15:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Snowing, -13°C

Flow characteristics:	
Total Flow:	1.65 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.71 (m <sup>2</sup> )
Wetted Width:	15.50 (m)
Hydraulic Depth:	0.240 (m)
Mean Velocity:	0.444 (m/s)
Froude Number:	0.290

Logger Details:		
	Before	After
Transducer Reading (m):	0.338	-
Water (°C):	0.3	-
Battery (Main):	13.0	-
Datalogger Clock:	14:25	-
Laptop Clock:	14:24	-
Enclosure Dessicant:	-	Good
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	Good

Datalogger / Station Notes:	
-	WL spikes a few times in December

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S55-02	1.128	101.309		100.181	100.181	2" Pipe 2 m S of logger
S55-03			1.506	99.803	99.806	3/4" Pipe 5 m SW of logger
S55-04			1.523	99.786	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.110	97.199		
Water Level:			4.169	97.140		
Other:						
<b>Setup #2</b>						
S55-02			1.115	100.180	100.181	2" Pipe 2 m S of logger
S55-03	1.492	101.295		99.803	99.806	3/4" Pipe 5 m SW of logger
S55-04			1.510	99.785	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.098	97.197		
Water Level:			4.157	97.138		
Other:						

Closing Error	0.001
WL Check	0.002

Average WL	97.139
Transducer Elevation Before	96.801
Transducer Elevation After	-

<b>Field Personnel:</b>	DW, SM	Trip Date:	9-Jan-13
<b>Data Entry Personnel:</b>	SM	Date:	9-Jan-13
<b>Data Check Personnel:</b>	TR	Date:	25-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

February 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	5.50	0.00	0.00	0.000	0.000	0.000	0.9	5.50	5.98	0.48	0.03	0.057	0.052	0.01	0.001	0%
1	6.45	0.45	0.35	0.229			0.9	5.98	6.83	0.85	0.10	0.229	0.206	0.09	0.018	1%
2	7.20	0.70	0.55	0.228			0.9	6.83	7.58	0.75	0.15	0.228	0.205	0.11	0.023	2%
3	7.95	0.70	0.45	0.209			0.9	7.58	8.25	0.68	0.25	0.209	0.188	0.17	0.032	3%
4	8.55	0.80	0.55	0.289			0.9	8.25	8.88	0.63	0.25	0.289	0.260	0.16	0.041	3%
5	9.20	0.70	0.55	0.393			0.9	8.88	9.45	0.57	0.15	0.393	0.354	0.09	0.031	2%
6	9.70	0.80	0.55	0.464			0.9	9.45	10.00	0.55	0.25	0.464	0.418	0.14	0.057	5%
7	10.30	0.78	0.55	0.483			0.9	10.00	10.65	0.65	0.23	0.483	0.435	0.15	0.065	5%
8	11.00	0.85	0.55	0.375			0.9	10.65	11.25	0.60	0.30	0.375	0.338	0.18	0.061	5%
9	11.50	0.80	0.55	0.387			0.9	11.25	11.75	0.50	0.25	0.387	0.348	0.13	0.044	4%
10	12.00	0.80	0.55	0.336			0.9	11.75	12.30	0.55	0.25	0.336	0.302	0.14	0.042	3%
11	12.60	0.80	0.45	0.124			0.9	12.30	12.90	0.60	0.35	0.124	0.112	0.21	0.023	2%
12	13.20	0.70	0.45	0.273			0.9	12.90	13.45	0.55	0.25	0.273	0.246	0.14	0.034	3%
13	13.70	0.75	0.35	0.511			0.9	13.45	14.05	0.60	0.40	0.511	0.460	0.24	0.110	9%
14	14.40	0.62	0.35	0.544			0.9	14.05	14.70	0.65	0.27	0.544	0.490	0.18	0.086	7%
15	15.00	0.75	0.40	0.304			0.9	14.70	15.30	0.60	0.35	0.304	0.274	0.21	0.057	5%
16	15.60	0.80	0.35	0.363			0.9	15.30	15.90	0.60	0.45	0.363	0.327	0.27	0.088	7%
17	16.20	0.70	0.35	0.263			0.9	15.90	16.55	0.65	0.35	0.263	0.237	0.23	0.054	4%
18	16.90	0.65	0.35	0.502			0.9	16.55	17.20	0.65	0.30	0.502	0.452	0.20	0.088	7%
19	17.50	0.65	0.35	0.548			0.9	17.20	17.85	0.65	0.30	0.548	0.493	0.20	0.096	8%
20	18.20	0.60	0.35	0.515			0.9	17.85	18.50	0.65	0.25	0.515	0.464	0.16	0.075	6%
21	18.80	0.58	0.35	0.355			0.9	18.50	19.10	0.60	0.23	0.355	0.320	0.14	0.044	4%
22	19.40	0.55	0.30	0.491			0.9	19.10	19.70	0.60	0.25	0.491	0.442	0.15	0.066	5%
RB	20.00	0.00	0.00	0.00	0.00	0.00	1.0	19.70	20.00	0.30	0.06	0.123	0.123	0.02	0.002	0%
<b>Total Flow</b>															<b>1.240</b>	

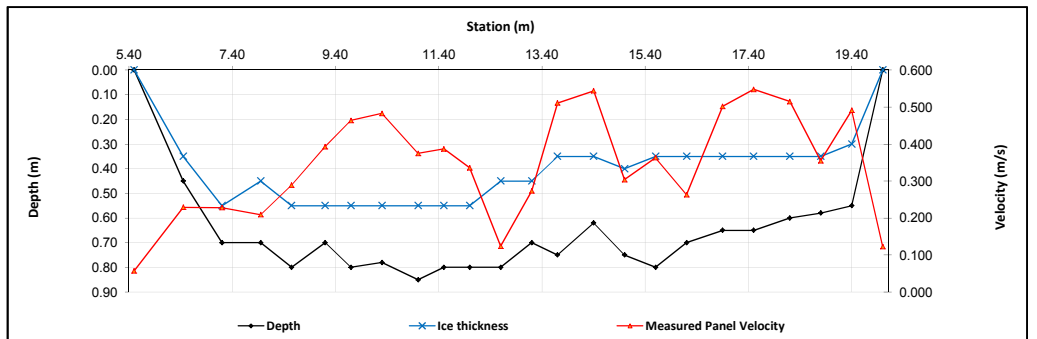
Measurement Details:	
Start Time (MST):	14:50
End Time (MST):	16:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Light snow, -20°C

Flow characteristics:	
Total Flow:	1.24 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.68 (m <sup>2</sup> )
Wetted Width:	14.50 (m)
Hydraulic Depth:	0.254 (m)
Mean Velocity:	0.337 (m/s)
Froude Number:	0.214

Logger Details:		
	Before	After
Transducer Reading (m):	0.379	-
Water (°C):	0.3	-
Battery (Main):	13.4	-
Datalogger Clock:	3:03	-
Laptop Clock:	3:02	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S55-02	1.187	101.368		100.181	100.181	2" Pipe 2 m S of logger
S55-03			1.564	99.804	99.806	3/4" Pipe 5 m SW of logger
S55-04			1.585	99.783	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.183	97.185		
Water Level:			4.195	97.173		
Other:						
<b>Setup #2</b>						
S55-02			1.168	100.183	100.181	2" Pipe 2 m S of logger
S55-03	1.547	101.351		99.804	99.806	3/4" Pipe 5 m SW of logger
S55-04			1.567	99.784	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.166	97.185		
Water Level:			4.178	97.173		
Other:						

Closing Error	-0.002	Average WL	97.173
WL Check	0.000	Transducer Elevation Before	96.794
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	1-Feb-13
Data Entry Personnel:	SM	Date:	1-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

February 24, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.10	0.00	0.00	0.000	0.000	0.000	0.9	4.10	4.35	0.25	0.06	0.108	0.097	0.02	0.002	0%
1	4.60	0.50	0.25	0.433			0.9	4.35	5.10	0.75	0.25	0.433	0.390	0.19	0.073	6%
2	5.60	0.60	0.25	0.410			0.9	5.10	5.70	0.60	0.35	0.410	0.369	0.21	0.077	7%
3	5.80	0.60	0.25	0.428			0.9	5.70	6.18	0.48	0.35	0.428	0.385	0.17	0.064	6%
4	6.55	0.60	0.25	0.399			0.9	6.18	6.98	0.80	0.35	0.399	0.359	0.28	0.101	9%
5	7.40	0.62	0.33	0.391			0.9	6.98	7.93	0.95	0.29	0.391	0.352	0.28	0.097	9%
6	8.45	0.55	0.35	0.444			0.9	7.93	8.70	0.77	0.20	0.444	0.400	0.16	0.062	5%
7	8.95	0.60	0.30	0.496			0.9	8.70	9.23	0.53	0.30	0.496	0.446	0.16	0.070	6%
8	9.50	0.55	0.25	0.469			0.9	9.23	9.78	0.55	0.30	0.469	0.422	0.17	0.070	6%
9	10.05	0.48	0.33	0.522			0.9	9.78	10.33	0.55	0.15	0.522	0.470	0.08	0.039	3%
10	10.60	0.60	0.35	0.506			0.9	10.33	10.88	0.55	0.25	0.506	0.455	0.14	0.063	6%
11	11.15	0.55	0.45	-0.001			0.9	10.88	11.40	0.53	0.10	-0.001	-0.001	0.05	0.000	0%
12	11.65	0.62	0.45	0.182			0.9	11.40	11.90	0.50	0.17	0.182	0.164	0.09	0.014	1%
13	12.15	0.75	0.50	0.260			0.9	11.90	12.43	0.53	0.25	0.260	0.234	0.13	0.031	3%
14	12.70	0.80	0.55	0.374			0.9	12.43	13.03	0.60	0.25	0.374	0.337	0.15	0.050	4%
15	13.35	0.86	0.54	0.030			0.9	13.03	13.68	0.65	0.32	0.030	0.027	0.21	0.006	0%
16	14.00	0.82	0.47	0.404			0.9	13.68	14.25	0.57	0.35	0.404	0.364	0.20	0.073	6%
17	14.50	0.85	0.45	0.401			0.9	14.25	14.85	0.60	0.40	0.401	0.361	0.24	0.087	8%
18	15.20	0.80	0.50	-0.002			0.9	14.85	15.48	0.63	0.30	-0.002	-0.002	0.19	0.000	0%
19	15.75	0.78	0.45	0.283			0.9	15.48	16.05	0.58	0.33	0.283	0.255	0.19	0.048	4%
20	16.35	0.60	0.45	0.165			0.9	16.05	16.60	0.55	0.15	0.165	0.149	0.08	0.012	1%
21	16.85	0.62	0.35	0.273			0.9	16.60	17.18	0.57	0.27	0.273	0.246	0.16	0.038	3%
22	17.50	0.57	0.33	0.331			0.9	17.18	17.85	0.68	0.24	0.331	0.298	0.16	0.048	4%
LB	18.20	0.00	0.00	0.00	0.00	0.00	1.0	17.85	18.20	0.35	0.06	0.083	0.083	0.02	0.002	0%
<b>Total Flow</b>															<b>1.130</b>	

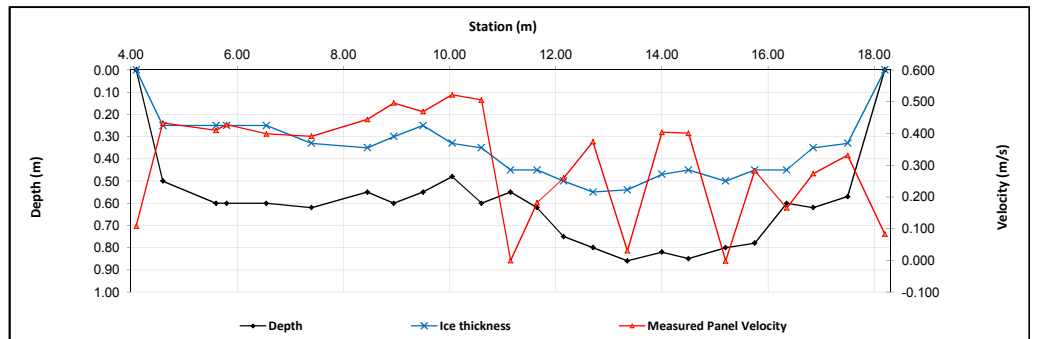
Measurement Details:	
Start Time (MST):	14:20
End Time (MST):	15:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 2°C

Flow characteristics:	
Total Flow:	1.13 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.70 (m <sup>2</sup> )
Wetted Width:	14.10 (m)
Hydraulic Depth:	0.262 (m)
Mean Velocity:	0.306 (m/s)
Froude Number:	0.191

Logger Details:		
	Before	After
Transducer Reading (m):	0.319	-
Water (°C):	0.3	-
Battery (Main):	14.3	-
Datalogger Clock:	14:23	-
Laptop Clock:	14:23	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	9723	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S55-02			1.264	100.184	100.181	2" Pipe 2m S of logger
S55-03			1.644	99.804	99.806	3/4" Pipe 5m SW of logger
S55-04	1.662	101.448		99.786	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.228	97.220		
Water Level:			4.328	97.120		
Other:						
<b>Setup #2</b>						
S55-02			1.250	100.183	100.181	2" Pipe 2m S of logger
S55-03	1.629	101.433		99.804	99.806	3/4" Pipe 5m SW of logger
S55-04			1.648	99.785	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.215	97.218		
Water Level:			4.312	97.121		
Other:						

Closing Error	0.001	Average WL	97.121
WL Check	0.001	Transducer Elevation Before	96.8015
		Transducer Elevation After	-

Field Personnel:	SM, TR	Trip Date:	24-Feb-13
Data Entry Personnel:	TR	Date:	24-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

March 31, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	17.40	0.00	0.00	0.000	0.000	0.000	0.9	17.40	17.03	0.38	0.04	0.060	0.054	0.02	0.001	0%
1	16.65	0.60	0.43	0.238			0.9	17.03	16.38	0.65	0.17	0.238	0.214	0.11	0.024	3%
2	16.10	0.55	0.48	0.182			0.9	16.38	15.80	0.57	0.07	0.182	0.164	0.04	0.007	1%
3	15.50	0.66	0.45	0.188			0.9	15.80	15.20	0.60	0.21	0.188	0.169	0.13	0.021	3%
4	14.90	0.70	0.47	0.342			0.9	15.20	14.68	0.52	0.23	0.342	0.308	0.12	0.037	5%
5	14.45	0.40	0.35	0.001			0.9	14.68	14.28	0.40	0.05	0.001	0.001	0.02	0.000	0%
6	14.10	0.80	0.50	0.333			0.9	14.28	13.95	0.32	0.30	0.333	0.300	0.10	0.029	4%
7	13.80	0.80	0.50	0.140			0.9	13.95	13.58	0.38	0.30	0.140	0.126	0.11	0.014	2%
8	13.35	0.90	0.50	0.141			0.9	13.58	13.15	0.43	0.40	0.141	0.127	0.17	0.022	3%
9	12.95	0.80	0.45	0.293			0.9	13.15	12.78	0.38	0.35	0.293	0.264	0.13	0.035	5%
10	12.60	0.86	0.46	0.385			0.9	12.78	12.40	0.38	0.40	0.385	0.347	0.15	0.052	7%
11	12.20	0.70	0.50	0.413			0.9	12.40	12.00	0.40	0.20	0.413	0.372	0.08	0.030	4%
12	11.80	0.70	0.54	0.378			0.9	12.00	11.60	0.40	0.16	0.378	0.340	0.06	0.022	3%
13	11.40	0.70	0.54	0.324			0.9	11.60	11.05	0.55	0.16	0.324	0.292	0.09	0.026	3%
14	10.70	0.75	0.52	0.371			0.9	11.05	10.35	0.70	0.23	0.371	0.334	0.16	0.054	7%
15	10.00	0.70	0.45	0.191			0.9	10.35	9.63	0.73	0.25	0.191	0.172	0.18	0.031	4%
16	9.25	0.60	0.35	0.322			0.9	9.63	8.93	0.70	0.25	0.322	0.290	0.18	0.051	7%
17	8.60	0.60	0.35	0.388			0.9	8.93	8.23	0.70	0.25	0.388	0.349	0.18	0.061	8%
18	7.85	0.60	0.35	0.231			0.9	8.23	7.48	0.75	0.25	0.231	0.208	0.19	0.039	5%
19	7.10	0.70	0.32	0.450			0.9	7.48	7.03	0.45	0.38	0.450	0.405	0.17	0.069	9%
20	6.95	0.65	0.35	0.464			0.9	7.03	6.55	0.48	0.30	0.464	0.418	0.14	0.060	8%
21	6.15	0.70	0.30	0.107			0.9	6.55	5.63	0.93	0.40	0.107	0.096	0.37	0.038	5%
22	5.10	0.63	0.30	0.074			0.9	5.63	4.55	1.08	0.33	0.074	0.067	0.35	0.024	3%
RB	4.00	0.00	0.00	0.00	0.00	0.00	1.0	4.55	4.00	0.55	0.08	0.019	0.019	0.05	0.001	0%
<b>Total Flow</b>															<b>0.743</b>	

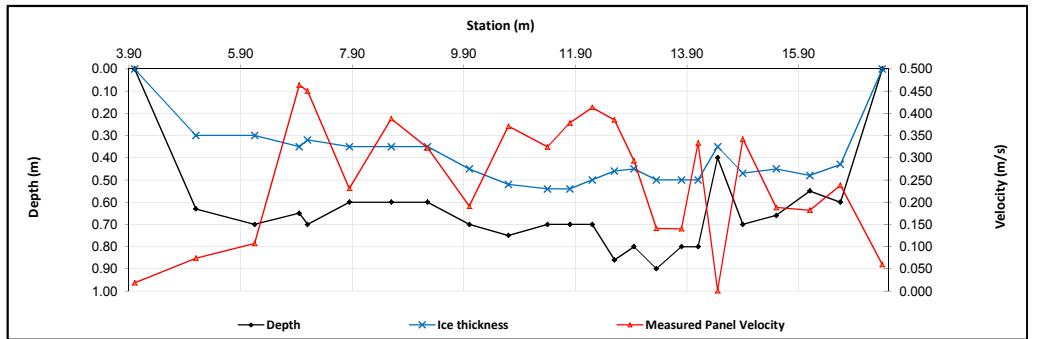
Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	17:10
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Overcast, 1°C

Flow characteristics:		
Total Flow:	0.743	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.29	(m <sup>2</sup> )
Wetted Width:	12.48	(m)
Hydraulic Depth:	0.264	(m)
Mean Velocity:	0.226	(m/s)
Froude Number:	0.140	

Logger Details:		
Transducer Reading (m):	0.313	-
Water (°C):	0.3	-
Battery (Main):	14.3	-
Datalogger Clock:	14:05	-
Laptop Clock:	14:05	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
S55-02	1.402	101.583		100.181	100.181	2" Pipe 2 m S of logger
S55-03			1.783	99.800	99.806	3/4" Pipe 5 m SW of logger
S55-04			1.799	99.784	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.445	97.138		
Water Level:			4.472	97.111		
Other:						
<b>Setup #2</b>						
S55-02			1.307	100.182	100.181	2" Pipe 2 m S of logger
S55-03			1.688	99.801	99.806	3/4" Pipe 5 m SW of logger
S55-04	1.705	101.489		99.784	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			4.352	97.137		
Water Level:			4.375	97.114		
Other:						

Closing Error	-0.001	Average WL	97.113
WL Check	0.003	Transducer Elevation Before	96.800
		Transducer Elevation After	-

Field Personnel:	CJ, XP	Trip Date:	31-Mar-13
Data Entry Personnel:	XP	Date:	31-Mar-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: May 9, 2013  
 Site Visit Time (MST): 16:05

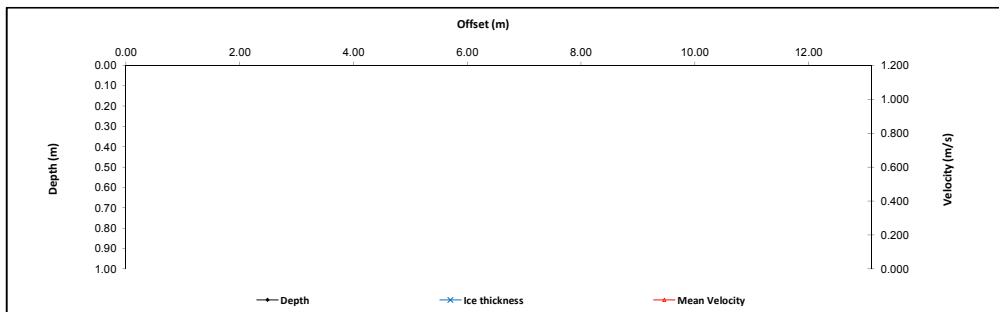


Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00				0.000		0.000		0.000	1.00						
1		<b>No Measurement Conducted</b>								1.00						
2		<b>No Measurement Conducted</b>								1.00						
3		<b>No Measurement Conducted</b>								1.00						
RB	0.00	0.00			0.00		0.00		0.00	1.00						
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	16:30
Meas. End Time (MST):	16:40
Equipment:	-
Method:	-
River Condition:	Very high flow
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Clear, breezy, 10°C



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.050	1.048
Water (°C):	4.8	4.9
Datalogger Clock:	04:12	16:49
Laptop Clock:	04:14	16:50
Battery (Main):	14.0	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Water level fluctuating 4 cm during survey

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S55-02	0.932	101.113		100.181	100.181	2" Pipe 2 m S of logger	S55-02
S55-03			1.312	99.801	99.806	3/4" Pipe 5 m SW of logger	S55-03
S55-04			1.329	99.784	99.786	3/4" Pipe 4 m W of logger	S55-04
Ice/PT:							WL
Water Level:			3.228	97.885		Time WL Surveyed: 16:19	WL
Other:							S55-04
<b>Setup #2</b>							S55-03
S55-02			0.917	100.180	100.181	2" Pipe 2 m S of logger	S55-02
S55-03	1.296	101.097		99.801	99.806	3/4" Pipe 5 m SW of logger	S55-03
S55-04			1.313	99.784	99.786	3/4" Pipe 4 m W of logger	S55-04
Ice/PT:							WL
Water Level:			3.210	97.887		Time WL Surveyed: 16:25	WL
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S55-03	1.296	101.097		99.801		
Water Level:			3.205	97.892		Time WL Surveyed: 16:45	
Water Level:			3.192	97.896		Time WL Surveyed: 16:47	
BM	S55-03	1.287	101.088		99.801		

**WL Survey Summary**

	Before	After
Average WL:	97.886	97.894
Transducer Elevation:	96.836	96.846
Closing Error:	0.001	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Data Entry Personnel:	SM, DW	Trip Date:	9-May-13
Data Check Personnel:	SM	Date:	9-May-13
Entered Digitally in the Field:	TR	Date:	28-Aug-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: June 6, 2013  
 Site Visit Time (MST): 14:00

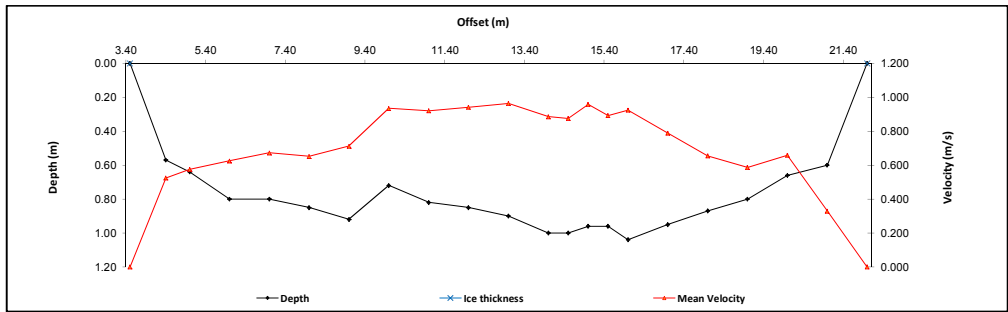


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.50	0.00	0.00		0.000		0.000		0.000	1.00	0.45	0.00	0.000	0.00	0.000	
1	4.40	0.57		0.34	0.524		0.626	0.16	0.625	1.00	0.75	0.57	0.524	0.43	0.224	2%
2	5.00	0.64		0.38	0.576		0.720	0.16	0.625	1.00	0.80	0.64	0.576	0.51	0.295	3%
3	6.00	0.80				0.64	0.608	0.17	0.696	1.00	1.00	0.80	0.626	0.80	0.500	5%
4	7.00	0.80				0.64	0.608	0.17	0.696	1.00	1.00	0.80	0.626	0.80	0.538	5%
5	8.00	0.85				0.68	0.648	0.18	0.776	1.00	1.00	0.85	0.652	0.85	0.554	5%
6	9.00	0.92				0.74	0.648	0.18	0.776	1.00	1.00	0.92	0.712	0.92	0.655	6%
7	10.00	0.72		0.43	0.935		0.787	0.16	1.055	1.00	1.00	0.72	0.935	0.72	0.673	6%
8	11.00	0.82				0.66	0.700	0.17	1.184	1.00	1.00	0.82	0.921	0.82	0.755	7%
9	12.00	0.85				0.68	0.745	0.18	1.184	1.00	1.00	0.85	0.942	0.85	0.801	7%
10	13.00	0.90				0.72	0.661	0.20	1.110	1.00	0.75	1.00	0.886	0.75	0.664	6%
11	14.00	1.00				0.80	0.624	0.20	1.127	1.00	0.50	1.00	0.876	0.50	0.438	4%
12	14.50	1.00				0.77	0.838	0.19	1.079	1.00	0.50	0.96	0.959	0.48	0.460	4%
13	15.00	0.96				0.77	0.676	0.19	1.109	1.00	0.50	0.96	0.893	0.48	0.428	4%
14	15.50	0.96				0.83	0.698	0.21	1.152	1.00	0.75	1.04	0.925	0.78	0.722	7%
15	16.00	1.04				0.76	0.478	0.19	1.099	1.00	1.00	0.95	0.789	0.95	0.749	7%
16	17.00	0.95				0.70	0.414	0.17	0.896	1.00	1.00	0.87	0.855	0.87	0.570	5%
17	18.00	0.87				0.70	0.414	0.17	0.896	1.00	1.00	0.80	0.587	0.80	0.470	4%
18	19.00	0.80				0.64	0.471	0.16	0.703	1.00	1.00	0.66	0.658	0.66	0.434	4%
19	20.00	0.66		0.40	0.658					1.00	1.00	0.60	0.329	0.60	0.197	2%
20	21.00	0.60		0.36	0.329					1.00	1.00	0.60	0.329	0.60	0.197	2%
RB	22.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>11.0</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:00
Meas. End Time (MST):	15:45
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 20°C



**Flow characteristics:**

Total Flow:	11.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	14.47	(m <sup>2</sup> )
Wetted Width:	18.50	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.76	(m/s)
Froude Number:	0.27	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.543	0.751
Water (°C):	18.2	18.5
Datalogger Clock:	14:01	16:01
Laptop Clock:	14:00	16:00
Battery (Main):	13.8	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent. Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS to deeper water

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S55-02	0.874	101.055		100.181	100.181	2" Pipe 2 m S of logger	S55-02
S55-03			1.254	99.801	99.806	3/4" Pipe 5 m SW of logger	S55-03
S55-04			1.270	99.785	99.786	3/4" Pipe 4 m W of logger	WL
Ice/PT:							WL
Water Level:			3.702	97.353		Time WL Surveyed: 14:14	S55-04
Other:							S55-03
<b>Setup #2</b>							S55-02
S55-02			0.855	100.184	100.181	2" Pipe 2 m S of logger	
S55-03			1.236	99.803	99.806	3/4" Pipe 5 m SW of logger	
S55-04	1.254	101.039		99.785	99.786	3/4" Pipe 4 m W of logger	
Ice/PT:							
Water Level:			3.686	97.353		Time WL Surveyed: 14:15	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S55-02	0.854	101.035		100.181		
Water Level:			3.681	97.354		Time WL Surveyed: 15:59	
Water Level:			3.661	97.355		Time WL Surveyed: 16:01	
BM:	S55-02	0.835	101.016		100.181		

**WL Survey Summary**

	Before	After
Average WL:	97.353	97.355
Transducer Elevation:	96.810	96.604
Closing Error:	-0.003	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	11
Expected Discharge:	10.95
Shift from Existing Rating (m <sup>3</sup> /s):	-0.05
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, CJ	Trip Date:	6-Jun-13
SM, CJ	Date:	6-Jun-13
TR	Date:	17-Jun-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: August 11, 2013  
 Site Visit Time (MST): 09:35

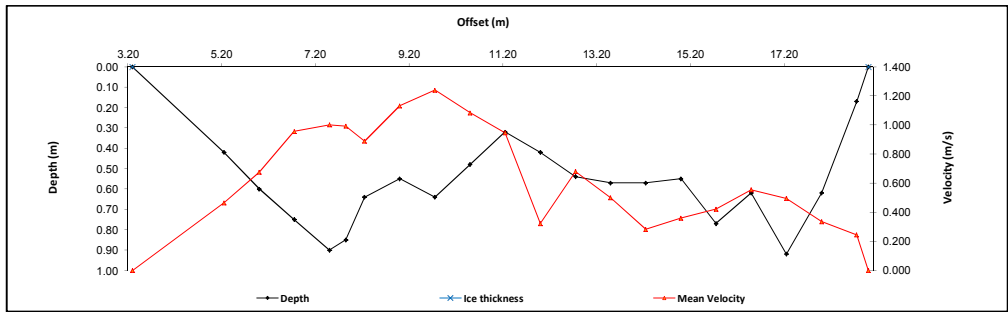


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.98	0.00	0.000	0.00	0.000	
1	5.25	0.42		0.25	0.465					1.00	1.35	0.42	0.465	0.57	0.264	5%
2	6.00	0.60		0.36	0.676					1.00	0.75	0.60	0.676	0.45	0.304	5%
3	6.75	0.75		0.45	0.956					1.00	0.75	0.75	0.956	0.56	0.538	9%
4	7.50	0.90				0.72	0.845	0.18	1.157	1.00	0.55	0.90	1.001	0.50	0.495	9%
5	7.85	0.85				0.68	0.853	0.17	1.131	1.00	0.38	0.85	0.992	0.32	0.316	5%
6	8.25	0.64	0.38		0.889					1.00	0.57	0.64	0.889	0.37	0.327	6%
7	9.00	0.55		0.33	1.132					1.00	0.75	0.55	1.132	0.41	0.467	8%
8	9.75	0.64		0.38	1.240					1.00	0.75	0.64	1.240	0.48	0.595	10%
9	10.50	0.48		0.29	1.084					1.00	0.75	0.48	1.084	0.36	0.390	7%
10	11.25	0.32		0.19	0.946					1.00	0.75	0.32	0.946	0.24	0.227	4%
11	12.00	0.42		0.25	0.322					1.00	0.75	0.42	0.322	0.32	0.101	2%
12	12.75	0.54		0.32	0.680					1.00	0.75	0.54	0.680	0.41	0.275	5%
13	13.50	0.57		0.34	0.500					1.00	0.75	0.57	0.500	0.43	0.214	4%
14	14.25	0.57		0.34	0.283					1.00	0.75	0.57	0.283	0.43	0.121	2%
15	15.00	0.55		0.33	0.360					1.00	0.75	0.55	0.360	0.41	0.149	3%
16	15.75	0.77				0.62	0.344	0.15	0.498	1.00	0.75	0.77	0.421	0.58	0.243	4%
17	16.50	0.82		0.37	0.554					1.00	0.75	0.62	0.554	0.47	0.258	4%
18	17.25	0.92				0.74	0.432	0.18	0.558	1.00	0.75	0.92	0.495	0.69	0.342	6%
19	18.00	0.62		0.37	0.335					1.00	0.75	0.62	0.335	0.47	0.156	3%
20	18.75	0.17		0.10	0.244					1.00	0.50	0.17	0.244	0.09	0.021	0%
LB	19.00	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.80</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from station

Meas. Start Time (MST):	9:45
Meas. End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	Good Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 22°C



**Flow characteristics:**

Total Flow:	5.80	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.52	(m <sup>2</sup> )
Wetted Width:	15.70	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.68	(m/s)
Froude Number:	0.29	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.408	0.409
Water (°C):	17.5	18.0
Datalogger Clock:	09:21	10:33
Laptop Clock:	09:20	10:32
Battery (Main):	14.2	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- BM2 is bent, BM3 was washed away and BM4 has been compromised
- PLS was found disconnected from logger, it was rewired and repositioned but requires a weight and anchor cable

**General Notes:**

- 10 m of river bank has been eroded away

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S55-01
S55-02			1.077	100.123	100.181	2" Pipe 2 m S of logger	S55-04
S55-03					99.806	3/4" Pipe 5 m SW of logger	S55-02
S55-04			1.410	99.790	99.786	3/4" Pipe 4 m W of logger	WL
Ice/PT:							WL
Water Level:			4.024	97.176			S55-02
S55-01	1.200	101.200		100.000	100.000	Bolt in Spruce tree	S55-04
<b>Setup #2</b>							S55-01
S55-02	1.064	101.187		100.123	100.181	2" Pipe 2 m S of logger	
S55-03					99.806	3/4" Pipe 5 m SW of logger	
S55-04			1.397	99.790	99.786	3/4" Pipe 4 m W of logger	
Ice/PT:							
Water Level:			4.011	97.176			S55-02
S55-01			1.187	100.000	100.000	Bolt in Spruce tree	(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S55-04	1.397	101.187	99.790			
Water Level:			4.013	97.174		Time WL Surveyed:	10:28
Water Level:			4.004	97.174		Time WL Surveyed:	10:30
BM	S55-04	1.388	101.178	99.790			

**WL Survey Summary**

	Before	After
Average WL:	97.176	97.174
Transducer Elevation:	96.768	96.765
Closing Error:	-0.004	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	5.8
Expected Discharge:	4.42
Shift from Existing Rating (m <sup>3</sup> /s):	-1.38
Shift from Existing Rating (%):	-24%

**Field Personnel:**

SM, TR	Trip Date:	11-Aug-13
SM	Date:	11-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: September 15, 2013  
 Site Visit Time (MST): 10:20

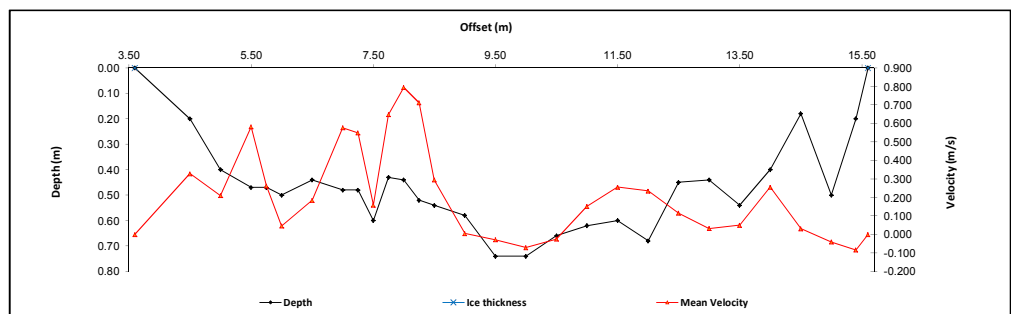


Flow Measurement:										Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)			
LB	3.60	0.00	0.00		0.000		0.000		0.000	1.00	0.45	0.00	0.000	0.00	0.000				
1	4.50	0.20		0.12	0.328					1.00	0.70	0.20	0.328	0.14	0.046	5%			
2	5.00	0.40		0.24	0.210					1.00	0.50	0.40	0.210	0.20	0.042	4%			
3	5.50	0.47		0.28	0.582					1.00	0.38	0.47	0.582	0.18	0.103	10%			
4	5.75	0.47		0.28	0.262					1.00	0.25	0.47	0.262	0.12	0.031	3%			
5	6.00	0.50		0.30	0.046					1.00	0.38	0.50	0.046	0.19	0.009	1%			
6	6.50	0.44		0.26	0.185					1.00	0.50	0.44	0.185	0.22	0.041	4%			
7	7.00	0.48		0.29	0.576					1.00	0.38	0.48	0.576	0.18	0.104	10%			
8	7.25	0.48		0.29	0.549					1.00	0.25	0.48	0.549	0.12	0.066	6%			
9	7.50	0.60		0.36	0.159					1.00	0.25	0.60	0.159	0.15	0.024	2%			
10	7.75	0.43		0.26	0.647					1.00	0.25	0.43	0.647	0.11	0.070	7%			
11	8.00	0.44		0.26	0.794					1.00	0.25	0.44	0.794	0.11	0.087	9%			
12	8.25	0.52		0.31	0.711					1.00	0.25	0.52	0.711	0.13	0.092	9%			
13	8.50	0.54		0.32	0.295					1.00	0.38	0.54	0.295	0.20	0.060	6%			
14	9.00	0.58		0.35	0.005					1.00	0.50	0.58	0.005	0.29	0.001	0%			
15	9.50	0.74		0.44	-0.029					1.00	0.50	0.74	-0.029	0.37	-0.011	-1%			
16	10.00	0.74		0.44	-0.071					1.00	0.50	0.74	-0.071	0.37	-0.028	-3%			
17	10.50	0.66		0.40	-0.025					1.00	0.50	0.66	-0.025	0.33	-0.008	-1%			
18	11.00	0.62		0.37	0.152					1.00	0.50	0.62	0.152	0.31	0.047	5%			
19	11.50	0.60		0.36	0.256					1.00	0.50	0.60	0.256	0.30	0.077	8%			
20	12.00	0.68		0.41	0.235					1.00	0.50	0.68	0.235	0.34	0.080	8%			
21	12.50	0.45		0.27	0.115					1.00	0.50	0.45	0.115	0.23	0.026	3%			
22	13.00	0.44		0.26	0.032					1.00	0.50	0.44	0.032	0.22	0.007	1%			
23	13.50	0.54		0.32	0.050					1.00	0.50	0.54	0.050	0.27	0.014	1%			
24	14.00	0.40		0.24	0.256					1.00	0.50	0.40	0.256	0.20	0.051	5%			
25	14.50	0.18		0.11	0.031					1.00	0.50	0.18	0.031	0.09	0.003	0%			
26	15.00	0.50		0.30	-0.041					1.00	0.45	0.50	-0.041	0.23	-0.009	-1%			
27	15.40	0.20		0.12	-0.084					1.00	0.30	0.20	-0.084	0.06	-0.005	0%			
RB	15.60	0.00	0.00	C	0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000				
<b>Total Flow</b>														<b>1.02</b>	<b>100%</b>				

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m US of station

Meas. Start Time (MST):	11:25
Meas. End Time (MST):	12:05
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	1.02	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.64	(m <sup>2</sup> )
Wetted Width:	10.40	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.614	0.616
Water (°C):	13.2	14.0
Datalogger Clock:	10:52	12:18
Laptop Clock:	10:51	12:17
Battery (Main):	13.8	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved pt, old depth 0.164 m
- Installed 2 new BM
- Added weight and anchor cable to PT

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S55-01
S55-01	1.132	101.132		100.000	100.000	Bolt in Spruce tree	S55-05
S55-05			1.321	99.811	99.811	3/4" Pipe 4 m N of logger	S55-06
S55-06			0.857	100.275	100.275	3/4" pipe 2 m SE of logger	WL
Ice/PT:							WL
Water Level:			4.223	96.909		Time WL Surveyed: 11:16	S55-06
Other:							S55-05
<b>Setup #2</b>							S55-01
S55-01			1.110	100.000	100.000	Bolt in Spruce tree	
S55-05	1.299	101.110		99.811	99.811	3/4" Pipe 4 m N of logger	
S55-06			0.835	100.275	100.275	3/4" pipe 2 m SE of logger	
Ice/PT:							
Water Level:			4.198	96.912		Time WL Surveyed: 11:18	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S55-06	0.835	101.110	100.275			
Water Level:			4.206	96.904		Time WL Surveyed: 12:11	
Water Level:			4.176	96.903		Time WL Surveyed: 12:12	
BM:	S55-06	0.804	101.079	100.275			

**WL Survey Summary**

	Before	After
Average WL:	96.911	96.904
Transducer Elevation:	96.297	96.288
Closing Error:	0.000	
WL Check:	0.003	0.001

**Site Rating Information**

Measured Discharge:	1.02
Expected Discharge:	0.13
Shift from Existing Rating (m <sup>3</sup> /s):	-0.89
Shift from Existing Rating (%):	-87%

**Field Personnel:**

	TR, CJ, SG	Trip Date:	15-Sep-13
Data Entry Personnel:	TR	Date:	15-Sep-13
Data Check Personnel:	TR	Date:	2-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: October 17, 2013  
 Site Visit Time (MST): 15:00

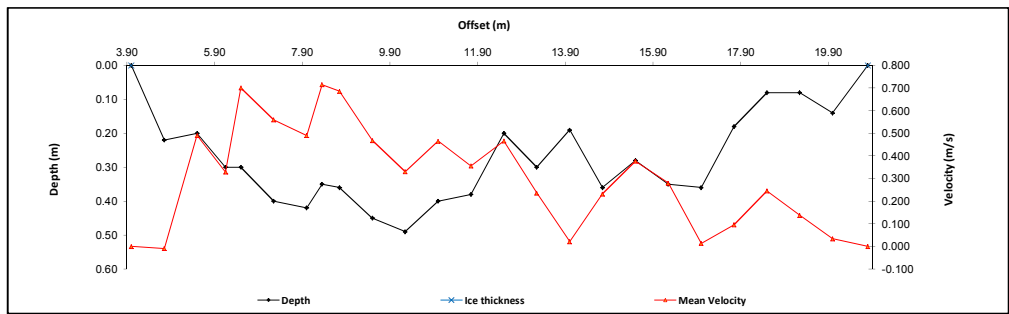


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	0.38	0.00	0.000	0.00	0.000	
1	4.75	0.22		0.13	-0.009					1.00	0.75	0.22	-0.009	0.17	-0.001	0%
2	5.50	0.20		0.12	0.491					1.00	0.70	0.20	0.491	0.14	0.069	4%
3	6.15	0.30		0.18	0.329					1.00	0.50	0.30	0.329	0.15	0.049	3%
4	6.50	0.30		0.18	0.701					1.00	0.55	0.30	0.701	0.17	0.116	7%
5	7.25	0.40		0.24	0.559					1.00	0.75	0.40	0.559	0.30	0.168	10%
6	8.00	0.42		0.25	0.490					1.00	0.55	0.42	0.490	0.23	0.113	7%
7	8.35	0.35		0.21	0.715					1.00	0.38	0.35	0.715	0.13	0.094	6%
8	8.75	0.36		0.22	0.686					1.00	0.57	0.36	0.686	0.21	0.142	9%
9	9.50	0.45		0.27	0.468					1.00	0.75	0.45	0.468	0.34	0.158	10%
10	10.25	0.49		0.29	0.330					1.00	0.75	0.49	0.330	0.37	0.121	7%
11	11.00	0.40		0.24	0.465					1.00	0.75	0.40	0.465	0.30	0.140	8%
12	11.75	0.38		0.23	0.356					1.00	0.75	0.38	0.356	0.29	0.101	6%
13	12.50	0.20		0.12	0.466					1.00	0.75	0.20	0.466	0.15	0.070	4%
14	13.25	0.30		0.18	0.236					1.00	0.75	0.30	0.236	0.23	0.053	3%
15	14.00	0.19		0.11	0.021					1.00	0.75	0.19	0.021	0.14	0.003	0%
16	14.75	0.36		0.22	0.232					1.00	0.75	0.36	0.232	0.27	0.063	4%
17	15.50	0.28		0.17	0.377					1.00	0.75	0.28	0.377	0.21	0.079	5%
18	16.25	0.35		0.21	0.280					1.00	0.75	0.35	0.280	0.26	0.074	4%
19	17.00	0.36		0.22	0.013					1.00	0.75	0.36	0.013	0.27	0.004	0%
20	17.75	0.18		0.11	0.095					1.00	0.75	0.18	0.095	0.14	0.013	1%
21	18.50	0.08		0.05	0.245					1.00	0.75	0.08	0.245	0.06	0.015	1%
22	19.25	0.08		0.05	0.137					1.00	0.75	0.08	0.137	0.06	0.008	0%
23	20.00	0.14		0.08	0.034					1.00	0.77	0.14	0.034	0.11	0.004	0%
LB	20.80	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.65</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:57
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. cloudy, calm, 8°C



**Flow characteristics:**

Total Flow:	1.65	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.67	(m <sup>2</sup> )
Wetted Width:	16.80	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.21	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.663	0.664
Water (°C):	4.8	4.9
Datalogger Clock:	15:08	16:01
Laptop Clock:	15:06	16:00
Battery (Main):	13.9	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S55-01
S55-01	1.168	101.168		100.000	100.000	Bolt in Spruce tree	S55-05
S55-05			1.358	99.810	99.811	3/4" Pipe 4 m N of logger	S55-06
S55-06			0.892	100.276	100.275	3/4" pipe 2 m SE of logger	WL
Ice/PT:							WL
Water Level:			4.208	96.960		Time WL Surveyed: 15:23	S55-06
Other:							S55-05
<b>Setup #2</b>							S55-01
S55-01			1.149	100.000	100.000	Bolt in Spruce tree	
S55-05			1.340	99.809	99.811	3/4" Pipe 4 m N of logger	
S55-06	0.873	101.149		100.276	100.275	3/4" pipe 2 m SE of logger	
Ice/PT:							
Water Level:			4.190	96.959		Time WL Surveyed: 15:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S55-05	1.358	101.149		99.810		
Water Level:			4.190	96.959		Time WL Surveyed: 16:04	
Water Level:			4.179	96.958		Time WL Surveyed: 16:06	
BM:	S55-05	1.327	101.137		99.810		

**WL Survey Summary**

	Before	After
Average WL:	96.960	96.959
Transducer Elevation:	96.297	96.295
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	1.65
Expected Discharge:	0.45
Shift from Existing Rating (m <sup>3</sup> /s):	-1.20
Shift from Existing Rating (%):	-73%

**Field Personnel:**

SM, DW	Trip Date:	17-Oct-13
SM	Date:	17-Oct-13
TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: December 4, 2013  
 Site Visit Time (MST): 14:30

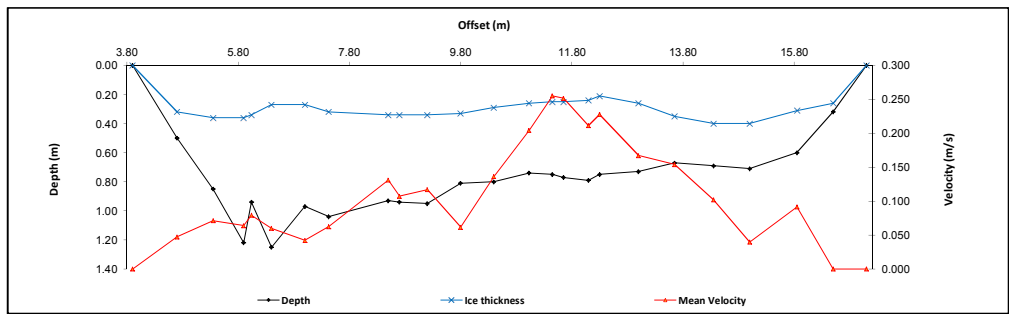


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.90	0.00	0.00		0.000		0.000		0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	4.70	0.50	0.32	0.41	0.054					0.88	0.73	0.18	0.048	0.13	0.006	1%
2	5.35	0.85	0.36	0.61	0.081					0.88	0.60	0.49	0.071	0.29	0.021	3%
3	5.90	1.22	0.36			1.05	0.037	0.53	0.091	1.00	0.35	0.86	0.064	0.30	0.019	3%
4	6.04	0.94	0.34	0.64	0.090					0.88	0.25	0.60	0.079	0.15	0.012	2%
5	6.40	1.25	0.27			1.05	0.042	0.47	0.078	1.00	0.48	0.98	0.060	0.47	0.028	4%
6	7.00	0.97	0.27	0.62	0.048					0.88	0.52	0.70	0.131	0.36	0.015	2%
7	7.43	1.04	0.32	0.68	0.071					0.88	0.75	0.72	0.062	0.54	0.034	5%
8	8.50	0.93	0.34	0.64	0.149					0.88	0.64	0.59	0.131	0.37	0.049	7%
9	8.70	0.94	0.34	0.64	0.122					0.88	0.35	0.60	0.107	0.21	0.023	3%
10	9.20	0.95	0.34	0.65	0.133					0.88	0.55	0.61	0.117	0.34	0.039	6%
11	9.80	0.81	0.33	0.57	0.070					0.88	0.60	0.48	0.062	0.29	0.018	3%
12	10.40	0.80	0.29	0.55	0.155					0.88	0.61	0.51	0.136	0.31	0.043	6%
13	11.03	0.74	0.26	0.50	0.232					0.88	0.52	0.48	0.204	0.25	0.051	8%
14	11.45	0.75	0.25	0.50	0.290					0.88	0.31	0.50	0.255	0.16	0.040	6%
15	11.65	0.77	0.25	0.51	0.286					0.88	0.32	0.52	0.252	0.17	0.043	6%
16	12.10	0.79	0.24	0.52	0.240					0.88	0.32	0.55	0.211	0.18	0.038	6%
17	12.30	0.75	0.21	0.48	0.259					0.88	0.45	0.54	0.228	0.24	0.055	8%
18	13.00	0.73	0.26	0.50	0.190					0.88	0.67	0.47	0.167	0.32	0.053	8%
19	13.65	0.67	0.35	0.51	0.175					0.88	0.68	0.32	0.154	0.22	0.033	5%
20	14.35	0.69	0.40	0.55	0.116					0.88	0.68	0.29	0.102	0.20	0.020	3%
21	15.00	0.71	0.40	0.56	0.045					0.88	0.75	0.31	0.040	0.23	0.009	1%
22	15.85	0.60	0.31	0.46	0.104					0.88	0.75	0.29	0.092	0.22	0.020	3%
23	16.50	0.32	0.26	0.29	0.000					0.88	0.63	0.06	0.000	0.04	0.000	0%
RB	17.10	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.669</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m US of station

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cclear, calm, -20°C



**Flow characteristics:**

Total Flow:	0.669	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.98	(m <sup>2</sup> )
Wetted Width:	13.20	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.793	0.793
Water (°C):	0.3	0.3
Datalogger Clock:	14:37	15:42
Laptop Clock:	14:36	15:40
Battery (Main):	14.1	13.4
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S55-01
S55-01	1.293	101.293		100.000	100.000	Bolt in Spruce tree	S55-05
S55-05			2.254	99.039	99.811	3/4" Pipe 4 m N of logger	S55-06
S55-06			1.020	100.273	100.275	3/4" pipe 2 m SE of logger	WL
Ice/PT:			4.199	97.094			Ice
Water Level:			4.218	97.075		Time WL Surveyed: 14:50	Ice
Other:							WL
<b>Setup #2</b>							S55-06
S55-01			1.273	99.998	100.000	Bolt in Spruce tree	S55-05
S55-05			1.988	99.283	99.811	3/4" Pipe 4 m N of logger	S55-01
S55-06	0.998	101.271		100.273	100.275	3/4" pipe 2 m SE of logger	
Ice/PT:			4.177	97.094			
Water Level:			4.192	97.079		Time WL Surveyed: 14:53	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:							
Water Level:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
BM:							

**WL Survey Summary**

	Before	After
Average WL:	97.077	-
Transducer Elevation:	96.284	-
Closing Error:	0.002	-
WL Check:	0.004	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

	TR, RM	Trip Date:	4-Dec-33
Data Entry Personnel:	TR	Date:	4-Dec-33
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

January 13, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	6.50	0.00	0.00	0.000	0.000	0.000	1.0	6.50	7.30	0.80	0.05	0.000	0.000	0.04	0.000	0%
1	8.10	0.51	0.33	0.000			1.0	7.30	8.90	1.60	0.18	0.000	0.000	0.29	0.000	0%
2	9.70	0.50	0.35	0.020			0.9	8.90	10.30	1.40	0.15	0.020	0.018	0.21	0.004	0%
3	10.90	0.60	0.37	0.151			0.9	10.30	11.55	1.25	0.23	0.151	0.136	0.29	0.039	2%
4	12.20	0.72	0.34	0.265			0.9	11.55	13.10	1.55	0.38	0.265	0.239	0.59	0.140	5%
5	14.00	0.83	0.35	0.347			0.9	13.10	14.45	1.35	0.48	0.347	0.312	0.65	0.202	8%
6	14.90	0.89	0.40	0.293			0.9	14.45	15.35	0.90	0.49	0.293	0.264	0.44	0.116	5%
7	15.80	0.93	0.33	0.311			0.9	15.35	16.30	0.95	0.60	0.311	0.280	0.57	0.160	6%
8	16.80	0.99	0.35	0.228			0.9	16.30	17.25	0.95	0.64	0.228	0.205	0.61	0.125	5%
9	17.70	0.97	0.34	0.249			0.9	17.25	18.10	0.85	0.63	0.249	0.224	0.54	0.120	5%
10	18.50	1.08	0.34		0.258	0.327	1.0	18.10	19.05	0.95	0.74	0.293	0.293	0.70	0.206	8%
11	19.60	1.23	0.35		0.214	0.340	1.0	19.05	19.95	0.90	0.88	0.277	0.277	0.79	0.219	9%
12	20.30	1.42	0.37		0.145	0.330	1.0	19.95	20.85	0.90	1.05	0.238	0.238	0.94	0.224	9%
13	21.40	1.53	0.37		0.162	0.318	1.0	20.85	21.85	1.00	1.16	0.240	0.240	1.16	0.278	11%
14	22.30	1.60	0.37		0.107	0.328	1.0	21.85	22.90	1.05	1.23	0.218	0.218	1.29	0.281	11%
15	23.50	1.50	0.39		0.128	0.255	1.0	22.90	23.80	0.90	1.11	0.192	0.192	1.00	0.191	7%
16	24.10	1.50	0.42		0.069	0.163	1.0	23.80	24.55	0.75	1.08	0.116	0.116	0.81	0.094	4%
17	25.00	1.10	0.43	0.072			0.9	24.55	25.50	0.95	0.67	0.072	0.065	0.64	0.041	2%
18	26.00	0.86	0.39	0.081			0.9	25.50	26.75	1.25	0.47	0.081	0.073	0.59	0.043	2%
19	27.50	0.82	0.36	0.093			0.9	26.75	28.30	1.55	0.46	0.093	0.084	0.71	0.060	2%
20	29.10	0.69	0.27	0.071			0.9	28.30	29.55	1.25	0.42	0.071	0.064	0.53	0.034	1%
LB	30.00	0.00	0.00	0.00	0.00	0.00	1.0	29.55	30.00	0.45	0.11	0.018	0.018	0.05	0.001	0%
<b>Total Flow</b>														<b>2.58</b>		

Measurement Details:	
Start Time (MST):	12:00
End Time (MST):	13:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, -20°C

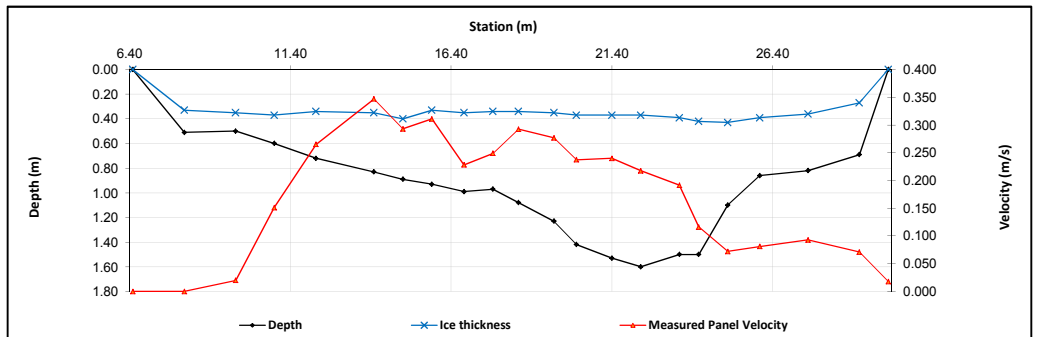
Flow characteristics:		
Total Flow:	2.58	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.42	(m <sup>2</sup> )
Wetted Width:	23.50	(m)
Hydraulic Depth:	0.571	(m)
Mean Velocity:	0.192	(m/s)
Froude Number:	0.081	

Logger Details:		
Transducer Reading (m):	Before	After
	0.761	-
Water (°C):	0.0	-
Battery (Main):	13.4	-
Datalogger Clock:	12:12	-
Laptop Clock:	12:11	-
Enclosure Dessicant:	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	

**Datalogger / Station Notes:**

**General Notes:**

- Lumps in ice present DS, likely caused by pack ice build up



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S56-01			1.197	99.999	100.000	T-post
S56-02			1.229	99.967	99.967	3/4" Pipe 2 m E of logger
S56-03	1.145	101.196		100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.463	98.733		
Water Level:			2.489	98.707		
Other:						
<b>Setup #2</b>						
S56-01			1.186	100.001	100.000	T-post
S56-02	1.220	101.187		99.967	99.967	3/4" Pipe 2 m E of logger
S56-03			1.134	100.053	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.454	98.733		
Water Level:			2.482	98.705		
Other:						

Closing Error	-0.002	Average WL	98.706
WL Check	0.002	Transducer Elevation Before	97.945
		Transducer Elevation After	-

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	13-Jan-13
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	13-Jan-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	25-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

February 10, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	24.20	0.00	0.00	0.000	0.000	0.000	0.9	24.20	23.55	0.65	0.03	-0.001	0.000	0.02	0.000	0%
1	22.90	0.63	0.50	-0.002			0.9	23.55	22.40	1.15	0.13	-0.002	-0.002	0.15	0.000	0%
2	21.90	0.80	0.60	0.111			0.9	22.40	21.40	1.00	0.20	0.111	0.100	0.20	0.020	1%
3	20.90	0.90	0.65	0.145			0.9	21.40	20.35	1.05	0.25	0.145	0.131	0.26	0.034	2%
4	19.80	1.00	0.60	0.219			0.9	20.35	19.10	1.25	0.40	0.219	0.197	0.50	0.099	4%
5	18.40	1.12	0.60	0.277			0.9	19.10	17.80	1.30	0.52	0.277	0.249	0.68	0.169	8%
6	17.20	1.00	0.63	0.316			0.9	17.80	16.65	1.15	0.37	0.316	0.284	0.43	0.121	5%
7	16.10	1.05	0.65	0.276			0.9	16.65	15.60	1.05	0.40	0.276	0.248	0.42	0.104	5%
8	15.10	1.20	0.65	0.200			0.9	15.60	14.70	0.90	0.55	0.200	0.180	0.50	0.089	4%
9	14.30	1.10	0.65	0.264			0.9	14.70	13.80	0.90	0.45	0.264	0.238	0.40	0.096	4%
10	13.30	1.05	0.65	0.355			0.9	13.80	12.90	0.90	0.40	0.355	0.320	0.36	0.115	5%
11	12.50	1.25	0.65	0.381			0.9	12.90	12.08	0.83	0.60	0.381	0.343	0.50	0.170	8%
12	11.65	1.40	0.65	0.287			0.9	12.08	11.25	0.82	0.75	0.287	0.258	0.62	0.160	7%
13	10.85	1.40	0.70	0.263			0.9	11.25	10.40	0.85	0.70	0.263	0.237	0.60	0.141	6%
14	9.95	1.60	0.67		0.171	0.351	1.0	10.40	9.58	0.82	0.93	0.261	0.261	0.77	0.200	9%
15	9.20	1.58	0.65		0.182	0.405	1.0	9.58	8.85	0.73	0.93	0.294	0.294	0.67	0.198	9%
16	8.50	1.68	0.65		0.184	0.301	1.0	8.85	8.10	0.75	1.03	0.243	0.243	0.77	0.187	8%
17	7.70	1.50	0.67		0.173	0.226	1.0	8.10	7.35	0.75	0.83	0.200	0.200	0.62	0.124	6%
18	7.00	1.50	0.65		0.002	0.108	1.0	7.35	6.58	0.77	0.85	0.055	0.055	0.66	0.036	2%
19	6.15	1.20	0.65	0.069			0.9	6.58	5.73	0.85	0.55	0.069	0.062	0.47	0.029	1%
20	5.30	0.95	0.60	0.048			0.9	5.73	4.78	0.95	0.35	0.048	0.043	0.33	0.014	1%
21	4.25	0.90	0.55	0.142			0.9	4.78	3.73	1.05	0.35	0.142	0.128	0.37	0.047	2%
22	3.20	0.90	0.55	0.191			0.9	3.73	2.53	1.20	0.35	0.191	0.172	0.42	0.072	3%
LB	1.85	0.00	0.00	0.00	0.00	0.00	1.0	2.53	1.85	0.68	0.09	0.048	0.048	0.06	0.003	0%
<b>Total Flow</b>														<b>2.23</b>		

Measurement Details:	
Start Time (MST):	13:10
End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice, slush on top
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, 1°C

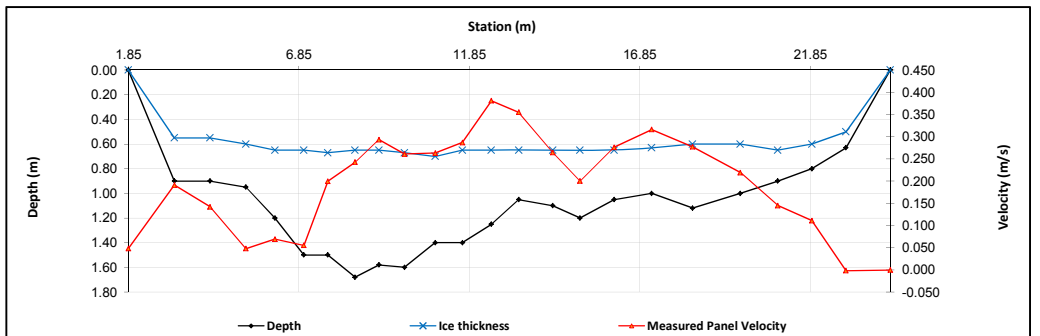
Flow characteristics:	
Total Flow:	2.23 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	10.77 (m <sup>2</sup> )
Wetted Width:	21.03 (m)
Hydraulic Depth:	0.512 (m)
Mean Velocity:	0.207 (m/s)
Froude Number:	0.092

Logger Details:		
	Before	After
Transducer Reading (m):	0.873	-
Water (°C):	0.0	-
Battery (Main):	13.6	-
Datalogger Clock:	13:23	-
Laptop Clock:	13:22	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	20963	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

**Datalogger / Station Notes:**

- Modem RSSI was -95, it was noted modem not powered at 13:30
- Large amount of water on top of ice US and DS, water withdrawal occurring 30 m US

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S56-01			1.600	100.000	100.000	T-post
S56-02	1.633	101.600		99.967	99.967	3/4" Pipe 2 m E of logger
S56-03			1.548	100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.878	98.722		
Water Level:			2.777	98.823		
Other:						
<b>Setup #2</b>						
S56-01			1.587	100.001	100.000	T-post
S56-02			1.621	99.967	99.967	3/4" Pipe 2 m E of logger
S56-03	1.536	101.588		100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.865	98.723		
Water Level:			2.767	98.821		
Other:						

Closing Error	0.000	Average WL	98.822
WL Check	0.002	Transducer Elevation Before	97.949
		Transducer Elevation After	-

Field Personnel:	TR, SM	Trip Date:	10-Feb-13
Data Entry Personnel:	TR	Date:	10-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

March 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	2.80	0.00	0.00	0.000	0.000	0.000	0.9	2.80	3.60	0.80	0.05	-0.002	-0.002	0.04	0.000	0%
1	4.40	0.80	0.62	-0.009			0.9	3.60	5.18	1.58	0.18	-0.009	-0.008	0.28	-0.002	0%
2	5.95	1.00	0.55	0.220			0.9	5.18	6.48	1.30	0.45	0.220	0.198	0.58	0.116	6%
3	7.00	1.17	0.63	0.273			0.9	6.48	7.35	0.88	0.54	0.273	0.246	0.47	0.116	6%
4	7.70	1.15	0.57	0.318			0.9	7.35	8.23	0.88	0.58	0.318	0.286	0.51	0.145	7%
5	8.75	1.05	0.57	0.346			0.9	8.23	9.18	0.95	0.48	0.346	0.311	0.46	0.142	7%
6	9.60	1.02	0.55	0.315			0.9	9.18	10.08	0.90	0.47	0.315	0.284	0.42	0.120	6%
7	10.55	1.10	0.65	0.179			0.9	10.08	10.98	0.90	0.45	0.179	0.161	0.41	0.065	3%
8	11.40	1.15	0.65	0.235			0.9	10.98	11.75	0.77	0.50	0.235	0.212	0.39	0.082	4%
9	12.10	1.08	0.63	0.291			0.9	11.75	12.50	0.75	0.45	0.291	0.262	0.34	0.088	4%
10	12.90	1.05	0.65	0.482			0.9	12.50	13.33	0.82	0.40	0.482	0.434	0.33	0.143	7%
11	13.75	1.10	0.65	0.459			0.9	13.33	14.08	0.75	0.45	0.459	0.413	0.34	0.139	7%
12	14.40	1.12	0.65	0.412			0.9	14.08	14.85	0.78	0.47	0.412	0.371	0.36	0.135	7%
13	15.30	1.15	0.65	0.312			0.9	14.85	15.65	0.80	0.50	0.312	0.281	0.40	0.112	5%
14	16.00	1.37	0.65	0.366			0.9	15.65	16.38	0.73	0.72	0.366	0.329	0.52	0.172	8%
15	16.75	1.40	0.57	0.357			0.9	16.38	17.05	0.68	0.83	0.357	0.321	0.56	0.180	9%
16	17.35	1.35	0.59	0.207			0.9	17.05	17.78	0.72	0.76	0.207	0.186	0.55	0.103	5%
17	18.20	1.18	0.65	0.201			0.9	17.78	18.68	0.90	0.53	0.201	0.181	0.48	0.086	4%
18	19.15	1.18	0.60	0.022			0.9	18.68	19.68	1.00	0.58	0.022	0.020	0.58	0.011	1%
19	20.20	0.82	0.60	0.003			0.9	19.68	20.63	0.95	0.22	0.003	0.003	0.21	0.001	0%
20	21.05	0.74	0.53	0.075			0.9	20.63	21.53	0.90	0.21	0.075	0.068	0.19	0.013	1%
21	22.00	0.76	0.45	0.139			0.9	21.53	22.55	1.03	0.31	0.139	0.125	0.32	0.040	2%
22	23.10	0.74	0.35	0.182			0.9	22.55	23.35	0.80	0.39	0.182	0.164	0.31	0.051	2%
LB	23.60	0.00	0.00	0.00	0.00	0.00	1.0	23.35	23.60	0.25	0.10	0.046	0.046	0.02	0.001	0%
<b>Total Flow</b>														<b>2.06</b>		

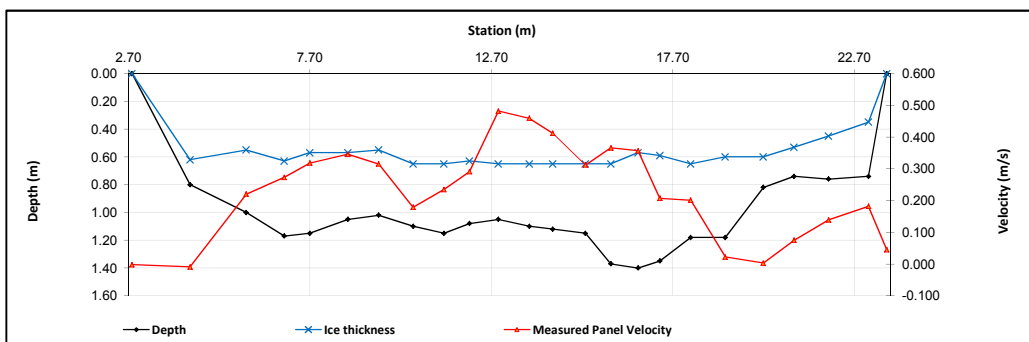
Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	14:45
Equipment:	ADV
Method:	Ice
River Condition:	Full ice
Quality/Error (see reverse):	Good
Weather:	Sunny, breezy, 2°C

Flow characteristics:	
Total Flow:	2.06 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	9.07 (m <sup>2</sup> )
Wetted Width:	20.80 (m)
Hydraulic Depth:	0.436 (m)
Mean Velocity:	0.227 (m/s)
Froude Number:	0.110

Logger Details:		
	Before	After
Transducer Reading (m):	0.751	-
Water (°C):	0.0	-
Battery (Main):	14.6	-
Datalogger Clock:	13:24	-
Laptop Clock:	13:23	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

Datalogger / Station Notes:	

General Notes:	
- Past overflow has caused the development of 3 distinct layers of ice	
- Water withdrawal stopped some time ago, ice solid in hole	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S56-01			1.317	99.999	100.000	T-post
S56-02	1.349	101.316		99.967	99.967	3/4" Pipe 2 m E of logger
S56-03			1.266	100.050	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.582	98.734		
Water Level:			2.625	98.691		
Other:						
<b>Setup #2</b>						
S56-01	1.359	101.358		99.999	100.000	T-post
S56-02			1.393	99.965	99.967	3/4" Pipe 2 m E of logger
S56-03			1.308	100.050	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.621	98.737		
Water Level:			2.664	98.694		
Other:						

Closing Error	0.002	Average WL	98.693
WL Check	0.003	Transducer Elevation Before	97.942
		Transducer Elevation After	-

Field Personnel:	DW, TR	Trip Date:	1-Mar-13
Data Entry Personnel:	TR	Date:	1-Mar-13
Data Check Personnel:	TR	Date:	14-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

April 3, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	4.00	0.00	0.00	0.000	0.000	0.000	0.9	4.00	5.08	1.08	0.06	0.037	0.033	0.07	0.002	0%
1	6.15	0.60	0.35	0.147			0.9	5.08	6.60	1.53	0.25	0.147	0.132	0.38	0.050	4%
2	7.05	0.50	0.35	0.092			0.9	6.60	7.58	0.98	0.15	0.092	0.083	0.15	0.012	1%
3	8.10	0.48	0.47	0.000			1.0	7.58	8.55	0.98	0.01	0.000	0.000	0.01	0.000	0%
4	9.00	0.50	0.30	0.001			0.9	8.55	9.45	0.90	0.20	0.001	0.001	0.18	0.000	0%
5	9.90	0.90	0.43	0.234			0.9	9.45	10.20	0.75	0.47	0.234	0.211	0.35	0.074	6%
6	10.50	0.95	0.45	0.256			0.9	10.20	10.85	0.65	0.50	0.256	0.230	0.33	0.075	6%
7	11.20	0.80	0.45	0.448			0.9	10.85	11.60	0.75	0.35	0.448	0.403	0.26	0.106	8%
8	12.00	0.90	0.50	0.410			0.9	11.60	12.35	0.75	0.40	0.410	0.369	0.30	0.111	8%
9	12.70	0.85	0.50	0.405			0.9	12.35	13.00	0.65	0.35	0.405	0.365	0.23	0.083	6%
10	13.30	0.80	0.55	0.284			0.9	13.00	13.65	0.65	0.25	0.284	0.256	0.16	0.042	3%
11	14.00	0.85	0.55	0.353			0.9	13.65	14.28	0.63	0.30	0.353	0.318	0.19	0.060	5%
12	14.55	0.95	0.55	0.340			0.9	14.28	14.90	0.63	0.40	0.340	0.306	0.25	0.077	6%
13	15.25	0.90	0.55	0.333			0.9	14.90	15.50	0.60	0.35	0.333	0.300	0.21	0.063	5%
14	15.75	0.88	0.53	0.341			0.9	15.50	16.03	0.52	0.35	0.341	0.307	0.18	0.056	4%
15	16.30	0.88	0.53	0.092			0.9	16.03	16.65	0.63	0.35	0.092	0.083	0.22	0.018	1%
16	17.00	0.85	0.55	0.207			0.9	16.65	17.45	0.80	0.30	0.207	0.186	0.24	0.045	3%
17	17.90	0.85	0.53	0.189			0.9	17.45	18.35	0.90	0.32	0.189	0.170	0.29	0.049	4%
18	18.80	0.50	0.45	0.082			0.9	18.35	19.28	0.92	0.05	0.082	0.074	0.05	0.003	0%
19	19.75	1.00	0.49	0.330			0.9	19.28	20.20	0.93	0.51	0.330	0.297	0.47	0.140	11%
20	20.65	1.10	0.45	0.261			0.9	20.20	21.18	0.97	0.65	0.261	0.235	0.63	0.149	11%
21	21.70	1.00	0.50	0.229			0.9	21.18	22.18	1.00	0.50	0.229	0.206	0.50	0.103	8%
22	22.65	0.70	0.30	-0.001			0.9	22.18	23.43	1.25	0.40	-0.001	-0.001	0.50	0.000	0%
RB	24.20	0.00	0.00	0.00	0.00	0.00	1.0	23.43	24.20	0.78	0.10	0.000	0.000	0.08	0.000	0%
<b>Total Flow</b>														<b>1.32</b>		

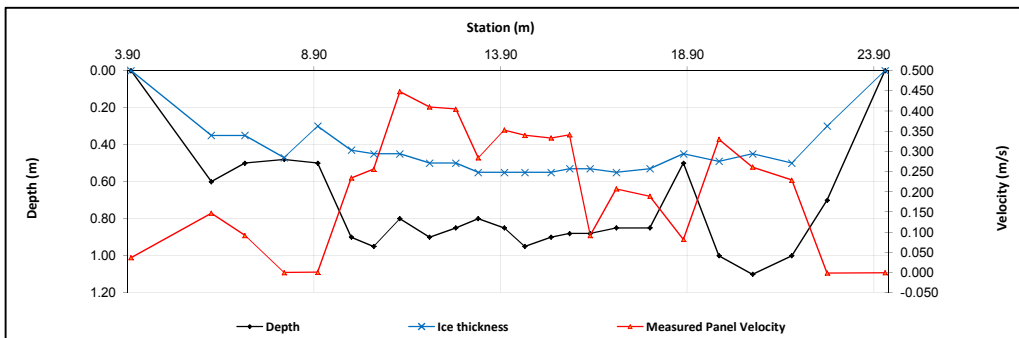
Measurement Details:	
Start Time (MST):	10:40
End Time (MST):	11:50
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	Overcast, windy, -3°C

Flow characteristics:	
Total Flow:	1.32 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	6.22 (m <sup>2</sup> )
Wetted Width:	20.20 (m)
Hydraulic Depth:	0.308 (m)
Mean Velocity:	0.212 (m/s)
Froude Number:	0.122

Logger Details:		
	Before	After
Transducer Reading (m):	0.525	-
Water (°C):	0.0	-
Battery (Main):	14.9	-
Datalogger Clock:	10:42	-
Laptop Clock:	10:43	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	20963	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S56-01	1.647	101.647		100.000	100.000	T-post
S56-02			1.680	99.967	99.967	3/4" Pipe 2 m E of logger
S56-03			1.597	100.050	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			3.028	98.619		
Water Level:			3.122	98.525		
Other:						
<b>Setup #2</b>						
S56-01			1.637	100.001	100.000	T-post
S56-02	1.671	101.638		99.967	99.967	3/4" Pipe 2 m E of logger
S56-03			1.586	100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			3.018	98.620		
Water Level:			3.110	98.528		
Other:						

Closing Error	-0.001	Average WL	98.527
WL Check	0.003	Transducer Elevation Before	98.002
		Transducer Elevation After	-

Field Personnel:	SM, CJ	Trip Date:	3-Apr-13
Data Entry Personnel:	SM	Date:	3-Apr-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: May 18, 2013  
 Site Visit Time (MST): 12:20

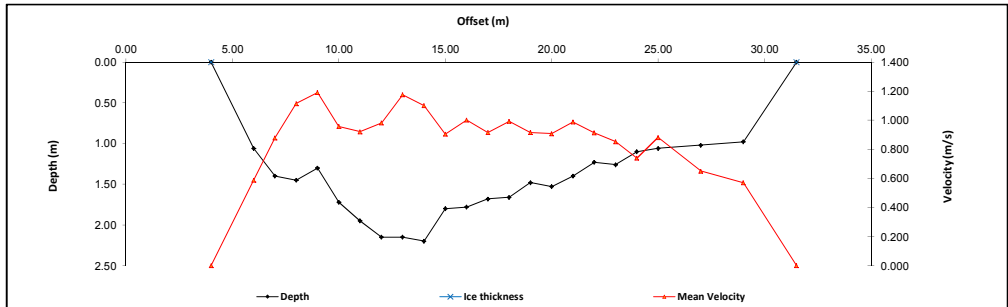


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	6.00	1.06			0.85	0.396	0.21	0.779	1.00	1.50	1.06	0.588	1.59	0.934	3%	
2	7.00	1.40			0.879	1.12	0.28		1.00	1.00	1.40	0.879	1.40	1.231	4%	
3	8.00	1.45			1.115	1.16	0.29		1.00	1.00	1.45	1.115	1.45	1.617	5%	
4	9.00	1.30			1.191	1.04	0.26		1.00	1.00	1.30	1.191	1.30	1.548	5%	
5	10.00	1.72			0.957	1.38	0.34		1.00	1.00	1.72	0.957	1.72	1.646	5%	
6	11.00	1.95			0.921	1.56	0.39		1.00	1.00	1.95	0.921	1.95	1.796	5%	
7	12.00	2.15			0.982	1.72	0.43		1.00	1.00	2.15	0.982	2.15	2.111	6%	
8	13.00	2.15			1.175	1.72	0.43		1.00	1.00	2.15	1.175	2.15	2.526	8%	
9	14.00	2.20			1.100	1.76	0.44		1.00	1.00	2.20	1.100	2.20	2.420	7%	
10	15.00	1.80			0.904	1.44	0.36		1.00	1.00	1.80	0.904	1.80	1.627	5%	
11	16.00	1.78			1.001	1.42	0.36		1.00	1.00	1.78	1.001	1.78	1.782	5%	
12	17.00	1.68			0.916	1.34	0.34		1.00	1.00	1.68	0.916	1.68	1.539	5%	
13	18.00	1.66			0.993	1.33	0.33		1.00	1.00	1.66	0.993	1.66	1.648	5%	
14	19.00	1.48			1.18		0.752	0.30	1.080	1.00	1.00	1.48	0.916	1.48	1.356	4%
15	20.00	1.53			1.22	0.722	0.31	1.094	1.00	1.00	1.53	0.908	1.53	1.389	4%	
16	21.00	1.40			1.12	0.924	0.28	1.053	1.00	1.00	1.40	0.989	1.40	1.384	4%	
17	22.00	1.23			0.968	0.903	0.25	1.024	1.00	1.00	1.23	0.914	1.23	1.124	3%	
18	23.00	1.26			0.714	1.01	0.25	0.931	1.00	1.00	1.26	0.853	1.26	1.074	3%	
19	24.00	1.10			0.88	0.530	0.22	0.950	1.00	1.00	1.10	0.740	1.10	0.814	2%	
20	25.00	1.06			0.85	0.830	0.21	0.933	1.00	1.50	1.06	0.882	1.59	1.402	4%	
21	27.00	1.02			0.82	0.534	0.20	0.766	1.00	2.00	1.02	0.650	2.04	1.326	4%	
22	29.00	0.98			0.78	0.520	0.20	0.621	1.00	2.25	0.98	0.571	2.21	1.258	4%	
RB	31.50	0.00	0.00		0.00	0.00	0.00	0.00	1.00	1.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>33.6</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:45
Equipment:	ADV
Method:	Fishcat
River Condition:	High and fast
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	P. Cloudy, calm, 20°C



**Flow characteristics:**

Total Flow:	33.6	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	36.67	(m <sup>2</sup> )
Wetted Width:	25.00	(m)
Hydraulic Depth:	1.47	(m)
Mean Velocity:	0.92	(m/s)
Froude Number:	0.24	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.013	1.006
Water (°C):	11.8	7.1
Datalogger Clock:	12:26	-
Laptop Clock:	12:27	-
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT Pulled out 13-MAY-2013, could not pull PT out to re-set due to debris stuck on anchor cable  
 - s/n 32293 was deployed until original PT can be recovered

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S56-01	1.133	101.133		100.000	100.000	T-post	S56-01
S56-02			1.167	99.966	99.967	3/4" Pipe 2 m E of logger	S56-02
S56-03			1.083	100.050	100.051	3/4" Pipe 4 m S of logger	S56-03
Ice/PT:							WL
Water Level:			1.845	99.288		Time WL Surveyed: 13:05	WL
Other:							S56-03
<b>Setup #2</b>							S56-02
S56-01			1.265	100.000	100.000	T-post	S56-01
S56-02	1.299	101.265		99.966	99.967	3/4" Pipe 2 m E of logger	
S56-03			1.214	100.051	100.051	3/4" Pipe 4 m S of logger	
Ice/PT:							
Water Level:			1.978	99.287		Time WL Surveyed: 13:06	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S56-01	1.265	101.265		100.000			
Water Level:			1.986	99.279		Time WL Surveyed: 14:50	
Water Level:			1.928	99.279		Time WL Surveyed: 14:51	
BM: S56-01	1.207	101.207		100.000			

**WL Survey Summary**

	Before	After
Average WL:	99.288	99.279
Transducer Elevation:	98.275	98.273
Closing Error:	0.000	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	33.6
Expected Discharge:	33.79
Shift from Existing Rating (m <sup>3</sup> /s):	0.19
Shift from Existing Rating (%):	1%

Field Personnel:	TR, JVR	Trip Date:	18-May-13
Data Entry Personnel:	JVR	Date:	18-May-13
Data Check Personnel:	TR	Date:	17-Jun-13
Entered Digitally in the Field:	Yes		

START  
 ↓  
 END

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: June 23, 2013  
 Site Visit Time (MST): 15:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000							
1				0.00												
2				0.00												
3				0.00												
4				0.00												
5				0.00												
6				0.00												
7				0.00												
8				0.00												
9				0.00												
10				0.00												
11				0.00												
12				0.00												
13				0.00												
14				0.00												
15				0.00												
16				0.00												
17				0.00												
18				0.00												
19				0.00												
20				0.00												
21				0.00												
22				0.00												
23				0.00												
24				0.00												
25				0.00												
26				0.00												
27				0.00												
28				0.00												
29				0.00												
30				0.00												
LB	0.00	0.00			0.00		0.00		0.00							
<b>Total Flow</b>															<b>0%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

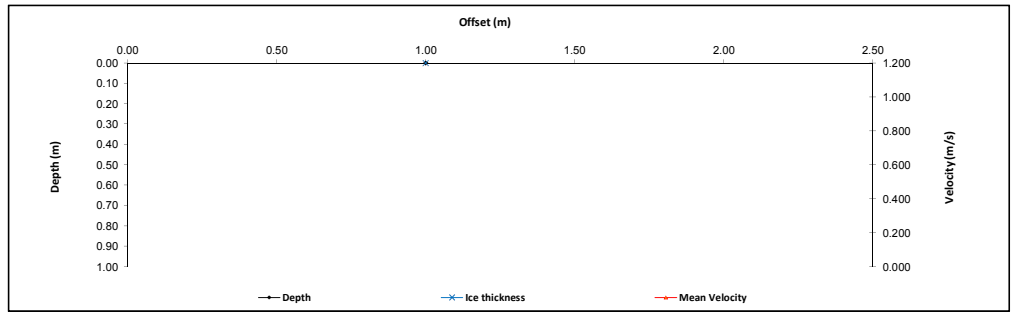
Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

<b>Flow characteristics:</b>		
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
Water (°C):	17.3	-
Datalogger Clock:	15:06	-
Laptop Clock:	15:05	-
Battery (Main):	14.2	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 - Water level was very high  
 - Flow measurement was not conducted due to safety concerns, see photos

**General Notes:**



Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>								
S56-01				1.189	100.000	100.000	T-post	S56-03
S56-01				1.222	99.967	99.967	3/4" Pipe 2 m E of logger	S56-01
S56-02					100.051	100.051	3/4" Pipe 4 m S of logger	S56-02
S56-03	1.138	101.189						WL
Ice/PT:								WL
Water Level:			1.757		99.432		Time WL Surveyed: 15:12	S56-02
Other:								S56-01
<b>Setup #2</b>								
S56-01				1.176	100.000	100.000	T-post	S56-03
S56-02	1.209	101.176			99.967	99.967	3/4" Pipe 2 m E of logger	S56-01
S56-03				1.125	100.051	100.051	3/4" Pipe 4 m S of logger	S56-02
Ice/PT:								
Water Level:				1.745	99.431		Time WL Surveyed: 15:13	
Other:								(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
BM:							Time WL Surveyed:	
Water Level:							Time WL Surveyed:	
Water Level:							Time WL Surveyed:	
BM:								

<b>WL Survey Summary</b>		
Average WL:	Before	After
Transducer Elevation:	99.432	-
Closing Error:	0.000	-
WL Check:	0.001	-

<b>Site Rating Information</b>		
Measured Discharge:		
Expected Discharge:		-
Shift from Existing Rating (m <sup>3</sup> /s):		-
Shift from Existing Rating (%):		-

<b>Field Personnel:</b>	SM, TR	Trip Date:	23-Jun-13
<b>Data Entry Personnel:</b>	SM	Date:	23-Jun-13
<b>Data Check Personnel:</b>	TR	Date:	19-Aug-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: August 20, 2013  
 Site Visit Time (MST): 15:10



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	1.00	0.60		0.36	0.106					1.00	0.75	0.60	0.106	0.45	0.048	1%
2	2.00	0.60		0.36	0.194					1.00	1.00	0.60	0.194	0.60	0.116	3%
3	3.00	0.68		0.41	0.141					1.00	1.00	0.68	0.141	0.68	0.096	2%
4	4.00	0.59		0.35	0.207					1.00	1.00	0.59	0.207	0.59	0.122	3%
5	5.00	0.64		0.38	0.255					1.00	1.00	0.64	0.255	0.64	0.163	4%
6	6.00	0.70		0.42	0.239					1.00	1.00	0.70	0.239	0.70	0.167	4%
7	7.00	1.02				0.82	0.211	0.20	0.338	1.00	1.00	1.02	0.275	1.02	0.280	6%
8	8.00	1.05				0.84	0.159	0.21	0.390	1.00	1.00	1.05	0.275	1.05	0.288	7%
9	9.00	1.08				0.86	0.197	0.22	0.263	1.00	1.00	1.08	0.230	1.08	0.248	6%
10	10.00	0.86				0.69	0.305	0.17	0.387	1.00	1.00	0.86	0.346	0.86	0.298	7%
11	11.00	0.89				0.71	0.283	0.18	0.414	1.00	1.00	0.89	0.349	0.89	0.310	7%
12	12.00	0.87				0.70	0.285	0.17	0.384	1.00	1.00	0.87	0.335	0.87	0.291	7%
13	13.00	0.92				0.74	0.251	0.18	0.376	1.00	1.00	0.92	0.314	0.92	0.288	7%
14	14.00	1.00				0.80	0.141	0.20	0.327	1.00	1.00	1.00	0.234	1.00	0.234	5%
15	15.00	0.94				0.75	0.148	0.19	0.300	1.00	1.00	0.94	0.224	0.94	0.211	5%
16	16.00	0.78				0.62	0.289	0.16	0.349	1.00	1.00	0.78	0.319	0.78	0.249	6%
17	17.00	1.01				0.81	0.212	0.20	0.372	1.00	1.00	1.01	0.292	1.01	0.295	7%
18	18.00	1.24				0.99	0.277	0.25	0.208	1.00	1.00	1.24	0.243	1.24	0.301	7%
19	19.00	1.28				1.02	0.192	0.26	0.122	1.00	1.00	1.28	0.157	1.28	0.201	5%
20	20.00	0.84				0.67	0.091	0.17	0.095	1.00	1.00	0.84	0.093	0.84	0.078	2%
21	21.00	0.69	0.41		0.092					1.00	1.00	0.69	0.092	0.69	0.063	1%
22	22.00	0.27	0.16		0.043					1.00	0.75	0.27	0.043	0.20	0.009	0%
LB	22.50	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>4.36</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	16:06
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 23°C

**Flow characteristics:**

Total Flow:	4.36	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	18.33	(m <sup>2</sup> )
Wetted Width:	21.50	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.88	

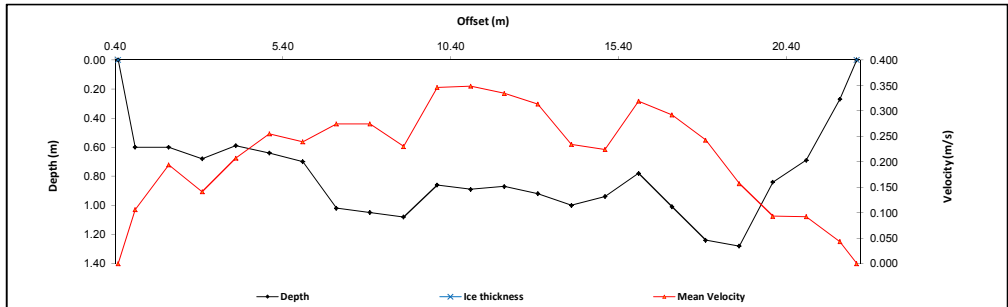
**Logger Details:**

	Before	After
Transducer Reading (m):	0.319	0.370
Water (°C):	17.7	17.8
Datalogger Clock:	14:55	16:23
Laptop Clock:	14:54	16:22
Battery (Main):	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Re-positioned PT

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S56-02
S56-01			1.267	100.000	100.000	T-Post	S56-01
S56-02	1.300	101.267		99.967	99.967	3/4" Pipe 2 m E of logger	S56-03
S56-03			1.216	100.051	100.051	3/4" Pipe 4 m S of logger	WL
Ice/PT:							WL
Water Level:			2.687	98.580		Time WL Surveyed: 15:21	S56-03
Other:							S56-01
<b>Setup #2</b>							S56-02
S56-01			1.257	99.999	100.000	T-Post	
S56-02			1.288	99.968	99.967	3/4" Pipe 2 m E of logger	
S56-03	1.205	101.256		100.051	100.051	3/4" Pipe 4 m S of logger	
Ice/PT:							
Water Level:			2.675	98.581		Time WL Surveyed: 15:23	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S56-03	1.205	101.256		2.675	100.051		
Water Level:				2.668	98.581	Time WL Surveyed: 16:15	
Water Level:				2.668	98.581	Time WL Surveyed: 16:17	
BM: S56-03	1.198	101.249			100.051		

**WL Survey Summary**

	Before	After
Average WL:	98.581	98.581
Transducer Elevation:	98.262	98.211
Closing Error:	-0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	4.36
Expected Discharge:	4.44
Shift from Existing Rating (m <sup>3</sup> /s):	0.08
Shift from Existing Rating (%):	2%

**Field Personnel:**

SM, DW	Trip Date:	20-Aug-13
DW	Date:	20-Aug-13
TR	Date:	28-Aug-13
Yes	Entered Digitally in the Field:	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: September 9, 2013  
 Site Visit Time (MST): 17:25

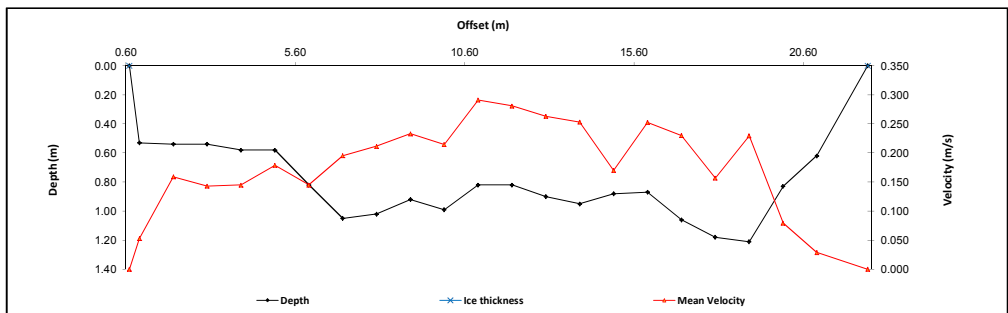


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.00	0.53		0.32	0.053					1.00	0.65	0.53	0.053	0.34	0.018	1%
2	2.00	0.54		0.32	0.159					1.00	1.00	0.54	0.159	0.54	0.086	2%
3	3.00	0.54		0.32	0.143					1.00	1.00	0.54	0.143	0.54	0.077	2%
4	4.00	0.58		0.35	0.145					1.00	1.00	0.58	0.145	0.58	0.084	2%
5	5.00	0.58		0.35	0.179					1.00	1.00	0.58	0.179	0.58	0.104	3%
6	6.00	0.82				0.66	0.038	0.16	0.252	1.00	1.00	0.82	0.145	0.82	0.119	3%
7	7.00	1.05				0.84	0.138	0.21	0.253	1.00	1.00	1.05	0.196	1.05	0.205	6%
8	8.00	1.02				0.82	0.122	0.20	0.301	1.00	1.00	1.02	0.212	1.02	0.216	6%
9	9.00	0.92				0.74	0.173	0.18	0.293	1.00	1.00	0.92	0.233	0.92	0.214	6%
10	10.00	0.99				0.79	0.088	0.20	0.341	1.00	1.00	0.99	0.215	0.99	0.212	6%
11	11.00	0.82				0.66	0.248	0.16	0.334	1.00	1.00	0.82	0.291	0.82	0.239	7%
12	12.00	0.82				0.66	0.238	0.16	0.324	1.00	1.00	0.82	0.281	0.82	0.230	7%
13	13.00	0.90				0.72	0.198	0.18	0.328	1.00	1.00	0.90	0.263	0.90	0.237	7%
14	14.00	0.95				0.76	0.197	0.19	0.309	1.00	1.00	0.95	0.253	0.95	0.240	7%
15	15.00	0.88				0.70	0.124	0.18	0.216	1.00	1.00	0.88	0.170	0.88	0.150	4%
16	16.00	0.87				0.70	0.222	0.17	0.283	1.00	1.00	0.87	0.253	0.87	0.220	6%
17	17.00	1.06				0.85	0.190	0.21	0.270	1.00	1.00	1.06	0.230	1.06	0.244	7%
18	18.00	1.18				0.94	0.151	0.24	0.163	1.00	1.00	1.18	0.157	1.18	0.195	5%
19	19.00	1.21				0.97	0.169	0.24	0.290	1.00	1.00	1.21	0.230	1.21	0.278	8%
20	20.00	0.83				0.66	0.079	0.17	0.080	1.00	1.00	0.83	0.080	0.83	0.066	2%
21	21.00	0.62		0.37	0.029					1.00	1.25	0.62	0.029	0.78	0.022	1%
RB	22.50	0.00	0.00		0.00		0.00		0.00	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.45</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	16:34
Meas. End Time (MST):	17:10
Equipment:	ADV
Method:	Wading
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 20°C



**Flow characteristics:**

Total Flow:	3.45	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.68	(m <sup>2</sup> )
Wetted Width:	21.80	(m)
Hydraulic Depth:	0.81	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.312	0.864
Water (°C):	19.3	19.1
Datalogger Clock:	16:06	17:19
Laptop Clock:	16:05	17:18
Battery (Main):	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS to deeper water
- Installed BMS56-4, BMS56-1 was destroyed by an Argo

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S56-03
S56-02	1.317	101.284		99.967	99.967	3/4" Pipe 2 m E of logger	S56-02
S56-03			1.233	100.051	100.051	3/4" Pipe 4 m S of logger	S56-04
S56-04			1.228	100.056	100.056	3/4" Pipe 3 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.751	98.533		Time WL Surveyed: 16:28	S56-04
Other:							S56-02
<b>Setup #2</b>							S56-03
S56-02			1.304	99.966	99.967	3/4" Pipe 2 m E of logger	
S56-03		101.270		100.051	100.051	3/4" Pipe 4 m S of logger	
S56-04	1.219			100.055	100.056	3/4" Pipe 3 m NW of logger	
Ice/PT:							
Water Level:			2.739	98.531		Time WL Surveyed: 16:30	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S56-04	1.215	101.271		100.056			
Water Level:			2.741	98.530		Time WL Surveyed: 17:14	
Water Level:			2.725	98.534		Time WL Surveyed: 17:16	
BM: S56-04	1.203	101.259		100.056			

**WL Survey Summary**

	Before	After
Average WL:	98.532	98.532
Transducer Elevation:	98.220	97.668
Closing Error:	0.001	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	3.45
Expected Discharge:	3.27
Shift from Existing Rating (m <sup>3</sup> /s):	-0.18
Shift from Existing Rating (%):	-5%

**Field Personnel:**

Data Entry Personnel:	SM	Trip Date:	9-Sep-13
Data Check Personnel:	TR	Date:	9-Sep-13
Entered Digitally in the Field:	Yes	Date:	2-Oct-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: October 24, 2013  
 Site Visit Time (MST): 11:00

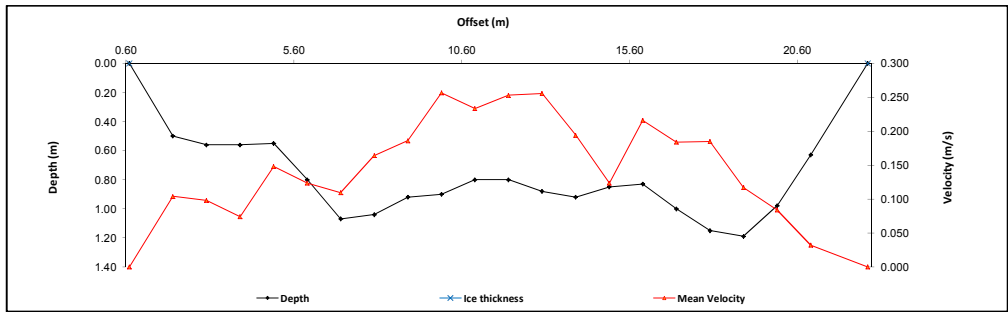


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	22.70	0.00	0.00		0.000		0.000		0.000	1.00	0.85	0.00	0.000	0.00	0.000	
1	21.00	0.63		0.38	0.032					1.00	1.35	0.63	0.032	0.85	0.027	1%
2	20.00	0.98				0.78	0.091	0.20	0.077	1.00	1.00	0.98	0.084	0.98	0.082	3%
3	19.00	1.19				0.95	0.146	0.24	0.088	1.00	1.00	1.19	0.117	1.19	0.139	5%
4	18.00	1.15				0.92	0.204	0.23	0.166	1.00	1.00	1.15	0.185	1.15	0.213	8%
5	17.00	1.00				0.80	0.140	0.20	0.228	1.00	1.00	1.00	0.184	1.00	0.184	7%
6	16.00	0.83				0.66	0.192	0.17	0.240	1.00	1.00	0.83	0.216	0.83	0.179	7%
7	15.00	0.85				0.68	0.050	0.17	0.197	1.00	1.00	0.85	0.124	0.85	0.105	4%
8	14.00	0.92				0.74	0.126	0.18	0.262	1.00	1.00	0.92	0.194	0.92	0.178	6%
9	13.00	0.88				0.70	0.222	0.18	0.289	1.00	1.00	0.88	0.256	0.88	0.225	8%
10	12.00	0.80				0.64	0.218	0.16	0.288	1.00	1.00	0.80	0.253	0.80	0.202	7%
11	11.00	0.80				0.64	0.167	0.16	0.300	1.00	1.00	0.80	0.234	0.80	0.187	7%
12	10.00	0.90				0.72	0.224	0.18	0.289	1.00	1.00	0.90	0.257	0.90	0.231	8%
13	9.00	0.92				0.74	0.125	0.18	0.247	1.00	1.00	0.92	0.186	0.92	0.171	6%
14	8.00	1.04				0.83	0.084	0.21	0.244	1.00	1.00	1.04	0.164	1.04	0.171	6%
15	7.00	1.07				0.86	0.010	0.21	0.209	1.00	1.00	1.07	0.110	1.07	0.117	4%
16	6.00	0.80				0.64	0.030	0.16	0.217	1.00	1.00	0.80	0.124	0.80	0.099	4%
17	5.00	0.55		0.33	0.148					1.00	1.00	0.55	0.148	0.55	0.081	3%
18	4.00	0.56		0.34	0.074					1.00	1.00	0.56	0.074	0.56	0.041	2%
19	3.00	0.56		0.34	0.098					1.00	1.00	0.56	0.098	0.56	0.055	2%
20	2.00	0.50		0.30	0.104					1.00	1.15	0.50	0.104	0.58	0.060	2%
LB	0.70	0.00	0.00		0.00		0.00		0.00	1.00	0.65	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.75</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	16:04
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 7°C



**Flow characteristics:**

Total Flow:	2.75	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.23	(m <sup>2</sup> )
Wetted Width:	22.00	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.96	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.833	0.735
Water (°C):	8.8	8.9
Datalogger Clock:	15:54	16:03
Laptop Clock:	15:53	16:03
Battery (Main):	14.5	14.2
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Trenched PT cable, moved PT to new depth of 0.737

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S56-02	1.161	101.128		99.967	99.967	3/4" Pipe 2 m E of logger	S56-04
S56-03			1.075	100.053	100.051	3/4" Pipe 4 m S of logger	S56-02
S56-04			1.072	100.056	100.056	3/4" Pipe 3 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.620	98.508		Time WL Surveyed: 15:14	S56-02
Other:							S56-03
<b>Setup #2</b>							S56-04
S56-02			1.151	99.967	99.967	3/4" Pipe 2 m E of logger	
S56-03	1.065	101.118		100.053	100.051	3/4" Pipe 4 m S of logger	
S56-04			1.062	100.056	100.056	3/4" Pipe 3 m NW of logger	
Ice/PT:							
Water Level:			2.609	98.509		Time WL Surveyed: 15:15	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S56-03	1.065	101.118		100.053		Time WL Surveyed: 15:59	
Water Level:			2.609	98.509		Time WL Surveyed: 16:02	
Water Level:			2.596	98.509			
BM: S56-03	1.052	101.105		100.053			

**WL Survey Summary**

	Before	After
Average WL:	98.509	98.509
Transducer Elevation:	97.676	97.774
Closing Error:	0.000	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	2.75
Expected Discharge:	2.76
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	0%

**Field Personnel:**

DW & TR	Trip Date:	24-Oct-13
DW	Date:	24-Oct-13
TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: November 30, 2013  
 Site Visit Time (MST): 12:35

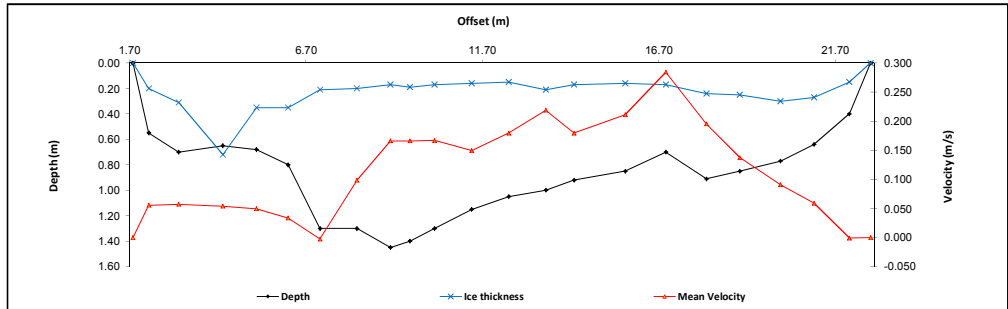


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000				0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	2.25	0.55	0.20	0.38	0.063					0.88	0.65	0.35	0.055	0.23	0.013	1%
2	3.10	0.70	0.31	0.51	0.065					0.88	1.05	0.39	0.057	0.41	0.023	1%
3	4.35	0.65	0.72	0.69	0.061					0.88	1.10	-0.07	0.054	-0.08	-0.004	0%
4	5.30	0.68	0.35	0.52	0.056					0.88	0.93	0.33	0.049	0.31	0.015	1%
5	6.20	0.80	0.35	0.58	0.038					0.88	0.90	0.45	0.033	0.41	0.014	1%
6	7.10	1.30	0.21			1.08	0.001	0.43	-0.006	1.00	0.98	1.09	-0.003	1.06	-0.003	0%
7	8.15	1.30	0.20			1.08	0.057	0.42	0.140	1.00	1.00	1.10	0.099	1.10	0.108	6%
8	9.10	1.45	0.17			1.19	0.103	0.43	0.229	1.00	0.75	1.28	0.166	0.96	0.159	8%
9	9.65	1.40	0.19			1.16	0.109	0.43	0.223	1.00	0.63	1.21	0.166	0.76	0.126	7%
10	10.35	1.30	0.17			1.07	0.176	0.40	0.158	1.00	0.88	1.13	0.167	0.99	0.165	9%
11	11.40	1.15	0.16			0.95	0.102	0.36	0.197	1.00	1.05	0.99	0.150	1.04	0.155	8%
12	12.45	1.05	0.15			0.87	0.157	0.33	0.202	1.00	1.05	0.90	0.180	0.94	0.170	9%
13	13.50	1.00	0.21			0.84	0.196	0.37	0.242	1.00	0.93	0.79	0.219	0.73	0.160	8%
14	14.30	0.92	0.17	0.55	0.204					0.88	1.13	0.75	0.180	0.84	0.151	8%
15	15.75	0.85	0.16	0.51	0.240					0.88	1.30	0.69	0.211	0.90	0.189	10%
16	16.90	0.70	0.17	0.44	0.323					0.88	1.15	0.53	0.284	0.61	0.173	9%
17	18.05	0.91	0.24	0.58	0.222					0.88	1.05	0.67	0.195	0.70	0.137	7%
18	19.00	0.85	0.25	0.55	0.156					0.88	1.05	0.60	0.137	0.63	0.086	5%
19	20.15	0.77	0.30	0.54	0.103					0.88	1.05	0.47	0.091	0.49	0.045	2%
20	21.10	0.64	0.27	0.46	0.067					0.88	0.98	0.37	0.059	0.36	0.021	1%
21	22.10	0.40	0.15	0.28	-0.001					0.88	0.80	0.25	-0.001	0.20	0.000	0%
RB	22.70	0.00	0.00		0.00				0.00	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.91</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5 m US of station

Meas. Start Time (MST):	13:05
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 0°C



**Flow characteristics:**

Total Flow:	1.91	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.59	(m <sup>2</sup> )
Wetted Width:	20.90	(m)
Hydraulic Depth:	0.65	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.86	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.796	0.797
Water (°C):	0.3	0.3
Datalogger Clock:	12:46	13:48
Laptop Clock:	12:45	13:46
Battery (Main):	13.7	13.7
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	Replaced
Vent Tube Desiccant:	Good	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ran ADV test, all good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S56-02			1.346	99.968	99.967	3/4" Pipe 2 m E of logger	S56-03
S56-03	1.263	101.314		100.051	100.051	3/4" Pipe 4 m S of logger	S56-04
S56-04			1.256	100.058	100.056	3/4" Pipe 3 m NW of logger	WL
Ice/PT:			2.757	98.557			Ice
Water Level:			2.747	98.567		Time WL Surveyed: 12:58	Ice
Other:							WL
<b>Setup #2</b>							S56-04
S56-02			1.329	99.969	99.967	3/4" Pipe 2 m E of logger	S56-02
S56-03			1.246	100.052	100.051	3/4" Pipe 4 m S of logger	S56-03
S56-04	1.240	101.298		100.058	100.056	3/4" Pipe 3 m NW of logger	
Ice/PT:			2.741	98.557			
Water Level:			2.727	98.571		Time WL Surveyed: 13:00	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S56-03	1.246	101.297	100.051			
Water Level:			2.728	98.569		Time WL Surveyed: 13:44	
Water Level:			2.700	98.572		Time WL Surveyed: 13:45	
BM:	S56-03	1.221	101.272	100.051			

**WL Survey Summary**

	Before	After
Average WL:	98.569	98.571
Transducer Elevation:	97.773	97.774
Closing Error:	-0.001	-
WL Check:	0.004	-0.003

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, SM	Trip Date:	30-Nov-13
TR	Date:	30-Nov-13
TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

January 13, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.20	0.00	0.00	0.000	0.000	0.000	0.9	5.20	5.55	0.35	0.05	0.001	0.000	0.02	0.000	0%
1	5.90	0.48	0.29	0.002			0.9	5.55	6.15	0.60	0.19	0.002	0.002	0.11	0.000	0%
2	6.40	0.60	0.31	0.001			0.9	6.15	6.70	0.55	0.29	0.001	0.001	0.16	0.000	0%
3	7.00	0.70	0.33	0.034			0.9	6.70	7.30	0.60	0.37	0.034	0.031	0.22	0.007	3%
4	7.60	0.68	0.28	0.133			0.9	7.30	7.85	0.55	0.40	0.133	0.120	0.22	0.026	10%
5	8.10	0.63	0.25	0.126			0.9	7.85	8.30	0.45	0.38	0.126	0.113	0.17	0.019	8%
6	8.50	0.66	0.27	0.130			0.9	8.30	8.75	0.45	0.39	0.130	0.117	0.18	0.021	8%
7	9.00	0.70	0.27	0.126			0.9	8.75	9.20	0.45	0.43	0.126	0.113	0.19	0.022	9%
8	9.40	0.70	0.28	0.158			0.9	9.20	9.65	0.45	0.42	0.158	0.142	0.19	0.027	11%
9	9.90	0.68	0.30	0.147			0.9	9.65	10.10	0.45	0.38	0.147	0.132	0.17	0.023	9%
10	10.30	0.62	0.32	0.088			0.9	10.10	10.50	0.40	0.30	0.088	0.079	0.12	0.010	4%
11	10.70	0.59	0.31	0.138			0.9	10.50	10.90	0.40	0.28	0.138	0.124	0.11	0.014	5%
12	11.10	0.57	0.31	0.162			0.9	10.90	11.35	0.45	0.26	0.162	0.146	0.12	0.017	7%
13	11.60	0.54	0.30	0.120			0.9	11.35	11.85	0.50	0.24	0.120	0.108	0.12	0.013	5%
14	12.10	0.50	0.32	0.103			0.9	11.85	12.30	0.45	0.18	0.103	0.093	0.08	0.008	3%
15	12.50	0.60	0.32	0.064			0.9	12.30	12.75	0.45	0.28	0.064	0.058	0.13	0.007	3%
16	13.00	0.58	0.33	0.095			0.9	12.75	13.15	0.40	0.25	0.095	0.086	0.10	0.009	3%
17	13.30	0.57	0.32	0.122			0.9	13.15	13.45	0.30	0.25	0.122	0.110	0.07	0.008	3%
18	13.60	0.57	0.31	0.119			0.9	13.45	13.85	0.40	0.26	0.119	0.107	0.10	0.011	4%
19	14.10	0.53	0.30	0.111			0.9	13.85	14.30	0.45	0.23	0.111	0.100	0.10	0.010	4%
20	14.50	0.51	0.25	0.065			0.9	14.30	14.85	0.55	0.26	0.065	0.059	0.14	0.008	3%
21	15.20	0.30	0.21	-0.079			0.9	14.85	15.50	0.65	0.09	-0.079	-0.071	0.06	-0.004	-2%
LB	15.80	0.00	0.00	0.00	0.00	0.00	1.0	15.50	15.80	0.30	0.02	-0.020	-0.020	0.01	0.000	0%
<b>Total Flow</b>														<b>0.255</b>		

## Measurement Details:

Start Time (MST):	9:50
End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, -22°C

## Flow characteristics:

Total Flow:	0.255	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.90	(m <sup>2</sup> )
Wetted Width:	10.60	(m)
Hydraulic Depth:	0.273	(m)
Mean Velocity:	0.088	(m/s)
Froude Number:	0.054	

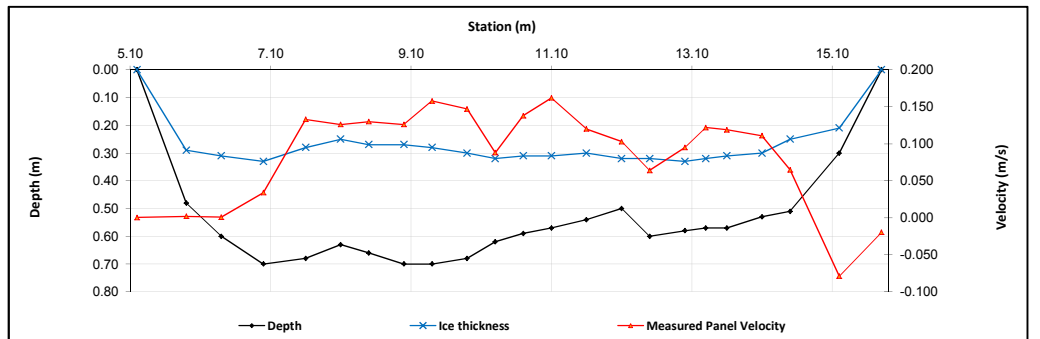
## Logger Details:

	Before	After
Transducer Reading (m):	0.555	-
Water (°C):	0.1	-
Battery (Main):	13.3	-
Datalogger Clock:	10:04	-
Laptop Clock:	10:04	-
Enclosure Dessiccant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessiccant:	Replaced	-

## Datalogger / Station Notes:

## General Notes:

- Ran ADV test



## Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S57-01	1.373	101.373		100.000	100.000	3/4" Pipe closest to logger
S57-02			1.412	99.961	99.961	3/4" Pipe 5 m W of logger
S57-03			1.312	100.061	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.615	97.758		
Water Level:			3.578	97.795		
Other:						
<b>Setup #2</b>						
S57-01			1.297	99.999	100.000	3/4" Pipe closest to logger
S57-02	1.335	101.296		99.961	99.961	3/4" Pipe 5 m W of logger
S57-03			1.237	100.059	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.539	97.757		
Water Level:			3.503	97.793		
Other:						

Closing Error	0.001
WL Check	0.002

Average WL	97.794
Transducer Elevation Before	97.239
Transducer Elevation After	-

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	13-Jan-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	13-Jan-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	25-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

February 11, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	15.20	0.00	0.00	0.000	0.000	0.000	0.9	15.20	14.93	0.27	0.03	0.055	0.050	0.01	0.000	0%
1	14.65	0.45	0.35	0.221			0.9	14.93	14.38	0.55	0.10	0.221	0.199	0.06	0.011	4%
2	14.10	0.50	0.35	0.290			0.9	14.38	13.85	0.53	0.15	0.290	0.261	0.08	0.021	8%
3	13.60	0.50	0.35	0.219			0.9	13.85	13.33	0.53	0.15	0.219	0.197	0.08	0.016	6%
4	13.05	0.50	0.35	0.222			0.9	13.33	12.78	0.55	0.15	0.222	0.200	0.08	0.016	7%
5	12.50	0.49	0.35	0.188			0.9	12.78	12.18	0.60	0.14	0.188	0.169	0.08	0.014	6%
6	11.85	0.52	0.40	0.212			0.9	12.18	11.55	0.63	0.12	0.212	0.191	0.08	0.014	6%
7	11.25	0.50	0.41	0.142			0.9	11.55	10.98	0.58	0.09	0.142	0.128	0.05	0.007	3%
8	10.70	0.50	0.43	0.159			0.9	10.98	10.45	0.53	0.07	0.159	0.143	0.04	0.005	2%
9	10.20	0.50	0.44	0.174			0.9	10.45	10.00	0.45	0.06	0.174	0.157	0.03	0.004	2%
10	9.80	0.55	0.35	0.068			0.9	10.00	9.58	0.43	0.20	0.068	0.061	0.09	0.005	2%
11	9.35	0.56	0.37	0.166			0.9	9.58	9.18	0.40	0.19	0.166	0.149	0.08	0.011	5%
12	9.00	0.57	0.37	0.169			0.9	9.18	8.75	0.43	0.20	0.169	0.152	0.09	0.013	5%
13	8.50	0.58	0.35	0.263			0.9	8.75	8.35	0.40	0.23	0.263	0.237	0.09	0.022	9%
14	8.20	0.60	0.35	0.241			0.9	8.35	8.13	0.23	0.25	0.241	0.217	0.06	0.012	5%
15	8.05	0.60	0.35	0.239			0.9	8.13	7.78	0.35	0.25	0.239	0.215	0.09	0.019	8%
16	7.50	0.50	0.35	0.137			0.9	7.78	7.28	0.50	0.15	0.137	0.123	0.08	0.009	4%
17	7.05	0.48	0.30	0.258			0.9	7.28	6.83	0.45	0.18	0.258	0.232	0.08	0.019	8%
18	6.60	0.47	0.30	0.263			0.9	6.83	6.35	0.48	0.17	0.263	0.237	0.08	0.019	8%
19	6.10	0.40	0.30	0.085			0.9	6.35	5.88	0.48	0.10	0.085	0.077	0.05	0.004	1%
20	5.65	0.35	0.25	0.151			0.9	5.88	5.35	0.53	0.10	0.151	0.136	0.05	0.007	3%
21	5.05	0.31	0.25	0.026			0.9	5.35	5.00	0.35	0.06	0.026	0.023	0.02	0.000	0%
RB	4.95	0.00	0.00	0.00	0.00	0.00	1.0	5.00	4.95	0.05	0.02	0.007	0.007	0.00	0.000	0%
<b>Total Flow</b>														<b>0.249</b>		

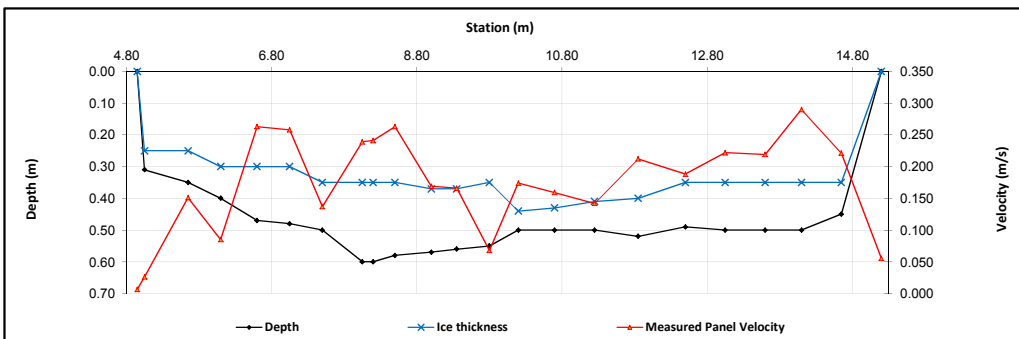
Measurement Details:	
Start Time (MST):	10:45
End Time (MST):	11:50
Equipment:	ADV
Method:	Ice
River Condition:	Full Ice
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 0°C

Flow characteristics:	
Total Flow:	0.249 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.42 (m <sup>2</sup> )
Wetted Width:	9.93 (m)
Hydraulic Depth:	0.143 (m)
Mean Velocity:	0.176 (m/s)
Froude Number:	0.149

Logger Details:		
	Before	After
Transducer Reading (m):	0.610	-
Water (°C):	0.1	-
Battery (Main):	14.3	-
Datalogger Clock:	10:57	-
Laptop Clock:	10:57	-
Enclosure Dessicant:	Good	-
Logger# (if Δ):	20959	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Good	-

Datalogger / Station Notes:	

**General Notes:**  
- Ice is in poor condition, chunks breaking away while augering



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S57-01			1.605	100.000	100.000	3/4" Pipe closest to logger
S57-02			1.644	99.961	99.961	3/4" Pipe 5 m W of logger
S57-03	1.545	101.605		100.060	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.805	97.800		
Water Level:			3.755	97.850		
Other:						
<b>Setup #2</b>						
S57-01	1.587	101.587		100.000	100.000	3/4" Pipe closest to logger
S57-02			1.626	99.961	99.961	3/4" Pipe 5 m W of logger
S57-03			1.527	100.060	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.799	97.788		
Water Level:			3.740	97.847		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	97.849
Transducer Elevation Before	97.239
Transducer Elevation After	-

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	11-Feb-13
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	11-Feb-13
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	28-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

March 1, 2013



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	5.40	0.00	0.00	0.000	0.000	0.000	0.9	5.40	5.48	0.07	0.05	0.041	0.037	0.00	0.000	0%
1	5.55	0.45	0.25	0.164			0.9	5.48	5.88	0.40	0.20	0.164	0.148	0.08	0.012	5%
2	6.20	0.52	0.36	0.120			0.9	5.88	6.55	0.68	0.16	0.120	0.108	0.11	0.012	5%
3	6.90	0.51	0.38	0.272			0.9	6.55	7.05	0.50	0.13	0.272	0.245	0.07	0.016	7%
4	7.20	0.58	0.42	0.222			0.9	7.05	7.35	0.30	0.16	0.222	0.200	0.05	0.010	4%
5	7.50	0.58	0.49	0.199			0.9	7.35	7.65	0.30	0.09	0.199	0.179	0.03	0.005	2%
6	7.80	0.55	0.43	0.075			0.9	7.65	8.15	0.50	0.12	0.075	0.068	0.06	0.004	2%
7	8.50	0.57	0.40	0.242			0.9	8.15	8.75	0.60	0.17	0.242	0.218	0.10	0.022	9%
8	9.00	0.58	0.47	0.040			0.9	8.75	9.28	0.53	0.11	0.040	0.036	0.06	0.002	1%
9	9.55	0.51	0.43	0.001			0.9	9.28	9.83	0.55	0.08	0.001	0.001	0.04	0.000	0%
10	10.10	0.51	0.43	0.013			0.9	9.83	10.28	0.45	0.08	0.013	0.012	0.04	0.000	0%
11	10.45	0.51	0.44	-0.007			0.9	10.28	10.70	0.43	0.07	-0.007	-0.006	0.03	0.000	0%
12	10.95	0.52	0.43	0.157			0.9	10.70	11.20	0.50	0.09	0.157	0.141	0.05	0.006	3%
13	11.45	0.51	0.37	0.180			0.9	11.20	11.70	0.50	0.14	0.180	0.162	0.07	0.011	5%
14	11.95	0.57	0.38	0.194			0.9	11.70	12.28	0.57	0.19	0.194	0.175	0.11	0.019	8%
15	12.60	0.60	0.43	0.192			0.9	12.28	12.85	0.58	0.17	0.192	0.173	0.10	0.017	7%
16	13.10	0.59	0.37	0.300			0.9	12.85	13.33	0.48	0.22	0.300	0.270	0.10	0.028	12%
17	13.55	0.57	0.32	0.248			0.9	13.33	13.73	0.40	0.25	0.248	0.223	0.10	0.022	9%
18	13.90	0.44	0.36	0.153			0.9	13.73	13.95	0.22	0.08	0.153	0.138	0.02	0.002	1%
19	14.00	0.50	0.31	0.323			0.9	13.95	14.30	0.35	0.19	0.323	0.291	0.07	0.019	8%
20	14.60	0.46	0.32	0.187			0.9	14.30	14.95	0.65	0.14	0.187	0.168	0.09	0.015	6%
21	15.30	0.43	0.32	0.232			0.9	14.95	15.65	0.70	0.11	0.232	0.209	0.08	0.016	7%
22	16.00	0.41	0.35	0.002			0.9	15.65	16.20	0.55	0.06	0.002	0.002	0.03	0.000	0%
LB	16.40	0.00	0.00	0.00	0.00	0.00	1.0	16.20	16.40	0.20	0.02	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>														<b>0.240</b>		

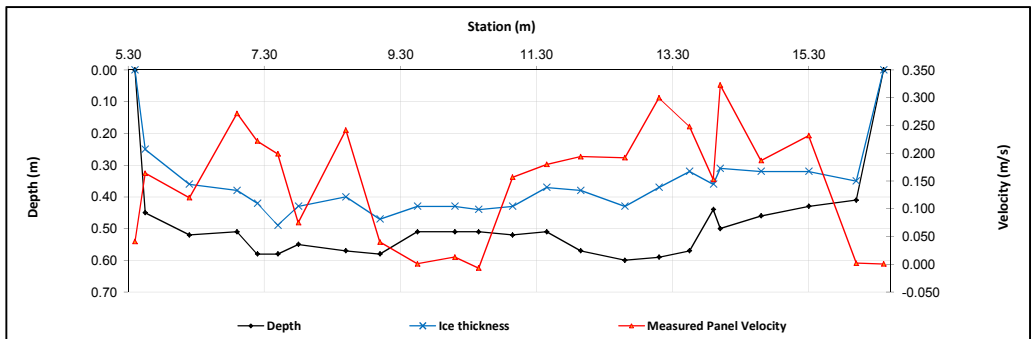
Measurement Details:	
Start Time (MST):	9:15
End Time (MST):	10:25
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Sunny, -1°C

Flow characteristics:	
Total Flow:	0.240 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.48 (m <sup>2</sup> )
Wetted Width:	11.00 (m)
Hydraulic Depth:	0.134 (m)
Mean Velocity:	0.163 (m/s)
Froude Number:	0.142

Logger Details:		
	Before	After
Transducer Reading (m):	0.612	-
Water (°C):	0.1	-
Battery (Main):	14.9	-
Datalogger Clock:	9:21	-
Laptop Clock:	9:21	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	20959	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	Good

Datalogger / Station Notes:	

General Notes:	
- Holes drilled DS of previous measurements	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S57-01			1.552	100.003	100.000	3/4" Pipe closest to logger
S57-02			1.591	99.964	99.961	3/4" Pipe 5 m W of logger
S57-03	1.495	101.555		100.060	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.681	97.874		
Water Level:			3.695	97.860		
Other:						
<b>Setup #2</b>						
S57-01	1.512	101.515		100.003	100.000	3/4" Pipe closest to logger
S57-02			1.550	99.965	99.961	3/4" Pipe 5 m W of logger
S57-03			1.453	100.062	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.640	97.875		
Water Level:			3.651	97.864		
Other:						

Closing Error	-0.002
WL Check	0.004

Average WL	97.862
Transducer Elevation Before	97.250
Transducer Elevation After	-

Field Personnel:	DW, TR	Trip Date:	1-Mar-13
Data Entry Personnel:	DW	Date:	1-Mar-13
Data Check Personnel:	TR	Date:	14-Mar-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

April 3, 2013



Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	3.80	0.00	0.00	0.000	0.000	0.000	0.9	3.80	4.05	0.25	0.05	0.038	0.034	0.01	0.000	0%
1	4.30	0.65	0.45	0.150			0.9	4.05	4.60	0.55	0.20	0.150	0.135	0.11	0.015	15%
2	4.90	0.65	0.50	0.212			0.9	4.60	5.20	0.60	0.15	0.212	0.191	0.09	0.017	17%
3	5.50	0.65	0.55	0.084			0.9	5.20	5.85	0.65	0.10	0.084	0.076	0.06	0.005	5%
4	6.20	0.70	0.50	0.101			0.9	5.85	6.43	0.58	0.20	0.101	0.091	0.12	0.010	10%
5	6.65	0.70	0.55	0.059			0.9	6.43	6.83	0.40	0.15	0.059	0.053	0.06	0.003	3%
6	7.00	0.70	0.50	-0.054			0.9	6.83	7.20	0.38	0.20	-0.054	-0.049	0.08	-0.004	-4%
7	7.40	0.70	0.55	0.030			0.9	7.20	7.63	0.43	0.15	0.030	0.027	0.06	0.002	2%
8	7.85	0.70	0.60	0.075			0.9	7.63	8.13	0.50	0.10	0.075	0.068	0.05	0.003	3%
9	8.40	0.75	0.50	0.139			0.9	8.13	8.60	0.48	0.25	0.139	0.125	0.12	0.015	15%
10	8.80	0.75	0.55	0.053			0.9	8.60	9.00	0.40	0.20	0.053	0.048	0.08	0.004	4%
11	9.20	0.75	0.55	-0.053			0.9	9.00	9.33	0.32	0.20	-0.053	-0.048	0.06	-0.003	-3%
12	9.45	0.75	0.55	0.075			0.9	9.33	9.63	0.30	0.20	0.075	0.068	0.06	0.004	4%
13	9.80	0.72	0.53	-0.040			0.9	9.63	10.00	0.38	0.19	-0.040	-0.036	0.07	-0.003	-3%
14	10.20	0.64	0.55	0.022			0.9	10.00	10.40	0.40	0.09	0.022	0.020	0.04	0.001	1%
15	10.60	0.70	0.40	0.191			0.9	10.40	10.80	0.40	0.30	0.191	0.172	0.12	0.021	20%
16	11.00	0.70	0.45	-0.078			0.9	10.80	11.30	0.50	0.25	-0.078	-0.070	0.13	-0.009	-9%
17	11.60	0.70	0.45	0.000			1.0	11.30	11.95	0.65	0.25	0.000	0.000	0.16	0.000	0%
18	12.30	0.60	0.43	0.167			1.0	11.95	12.65	0.70	0.17	0.167	0.150	0.12	0.018	18%
RB	13.00	0.00	0.00	0.00	0.00	0.00	1.0	12.65	13.00	0.35	0.04	0.042	0.042	0.01	0.001	1%
<b>Total Flow</b>														<b>0.101</b>		

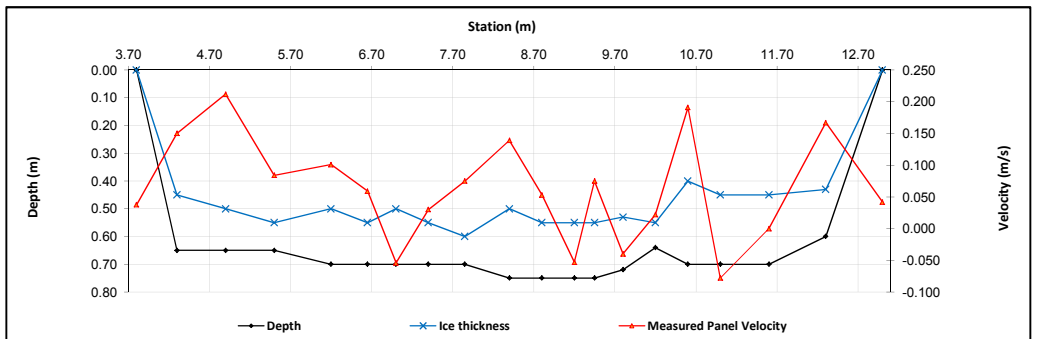
Measurement Details:	
Start Time (MST):	8:25
End Time (MST):	9:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Partial, windy, -3°C

Flow characteristics:		
Total Flow:	0.101	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.61	(m <sup>2</sup> )
Wetted Width:	9.20	(m)
Hydraulic Depth:	0.175	(m)
Mean Velocity:	0.063	(m/s)
Froude Number:	0.048	

Logger Details:		
Transducer Reading (m):	Before	After
	0.755	-
Water (°C):	0.1	-
Battery (Main):	14.5	-
Datalogger Clock:	8:32	-
Laptop Clock:	8:33	-
Enclosure Dessoricant:	Good	-
Logger# (if Δ):	20959	-
PT# (if Δ):	-	-
Vent Tube Dessoricant:	Good	-

Datalogger / Station Notes:	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S57-01	1.678	101.678		100.000	100.000	3/4" Pipe closest to logger
S57-02			1.717	99.961	99.961	3/4" Pipe 5 m W of logger
S57-03			1.618	100.060	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.618	98.060		
Water Level:			3.676	98.002		
Other:						
<b>Setup #2</b>						
S57-01			1.663	99.999	100.000	3/4" Pipe closest to logger
S57-02			1.701	99.961	99.961	3/4" Pipe 5 m W of logger
S57-03	1.602	101.662		100.060	100.060	3/4" Pipe 10 m W of logger
Ice/PT:			3.600	98.062		
Water Level:			3.660	98.002		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	98.002
Transducer Elevation Before	97.247
Transducer Elevation After	-

Field Personnel:		Trip Date:	3-Apr-13
Data Entry Personnel:	SM, CJ	Date:	3-Apr-13
Data Check Personnel:	TR	Date:	22-Apr-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: May 6, 2013  
 Site Visit Time (MST): 07:30

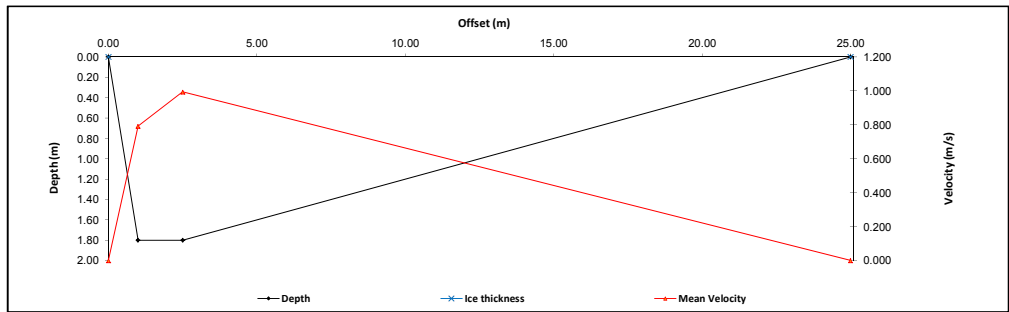


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	1.00	1.80				1.44	0.641	0.36	0.944	1.00	1.25	1.80	0.793	2.25	1.783	8%
2	2.50	1.80				1.44	0.738	0.36	1.250	1.00	12.00	1.80	0.994	21.60	21.470	92%
LB	25.00	0.00	0.00		0.000		0.000		0.000	1.00	11.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>23.3</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:00
Meas. End Time (MST):	8:15
Equipment:	ADV
Method:	Fishcat
River Condition:	Very high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, calm, 10°C



**Flow Characteristics:**

Total Flow:	23.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	23.85	(m <sup>2</sup> )
Wetted Width:	25.00	(m)
Hydraulic Depth:	0.95	(m)
Mean Velocity:	0.98	(m/s)
Froude Number:	0.32	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.136	2.157
Water (°C):	1.7	1.7
Datalogger Clock:	07:25	08:39
Laptop Clock:	07:24	08:40
Battery (Main):	14.6	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Banks are flooded

**General Notes:**

- Flow measurement discontinued due to safety concerns: deep, fast flow, logs coming down river

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S57-01
S57-01	1.417	101.417		100.000	100.000	3/4" Pipe closest to logger	S57-02
S57-02			1.455	99.962	99.961	3/4" Pipe 5 m W of logger	S57-03
S57-03			1.356	100.061	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:							WL
Water Level:			1.973	99.444	Time WL Surveyed:	7:47	S57-03
Other:							S57-02
<b>Setup #2</b>							S57-01
S57-01			1.402	99.998	100.000	3/4" Pipe closest to logger	
S57-02			1.440	99.960	99.961	3/4" Pipe 5 m W of logger	
S57-03	1.339	101.400		100.061	100.060	3/4" Pipe furthest (W) from logger	
Ice/PT:							
Water Level:			1.954	99.446	Time WL Surveyed:	7:49	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S57-01	1.402	101.402		100.000			
Water Level:			1.937	99.465	Time WL Surveyed:	8:34	
Water Level:			1.914	99.469	Time WL Surveyed:	8:36	
BM: S57-01	1.383	101.383		100.000			

**WL Survey Summary**

	Before	After
Average WL:	99.445	99.467
Transducer Elevation:	97.309	97.310
Closing Error:	0.002	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	23.3
Expected Discharge:	28.79
Shift from Existing Rating (m <sup>3</sup> /s):	5.49
Shift from Existing Rating (%):	24%

**Field Personnel:**

SM, DW	Trip Date:	6-May-13
Data Entry Personnel: SM	Date:	6-May-13
Data Check Personnel: TR	Date:	17-Jun-13
Entered Digitally in the Field: Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: June 8, 2013  
 Site Visit Time (MST): 09:30

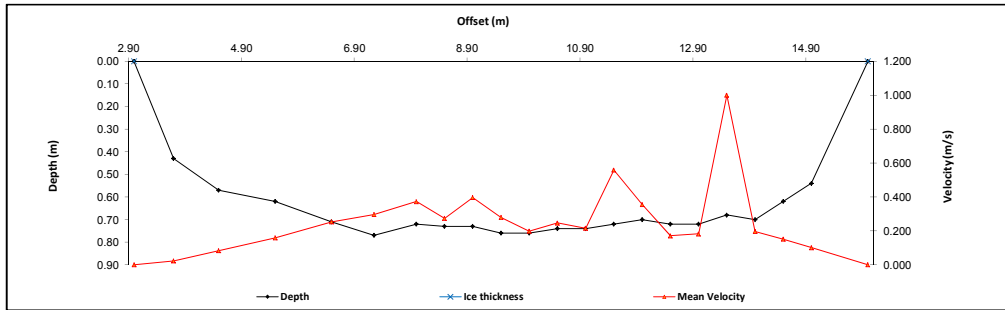


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.000				0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	3.70	0.43		0.26	0.023					1.00	0.75	0.43	0.023	0.32	0.007	0%
2	4.50	0.57		0.34	0.083					1.00	0.90	0.57	0.083	0.51	0.043	2%
3	5.50	0.62		0.37	0.159					1.00	1.00	0.62	0.159	0.62	0.099	5%
4	6.50	0.71		0.43	0.253					1.00	0.88	0.71	0.253	0.62	0.157	7%
5	7.25	0.77				0.62	0.231	0.15	0.361	1.00	0.75	0.77	0.296	0.58	0.171	8%
6	8.00	0.72		0.43	0.373					1.00	0.63	0.72	0.373	0.45	0.168	8%
7	8.50	0.73		0.44	0.274					1.00	0.50	0.73	0.274	0.37	0.100	5%
8	9.00	0.73		0.44	0.396					1.00	0.50	0.73	0.396	0.37	0.145	7%
9	9.50	0.76				0.61	0.281	0.15	0.278	1.00	0.50	0.76	0.280	0.38	0.106	5%
10	10.00	0.76				0.61	0.088	0.15	0.309	1.00	0.50	0.76	0.199	0.38	0.075	3%
11	10.50	0.74		0.44	0.246					1.00	0.50	0.74	0.246	0.37	0.091	4%
12	11.00	0.74		0.44	0.215					1.00	0.50	0.74	0.215	0.37	0.080	4%
13	11.50	0.72		0.43	0.558					1.00	0.50	0.72	0.558	0.36	0.201	9%
14	12.00	0.70		0.42	0.356					1.00	0.50	0.70	0.356	0.35	0.125	6%
15	12.50	0.72		0.43	0.171					1.00	0.50	0.72	0.171	0.36	0.062	3%
16	13.00	0.72		0.43	0.182					1.00	0.50	0.72	0.182	0.36	0.066	3%
17	13.50	0.68		0.41	0.189					1.00	0.50	0.68	1.000	0.34	0.340	16%
18	14.00	0.70		0.42	0.196					1.00	0.50	0.70	0.196	0.35	0.069	3%
19	14.50	0.62		0.37	0.151					1.00	0.50	0.62	0.151	0.31	0.047	2%
20	15.00	0.54		0.32	0.101					1.00	0.75	0.54	0.101	0.41	0.041	2%
LB	16.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.19</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST): 9:54  
 Meas. End Time (MST): 10:29  
 Equipment: ADV  
 Method: Wading  
 River Condition: Med flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Fair  
 Weather: Cloudy, 10°C



**Flow characteristics:**

Total Flow:	2.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	8.17	(m <sup>2</sup> )
Wetted Width:	13.00	(m)
Hydraulic Depth:	0.63	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.368	0.748
Water (°C):	14.5	14.6
Datalogger Clock:	09:38	10:43
Laptop Clock:	09:37	10:42
Battery (Main):	14.0	14.4
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS moved downstream during freshet, crew repositioned to original location

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S57-01
S57-01	1.284	101.284		100.000	100.000	3/4" Pipe closest to logger	S57-02
S57-02			1.323	99.961	99.961	3/4" Pipe 5 m W of logger	S57-03
S57-03			1.224	100.060	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:							WL
Water Level:			3.268	98.016		Time WL Surveyed: 9:45	S57-03
Other:							S57-02
<b>Setup #2</b>							S57-01
S57-01			1.264	100.000	100.000	3/4" Pipe closest to logger	
S57-02			1.303	99.961	99.961	3/4" Pipe 5 m W of logger	
S57-03	1.204	101.264		100.060	100.060	3/4" Pipe furthest (W) from logger	
Ice/PT:							
Water Level:			3.246	98.018		Time WL Surveyed: 9:46	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S57-01	1.264	101.264		100.000			
Water Level:			3.245	98.019		Time WL Surveyed: 10:39	
Water Level:			3.228	98.020		Time WL Surveyed: 10:40	
BM: S57-01	1.248	101.248		100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.017	98.020
Transducer Elevation:	97.649	97.272
Closing Error:	0.000	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	2.19
Expected Discharge:	2.11
Shift from Existing Rating (m <sup>3</sup> /s):	-0.08
Shift from Existing Rating (%):	-4%

**Field Personnel:**

SM, CJ	Trip Date:	8-Jun-13
SM	Date:	8-Jun-13
TR	Date:	17-Jun-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: August 17, 2013  
 Site Visit Time (MST): 11:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	1.50	0.54		0.32	-0.008					1.00	0.85	0.54	-0.008	0.46	-0.004	-1%
2	2.50	0.50		0.30	0.022					1.00	0.75	0.50	0.022	0.38	0.008	3%
3	3.00	0.54		0.32	0.032					1.00	0.50	0.54	0.032	0.27	0.009	3%
4	3.50	0.54		0.32	0.049					1.00	0.50	0.54	0.049	0.27	0.013	4%
5	4.00	0.56		0.34	0.054					1.00	0.50	0.56	0.054	0.28	0.015	5%
6	4.50	0.58		0.35	0.050					1.00	0.50	0.58	0.050	0.29	0.015	4%
7	5.00	0.61		0.37	0.070					1.00	0.50	0.61	0.070	0.31	0.021	6%
8	5.50	0.66		0.40	0.054					1.00	0.50	0.66	0.054	0.33	0.018	5%
9	6.00	0.62		0.37	0.071					1.00	0.50	0.62	0.071	0.31	0.022	7%
10	6.50	0.64		0.38	0.074					1.00	0.50	0.64	0.074	0.32	0.024	7%
11	7.00	0.60		0.36	0.078					1.00	0.50	0.60	0.078	0.30	0.023	7%
12	7.50	0.56		0.34	0.071					1.00	0.50	0.56	0.071	0.28	0.020	6%
13	8.00	0.56		0.34	0.078					1.00	0.50	0.56	0.078	0.28	0.022	7%
14	8.50	0.52		0.31	0.090					1.00	0.50	0.52	0.090	0.26	0.023	7%
15	9.00	0.52		0.31	0.078					1.00	0.50	0.52	0.078	0.26	0.020	6%
16	9.50	0.56		0.34	0.060					1.00	0.50	0.56	0.060	0.28	0.017	5%
17	10.00	0.54		0.32	0.062					1.00	0.50	0.54	0.062	0.27	0.017	5%
18	10.50	0.55		0.33	0.049					1.00	0.50	0.55	0.049	0.28	0.013	4%
19	11.00	0.55		0.33	0.041					1.00	0.50	0.55	0.041	0.28	0.011	3%
20	11.50	0.58		0.35	0.029					1.00	1.30	0.58	0.029	0.75	0.022	7%
LB	13.60	0.00	0.00		0.00		0.00		0.00	1.00	1.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.330</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from station

Meas. Start Time (MST):	11:45
Meas. End Time (MST):	12:10
Equipment:	ADV
Method:	Wading
River Condition:	slow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 24°C

**Flow characteristics:**

Total Flow:	0.330	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.44	(m <sup>2</sup> )
Wetted Width:	12.80	(m)
Hydraulic Depth:	0.50	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

**Logger Details:**

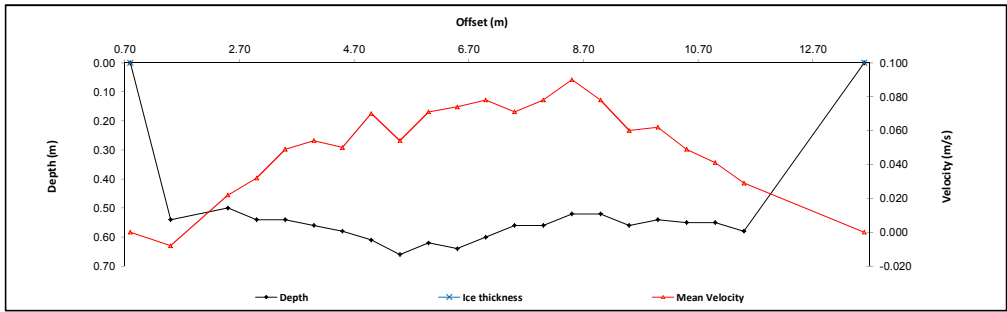
	Before	After
Transducer Reading (m):	0.494	0.500
Water (°C):	17.7	19.0
Datalogger Clock:	11:30	12:22
Laptop Clock:	11:30	12:23
Battery (Main):	13.6	13.6
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Re-positioned PLS

**General Notes:**

- Beaver seen US, suspected dam DS of station attributing to the observed low flow



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Station							
Setup #1							
S57-01			1.293	100.000	100.000	3/4" Pipe closest to logger	S57-03
S57-02			1.331	99.962	99.960	3/4" Pipe 5 m W of logger	S57-01
S57-03	1.233	101.293		100.060	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:							WL
Water Level:			3.383	97.910		Time WL Surveyed: 11:40	S57-01
Other:							S57-02
Setup #2							S57-03
S57-01	1.247	101.247		100.000	100.000	3/4" Pipe closest to logger	
S57-02			1.285	99.962	99.960	3/4" Pipe 5 m W of logger	
S57-03			1.187	100.060	100.060	3/4" Pipe 10 m W of logger	
Ice/PT:							
Water Level:			3.337	97.910		Time WL Surveyed: 11:42	
Other:							(must close survey loop on survey starting point)
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM:	S57-01	1.247	101.247	100.000		Time WL Surveyed: 12:15	
Water Level:			3.336	97.911		Time WL Surveyed: 12:17	
Water Level:			3.281	97.910			
BM	S57-01	1.191	101.191	100.000			

**WL Survey Summary**

	Before	After
Average WL:	97.910	97.911
Transducer Elevation:	97.416	97.411
Closing Error:	0.000	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	0.33
Expected Discharge:	1.25
Shift from Existing Rating (m <sup>3</sup> /s):	0.92
Shift from Existing Rating (%):	279%

**Field Personnel:**

TR, DW	Trip Date:	17-Aug-13
DW	Date:	17-Aug-13
TR	Date:	28-Aug-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: September 20, 2013  
 Site Visit Time (MST): 09:20

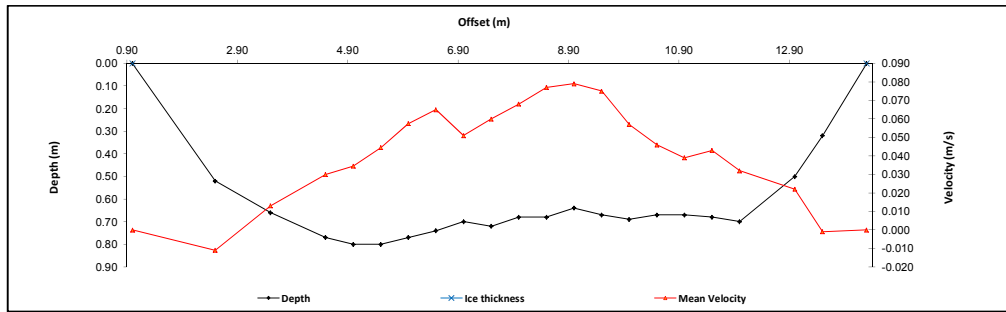


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	2.50	0.52		0.31	-0.011					1.00	1.25	0.52	-0.011	0.65	-0.007	-2%
2	3.50	0.66		0.40	0.013					1.00	1.00	0.66	0.013	0.66	0.009	3%
3	4.50	0.77				0.62	0.013	0.15	0.047	1.00	0.75	0.77	0.030	0.58	0.017	5%
4	5.00	0.80				0.64	0.016	0.16	0.053	1.00	0.50	0.80	0.035	0.40	0.014	4%
5	5.50	0.80				0.64	0.032	0.16	0.057	1.00	0.50	0.80	0.045	0.40	0.018	6%
6	6.00	0.77				0.62	0.049	0.15	0.066	1.00	0.50	0.77	0.058	0.39	0.022	7%
7	6.50	0.74		0.44	0.065					1.00	0.50	0.74	0.065	0.37	0.024	7%
8	7.00	0.70		0.42	0.051					1.00	0.50	0.70	0.051	0.35	0.018	6%
9	7.50	0.72		0.43	0.060					1.00	0.50	0.72	0.060	0.36	0.022	7%
10	8.00	0.68		0.41	0.068					1.00	0.50	0.68	0.068	0.34	0.023	7%
11	8.50	0.68		0.41	0.077					1.00	0.50	0.68	0.077	0.34	0.026	8%
12	9.00	0.64		0.38	0.079					1.00	0.50	0.64	0.079	0.32	0.025	8%
13	9.50	0.67		0.40	0.075					1.00	0.50	0.67	0.075	0.34	0.025	8%
14	10.00	0.69		0.41	0.057					1.00	0.50	0.69	0.057	0.35	0.020	6%
15	10.50	0.67		0.40	0.046					1.00	0.50	0.67	0.046	0.34	0.015	5%
16	11.00	0.67		0.40	0.039					1.00	0.50	0.67	0.039	0.34	0.013	4%
17	11.50	0.68		0.41	0.043					1.00	0.50	0.68	0.043	0.34	0.015	5%
18	12.00	0.70		0.42	0.032					1.00	0.75	0.70	0.032	0.53	0.017	5%
19	13.00	0.50		0.30	0.022					1.00	0.75	0.50	0.022	0.38	0.008	3%
20	13.50	0.32		0.19	-0.001					1.00	0.65	0.32	-0.001	0.21	0.000	0%
LB	14.30	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.323</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:35
Meas. End Time (MST):	10:03
Equipment:	ADV
Method:	Wading
River Condition:	High water level
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 12°C



**Flow characteristics:**

Total Flow:	0.323	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.95	(m <sup>2</sup> )
Wetted Width:	13.30	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.648	0.648
Water (°C):	9.4	9.6
Datalogger Clock:	09:24	10:11
Laptop Clock:	09:23	10:10
Battery (Main):	13.5	13.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV test results good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S57-01	1.349	101.349		100.000	100.000	3/4" Pipe closest to logger	S57-01
S57-02			1.388	99.961	99.960	3/4" Pipe 5 m W of logger	S57-02
S57-03			1.289	100.060	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:							WL
Water Level:			3.304	98.045		Time WL Surveyed: 9:30	S57-03
Other:							S57-02
<b>Setup #2</b>							
S57-01			1.335	100.000	100.000	3/4" Pipe closest to logger	S57-01
S57-02			1.374	99.961	99.960	3/4" Pipe 5 m W of logger	
S57-03	1.275	101.335		100.060	100.060	3/4" Pipe 10 m W of logger	
Ice/PT:							
Water Level:			3.286	98.049		Time WL Surveyed: 9:32	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S57-01	1.335	101.335		100.000		
Water Level:				3.290	98.045	Time WL Surveyed: 10:06	
Water Level:				3.274	98.047	Time WL Surveyed: 10:08	
BM:	S57-01	1.321	101.321		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.047	98.046
Transducer Elevation:	97.399	97.398
Closing Error:	0.000	-
WL Check:	0.004	-0.002

**Site Rating Information**

Measured Discharge:	0.323
Expected Discharge:	2.38
Shift from Existing Rating (m <sup>3</sup> /s):	2.06
Shift from Existing Rating (%):	637%

**Field Personnel:**

SM, TR	Trip Date:	20-Sep-13
SM	Date:	20-Sep-13
TR	Date:	2-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: October 24, 2013  
 Site Visit Time (MST): 11:00

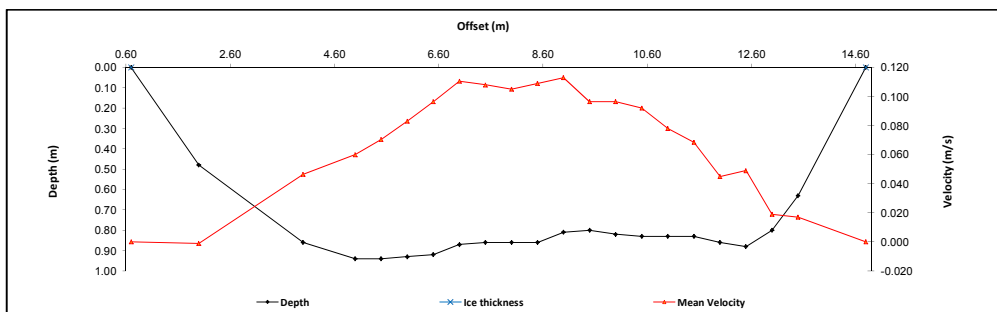


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.70	0.00	0.00		0.000		0.000		0.000	1.00	0.65	0.00	0.000	0.00	0.000	
1	2.00	0.48		0.29	-0.001					1.00	1.65	0.48	-0.001	0.79	-0.001	0%
2	4.00	0.86				0.69	0.046	0.17	0.047	1.00	1.50	0.86	0.047	1.29	0.060	9%
3	5.00	0.94				0.75	0.076	0.19	0.044	1.00	0.75	0.94	0.060	0.71	0.042	6%
4	5.50	0.94				0.75	0.048	0.19	0.093	1.00	0.50	0.94	0.071	0.47	0.033	5%
5	6.00	0.93				0.74	0.070	0.19	0.096	1.00	0.50	0.93	0.083	0.47	0.039	6%
6	6.50	0.92				0.74	0.087	0.18	0.106	1.00	0.50	0.92	0.097	0.46	0.044	6%
7	7.00	0.87				0.70	0.102	0.17	0.119	1.00	0.50	0.87	0.111	0.44	0.048	7%
8	7.50	0.86				0.69	0.103	0.17	0.113	1.00	0.50	0.86	0.108	0.43	0.046	7%
9	8.00	0.86				0.69	0.088	0.17	0.122	1.00	0.50	0.86	0.105	0.43	0.045	7%
10	8.50	0.86				0.69	0.096	0.17	0.122	1.00	0.50	0.86	0.109	0.43	0.047	7%
11	9.00	0.81				0.65	0.092	0.16	0.134	1.00	0.50	0.81	0.113	0.41	0.046	7%
12	9.50	0.80				0.64	0.064	0.16	0.129	1.00	0.50	0.80	0.097	0.40	0.039	6%
13	10.00	0.82				0.66	0.086	0.16	0.107	1.00	0.50	0.82	0.097	0.41	0.040	6%
14	10.50	0.83				0.66	0.078	0.17	0.106	1.00	0.50	0.83	0.092	0.42	0.038	6%
15	11.00	0.83				0.66	0.073	0.17	0.083	1.00	0.50	0.83	0.078	0.42	0.032	5%
16	11.50	0.83				0.66	0.068	0.17	0.069	1.00	0.50	0.83	0.069	0.42	0.028	4%
17	12.00	0.86				0.69	0.042	0.17	0.049	1.00	0.50	0.86	0.045	0.43	0.019	3%
18	12.50	0.88				0.70	0.038	0.18	0.060	1.00	0.50	0.88	0.049	0.44	0.022	3%
19	13.00	0.80				0.64	0.008	0.16	0.030	1.00	0.50	0.80	0.019	0.40	0.008	1%
20	13.50	0.63	0.38		0.017					1.00	0.90	0.63	0.017	0.57	0.010	1%
LB	14.80	0.00	0.00		0.00		0.00		0.00	1.00	0.65	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.685</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3 m US of PT

Meas. Start Time (MST):	11:20
Meas. End Time (MST):	11:58
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P. cloudy, calm, 6°C



**Flow characteristics:**

Total Flow:	0.685	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.20	(m <sup>2</sup> )
Wetted Width:	14.10	(m)
Hydraulic Depth:	0.72	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.93	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.805	0.806
Water (°C):	3.6	3.8
Datalogger Clock:	11:01	11:59
Laptop Clock:	11:00	11:59
Battery (Main):	14.2	13.3
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S57-01
S57-01	1.388	101.388		100.000	100.000	3/4" Pipe closest to logger	S57-03
S57-02			1.427	99.961	99.960	3/4" Pipe 5 m W of logger	S57-02
S57-03			1.328	100.060	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:							
Water Level:			3.196	98.192		Time WL Surveyed: 11:13	S57-02
Other:							S57-03
<b>Setup #2</b>							S57-01
S57-01			1.373	100.000	100.000	3/4" Pipe closest to logger	
S57-02	1.412	101.373		99.961	99.960	3/4" Pipe 5 m W of logger	
S57-03			1.313	100.060	100.060	3/4" Pipe 10 m W of logger	
Ice/PT:							
Water Level:			3.179	98.194		Time WL Surveyed: 11:15	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S57-01	1.374	101.374		100.000			
Water Level:			3.178	98.196		Time WL Surveyed: 12:02	
Water Level:			3.167	98.200		Time WL Surveyed: 12:03	
BM: S57-01	1.367	101.367		100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.193	98.198
Transducer Elevation:	97.388	97.392
Closing Error:	0.000	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	0.685
Expected Discharge:	3.91
Shift from Existing Rating (m <sup>3</sup> /s):	3.23
Shift from Existing Rating (%):	471%

**Field Personnel:**

Field Personnel:	DW, TR	Trip Date:	24-Oct-13
Data Entry Personnel:	DW	Date:	24-Oct-13
Data Check Personnel:	TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: December 10, 2013  
 Site Visit Time (MST): 10:40

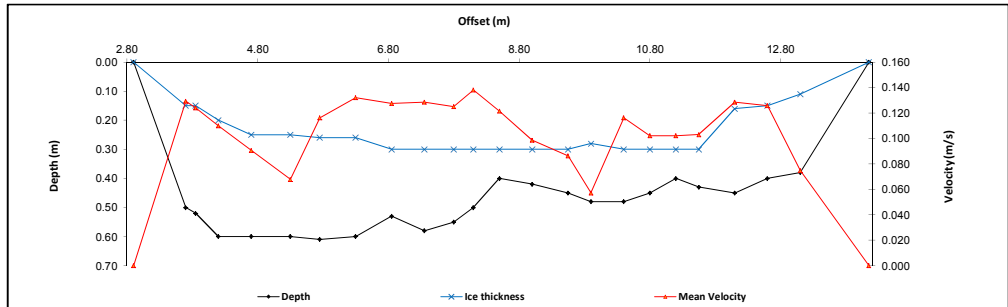


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000				0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	3.70	0.50	0.15	0.33	0.147				0.88	0.48	0.35	0.129	0.17	0.022	8%	
2	3.85	0.52	0.15	0.34	0.141				0.88	0.25	0.37	0.124	0.09	0.011	4%	
3	4.20	0.60	0.20	0.40	0.125				0.88	0.43	0.40	0.110	0.17	0.019	7%	
4	4.70	0.60	0.25	0.43	0.103				0.88	0.55	0.35	0.091	0.19	0.017	6%	
5	5.30	0.60	0.25	0.43	0.077				0.88	0.53	0.35	0.068	0.18	0.012	4%	
6	5.75	0.61	0.26	0.44	0.132				0.88	0.50	0.35	0.116	0.18	0.020	7%	
7	6.30	0.60	0.26	0.43	0.150				0.88	0.55	0.34	0.132	0.19	0.025	9%	
8	6.85	0.53	0.30	0.42	0.145				0.88	0.53	0.23	0.128	0.12	0.015	6%	
9	7.35	0.58	0.30	0.44	0.146				0.88	0.48	0.28	0.128	0.13	0.017	6%	
10	7.80	0.55	0.30	0.43	0.142				0.88	0.38	0.25	0.125	0.09	0.012	4%	
11	8.10	0.50	0.30	0.40	0.157				0.88	0.35	0.20	0.138	0.07	0.010	3%	
12	8.50	0.40	0.30	0.35	0.138				0.88	0.45	0.10	0.121	0.04	0.005	2%	
13	9.00	0.42	0.30	0.36	0.112				0.88	0.53	0.12	0.099	0.06	0.006	2%	
14	9.55	0.45	0.30	0.38	0.098				0.88	0.45	0.15	0.086	0.07	0.006	2%	
15	9.90	0.48	0.28	0.38	0.065				0.88	0.42	0.20	0.057	0.08	0.005	2%	
16	10.40	0.48	0.30	0.39	0.132				0.88	0.45	0.18	0.116	0.08	0.009	3%	
17	10.80	0.45	0.30	0.38	0.116				0.88	0.40	0.15	0.102	0.06	0.006	2%	
18	11.20	0.40	0.30	0.35	0.116				0.88	0.38	0.10	0.102	0.04	0.004	1%	
19	11.55	0.43	0.30	0.37	0.117				0.88	0.45	0.13	0.103	0.06	0.006	2%	
20	12.10	0.45	0.16	0.31	0.146				0.88	0.53	0.29	0.128	0.15	0.020	7%	
21	12.60	0.40	0.15	0.28	0.143				0.88	0.50	0.25	0.126	0.13	0.016	6%	
22	13.10	0.38	0.11	0.25	0.085				0.88	0.78	0.27	0.075	0.21	0.016	6%	
LB	14.15	0.00	0.00		0.00		0.00		0.88	0.53	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.279</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
2 m US of PT

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	11:43
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -25°C



**Flow characteristics:**

Total Flow:	0.279	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.57	(m <sup>2</sup> )
Wetted Width:	11.25	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.426	0.426
Water (°C):	0.2	0.2
Datalogger Clock:	10:56	12:00
Laptop Clock:	10:56	11:59
Battery (Main):	13.0	13.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S57-01
S57-01	1.451	101.451		100.000	100.000	3/4" Pipe closest to logger	S57-02
S57-02			1.488	99.963	99.960	3/4" Pipe 5 m W of logger	S57-03
S57-03			1.389	100.062	100.060	3/4" Pipe 10 m W of logger	WL
Ice/PT:			3.569	97.882			Ice
Water Level:			3.645	97.806			Ice
Other:							WL
<b>Setup #2</b>							S57-03
S57-01			1.415	100.001	100.000	3/4" Pipe closest to logger	S57-02
S57-02			1.453	99.963	99.960	3/4" Pipe 5 m W of logger	S57-01
S57-03	1.354	101.416		100.062	100.060	3/4" Pipe 10 m W of logger	
Ice/PT:			3.536	97.880			
Water Level:			3.610	97.806			
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S57-01	1.415	101.415		100.000			
Water Level:			3.621	97.794			Time WL Surveyed: 11:52
Water Level:			3.596	97.797			Time WL Surveyed: 11:55
BM: S57-01	1.393	101.393		100.000			

**WL Survey Summary**

	Before	After
Average WL:	97.806	97.796
Transducer Elevation:	97.380	97.370
Closing Error:	-0.001	-
WL Check:	0.000	-0.003

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

Field Personnel:	TR, CJ	Trip Date:	10-Dec-13
Data Entry Personnel:	CJ	Date:	10-Dec-13
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date:

February 11, 2013



## Flow Measurement:

Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.40	4.58	0.18	0.09	0.000	0.000	0.02	0.000	0%
1	4.75	0.50	0.15	0.000			1.0	4.58	4.90	0.33	0.35	0.000	0.000	0.11	0.000	0%
2	5.05	0.80	0.17	0.011			0.9	4.90	5.25	0.35	0.63	0.011	0.010	0.22	0.002	3%
3	5.45	1.15	0.23		0.015	0.011	1.0	5.25	5.58	0.33	0.92	0.013	0.013	0.30	0.004	6%
4	5.70	1.20	0.20	0.015	0.001		1.0	5.58	5.80	0.23	1.00	0.008	0.008	0.23	0.002	3%
5	5.90	1.30	0.25	0.016	-0.002		1.0	5.80	6.08	0.27	1.05	0.007	0.007	0.29	0.002	3%
6	6.25	1.30	0.27	0.022	0.020		1.0	6.08	6.30	0.23	1.03	0.021	0.021	0.23	0.005	7%
7	6.35	1.30	0.35	0.018	0.018		1.0	6.30	6.45	0.15	0.95	0.018	0.018	0.14	0.003	4%
8	6.55	1.40	0.35	0.004	0.019		1.0	6.45	6.75	0.30	1.05	0.012	0.012	0.32	0.004	6%
9	6.95	1.35	0.35	0.016	0.013		1.0	6.75	7.13	0.38	1.00	0.015	0.015	0.38	0.005	8%
10	7.30	1.35	0.35	0.016	0.004		1.0	7.13	7.45	0.32	1.00	0.010	0.010	0.32	0.003	5%
11	7.60	1.35	0.35	0.016	0.018		1.0	7.45	7.73	0.28	1.00	0.017	0.017	0.28	0.005	7%
12	7.85	1.30	0.35	0.017	0.020		1.0	7.73	8.00	0.28	0.95	0.019	0.019	0.26	0.005	7%
13	8.15	1.25	0.35	0.014	0.016		1.0	8.00	8.20	0.20	0.90	0.015	0.015	0.18	0.003	4%
14	8.25	1.20	0.35	0.021	0.020		1.0	8.20	8.43	0.23	0.85	0.021	0.021	0.19	0.004	6%
15	8.60	1.20	0.35	0.016	0.019		1.0	8.43	8.68	0.25	0.85	0.018	0.018	0.21	0.004	6%
16	8.75	1.10	0.35		0.021	0.018	1.0	8.68	8.93	0.25	0.75	0.020	0.020	0.19	0.004	6%
17	9.10	1.10	0.30	0.015			0.9	8.93	9.33	0.40	0.80	0.015	0.014	0.32	0.004	7%
18	9.55	1.00	0.25	0.015			0.9	9.33	9.65	0.33	0.75	0.015	0.014	0.24	0.003	5%
19	9.75	0.90	0.25	0.018			0.9	9.65	9.93	0.28	0.65	0.018	0.016	0.18	0.003	4%
20	10.10	0.80	0.23	0.007			0.9	9.93	10.30	0.38	0.57	0.007	0.008	0.21	0.001	2%
LB	10.50	0.00	0.00	0.00	0.00	0.00	1.0	10.30	10.50	0.20	0.14	0.002	0.002	0.03	0.000	0%
<b>Total Flow</b>														<b>0.065</b>		

## Measurement Details:

Start Time (MST):	15:20
End Time (MST):	16:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, Calm, 0°C

## Flow characteristics:

Total Flow:	0.065	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.84	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.794	(m)
Mean Velocity:	0.013	(m/s)
Froude Number:	0.005	

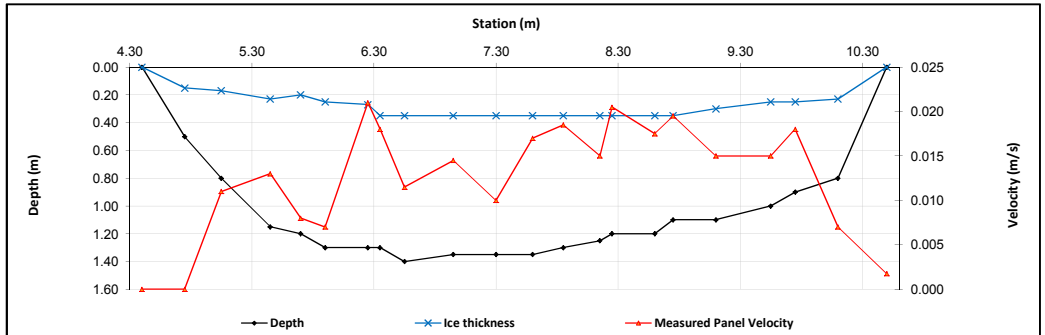
## Logger Details:

	Before	After
Transducer Reading (m):	1.127	-
Water (°C):	0.4	-
Battery (Main):	12.5	14.06
Datalogger Clock:	15:25	-
Laptop Clock:	15:24	-
Enclosure Dessicant:	Replaced	-
Logger# (if Δ):	20953	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	Replaced	-

## Datalogger / Station Notes:

Replaced battery, wired modem to SW12  
Slush present in water column

## General Notes:



## Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
S58-01			1.248	100.000	100.000	3/4" Pipe W of logger
S58-02	1.376	101.248		99.872	99.872	3/4" Pipe SW of logger
S58-03			1.385	99.863	99.865	3/4" Pipe S of logger
Ice/PT:			2.128	99.120		
Water Level:			2.263	98.985		
Other:						
<b>Setup #2</b>						
S58-01	1.235	101.235		100.000	100.000	3/4" Pipe W of logger
S58-02			1.364	99.871	99.872	3/4" Pipe SW of logger
S58-03			1.372	99.863	99.865	3/4" Pipe S of logger
Ice/PT:			2.115	99.120		
Water Level:			2.247	98.988		
Other:						

Closing Error	0.001
WL Check	0.003

Average WL	98.987
Transducer Elevation Before	97.880
Transducer Elevation After	-

Field Personnel:	TR, SM	Trip Date:	11-Feb-13
Data Entry Personnel:	TR	Date:	11-Feb-13
Data Check Personnel:	TR	Date:	28-Feb-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: May 15, 2013  
 Site Visit Time (MST): 15:15

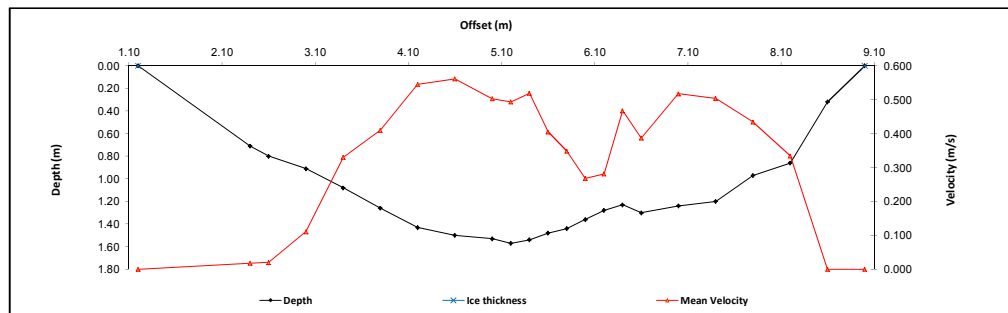


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.20	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	2.40	0.71		0.43	0.018					1.00	0.70	0.71	0.018	0.50	0.009	0%
2	2.60	0.80				0.64	-0.033	0.16	0.074	1.00	0.30	0.80	0.021	0.24	0.005	0%
3	3.00	0.91				0.73	-0.079	0.18	0.301	1.00	0.40	0.91	0.111	0.36	0.040	1%
4	3.40	1.08				0.86	0.189	0.22	0.471	1.00	0.40	1.08	0.330	0.43	0.143	5%
5	3.80	1.26				1.01	0.344	0.25	0.476	1.00	0.40	1.26	0.410	0.50	0.207	7%
6	4.20	1.43				1.14	0.543	0.29	0.548	1.00	0.40	1.43	0.546	0.57	0.312	10%
7	4.60	1.50				1.20	0.557	0.30	0.566	1.00	0.40	1.50	0.562	0.60	0.337	11%
8	5.00	1.53				1.22	0.398	0.31	0.607	1.00	0.30	1.53	0.503	0.46	0.231	8%
9	5.20	1.57				1.26	0.371	0.31	0.616	1.00	0.20	1.57	0.494	0.31	0.155	5%
10	5.40	1.54				1.23	0.415	0.31	0.622	1.00	0.20	1.54	0.519	0.31	0.160	5%
11	5.60	1.48				1.18	0.248	0.30	0.562	1.00	0.20	1.48	0.405	0.30	0.120	4%
12	5.80	1.44				1.15	0.058	0.29	0.639	1.00	0.20	1.44	0.349	0.29	0.100	3%
13	6.00	1.36				1.09	-0.082	0.27	0.618	1.00	0.20	1.36	0.268	0.27	0.073	2%
14	6.20	1.28				1.02	0.040	0.26	0.522	1.00	0.20	1.28	0.281	0.26	0.072	2%
15	6.40	1.23				0.98	0.389	0.25	0.546	1.00	0.20	1.23	0.468	0.25	0.115	4%
16	6.60	1.30				1.04	0.292	0.26	0.492	1.00	0.30	1.30	0.387	0.39	0.151	5%
17	7.00	1.24				0.99	0.575	0.25	0.460	1.00	0.40	1.24	0.518	0.50	0.257	9%
18	7.40	1.20				0.96	0.546	0.24	0.461	1.00	0.40	1.20	0.504	0.48	0.242	8%
19	7.80	0.97				0.78	0.480	0.19	0.389	1.00	0.40	0.97	0.435	0.39	0.169	6%
20	8.20	0.86				0.69	0.373	0.17	0.296	1.00	0.40	0.86	0.335	0.34	0.115	4%
21	8.60	0.32		0.19	0.000					1.00	0.40	0.32	0.000	0.13	0.000	0%
RB	9.00	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.01</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Under bridge

Meas. Start Time (MST):	16:05
Meas. End Time (MST):	17:10
Equipment:	ADV
Method:	Fishcat
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 20°C



**Flow characteristics:**

Total Flow:	3.01	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.87	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	1.01	(m)
Mean Velocity:	0.38	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.632	1.631
Water (°C):	12.4	12.7
Datalogger Clock:	15:43	17:27
Laptop Clock:	15:43	17:27
Battery (Main):	13.7	12.7
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

High water

**General Notes:**

- Gravel substrate below bridge, better for measurement than the silt US of station
- Flooded banks have weeds effecting flow

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S58-01			0.983	99.998	100.000	3/4" Pipe W of logger	S58-02
S58-02	1.109	100.981		99.872	99.872	3/4" Pipe SW of logger	S58-01
S58-03			1.118	99.863	99.865	3/4" Pipe S of logger	WL
Ice/PT:							WL
Water Level:			1.502	99.479		Time WL Surveyed: 15:36	S58-01
Other:							S58-03
<b>Setup #2</b>							S58-02
S58-01	0.967	100.965		99.998	100.000	3/4" Pipe W of logger	
S58-02			1.092	99.873	99.872	3/4" Pipe SW of logger	
S58-03			1.101	99.864	99.865	3/4" Pipe S of logger	
Ice/PT:							
Water Level:			1.486	99.479		Time WL Surveyed: 15:37	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S58-03	1.102	100.965		99.863		
Water Level:			1.486	99.479		Time WL Surveyed: 17:30	
Water Level:			1.472	99.477		Time WL Surveyed: 17:31	
BM:	S58-03	1.086	100.949		99.863		

**WL Survey Summary**

	Before	After
Average WL:	99.479	99.478
Transducer Elevation:	97.847	97.847
Closing Error:	-0.001	-
WL Check:	0.000	0.002

**Site Rating Information**

Measured Discharge:	3.01
Expected Discharge:	3.02
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	0%

**Field Personnel:**

TR, DW	Trip Date:	15-May-13
DW	Date:	15-May-13
TR	Date:	17-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: June 8, 2013  
 Site Visit Time (MST): 16:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00			0.000		0.000		0.000	1.00						
1				0.00						1.00						
2				0.00						1.00						
3				0.00						1.00						
4				0.00						1.00						
5				0.00						1.00						
6				0.00						1.00						
7				0.00						1.00						
8				0.00						1.00						
9				0.00						1.00						
10				0.00						1.00						
11				0.00						1.00						
12				0.00						1.00						
13				0.00						1.00						
14				0.00						1.00						
15				0.00						1.00						
16				0.00						1.00						
17				0.00						1.00						
18				0.00						1.00						
19				0.00						1.00						
20				0.00						1.00						
21				0.00						1.00						
22				0.00						1.00						
23				0.00						1.00						
24				0.00						1.00						
25				0.00						1.00						
26				0.00						1.00						
27				0.00						1.00						
28				0.00						1.00						
29				0.00						1.00						
30				0.00						1.00						
LB	0.00	0.00			0.00		0.00		0.00	1.00	0.00	0.00	0.000	0.00	0.000	0%

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):

Meas. End Time (MST):

Equipment:

Method:

River Condition:

Channel Edges:

Quality/Error (see reverse):

Weather:

**Flow characteristics:**

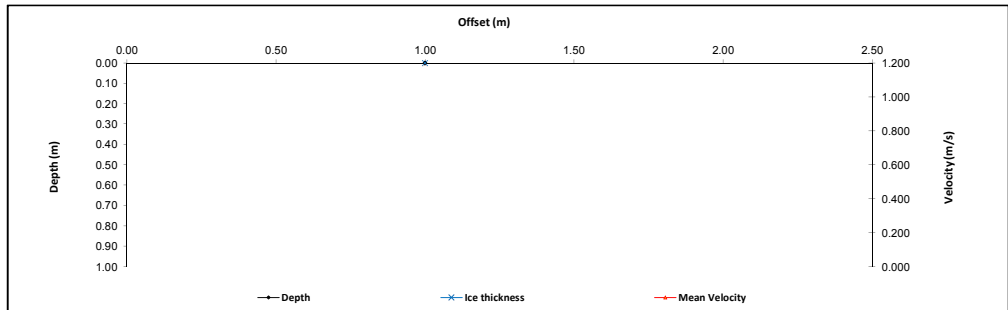
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.015	-
Water (°C):	15.8	-
Datalogger Clock:	15:51	-
Laptop Clock:	15:51	-
Battery (Main):	13.8	-
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S58-02
S58-01			1.725	99.997	100.000	3/4" Pipe W of logger	S58-03
S58-02	1.850	101.722		99.872	99.872	3/4" Pipe SW of logger	S58-01
S58-03					99.865	3/4" Pipe S of logger	WL
Ice/PT:							WL
Water Level:		2.841		98.881		Time WL Surveyed: 16:41	S58-01
Other:							S58-03
<b>Setup #2</b>							S58-02
S58-01	1.708	101.705		99.997	100.000	3/4" Pipe W of logger	
S58-02			1.835	99.870	99.872	3/4" Pipe SW of logger	
S58-03					99.865	3/4" Pipe S of logger	
Ice/PT:							
Water Level:		2.828		98.877		Time WL Surveyed: 16:43	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:						Time WL Surveyed:	
Water Level:						Time WL Surveyed:	
Water Level:							
BM:							

**WL Survey Summary**

	Before	After
Average WL:	99.879	-
Transducer Elevation:	97.864	-
Closing Error:	0.002	-
WL Check:	0.004	-

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

<b>Field Personnel:</b>	SM, CJ	Trip Date:	8-Jun-13
<b>Data Entry Personnel:</b>	SM	Date:	8-Jun-13
<b>Data Check Personnel:</b>	TR	Date:	17-Jun-13
<b>Entered Digitally in the Field:</b>	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: July 2, 2013  
 Site Visit Time (MST): 12:45

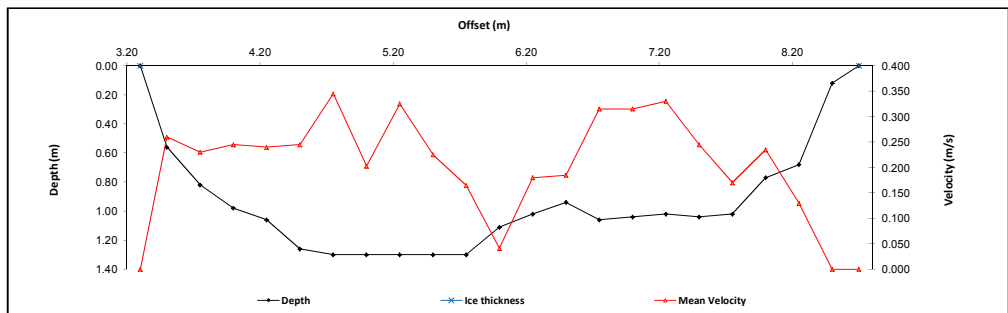


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.50	0.56		0.34	0.260		0.210	0.16	0.250	1.00	0.23	0.56	0.260	0.13	0.033	3%
2	3.75	0.82				0.66	0.230	0.20	0.260	1.00	0.25	0.82	0.230	0.21	0.047	4%
3	4.00	0.98				0.78	0.240	0.21	0.240	1.00	0.25	0.98	0.245	0.25	0.060	5%
4	4.25	1.06				0.85	0.260	0.25	0.230	1.00	0.25	1.06	0.240	0.27	0.064	5%
5	4.50	1.26				1.01	0.320	0.26	0.370	1.00	0.25	1.26	0.245	0.32	0.077	6%
6	4.75	1.30				1.04	0.320	0.26	0.370	1.00	0.25	1.30	0.345	0.33	0.112	9%
7	5.00	1.30				1.04	0.340	0.26	0.310	1.00	0.25	1.30	0.203	0.33	0.066	5%
8	5.25	1.30				1.04	0.340	0.26	0.310	1.00	0.25	1.30	0.325	0.33	0.106	9%
9	5.50	1.30				1.04	0.100	0.26	0.350	1.00	0.25	1.30	0.225	0.33	0.073	6%
10	5.75	1.30				1.04	-0.020	0.26	0.350	1.00	0.25	1.30	0.165	0.33	0.054	4%
11	6.00	1.11				0.89	0.060	0.22	0.022	1.00	0.25	1.11	0.041	0.28	0.011	1%
12	6.25	1.02				0.82	0.060	0.20	0.300	1.00	0.25	1.02	0.180	0.26	0.046	4%
13	6.50	0.94				0.75	0.060	0.19	0.310	1.00	0.25	0.94	0.185	0.24	0.043	4%
14	6.75	1.06				0.85	0.280	0.21	0.350	1.00	0.25	1.06	0.315	0.27	0.083	7%
15	7.00	1.04				0.83	0.280	0.21	0.350	1.00	0.25	1.04	0.315	0.26	0.082	7%
16	7.25	1.02				0.82	0.310	0.20	0.350	1.00	0.25	1.02	0.330	0.26	0.084	7%
17	7.50	1.04				0.83	0.260	0.21	0.230	1.00	0.25	1.04	0.245	0.26	0.064	5%
18	7.75	1.02				0.82	0.110	0.20	0.230	1.00	0.25	1.02	0.170	0.26	0.043	4%
19	8.00	0.77				0.82	0.250	0.15	0.220	1.00	0.25	0.77	0.235	0.19	0.045	4%
20	8.25	0.68		0.41	0.130					1.00	0.25	0.68	0.130	0.17	0.022	2%
21	8.50	0.12		0.07	0.000					1.00	0.23	0.12	0.000	0.03	0.000	0%
RB	8.70	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.22</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Under bridge

Meas. Start Time (MST):	13:04
Meas. End Time (MST):	13:30
Equipment:	Marsh McBirney
Method:	Fishcat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 30°C



**Flow characteristics:**

Total Flow:	1.22	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.23	(m <sup>2</sup> )
Wetted Width:	5.20	(m)
Hydraulic Depth:	1.01	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.438	1.441
Water (°C):	22.7	23.9
Datalogger Clock:	12:46	16:24
Laptop Clock:	12:46	16:24
Battery (Main):	13.3	13.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Time 16:24, SL flow 1.135
- SL appears operational

**General Notes:**

- DSL elevation 2.094 m, moved to 2.276 m

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S58-01			0.982	99.998	100.000	3/4" Pipe W of logger	S58-02
S58-02	1.108	100.980		99.872	99.872	3/4" Pipe SW of logger	S58-01
S58-03			1.116	99.864	99.865	3/4" Pipe S of logger	WL
Ice/PT:							WL
Water Level:			1.729	99.251		Time WL Surveyed: 12:53	S58-01
Other:							S58-03
<b>Setup #2</b>							S58-02
S58-01	0.967	100.965		99.998	100.000	3/4" Pipe W of logger	
S58-02			1.093	99.872	99.872	3/4" Pipe SW of logger	
S58-03			1.102	99.863	99.865	3/4" Pipe S of logger	
Ice/PT:							
Water Level:			1.714	99.251		Time WL Surveyed: 12:56	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S58-03	1.102	100.966		99.864			
Water Level:			1.718	99.248		Time WL Surveyed: 13:42	
Water Level:			1.707	99.249		Time WL Surveyed: 13:43	
BM: S58-03	1.092	100.956		99.864			

**WL Survey Summary**

	Before	After
Average WL:	99.251	99.249
Transducer Elevation:	97.813	97.808
Closing Error:	0.000	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	1.22
Expected Discharge:	1.35
Shift from Existing Rating (m <sup>3</sup> /s):	0.13
Shift from Existing Rating (%):	11%

**Field Personnel:**

SM, TR	Trip Date:	2-Jul-13
SM	Date:	2-Jul-13
TR	Date:	19-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: August 20, 2013  
 Site Visit Time (MST): 12:50

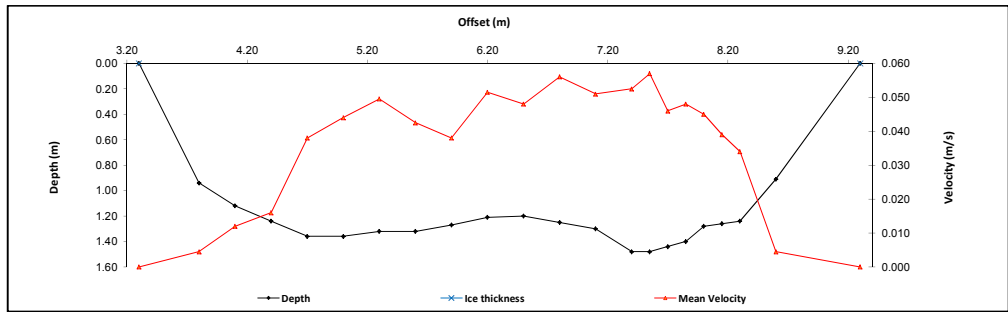


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.80	0.94				0.75	0.004	0.19	0.005	1.00	0.40	0.94	0.005	0.38	0.002	1%
2	4.10	1.12				0.90	0.006	0.22	0.018	1.00	0.30	1.12	0.012	0.34	0.004	2%
3	4.40	1.24				0.99	0.005	0.25	0.027	1.00	0.30	1.24	0.016	0.37	0.006	2%
4	4.70	1.36				1.09	0.028	0.27	0.048	1.00	0.30	1.36	0.038	0.41	0.016	6%
5	5.00	1.36				1.09	0.039	0.27	0.049	1.00	0.30	1.36	0.044	0.41	0.018	7%
6	5.30	1.32				1.06	0.050	0.26	0.049	1.00	0.30	1.32	0.050	0.40	0.020	8%
7	5.60	1.32				1.06	0.046	0.26	0.039	1.00	0.30	1.32	0.043	0.40	0.017	7%
8	5.90	1.27				1.02	0.035	0.25	0.041	1.00	0.30	1.27	0.038	0.38	0.014	6%
9	6.20	1.21				0.97	0.049	0.24	0.054	1.00	0.30	1.21	0.052	0.36	0.019	7%
10	6.50	1.20				0.96	0.044	0.24	0.052	1.00	0.30	1.20	0.048	0.36	0.017	7%
11	6.80	1.25				1.00	0.058	0.25	0.054	1.00	0.30	1.25	0.056	0.37	0.021	8%
12	7.10	1.30				1.04	0.052	0.26	0.050	1.00	0.30	1.30	0.051	0.39	0.020	8%
13	7.40	1.48				1.18	0.049	0.30	0.056	1.00	0.23	1.48	0.053	0.33	0.017	7%
14	7.55	1.48				1.18	0.054	0.30	0.060	1.00	0.15	1.48	0.057	0.22	0.013	5%
15	7.70	1.44				1.15	0.058	0.29	0.034	1.00	0.15	1.44	0.046	0.22	0.010	4%
16	7.85	1.44				1.12	0.052	0.28	0.044	1.00	0.15	1.40	0.048	0.21	0.010	4%
17	8.00	1.28				1.02	0.048	0.26	0.042	1.00	0.15	1.28	0.045	0.19	0.009	3%
18	8.15	1.26				1.01	0.037	0.25	0.041	1.00	0.15	1.26	0.039	0.19	0.007	3%
19	8.30	1.24				0.99	0.041	0.25	0.027	1.00	0.22	1.24	0.034	0.28	0.009	4%
20	8.60	0.91				0.73	0.003	0.18	0.006	1.00	0.50	0.91	0.005	0.46	0.002	1%
RB	9.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.251</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:45
Equipment:	ADV
Method:	Fishcat
River Condition:	Med flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 23°C



**Flow characteristics:**

Total Flow:	0.251	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.66	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	1.11	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.143	1.143
Water (°C):	16.1	16.9
Datalogger Clock:	12:10	13:58
Laptop Clock:	12:10	12:58
Battery (Main):	13.7	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- SL flow showing 0.22 to 0.32
- Removed weeds and growth around SL

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S58-01			0.895	99.999	100.000	3/4" Pipe W of logger	S58-02
S58-02	1.022	100.894		99.872	99.872	3/4" Pipe SW of logger	S58-03
S58-03			1.029	99.865	99.865	3/4" Pipe S of logger	WL
Ice/PT:							WL
Water Level:			1.947	98.947		Time WL Surveyed: 12:47	S58-03
Other:							S58-01
<b>Setup #2</b>							S58-02
S58-01			0.885	99.999	100.000	3/4" Pipe W of logger	
S58-02			1.012	99.872	99.872	3/4" Pipe SW of logger	
S58-03	1.019	100.884		99.865	99.865	3/4" Pipe S of logger	
Ice/PT:							
Water Level:			1.937	98.947		Time WL Surveyed: 12:49	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S58-03	1.019	100.884		99.865		
Water Level:			1.936	98.948		Time WL Surveyed: 13:53	
Water Level:			1.925	98.947		Time WL Surveyed: 13:55	
BM:	S58-03	1.007	100.872		99.865		

**WL Survey Summary**

	Before	After
Average WL:	98.947	98.948
Transducer Elevation:	97.804	97.805
Closing Error:	0.000	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	0.251
Expected Discharge:	0.25
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, DW	Trip Date:	20-Aug-13
SM	Date:	20-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: September 9, 2013  
 Site Visit Time (MST): 15:10

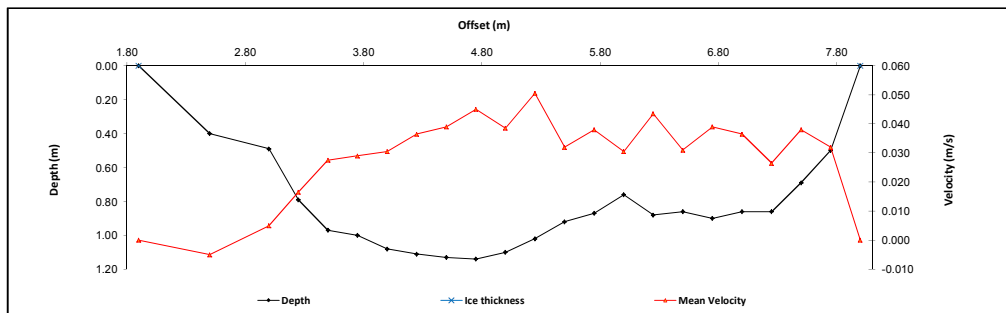


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
LB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000								
1	2.50	0.40		0.24	-0.005					1.00	0.55	0.40	-0.005	0.22	-0.001	-1%							
2	3.00	0.49		0.29	0.005					1.00	0.38	0.49	0.005	0.18	0.001	1%							
3	3.25	0.79				0.63	0.001	0.16	0.032	1.00	0.25	0.79	0.017	0.20	0.003	2%							
4	3.50	0.97				0.78	0.012	0.19	0.043	1.00	0.25	0.97	0.028	0.24	0.007	4%							
5	3.75	1.00				0.80	0.024	0.20	0.034	1.00	0.25	1.00	0.029	0.25	0.007	5%							
6	4.00	1.08				0.86	0.019	0.22	0.042	1.00	0.25	1.08	0.031	0.27	0.008	5%							
7	4.25	1.11				0.89	0.028	0.22	0.045	1.00	0.25	1.11	0.037	0.28	0.010	7%							
8	4.50	1.13				0.90	0.023	0.23	0.055	1.00	0.25	1.13	0.039	0.28	0.011	7%							
9	4.75	1.14				0.91	0.027	0.23	0.063	1.00	0.25	1.14	0.045	0.29	0.013	8%							
10	5.00	1.10				0.88	0.025	0.22	0.052	1.00	0.25	1.10	0.039	0.28	0.011	7%							
11	5.25	1.02				0.82	0.045	0.20	0.056	1.00	0.25	1.02	0.051	0.26	0.013	8%							
12	5.50	0.92				0.74	0.022	0.18	0.042	1.00	0.25	0.92	0.032	0.23	0.007	5%							
13	5.75	0.87				0.70	0.019	0.17	0.057	1.00	0.25	0.87	0.038	0.22	0.008	5%							
14	6.00	0.76				0.61	0.007	0.15	0.054	1.00	0.25	0.76	0.031	0.19	0.006	4%							
15	6.25	0.88				0.70	0.041	0.18	0.046	1.00	0.25	0.88	0.044	0.22	0.010	6%							
16	6.50	0.86				0.69	0.014	0.17	0.048	1.00	0.25	0.86	0.031	0.22	0.007	4%							
17	6.75	0.90				0.72	0.031	0.18	0.047	1.00	0.25	0.90	0.039	0.23	0.009	6%							
18	7.00	0.86				0.69	0.028	0.17	0.045	1.00	0.25	0.86	0.037	0.22	0.008	5%							
19	7.25	0.86				0.69	0.007	0.17	0.046	1.00	0.25	0.86	0.027	0.22	0.006	4%							
20	7.50	0.69		0.41	0.038					1.00	0.25	0.69	0.038	0.17	0.007	4%							
21	7.75	0.50		0.30	0.032					1.00	0.25	0.50	0.032	0.13	0.004	3%							
RB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000								
<b>Total Flow</b>														<b>0.153</b>	<b>100%</b>								

**Flow Measurement Details:**

Metering Section Location (describe):  
Under bridge

Meas. Start Time (MST):	13:15
Meas. End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 18°C



**Flow characteristics:**

Total Flow:	0.153	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.76	(m <sup>2</sup> )
Wetted Width:	5.85	(m)
Hydraulic Depth:	0.81	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.264	1.184
Water (°C):	15.4	16.3
Datalogger Clock:	12:25	15:06
Laptop Clock:	12:25	15:06
Battery (Main):	13.6	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Water (°C):	-	-
Discharge (m <sup>3</sup> /s):	-	-

**Datalogger / Station Notes:**  
 Note: When downloading SL use sond Utils and set the drop down menu to "direct"

**General Notes:**  
 - PLS position may have been affected by crew launching a boat today

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S58-01			0.954	100.000	100.000	3/4" Pipe W of logger	S58-02
S58-02	1.082	100.954		99.872	99.872	3/4" Pipe SW of logger	S58-01
S58-03			1.088	99.866	99.865	3/4" Pipe S of logger	S58-03
Ice/PT:							WL
Water Level:			1.886	99.068			WL
Other:							S58-03
<b>Setup #2</b>							S58-01
S58-01			0.965	100.001	100.000	3/4" Pipe W of logger	S58-02
S58-02			1.092	99.874	99.872	3/4" Pipe SW of logger	S58-03
S58-03	1.100	100.966		99.866	99.865	3/4" Pipe S of logger	S58-01
Ice/PT:							S58-02
Water Level:			1.900	99.066			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S58-02	1.089	100.955		99.866			
Water Level:			1.886	99.069			
Water Level:			1.873	99.070			
BM: S58-02	1.077	100.943		99.866			

**WL Survey Summary**

	Before	After
Average WL:	99.067	99.070
Transducer Elevation:	97.803	97.886
Closing Error:	-0.002	-
WL Check:	0.002	-0.001

**Site Rating Information**

Measured Discharge:	0.153
Expected Discharge:	0.56
Shift from Existing Rating (m <sup>3</sup> /s):	0.40
Shift from Existing Rating (%):	263%

**Field Personnel:**

SM, TR	Trip Date:	9-Sep-13
SM	Date:	9-Sep-13
TR	Date:	12-Sep-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: October 26, 2013  
 Site Visit Time (MST): 11:40

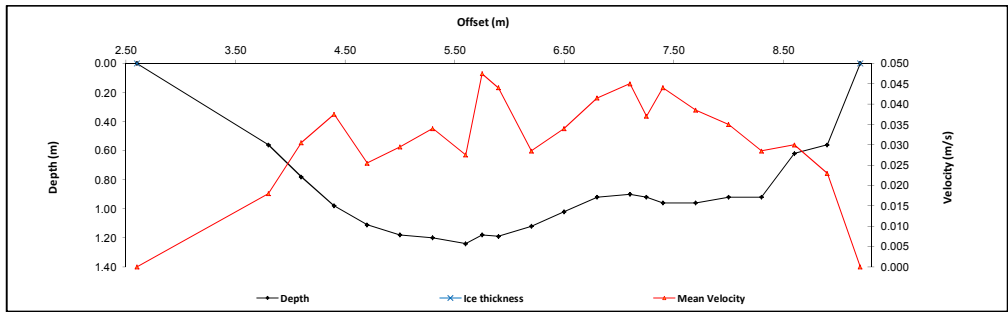


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.60	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	3.80	0.56		0.34	0.018					1.00	0.75	0.56	0.018	0.42	0.008	4%
2	4.10	0.78			0.62	0.033	0.16	0.028		1.00	0.30	0.78	0.031	0.23	0.007	4%
3	4.40	0.98			0.78	0.033	0.20	0.042		1.00	0.30	0.98	0.038	0.29	0.011	6%
4	4.70	1.11			0.89	0.008	0.22	0.043		1.00	0.30	1.11	0.026	0.33	0.008	5%
5	5.00	1.18			0.94	0.020	0.24	0.039		1.00	0.30	1.18	0.030	0.35	0.010	6%
6	5.30	1.20			0.96	0.027	0.24	0.041		1.00	0.30	1.20	0.034	0.36	0.012	7%
7	5.60	1.24			0.99	0.015	0.25	0.040		1.00	0.23	1.24	0.028	0.28	0.008	4%
8	5.75	1.18			0.94	0.045	0.24	0.050		1.00	0.15	1.18	0.048	0.18	0.008	5%
9	5.90	1.19			0.95	0.045	0.24	0.043		1.00	0.22	1.19	0.044	0.27	0.012	7%
10	6.20	1.12			0.90	0.035	0.22	0.022		1.00	0.30	1.12	0.029	0.34	0.010	5%
11	6.50	1.02			0.82	0.020	0.20	0.048		1.00	0.30	1.02	0.034	0.31	0.010	6%
12	6.80	0.92			0.74	0.035	0.18	0.048		1.00	0.30	0.92	0.042	0.28	0.011	6%
13	7.10	0.90			0.72	0.038	0.18	0.052		1.00	0.23	0.90	0.045	0.20	0.009	5%
14	7.25	0.92			0.74	0.030	0.18	0.044		1.00	0.15	0.92	0.037	0.14	0.005	3%
15	7.40	0.96			0.77	0.045	0.19	0.043		1.00	0.23	0.96	0.044	0.22	0.010	5%
16	7.70	0.96			0.77	0.033	0.19	0.044		1.00	0.30	0.96	0.039	0.31	0.011	6%
17	8.00	0.92			0.74	0.028	0.18	0.042		1.00	0.30	0.92	0.035	0.28	0.010	5%
18	8.30	0.92			0.74	0.017	0.18	0.040		1.00	0.30	0.92	0.029	0.28	0.008	4%
19	8.60	0.62		0.37	0.030					1.00	0.30	0.62	0.030	0.19	0.006	3%
20	8.90	0.56		0.34	0.023					1.00	0.30	0.56	0.023	0.17	0.004	2%
RB	9.20	0.00	0.00		0.00		0.00	0.00		1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.178</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Under bridge

Meas. Start Time (MST):	12:51
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast



**Flow characteristics:**

Total Flow:	0.178	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.39	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.82	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.258	1.258
Water (°C):	2.8	3.0
Datalogger Clock:	11:42	13:44
Laptop Clock:	11:42	13:44
Battery (Main):	14.6	13.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):	-2.016	-1.978
Index Velocity (m/s):	2.7	2.2
Water (°C):	NAN	2.81
Discharge (m <sup>3</sup> /s):	0.288	0.193

**Datalogger / Station Notes:**

- Updated System Elevation in Config File and re-calibrated pressure sensor on SL

**General Notes:**

- Incut bank from 3.8 m to LB

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S58-01	1.031	101.031		100.000	100.000	3/4" Pipe W of logger	S58-01
S58-02			1.159	99.872	99.872	3/4" Pipe SW of logger	S58-02
S58-03					99.865	3/4" Pipe S of logger	WL
Ice/PT:							WL
Water Level:			1.892	99.139		Time WL Surveyed: 12:47	S58-02
Other:							S58-03
<b>Setup #2</b>							S58-01
S58-01			1.041	99.999	100.000	3/4" Pipe W of logger	
S58-02	1.168	101.040		99.872	99.872	3/4" Pipe SW of logger	
S58-03			1.177	99.863	99.865	3/4" Pipe S of logger	
Ice/PT:							
Water Level:			1.902	99.138		Time WL Surveyed: 12:43	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S58-02	1.167	101.039	99.872			
Water Level:			1.893	99.146		Time WL Surveyed: 13:40	
Water Level:			1.878	99.145		Time WL Surveyed: 13:41	
BM:	S58-02	1.151	101.023	99.872			

**WL Survey Summary**

	Before	After
Average WL:	99.139	99.146
Transducer Elevation:	97.881	97.888
Closing Error:	0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.178
Expected Discharge:	0.81
Shift from Existing Rating (m <sup>3</sup> /s):	0.64
Shift from Existing Rating (%):	357%

**Field Personnel:**

Field Personnel:	DW, TR	Trip Date:	26-Oct-13
Data Entry Personnel:	DW	Date:	26-Oct-13
Data Check Personnel:	TR	Date:	5-Nov-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: May 6, 2013  
 Site Visit Time (MST): 11:00

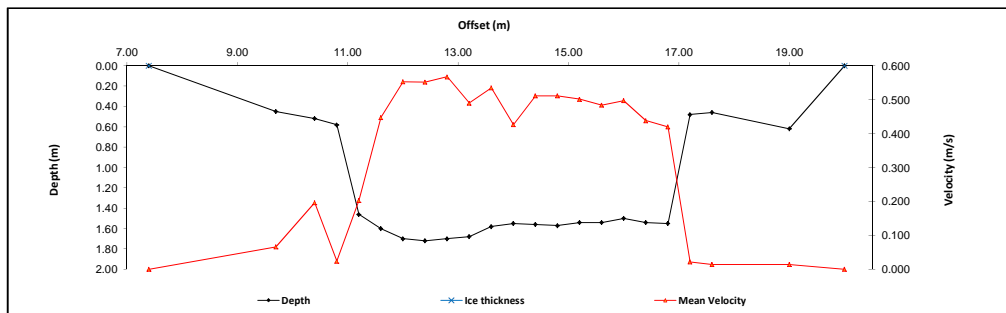


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.40	0.00	0.00		0.000		0.000		0.000	1.00	1.15	0.00	0.000	0.00	0.000	
1	9.70	0.45		0.27	0.066					1.00	1.50	0.45	0.066	0.68	0.045	1%
2	10.40	0.52		0.31	0.196					1.00	0.55	0.52	0.196	0.29	0.056	1%
3	10.80	0.58		0.35	0.024					1.00	0.40	0.58	0.024	0.23	0.006	0%
4	11.20	1.46				1.17	0.376	0.29	0.030	1.00	0.40	1.46	0.203	0.58	0.119	3%
5	11.60	1.60				1.28	0.488	0.32	0.407	1.00	0.40	1.60	0.448	0.64	0.286	6%
6	12.00	1.70				1.36	0.551	0.34	0.554	1.00	0.40	1.70	0.553	0.68	0.376	8%
7	12.40	1.72				1.38	0.617	0.34	0.487	1.00	0.40	1.72	0.552	0.69	0.380	8%
8	12.80	1.70				1.36	0.610	0.34	0.525	1.00	0.40	1.70	0.568	0.68	0.386	8%
9	13.20	1.68				1.34	0.500	0.34	0.480	1.00	0.40	1.68	0.490	0.67	0.329	7%
10	13.60	1.58				1.26	0.565	0.32	0.505	1.00	0.40	1.58	0.535	0.63	0.338	7%
11	14.00	1.55				1.24	0.381	0.31	0.472	1.00	0.40	1.55	0.427	0.62	0.264	6%
12	14.40	1.56				1.25	0.567	0.31	0.456	1.00	0.40	1.56	0.512	0.62	0.319	7%
13	14.80	1.57				1.26	0.545	0.31	0.477	1.00	0.40	1.57	0.511	0.63	0.321	7%
14	15.20	1.54				1.23	0.529	0.31	0.474	1.00	0.40	1.54	0.502	0.62	0.309	7%
15	15.60	1.54				1.23	0.533	0.31	0.435	1.00	0.40	1.54	0.484	0.62	0.298	6%
16	16.00	1.50				1.20	0.534	0.30	0.460	1.00	0.40	1.50	0.497	0.60	0.298	6%
17	16.40	1.54				1.23	0.436	0.31	0.440	1.00	0.40	1.54	0.438	0.62	0.270	6%
18	16.80	1.55				1.24	0.374	0.31	0.465	1.00	0.40	1.55	0.420	0.62	0.260	6%
19	17.20	0.48		0.29	0.022					1.00	0.40	0.48	0.022	0.19	0.004	0%
20	17.60	0.46		0.28	0.014					1.00	0.90	0.46	0.014	0.41	0.006	0%
21	19.00	0.62		0.37	0.014					1.00	1.20	0.62	0.014	0.74	0.010	0%
LB	20.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>4.68</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:30
Meas. End Time (MST):	12:20
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow, flooded banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 20°C



**Flow characteristics:**

Total Flow:	4.68	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	12.06	(m <sup>2</sup> )
Wetted Width:	1.10	(m)
Hydraulic Depth:	10.96	(m)
Mean Velocity:	0.39	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.008	1.036
Water (°C):	2.6	3.7
Datalogger Clock:	10:46	12:34
Laptop Clock:	10:46	12:34
Battery (Main):	12.9	13.4
Battery Condition:		New
Battery Serial #:	-	-
Enclosure Desiccant:		New
Vent Tube Desiccant:		New
PT# (if replaced):	284716	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Next visit install solar panel and replace PLS with 30 m unit

**General Notes:**

- TSS sampled at 12.2 m
- Vegetation along left bank from 17.2 m to 20 m

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S60-01	0.623	100.623		100.000	100.000	3/4" Pipe 8 m NE of logger	S60-01
S60-02			0.676	99.947	99.947	3/4" Pipe 4 m E of logger	S60-02
S60-03			0.826	99.797	99.798	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:			2.055	98.568		Time WL Surveyed: 11:14	S60-02
Other:							S60-03
<b>Setup #2</b>							S60-01
S60-01			0.611	100.001	100.000	Pipe 8 m NE	
S60-02	0.665	100.612		99.947	99.947	Pipe 4 m E	
S60-03			0.814	99.798	99.798	Pipe 6 m E	
Ice/PT:							
Water Level:			2.045	98.567		Time WL Surveyed: 11:15	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S60-02	0.665	100.612		99.947			
Water Level:			2.032	98.580		Time WL Surveyed: -	
Water Level:			2.018	98.582		Time WL Surveyed: -	
BM: S60-02	0.653	100.600		99.947			

**WL Survey Summary**

	Before	After
Average WL:	98.568	98.581
Transducer Elevation:	97.560	97.545
Closing Error:	-0.001	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	4.68
Expected Discharge:	4.66
Shift from Existing Rating (m <sup>3</sup> /s):	-0.02
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, DW	Trip Date:	6-May-13
SM	Date:	6-May-13
DW	Date:	12-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: June 8, 2013  
 Site Visit Time (MST): 11:50

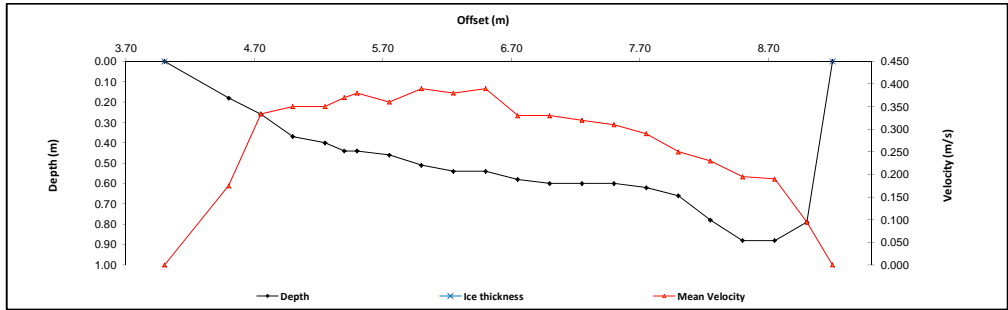


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	4.50	0.18		0.11	0.175					1.00	0.38	0.18	0.175	0.07	0.012	2%
2	4.75	0.26		0.16	0.334					1.00	0.25	0.26	0.334	0.07	0.022	3%
3	5.00	0.37		0.22	0.350					1.00	0.25	0.37	0.350	0.09	0.032	4%
4	5.25	0.40		0.24	0.350					1.00	0.20	0.40	0.350	0.08	0.028	4%
5	5.40	0.44		0.26	0.370					1.00	0.13	0.44	0.370	0.06	0.020	3%
6	5.50	0.44		0.26	0.380					1.00	0.18	0.44	0.380	0.08	0.029	4%
7	5.75	0.46		0.28	0.360					1.00	0.25	0.46	0.360	0.12	0.041	5%
8	6.00	0.51		0.31	0.390					1.00	0.25	0.51	0.390	0.13	0.050	7%
9	6.25	0.54		0.32	0.380					1.00	0.25	0.54	0.380	0.14	0.051	7%
10	6.50	0.54		0.32	0.390					1.00	0.25	0.54	0.390	0.14	0.053	7%
11	6.75	0.58		0.35	0.330					1.00	0.25	0.58	0.330	0.15	0.048	6%
12	7.00	0.60		0.36	0.330					1.00	0.25	0.60	0.330	0.15	0.050	6%
13	7.25	0.60		0.36	0.320					1.00	0.25	0.60	0.320	0.15	0.048	6%
14	7.50	0.60		0.36	0.310					1.00	0.25	0.60	0.310	0.15	0.047	6%
15	7.75	0.62		0.37	0.290					1.00	0.25	0.62	0.290	0.16	0.045	5%
16	8.00	0.66		0.40	0.250					1.00	0.25	0.66	0.250	0.17	0.041	5%
17	8.25	0.78				0.62	0.210	0.16	0.250	1.00	0.25	0.78	0.230	0.20	0.045	6%
18	8.50	0.88				0.70	0.180	0.18	0.210	1.00	0.25	0.88	0.195	0.22	0.043	6%
19	8.75	0.88				0.70	0.180	0.18	0.200	1.00	0.25	0.88	0.190	0.22	0.042	5%
20	9.00	0.79				0.63	0.140	0.16	0.050	1.00	0.23	0.79	0.095	0.18	0.017	2%
RB	9.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.763</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:06
Meas. End Time (MST):	13:00
Equipment:	ADC
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P. cloudy, 15°C



**Flow characteristics:**

Total Flow:	0.763	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.68	(m <sup>2</sup> )
Wetted Width:	5.20	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.151	0.909
Water (°C):	14.1	15.2
Datalogger Clock:	11:18	13:25
Laptop Clock:	11:18	13:25
Battery (Main):	14.4	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	284716	298705
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed 30 m PLS

**General Notes:**

- Right bank slightly undercut
- ADV tailed, ADC was used for flow measurement

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S60-01
S60-01	1.692	101.692		100.000	100.000	3/4" Pipe 8 m NE of logger	S60-02
S60-02			1.745	99.947	99.947	3/4" Pipe 4 m E of logger	S60-03
S60-03			1.894	99.798	99.798	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:			4.062	97.630		Time WL Surveyed: 11:56	S60-03
Other:							S60-02
<b>Setup #2</b>							S60-01
S60-01			1.677	100.001	100.000		
S60-02			1.732	99.946	99.947		
S60-03	1.880	101.678		99.798	99.798		
Ice/PT:							
Water Level:			4.049	97.629		Time WL Surveyed: 11:57	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S60-01	1.675	101.675		100.000		
Water Level:			4.042	97.633		Time WL Surveyed: 13:19	
Water Level:			4.025	97.632		Time WL Surveyed: 13:20	
BM:	S60-01	1.657	101.657		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.630	97.633
Transducer Elevation:	97.479	96.724
Closing Error:	-0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.763
Expected Discharge:	0.65
Shift from Existing Rating (m <sup>3</sup> /s):	-0.11
Shift from Existing Rating (%):	-15%

**Field Personnel:**

SM, CJ	Trip Date:	8-Jun-13
SM	Date:	8-Jun-13
DW	Date:	13-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: August 17, 2013  
 Site Visit Time (MST): 08:50

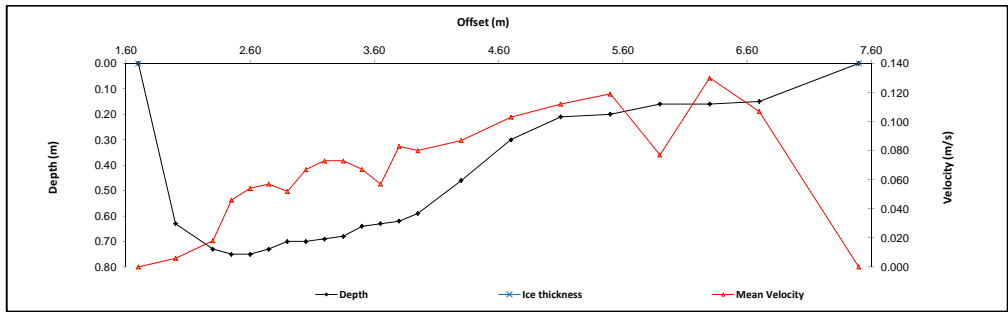


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.00	0.63		0.38	0.006					1.00	0.30	0.63	0.006	0.19	0.001	1%
2	2.30	0.73		0.44	0.018					1.00	0.23	0.73	0.018	0.16	0.003	2%
3	2.45	0.75		0.45	0.046					1.00	0.15	0.75	0.046	0.11	0.005	3%
4	2.60	0.75		0.45	0.054					1.00	0.15	0.75	0.054	0.11	0.006	4%
5	2.75	0.73		0.44	0.057					1.00	0.15	0.73	0.057	0.11	0.006	4%
6	2.90	0.70		0.42	0.052					1.00	0.15	0.70	0.052	0.11	0.005	4%
7	3.05	0.70		0.42	0.067					1.00	0.15	0.70	0.067	0.11	0.007	5%
8	3.20	0.69		0.41	0.073					1.00	0.15	0.69	0.073	0.10	0.008	5%
9	3.35	0.68		0.41	0.073					1.00	0.15	0.68	0.073	0.10	0.007	5%
10	3.50	0.64		0.38	0.067					1.00	0.15	0.64	0.067	0.10	0.006	4%
11	3.65	0.63		0.38	0.057					1.00	0.15	0.63	0.057	0.09	0.005	4%
12	3.80	0.62		0.37	0.083					1.00	0.15	0.62	0.083	0.09	0.008	5%
13	3.95	0.59		0.35	0.080					1.00	0.25	0.59	0.080	0.15	0.012	8%
14	4.30	0.46		0.28	0.087					1.00	0.38	0.46	0.087	0.17	0.015	10%
15	4.70	0.30		0.18	0.103					1.00	0.40	0.30	0.103	0.12	0.012	8%
16	5.10	0.21		0.13	0.112					1.00	0.40	0.21	0.112	0.08	0.009	6%
17	5.50	0.20		0.12	0.119					1.00	0.40	0.20	0.119	0.08	0.010	6%
18	5.90	0.16		0.10	0.077					1.00	0.40	0.16	0.077	0.06	0.005	3%
19	6.30	0.16		0.10	0.130					1.00	0.40	0.16	0.130	0.06	0.008	6%
20	6.70	0.15		0.09	0.107					1.00	0.60	0.15	0.107	0.09	0.010	6%
LB	7.50	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.150</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 15 m US of PLS

Meas. Start Time (MST):	10:00
Meas. End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	Flow dropping
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	0.150	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.21	(m <sup>2</sup> )
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.94	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.608	0.611
Water (°C):	16.7	17.7
Datalogger Clock:	08:56	10:43
Laptop Clock:	08:56	10:43
Battery (Main):	13.6	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed YAGGI
- Modem RSSI -88
- Solar panel needs mounts, U-bolts inside enclosure

**General Notes:**

- Ran ADV test, all good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S60-01	1.530	101.530		100.000	100.000	3/4" Pipe 8 m NE of logger	S60-01
S60-02			1.584	99.946	99.947	3/4" Pipe 4 m E of logger	S60-02
S60-03			1.733	99.797	99.798	3/4" Pipe 6 m E of logger	S60-03
Ice/PT:							WL
Water Level:			4.223	97.307		Time WL Surveyed: 9:51	S60-03
Other:							S60-02
<b>Setup #2</b>							S60-01
S60-01			1.521	99.999	100.000	3/4" Pipe 8 m NE of logger	
S60-02			1.575	99.945	99.947	3/4" Pipe 4 m E of logger	
S60-03	1.723	101.520		99.797	99.798	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:			4.209	97.311		Time WL Surveyed: 9:53	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S60-02	1.575	101.521		99.946		
Water Level:			4.208	97.313		Time WL Surveyed: 10:38	
Water Level:			4.200	97.311		Time WL Surveyed: 10:39	
BM	S60-02	1.565	101.511		99.946		

**WL Survey Summary**

	Before	After
Average WL:	97.309	97.312
Transducer Elevation:	96.701	96.701
Closing Error:	0.001	-
WL Check:	0.004	0.002

**Site Rating Information**

Measured Discharge:	0.15
Expected Discharge:	0.11
Shift from Existing Rating (m <sup>3</sup> /s):	-0.04
Shift from Existing Rating (%):	-28%

**Field Personnel:**

TR, DW	Trip Date:	17-Aug-13
TR	Date:	17-Aug-13
TR	Date:	28-Aug-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: September 20, 2013  
 Site Visit Time (MST): 11:25

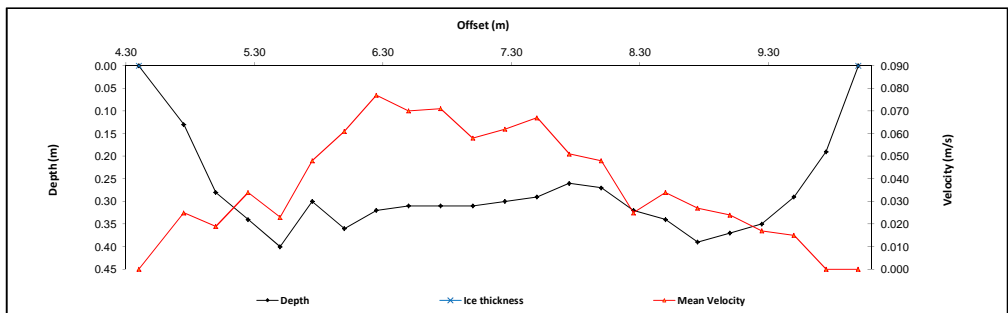


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.40	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	4.75	0.13		0.08	0.025					1.00	0.30	0.13	0.025	0.04	0.001	1%
2	5.00	0.28		0.17	0.019					1.00	0.25	0.28	0.019	0.07	0.001	2%
3	5.25	0.34		0.20	0.034					1.00	0.25	0.34	0.034	0.09	0.003	4%
4	5.50	0.40		0.24	0.023					1.00	0.25	0.40	0.023	0.10	0.002	3%
5	5.75	0.30		0.18	0.048					1.00	0.25	0.30	0.048	0.08	0.004	5%
6	6.00	0.36		0.22	0.061					1.00	0.25	0.36	0.061	0.09	0.005	8%
7	6.25	0.32		0.19	0.077					1.00	0.25	0.32	0.077	0.08	0.006	9%
8	6.50	0.31		0.19	0.070					1.00	0.25	0.31	0.070	0.08	0.005	8%
9	6.75	0.31		0.19	0.071					1.00	0.25	0.31	0.071	0.08	0.006	8%
10	7.00	0.31		0.19	0.058					1.00	0.25	0.31	0.058	0.08	0.004	7%
11	7.25	0.30		0.18	0.062					1.00	0.25	0.30	0.062	0.08	0.005	7%
12	7.50	0.29		0.17	0.067					1.00	0.25	0.29	0.067	0.07	0.005	7%
13	7.75	0.26		0.16	0.051					1.00	0.25	0.26	0.051	0.07	0.003	5%
14	8.00	0.27		0.16	0.048					1.00	0.25	0.27	0.048	0.07	0.003	5%
15	8.25	0.32		0.19	0.025					1.00	0.25	0.32	0.025	0.08	0.002	3%
16	8.50	0.34		0.20	0.034					1.00	0.25	0.34	0.034	0.09	0.003	4%
17	8.75	0.39		0.23	0.027					1.00	0.25	0.39	0.027	0.10	0.003	4%
18	9.00	0.37		0.22	0.024					1.00	0.25	0.37	0.024	0.09	0.002	3%
19	9.25	0.35		0.21	0.017					1.00	0.25	0.35	0.017	0.09	0.001	2%
20	9.50	0.29		0.17	0.015					1.00	0.25	0.29	0.015	0.07	0.001	2%
21	9.75	0.19		0.11	0.000					1.00	0.25	0.19	0.000	0.05	0.000	0%
LB	10.00	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.067</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:35
Meas. End Time (MST):	11:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 15°C



**Flow characteristics:**

Total Flow:	0.067	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.61	(m <sup>2</sup> )
Wetted Width:	5.35	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.615	0.616
Water (°C):	10.1	10.9
Datalogger Clock:	10:54	12:05
Laptop Clock:	10:54	12:05
Battery (Main):	13.7	14.3
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Replaced solar panel

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S60-01	1.419	101.419		100.000	100.000	3/4" Pipe 8 m NE of logger	S60-01
S60-02			1.473	99.946	99.947	3/4" Pipe 4 m E of logger	S60-02
S60-03			1.622	99.797	99.798	3/4" Pipe 6 m E of logger	S60-03
Ice/PT:							WL
Water Level:			4.099	97.320		Time WL Surveyed: 11:23	S60-03
Other:							S60-02
<b>Setup #2</b>							S60-01
S60-01			1.404	100.000	100.000	3/4" Pipe 8 m NE of logger	
S60-02			1.458	99.946	99.947	3/4" Pipe 4 m E of logger	
S60-03	1.607	101.404		99.797	99.798	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:			4.082	97.322		Time WL Surveyed: 11:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S60-02	1.458	101.404	99.946			
Water Level:			4.084	97.320		Time WL Surveyed: 12:00	
Water Level:			4.066	97.324		Time WL Surveyed: 12:02	
BM:	S60-02	1.444	101.390	99.946			

**WL Survey Summary**

	Before	After
Average WL:	97.321	97.322
Transducer Elevation:	96.706	96.706
Closing Error:	0.000	-
WL Check:	0.002	-0.004

**Site Rating Information**

Measured Discharge:	0.0665
Expected Discharge:	0.12
Shift from Existing Rating (m <sup>3</sup> /s):	0.05
Shift from Existing Rating (%):	81%

**Field Personnel:**

SM, TR	Trip Date:	20-Sep-13
SM	Date:	20-Sep-13
TR	Date:	2-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: October 24, 2013  
 Site Visit Time (MST): 12:30

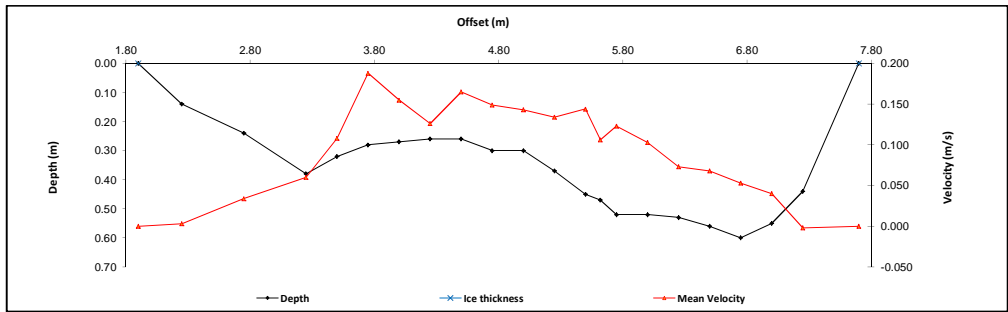


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.90	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	2.25	0.14		0.08	0.003					1.00	0.43	0.14	0.003	0.06	0.000	0%
2	2.75	0.24		0.14	0.034					1.00	0.50	0.24	0.034	0.12	0.004	2%
3	3.25	0.38		0.23	0.060					1.00	0.38	0.38	0.060	0.14	0.009	5%
4	3.50	0.32		0.19	0.108					1.00	0.25	0.32	0.108	0.08	0.009	5%
5	3.75	0.28		0.17	0.188					1.00	0.25	0.28	0.188	0.07	0.013	8%
6	4.00	0.27		0.16	0.155					1.00	0.25	0.27	0.155	0.07	0.010	6%
7	4.25	0.26		0.16	0.126					1.00	0.25	0.26	0.126	0.07	0.008	5%
8	4.50	0.26		0.16	0.165					1.00	0.25	0.26	0.165	0.07	0.011	6%
9	4.75	0.30		0.18	0.149					1.00	0.25	0.30	0.149	0.08	0.011	6%
10	5.00	0.30		0.18	0.143					1.00	0.25	0.30	0.143	0.08	0.011	6%
11	5.25	0.37		0.22	0.134					1.00	0.25	0.37	0.134	0.09	0.012	7%
12	5.50	0.45		0.27	0.144					1.00	0.19	0.45	0.144	0.08	0.012	7%
13	5.62	0.47		0.28	0.106					1.00	0.13	0.47	0.106	0.06	0.006	4%
14	5.75	0.52		0.31	0.123					1.00	0.19	0.52	0.123	0.10	0.012	7%
15	6.00	0.52		0.31	0.103					1.00	0.25	0.52	0.103	0.13	0.013	8%
16	6.25	0.53		0.32	0.073					1.00	0.25	0.53	0.073	0.13	0.010	6%
17	6.50	0.56		0.34	0.068					1.00	0.25	0.56	0.068	0.14	0.010	5%
18	6.75	0.60		0.36	0.053					1.00	0.25	0.60	0.053	0.15	0.008	5%
19	7.00	0.55		0.33	0.040					1.00	0.25	0.55	0.040	0.14	0.006	3%
20	7.25	0.44		0.26	-0.002					1.00	0.35	0.44	-0.002	0.15	0.000	0%
RB	7.70	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.174</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m US of bridge

Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:20
Equipment:	ADV
Method:	Fishcat
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 9°C



**Flow characteristics:**

Total Flow:	0.174	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.00	(m <sup>2</sup> )
Wetted Width:	5.80	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.726	0.726
Water (°C):	4.3	4.4
Datalogger Clock:	12:39	13:23
Laptop Clock:	12:39	13:23
Battery (Main):	14.6	13.9
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Buried PT cable and secured with rocks

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S60-01			0.282	100.001	100.000	3/4" Pipe 8 m NE of logger	S60-02
S60-02	0.336	100.283		99.947	99.947	3/4" Pipe 4 m E of logger	S60-03
S60-03			0.484	99.799	99.798	3/4" Pipe 6 m E of logger	WL
Ice/PT:							WL
Water Level:		2.850		97.433		Time WL Surveyed: 12:48	S60-01
Other:							S60-03
<b>Setup #2</b>							
S60-01	0.255	100.256		100.001	100.000	3/4" Pipe 8 m NE of logger	S60-02
S60-02			0.308	99.948	99.947	3/4" Pipe 4 m E of logger	
S60-03			0.457	99.799	99.798	3/4" Pipe 6 m E of logger	
Ice/PT:							
Water Level:		2.822		97.434		Time WL Surveyed: 12:50	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S60-02	0.308	100.255		99.947		
Water Level:			2.826	97.429		Time WL Surveyed: 13:31	
Water Level:			2.802	97.430		Time WL Surveyed: 13:33	
BM:	S60-02	0.285	100.232		99.947		

**WL Survey Summary**

	Before	After
Average WL:	97.434	97.430
Transducer Elevation:	96.708	96.704
Closing Error:	-0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	0.174
Expected Discharge:	0.27
Shift from Existing Rating (m <sup>3</sup> /s):	0.09
Shift from Existing Rating (%):	53%

**Field Personnel:**

TR, DW	Trip Date:	24-Oct-13
TR	Date:	24-Oct-13
TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: May 10, 2013  
 Site Visit Time (MST): 09:16

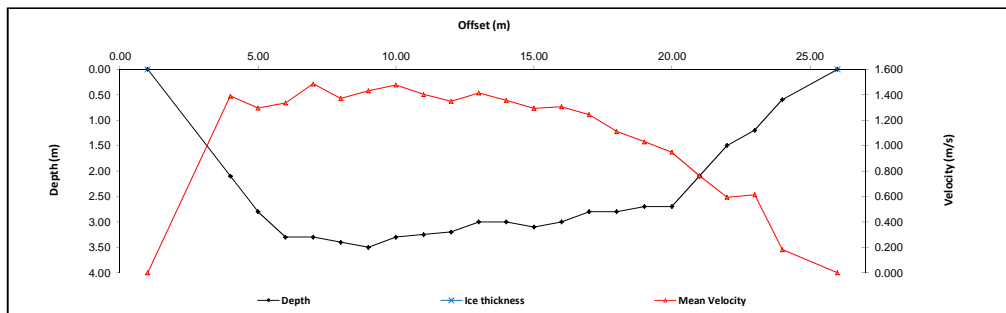


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	1.50	0.00	0.000	0.00	0.000	
1	4.00	2.10			1.68	1.494	0.42	1.285	1.00	2.00	2.10	1.390	4.20	5.836	8%	
2	5.00	2.80			2.24	1.274	0.56	1.316	1.00	1.00	2.80	1.295	2.80	3.626	5%	
3	6.00	3.30			2.64	1.288	0.66	1.382	1.00	1.00	3.30	1.335	3.30	4.406	6%	
4	7.00	3.30			2.64	1.472	0.66	1.497	1.00	1.00	3.30	1.485	3.30	4.899	7%	
5	8.00	3.40			2.72	1.268	0.68	1.473	1.00	1.00	3.40	1.371	3.40	4.660	6%	
6	9.00	3.50			2.80	1.320	0.70	1.542	1.00	1.00	3.50	1.431	3.50	5.009	7%	
7	10.00	3.30			2.64	1.391	0.66	1.562	1.00	1.00	3.30	1.477	3.30	4.872	7%	
8	11.00	3.25			2.60	1.304	0.65	1.499	1.00	1.00	3.25	1.402	3.25	4.555	6%	
9	12.00	3.20			2.56	1.164	0.64	1.530	1.00	1.00	3.20	1.347	3.20	4.310	6%	
10	13.00	3.00			2.40	1.354	0.60	1.472	1.00	1.00	3.00	1.413	3.00	4.239	6%	
11	14.00	3.00			2.40	1.281	0.60	1.430	1.00	1.00	3.00	1.356	3.00	4.067	6%	
12	15.00	3.10			2.48	1.198	0.62	1.387	1.00	1.00	3.10	1.293	3.10	4.007	5%	
13	16.00	3.00			2.40	1.248	0.60	1.362	1.00	1.00	3.00	1.305	3.00	3.915	5%	
14	17.00	2.80			2.24	1.178	0.56	1.306	1.00	1.00	2.80	1.242	2.80	3.478	5%	
15	18.00	2.80			2.24	1.061	0.56	1.160	1.00	1.00	2.80	1.111	2.80	3.109	4%	
16	19.00	2.70			2.16	0.892	0.54	1.167	1.00	1.00	2.70	1.030	2.70	2.780	4%	
17	20.00	2.70			2.16	0.848	0.54	1.048	1.00	1.00	2.70	0.949	2.70	2.560	3%	
18	21.00	2.10			1.68	0.533	0.42	0.990	1.00	1.00	2.10	0.762	2.10	1.599	2%	
19	22.00	1.50			1.20	0.354	0.30	0.833	1.00	1.00	1.50	0.594	1.50	0.890	1%	
20	23.00	1.20		0.36	0.96	0.537	0.24	0.691	1.00	1.00	1.20	0.614	1.20	0.737	1%	
21	24.00	0.60				0.364			1.00	1.50	0.60	0.182	0.90	0.164	0%	
LB	26.00	0.00	0.00		0.00		0.00		1.00	1.00	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>73.7</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:15
Meas. End Time (MST):	12:14
Equipment:	ADV
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 10°C



**Flow characteristics:**

Total Flow:	73.7	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	59.05	(m <sup>2</sup> )
Wetted Width:	25.00	(m)
Hydraulic Depth:	2.36	(m)
Mean Velocity:	1.25	(m/s)
Froude Number:	0.26	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.325	2.314
Water (°C):	3.6	3.8
Datalogger Clock:	09:16	12:46
Laptop Clock:	09:17	12:46
Battery (Main):	14.8	14.3
Battery Condition:		New
Battery Serial #:	-	-
Enclosure Dessicant:		New
Vent Tube Dessicant:		Replaced
PT# (if replaced):	284721	-
Logger# (if replaced):	25577	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S61-01	1.262	101.262		100.000	100.000	Pipe 6 m S of logger	S61-01
S61-02			0.737	100.525	100.525	Pipe 8 m SW of logger	S61-03
S61-03			1.242	100.020	100.020	Pipe 4 m NW of logger	S61-02
Ice/PT:							WL
Water Level:			2.352	98.910			WL
Other:							S61-02
<b>Setup #2</b>							S61-03
S61-01			1.243	100.002	100.000	Pipe 6 m S of logger	S61-01
S61-02	0.720	101.245		100.525	100.525	Pipe 8 m SW of logger	
S61-03			1.223	100.022	100.020	Pipe 4 m NW of logger	
Ice/PT:							
Water Level:			2.331	98.914			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S61-03	1.223	101.243		100.020		
Water Level:			2.348	98.895			
Water Level:			2.336	98.894			
BM:	S61-03	1.210	101.230		100.020		

**WL Survey Summary**

	Before	After
Average WL:	98.912	98.895
Transducer Elevation:	96.587	96.581
Closing Error:	-0.002	-
WL Check:	0.004	0.001

**Site Rating Information**

Measured Discharge:	73.7
Expected Discharge:	74.26
Shift from Existing Rating (m <sup>3</sup> /s):	0.56
Shift from Existing Rating (%):	1%

**Field Personnel:**

SM, DW	Trip Date:	10-May-13
SM, DW	Date:	10-May-13
DW	Date:	12-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Stattoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: June 15, 2013  
 Site Visit Time (MST): 15:18



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.00	0.70		0.42	-0.010					1.00	0.80	0.70	-0.010	0.56	-0.006	0%
2	4.00	1.10				0.88	0.030	0.22	0.070	1.00	1.00	1.10	0.050	1.10	0.055	1.00
3	5.00	2.50				2.00	0.530	0.50	0.530	1.00	1.00	2.50	0.530	2.50	1.325	2%
4	6.00	2.55				2.04	0.840	0.51	0.840	1.00	1.00	2.55	0.840	2.55	2.142	4%
5	7.00	2.65				2.12	1.020	0.53	1.020	1.00	1.00	2.65	1.020	2.65	2.703	5%
6	8.00	2.76				2.21	1.190	0.55	1.190	1.00	1.00	2.76	1.190	2.76	3.284	6%
7	9.00	2.80				2.24	1.230	0.56	1.230	1.00	1.00	2.80	1.230	2.80	3.444	6%
8	10.00	2.80				2.24	1.540	0.56	1.540	1.00	1.00	2.80	1.540	2.80	4.312	8%
9	11.00	2.90				2.32	1.400	0.58	1.400	1.00	1.00	2.90	1.400	2.90	4.060	7%
10	12.00	2.96				2.37	1.440	0.59	1.440	1.00	1.00	2.96	1.440	2.96	4.262	8%
11	13.00	3.08				2.46	1.450	0.62	1.450	1.00	1.00	3.08	1.450	3.08	4.466	8%
12	14.00	3.10				2.48	1.340	0.62	1.340	1.00	1.00	3.10	1.340	3.10	4.154	7%
13	15.00	3.15				2.52	1.260	0.63	1.170	1.00	1.00	3.15	1.215	3.15	3.827	7%
14	16.00	3.18				2.54	1.120	0.64	1.390	1.00	1.00	3.18	1.255	3.18	3.991	7%
15	17.00	3.16				2.53	1.120	0.63	1.040	1.00	1.00	3.16	1.080	3.16	3.413	6%
16	18.00	2.96				2.37	1.130	0.59	1.060	1.00	1.00	2.96	1.095	2.96	3.241	6%
17	19.00	2.74				2.19	1.020	0.55	1.040	1.00	1.00	2.74	1.030	2.74	2.822	5%
18	20.00	2.72				2.18	0.880	0.54	0.940	1.00	1.00	2.72	0.910	2.72	2.475	4%
19	21.00	2.32				1.86	0.670	0.46	0.690	1.00	1.50	2.32	0.680	3.48	2.366	4%
20	23.00	0.99							0.270	1.00	2.00	0.99	0.144	1.98	0.285	1%
21	25.00	0.28	0.17		0.010	0.79	0.018	0.20		1.00	1.30	0.28	0.010	0.36	0.004	0%
RB	25.60	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>56.6</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:30
Equipment:	Marsh McBirney
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Drizzle

**Flow characteristics:**

Total Flow:	56.6	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	53.49	(m <sup>2</sup> )
Wetted Width:	23.20	(m)
Hydraulic Depth:	2.31	(m)
Mean Velocity:	1.06	(m/s)
Froude Number:	0.22	

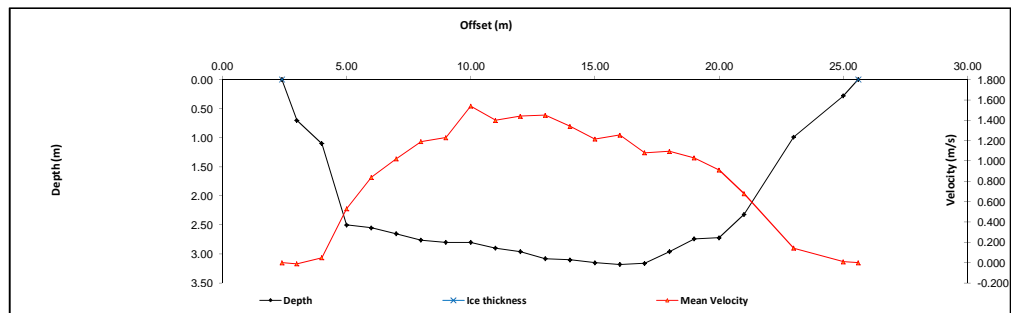
**Logger Details:**

	Before	After
Transducer Reading (m):	2.116	2.114
Water (°C):	13.7	13.7
Datalogger Clock:	15:20	16:36
Laptop Clock:	15:20	16:36
Battery (Main):	13.9	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Measurements 4 through 16 had estimated 0.8 velocities due to safety concerns. Depths were assumed for the 0.2 measurement at these offsets.
- Channel will be surveyed during lower water later in summer and adjustments will be completed.

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S61-01
S61-01	1.523	101.523		100.000	100.000	Pipe 6 m S of logger	S61-03
S61-02			0.998	100.525		Pipe 8 m SW of logger	S61-02
S61-03			1.506	100.017	100.020	Pipe 4 m NW of logger	WL
Ice/PT:							WL
Water Level:			2.923	98.600		Time WL Surveyed: 15:24	S61-02
Other:							S61-03
<b>Setup #2</b>							S61-01
S61-01			1.491	99.999	100.000		
S61-02	0.965	101.490		100.525	100.525		
S61-03			1.469	100.021	100.020		
Ice/PT:							
Water Level:			2.891	98.599		Time WL Surveyed: 15:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S61-01	1.489	101.489		100.000		
Water Level:			2.894	98.595		Time WL Surveyed: 16:43	
Water Level:			2.882	98.599		Time WL Surveyed: 16:44	
BM:	S61-01	1.481	101.481		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.600	98.597
Transducer Elevation:	96.484	96.483
Closing Error:	0.001	-
WL Check:	0.001	-0.004

**Site Rating Information**

Measured Discharge:	56.6
Expected Discharge:	59.30
Shift from Existing Rating (m <sup>3</sup> /s):	2.70
Shift from Existing Rating (%):	5%

**Field Personnel:**

TR, SG	Trip Date:	15-Jun-13
SG	Date:	15-Jun-13
TR	Date:	18-Jun-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: August 9, 2013  
 Site Visit Time (MST): 15:00

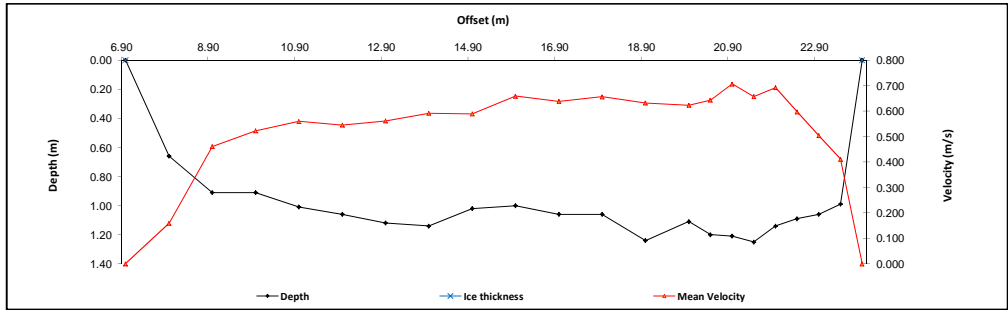


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	8.00	0.66		0.40	0.159					1.00	1.00	0.66	0.159	0.66	0.105	1%
2	9.00	0.91				0.73	0.469	0.18	0.452	1.00	1.00	0.91	0.461	0.91	0.419	4%
3	10.00	0.91				0.73	0.507	0.18	0.538	1.00	1.00	0.91	0.523	0.91	0.475	5%
4	11.00	1.01				0.81	0.458	0.20	0.661	1.00	1.00	1.01	0.560	1.01	0.565	6%
5	12.00	1.06				0.85	0.461	0.21	0.630	1.00	1.00	1.06	0.546	1.06	0.578	6%
6	13.00	1.12				0.90	0.464	0.22	0.659	1.00	1.00	1.12	0.562	1.12	0.629	6%
7	14.00	1.14				0.91	0.483	0.23	0.700	1.00	1.00	1.14	0.592	1.14	0.674	7%
8	15.00	1.02				0.82	0.485	0.20	0.694	1.00	1.00	1.02	0.590	1.02	0.601	6%
9	16.00	1.00				0.80	0.592	0.20	0.726	1.00	1.00	1.00	0.659	1.00	0.659	7%
10	17.00	1.06				0.85	0.593	0.21	0.684	1.00	1.00	1.06	0.639	1.06	0.677	7%
11	18.00	1.06				0.85	0.615	0.21	0.698	1.00	1.00	1.06	0.657	1.06	0.696	7%
12	19.00	1.24				0.99	0.554	0.25	0.710	1.00	1.00	1.24	0.632	1.24	0.784	8%
13	20.00	1.11				0.89	0.522	0.22	0.724	1.00	0.75	1.11	0.623	0.83	0.519	5%
14	20.50	1.20				0.96	0.596	0.24	0.691	1.00	0.50	1.20	0.644	0.60	0.386	4%
15	21.00	1.21				0.97	0.702	0.24	0.711	1.00	0.50	1.21	0.707	0.61	0.427	4%
16	21.50	1.25				1.00	0.598	0.25	0.716	1.00	0.50	1.25	0.657	0.63	0.411	4%
17	22.00	1.14				0.91	0.706	0.23	0.678	1.00	0.50	1.14	0.692	0.57	0.394	4%
18	22.50	1.09				0.87	0.616	0.22	0.578	1.00	0.50	1.09	0.597	0.55	0.325	3%
19	23.00	1.06				0.85	0.423	0.21	0.585	1.00	0.50	1.06	0.504	0.53	0.267	3%
20	23.50	0.99				0.79	0.361	0.20	0.461	1.00	0.50	0.99	0.411	0.50	0.203	2%
LB	24.00	0.00	0.00	C	0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>9.80</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:12
Meas. End Time (MST):	15:57
Equipment:	ADV
Method:	Boat
River Condition:	Med flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20°C



**Flow characteristics:**

Total Flow:	9.80	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	16.99	(m <sup>2</sup> )
Wetted Width:	17.00	(m)
Hydraulic Depth:	1.00	(m)
Mean Velocity:	0.58	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.409	0.883
Water (°C):	15.3	15.6
Datalogger Clock:	14:15	16:11
Laptop Clock:	14:15	16:11
Battery (Main):	12.9	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved transducer to deeper water, requires extra anchor cable next visit

**General Notes:**

**Level Survey: 15:57**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S61-01	1.312	101.312	1.312	100.000	100.000	Pipe 6 m S of logger	S61-01
S61-02			0.787	100.525	100.525	Pipe 8 m SW of logger	S61-02
S61-03			1.292	100.020	100.020	Pipe 4 m NW of logger	WL
Ice/PT:							WL
Water Level:			4.445	96.867		Time WL Surveyed: 14:54	S61-02
Other:							S61-03
<b>Setup #2</b>							
S61-01			1.301	100.001	100.000		S61-01
S61-02	0.777	101.302		100.525	100.525		
S61-03			1.282	100.020	100.020		
Ice/PT:							
Water Level:			4.435	96.867		Time WL Surveyed: 14:56	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S61-03	1.282	101.302		100.020		
Water Level:			4.439	96.863		Time WL Surveyed: 16:07	
Water Level:			4.427	96.863		Time WL Surveyed: 16:09	
BM:	S61-03	1.270	101.290		100.020		

**WL Survey Summary**

	Before	After
Average WL:	96.867	96.863
Transducer Elevation:	96.458	95.990
Closing Error:	-0.001	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	9.8
Expected Discharge:	8.69
Shift from Existing Rating (m <sup>3</sup> /s):	-1.11
Shift from Existing Rating (%):	-11%

**Field Personnel:**

SM, TR	Trip Date:	9-Aug-13
SM	Date:	9-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: September 16, 2013  
 Site Visit Time (MST): 13:00

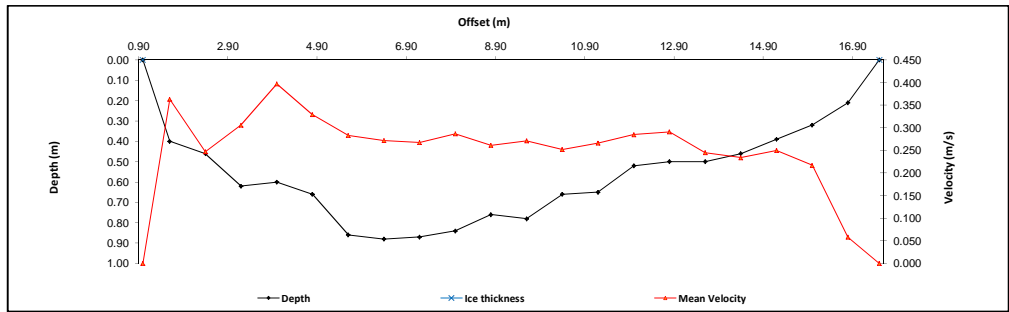


Measured Data										Calculated Data						
Bank/	Offset	Depth from bottom to WS	WS to bottom of ice	Depth of Obs. @ 0.6 Depth	Velocity @ 0.6 Depth	Depth of Obs. @ 0.8 Depth	Velocity @ 0.8 Depth	Depth of Obs. @ 0.2 Depth	Velocity @ 0.2 Depth	Velocity Correction Factor	Pannel Width	Effective Pannel Depth	Effective Average Pannel Velocity	Pannel Area	Pannel Discharge	Percent of total flow
Mmt #	(m)	(m)	(m)	(m)	(m/s)	(m)	(m/s)	(m)	(m/s)	(m)	(m)	(m)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	(%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	1.60	0.40		0.24	0.363					1.00	0.70	0.40	0.363	0.28	0.102	4%
2	2.40	0.46		0.28	0.247					1.00	0.80	0.46	0.247	0.37	0.091	3%
3	3.20	0.62		0.37	0.306					1.00	0.80	0.62	0.306	0.50	0.152	6%
4	4.00	0.60		0.36	0.397					1.00	0.80	0.60	0.397	0.48	0.191	7%
5	4.80	0.66		0.40	0.329					1.00	0.80	0.66	0.329	0.53	0.174	7%
6	5.60	0.86				0.69	0.173	0.17	0.393	1.00	0.80	0.86	0.283	0.69	0.195	7%
7	6.40	0.88				0.70	0.209	0.18	0.335	1.00	0.80	0.88	0.272	0.70	0.191	7%
8	7.20	0.87				0.70	0.234	0.17	0.301	1.00	0.80	0.87	0.268	0.70	0.186	7%
9	8.00	0.84				0.67	0.236	0.17	0.337	1.00	0.80	0.84	0.287	0.67	0.193	7%
10	8.80	0.76				0.61	0.212	0.15	0.310	1.00	0.80	0.76	0.261	0.61	0.159	6%
11	9.60	0.78				0.62	0.212	0.16	0.330	1.00	0.80	0.78	0.271	0.62	0.169	6%
12	10.40	0.66	0.40		0.252					1.00	0.80	0.66	0.252	0.53	0.133	5%
13	11.20	0.65		0.39	0.286					1.00	0.80	0.65	0.266	0.52	0.138	5%
14	12.00	0.52		0.31	0.285					1.00	0.80	0.52	0.285	0.42	0.119	5%
15	12.80	0.50		0.30	0.291					1.00	0.80	0.50	0.291	0.40	0.116	4%
16	13.60	0.50		0.30	0.245					1.00	0.80	0.50	0.245	0.40	0.098	4%
17	14.40	0.46		0.28	0.234					1.00	0.80	0.46	0.234	0.37	0.096	3%
18	15.20	0.39		0.23	0.250					1.00	0.80	0.39	0.250	0.31	0.078	3%
19	16.00	0.32		0.19	0.217					1.00	0.80	0.32	0.217	0.26	0.056	2%
20	16.80	0.21		0.13	0.058					1.00	0.75	0.21	0.058	0.16	0.009	0%
LB	17.50	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.63</b>	<b>100%</b>

**Flow Measurement Details:**

**Metering Section Location (describe):**  
Across from station

Meas. Start Time (MST):	14:00
Meas. End Time (MST):	14:40
Equipment:	ADV
Method:	Wading
River Condition:	low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 25°C



**Flow characteristics:**

Total Flow:	2.63	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.50	(m <sup>2</sup> )
Wetted Width:	16.50	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.343	0.344
Water (°C):	13.0	13.4
Datalogger Clock:	13:11	14:52
Laptop Clock:	13:11	14:52
Battery (Main):	13.0	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Wildlife pulled PT out and chewed solar cable
- Installed modem
- Need to send new program to station

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S61-01	1.710	101.710		100.000	100.000	3/4" Pipe 6 m S of logger	S61-01
S61-02			1.183	100.527	100.525	3/4" Pipe 8 m SW of logger	S61-02
S61-03			1.689	100.021	100.020	3/4" Pipe 4 m NW of logger	WL
Ice/PT:							WL
Water Level:			5.388	96.322		Time WL Surveyed: 13:54	S61-02
Other:							S61-03
<b>Setup #2</b>							S61-01
S61-01			1.696	100.000	100.000	3/4" Pipe 6 m S of logger	
S61-02	1.169	101.696		100.527	100.525	3/4" Pipe 8 m SW of logger	
S61-03			1.676	100.020	100.020	3/4" Pipe 4 m NW of logger	
Ice/PT:							
Water Level:			5.372	96.324		Time WL Surveyed: 13:56	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S61-03	1.676	101.697	100.021		Time WL Surveyed: 14:46	
Water Level:			5.372	96.325		Time WL Surveyed: 14:47	
Water Level:			5.364	96.321			
BM:	S61-03	1.664	101.685	100.021			

**WL Survey Summary**

	Before	After
Average WL:	96.323	96.323
Transducer Elevation:	95.980	95.979
Closing Error:	0.000	-
WL Check:	0.002	0.004

**Site Rating Information**

Measured Discharge:	2.63
Expected Discharge:	2.63
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	0%

**Field Personnel:**

Field Personnel:	TR, CJ, SG	Trip Date:	16-Sep-13
Data Entry Personnel:	CJ	Date:	16-Sep-13
Data Check Personnel:	TR	Date:	1-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: October 17, 2013  
 Site Visit Time (MST): 12:50

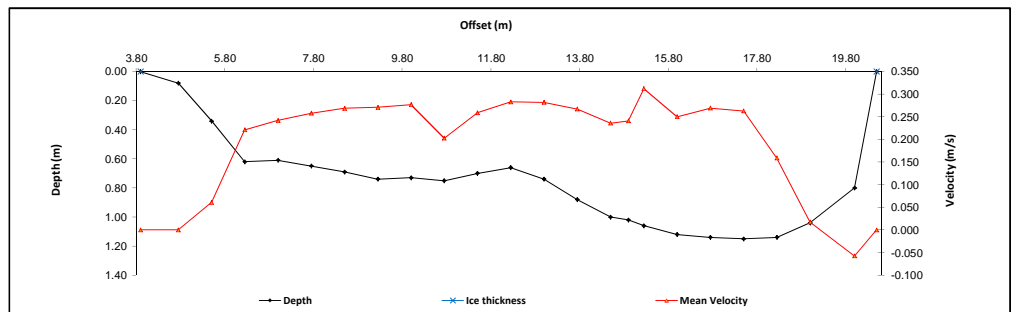


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.90	0.00	0.00		0.000		0.000		0.000	1.00	0.43	0.00	0.000	0.00	0.000	
1	4.75	0.08		0.05	0.000					1.00	0.80	0.08	0.000	0.06	0.000	0%
2	5.50	0.34		0.20	0.061					1.00	0.75	0.34	0.061	0.26	0.016	1%
3	6.25	0.62		0.37	0.221					1.00	0.75	0.62	0.221	0.47	0.103	4%
4	7.00	0.61		0.37	0.242					1.00	0.75	0.61	0.242	0.46	0.111	4%
5	7.75	0.65		0.39	0.258					1.00	0.75	0.65	0.258	0.49	0.126	5%
6	8.50	0.69		0.41	0.269					1.00	0.75	0.69	0.269	0.52	0.139	5%
7	9.25	0.74		0.44	0.271					1.00	0.75	0.74	0.271	0.56	0.150	6%
8	10.00	0.73		0.44	0.277					1.00	0.75	0.73	0.277	0.55	0.152	6%
9	10.75	0.75		0.45	0.203					1.00	0.75	0.75	0.203	0.56	0.114	4%
10	11.50	0.70		0.42	0.259					1.00	0.75	0.70	0.259	0.53	0.136	5%
11	12.25	0.66		0.40	0.283					1.00	0.75	0.66	0.283	0.50	0.140	5%
12	13.00	0.74		0.44	0.282					1.00	0.75	0.74	0.282	0.56	0.157	6%
13	13.75	0.88				0.70	0.216	0.18	0.318	1.00	0.75	0.88	0.267	0.66	0.176	7%
14	14.50	1.00				0.80	0.144	0.20	0.328	1.00	0.57	1.00	0.236	0.57	0.136	5%
15	14.90	1.02				0.82	0.173	0.20	0.309	1.00	0.38	1.02	0.241	0.38	0.092	3%
16	15.25	1.06				0.85	0.240	0.21	0.395	1.00	0.55	1.06	0.313	0.58	0.162	7%
17	16.00	1.12				0.90	0.141	0.22	0.359	1.00	0.75	1.12	0.250	0.84	0.210	6%
18	16.75	1.14				0.91	0.194	0.23	0.345	1.00	0.75	1.14	0.270	0.86	0.230	9%
19	17.50	1.15				0.92	0.188	0.23	0.338	1.00	0.75	1.15	0.263	0.86	0.227	8%
20	18.25	1.14				0.91	0.124	0.23	0.194	1.00	0.75	1.14	0.159	0.86	0.136	5%
21	19.00	1.04				0.83	0.001	0.21	0.034	1.00	0.88	1.04	0.018	0.91	0.016	1%
22	20.00	0.80				0.64	-0.040	0.16	-0.075	1.00	0.75	0.80	-0.058	0.60	-0.035	-1%
RB	20.50	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.71</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:30
Meas. End Time (MST):	14:05
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	P. cloudy, 5°C



**Flow characteristics:**

Total Flow:	2.71	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	12.61	(m <sup>2</sup> )
Wetted Width:	16.60	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.88	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.312	0.313
Water (°C):	3.5	3.6
Datalogger Clock:	12:46	14:11
Laptop Clock:	12:45	14:11
Battery (Main):	12.1	12.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Trenched PLS cable
- Wildlife damage, PT, antenna and solar panel cables were re-wired
- Antenna cable replaced

**General Notes:**

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1	S61-01	1.368	101.368		100.000	100.000	3/4" Pipe 6 m S of logger	S61-01
	S61-02			0.843	100.525	100.525	3/4" Pipe 8 m SW of logger	S61-02
	S61-03			1.347	100.021	100.020	3/4" Pipe 4 m NW of logger	WL
Water Level:				5.002	96.366		Time WL Surveyed: 13:21	S61-02
Other:								S61-03
Setup #2	S61-01			1.354	99.999	100.000	3/4" Pipe 6 m S of logger	
	S61-02	0.828	101.353		100.525	100.525	3/4" Pipe 8 m SW of logger	
	S61-03			1.333	100.020	100.020	3/4" Pipe 4 m NW of logger	
Water Level:				4.987	96.366		Time WL Surveyed: 13:23	(must close survey loop on survey starting point)
Other:								
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>								
BM:	S61-01	1.354	101.354		4.986	96.368	Time WL Surveyed: 14:16	
Water Level:					4.970	96.369	Time WL Surveyed: 14:17	
BM:	S61-01	1.339	101.339			100.000		

**WL Survey Summary**

	Before	After
Average WL:	96.366	96.369
Transducer Elevation:	96.054	96.056
Closing Error:	0.001	-
WL Check:	0.000	-0.001

**Site Rating Information**

Measured Discharge:	2.71
Expected Discharge:	2.97
Shift from Existing Rating (m <sup>3</sup> /s):	0.26
Shift from Existing Rating (%):	9%

**Field Personnel:**

Field Personnel:	DW, SM	Trip Date:	17-Oct-13
Data Entry Personnel:	DW	Date:	17-Oct-13
Data Check Personnel:	TR	Date:	25-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: December 9, 2013  
 Site Visit Time (MST): 09:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.90	0.00	0.00		0.000		0.000		0.000	0.88	0.43	0.00	0.000	0.00	0.000	
1	2.75	0.30	0.20	0.25	0.222					0.88	1.08	0.10	0.195	0.11	0.021	1%
2	4.05	0.50	0.22	0.36	0.249					0.88	1.33	0.28	0.219	0.37	0.081	5%
3	5.40	0.60	0.25	0.43	0.281					0.88	1.38	0.35	0.247	0.48	0.119	8%
4	6.80	0.68	0.25	0.47	0.275					0.88	1.33	0.43	0.242	0.57	0.138	9%
5	8.05	0.60	0.25	0.43	0.271					0.88	0.95	0.35	0.238	0.33	0.079	5%
6	8.70	0.55	0.25	0.40	0.218					0.88	0.68	0.30	0.192	0.20	0.039	3%
7	9.40	0.55	0.25	0.40	0.249					0.88	0.85	0.30	0.219	0.26	0.056	4%
8	10.40	0.65	0.25	0.45	0.306					0.88	0.73	0.40	0.269	0.29	0.078	5%
9	10.85	0.68	0.25	0.47	0.274					0.88	0.48	0.43	0.241	0.20	0.049	3%
10	11.35	0.70	0.25	0.48	0.293					0.88	0.48	0.45	0.258	0.21	0.055	4%
11	11.80	0.73	0.25	0.49	0.320					0.88	0.45	0.48	0.282	0.22	0.061	4%
12	12.25	0.75	0.25	0.50	0.296					0.88	0.40	0.50	0.260	0.20	0.052	3%
13	12.60	0.75	0.25	0.50	0.315					0.88	0.38	0.50	0.277	0.19	0.052	3%
14	13.00	0.75	0.25	0.50	0.317					0.88	0.40	0.50	0.279	0.20	0.056	4%
15	13.40	0.78	0.25	0.52	0.235					0.88	0.40	0.53	0.207	0.21	0.044	3%
16	13.80	0.72	0.25	0.49	0.304					0.88	0.45	0.47	0.268	0.21	0.057	4%
17	14.30	0.75	0.22	0.49	0.360					0.88	0.52	0.53	0.317	0.28	0.088	6%
18	14.85	0.75	0.22	0.49	0.317					0.88	0.55	0.53	0.279	0.29	0.081	5%
19	15.40	0.72	0.17	0.45	0.351					0.88	0.57	0.55	0.309	0.32	0.098	7%
20	16.00	0.60	0.15	0.38	0.362					0.88	0.60	0.45	0.319	0.27	0.086	6%
21	16.60	0.56	0.15	0.36	0.276					0.88	0.57	0.41	0.243	0.24	0.057	4%
22	17.15	0.60	0.15	0.38	0.248					0.88	0.50	0.45	0.218	0.23	0.049	3%
RB	17.60	0.00	0.00		0.000		0.000		0.000	0.88	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.50</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 15 m DS of Station

Meas. Start Time (MST):	9:45
Meas. End Time (MST):	10:10
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light snow, -15°C

**Flow characteristics:**

Total Flow:	1.50	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.87	(m <sup>2</sup> )
Wetted Width:	15.70	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.13	

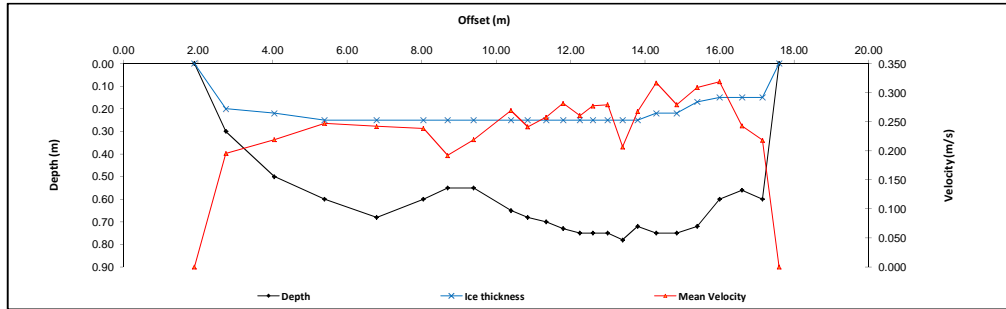
**Logger Details:**

	Before	After
Transducer Reading (m):	0.340	0.341
Water (°C):	0.2	0.2
Datalogger Clock:	09:26	10:16
Laptop Clock:	09:26	10:16
Battery (Main):	12.5	12.6
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Overflow present

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S61-01	1.238	101.238		100.000	100.000	3/4" Pipe 6 m S of logger	S61-01
S61-02			0.712	100.526	100.525	3/4" Pipe 8 m SW of logger	S61-02
S61-03			1.218	100.020	100.020	3/4" Pipe 4 m NW of logger	WL
Ice/PT:			4.847	96.391			Ice
Water Level:			4.843	96.395		Time WL Surveyed: 9:36	Ice
Other:							WL
<b>Setup #2</b>							
S61-01			1.228	100.001	100.000	3/4" Pipe 6 m S of logger	S61-02
S61-02	0.703	101.229		100.526	100.525	3/4" Pipe 8 m SW of logger	S61-03
S61-03			1.207	100.022	100.020	3/4" Pipe 4 m NW of logger	S61-01
Ice/PT:			4.838	96.391			Ice
Water Level:			4.835	96.394		Time WL Surveyed: 9:38	Ice
Other:							WL
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S61-01	1.227	101.227		100.000		
Water Level:				4.836	96.391	Time WL Surveyed: 10:13	
Water Level:				4.821	96.393	Time WL Surveyed: 10:14	
BM:	S61-01	1.214	101.214		100.000		

**WL Survey Summary**

	Before	After
Average WL:	96.395	96.392
Transducer Elevation:	96.055	96.051
Closing Error:	-0.001	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

TR, CJ	Trip Date:	9-Dec-13
CJ	Date:	9-Dec-13
SG	Date:	29-Jan-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: May 18, 2012  
 Site Visit Time (MST): 08:45

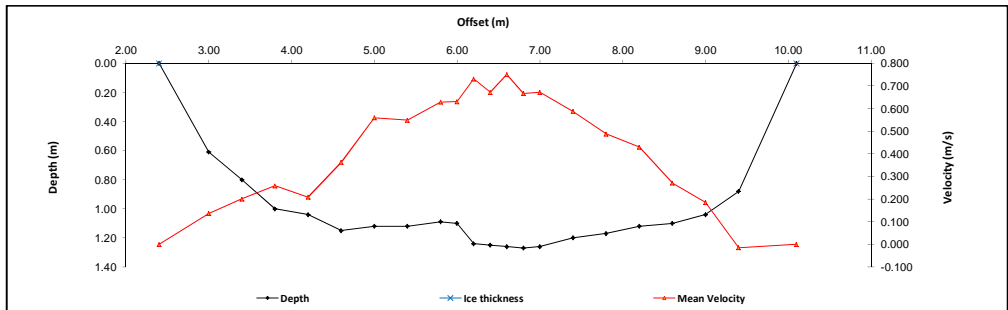


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.00	0.61		0.37	0.136		0.64		0.244	1.00	0.50	0.61	0.136	0.31	0.041	1%
2	3.40	0.80					0.80		0.369	1.00	0.40	0.80	0.201	0.32	0.064	2%
3	3.80	1.00					0.83		0.249	1.00	0.40	1.00	0.259	0.40	0.103	3%
4	4.20	1.04					0.92		0.432	1.00	0.40	1.04	0.209	0.42	0.087	3%
5	4.60	1.15					0.90		0.545	1.00	0.40	1.15	0.363	0.46	0.167	5%
6	5.00	1.12					0.90		0.551	1.00	0.40	1.12	0.559	0.45	0.250	8%
7	5.40	1.12					0.87		0.672	1.00	0.40	1.12	0.549	0.45	0.246	8%
8	5.80	1.09					0.88		0.638	1.00	0.30	1.09	0.629	0.33	0.206	7%
9	6.00	1.10					0.99		0.735	1.00	0.20	1.10	0.631	0.22	0.139	4%
10	6.20	1.24					1.00		0.625	1.00	0.20	1.24	0.732	0.25	0.181	6%
11	6.40	1.25					1.01		0.728	1.00	0.20	1.25	0.672	0.25	0.168	5%
12	6.60	1.26					1.02		0.728	1.00	0.20	1.26	0.751	0.25	0.189	6%
13	6.80	1.27					1.01		0.622	1.00	0.20	1.27	0.667	0.25	0.169	5%
14	7.00	1.26					0.96		0.422	1.00	0.30	1.26	0.672	0.38	0.254	8%
15	7.40	1.20					0.94		0.422	1.00	0.40	1.20	0.588	0.48	0.282	9%
16	7.80	1.17					0.90		0.412	1.00	0.40	1.17	0.488	0.47	0.228	7%
17	8.20	1.12					0.88		0.318	1.00	0.40	1.12	0.430	0.45	0.193	6%
18	8.60	1.10					0.83		0.318	1.00	0.40	1.10	0.271	0.44	0.119	4%
19	9.00	1.04					0.83		0.186	1.00	0.40	1.04	0.185	0.42	0.077	2%
20	9.40	0.88					0.70		-0.012	1.00	0.55	0.88	-0.015	0.48	-0.007	0%
LB	10.10	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>3.16</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 5 m US of PT

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	11:35
Equipment:	ADV
Method:	Fishcat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. Cloudy, breezy, 15°C



**Flow characteristics:**

Total Flow:	3.16	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.46	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.97	(m)
Mean Velocity:	0.42	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.145	1.154
Water (°C):	8.4	8.8
Datalogger Clock:	09:40	-
Laptop Clock:	09:40	-
Battery (Main):	13.7	14.1
Battery Condition:	-	New
Battery Serial #:	-	-
Enclosure Dessiccant:	-	New
Vent Tube Dessiccant:	-	New
PT# (# replaced):	323017	-
Logger# (# replaced):	25576	-

**Datalogger / Station Notes:**

- Installed station 40 m US from Hwy 881 on LB follow horse trail.
- UTM 492149E 6163182N
- Bed very silty

**General Notes:**

- Ran ADC Test all good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S62-01	1.138	101.138		100.000	100.000	3/4" Pipe 2 m N of Station	S62-01
S62-02			1.188	99.950	99.949	3/4" Pipe 5 m W of Station	S62-03
S62-03			1.105	100.033	100.034	3/4" Pipe 8 m W of Station	S62-02
Ice/PT:							WL
Water Level:			3.169	97.969		Time WL Surveyed: 10:07	WL
Other:							S62-02
<b>Setup #2</b>							S62-03
S62-01			1.074	100.001	100.000	3/4" Pipe 2 m N of Station	S62-01
S62-02	1.125	101.075		99.950	99.949	3/4" Pipe 5 m W of Station	
S62-03			1.040	100.035	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:							
Water Level:			3.106	97.969		Time WL Surveyed: 10:11	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.073	101.073	3.105	100.000	Time WL Surveyed: 11:40	
Water Level:			3.060	97.968		Time WL Surveyed: 11:41	
BM:	S62-01	1.025	101.025	3.060	97.965		

**WL Survey Summary**

	Before	After
Average WL:	97.969	97.967
Transducer Elevation:	96.824	96.813
Closing Error:	-0.001	-
WL Check:	0.000	0.003

**Site Rating Information**

Measured Discharge:	3.16
Expected Discharge:	3.14
Shift from Existing Rating (m <sup>3</sup> /s):	-0.02
Shift from Existing Rating (%):	-1%

**Field Personnel:**

Field Personnel:	TR, JVR	Trip Date:	18-May-13
Data Entry Personnel:	JVR	Date:	18-May-13
Data Check Personnel:	DW	Date:	12-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: June 25, 2013  
 Site Visit Time (MST): 08:10



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	1.80	0.45		0.27	-0.040					1.00	0.38	0.45	-0.040	0.17	-0.007	0%
2	2.15	0.62		0.37	0.020					1.00	0.33	0.62	0.020	0.20	0.004	0%
3	2.45	0.73		0.44	0.060					1.00	0.33	0.73	0.060	0.24	0.014	1%
4	2.80	0.80				0.64	0.260	0.16	0.190	1.00	0.35	0.80	0.225	0.28	0.063	4%
5	3.15	0.87				0.70	0.250	0.17	0.270	1.00	0.35	0.87	0.260	0.30	0.079	5%
6	3.50	0.91				0.73	0.270	0.18	0.320	1.00	0.35	0.91	0.295	0.32	0.094	6%
7	3.85	0.96				0.77	0.220	0.19	0.420	1.00	0.35	0.96	0.320	0.34	0.108	6%
8	4.20	1.00				0.80	0.400	0.20	0.440	1.00	0.35	1.00	0.420	0.35	0.147	9%
9	4.55	1.04				0.83	0.450	0.21	0.540	1.00	0.25	1.04	0.495	0.26	0.129	8%
10	4.70	1.06				0.85	0.520	0.21	0.560	1.00	0.18	1.06	0.540	0.19	0.100	6%
11	4.90	1.04				0.83	0.450	0.21	0.540	1.00	0.21	1.04	0.495	0.22	0.108	6%
12	5.12	1.06				0.85	0.300	0.21	0.620	1.00	0.18	1.06	0.460	0.19	0.085	5%
13	5.25	1.09				0.87	0.340	0.22	0.600	1.00	0.24	1.09	0.470	0.26	0.123	7%
14	5.60	0.90				0.72	0.360	0.18	0.540	1.00	0.35	0.90	0.450	0.32	0.142	8%
15	5.95	0.82				0.66	0.390	0.16	0.420	1.00	0.35	0.82	0.405	0.29	0.116	7%
16	6.30	0.86				0.69	0.290	0.17	0.390	1.00	0.35	0.86	0.340	0.30	0.102	6%
17	6.65	0.86				0.69	0.270	0.17	0.390	1.00	0.35	0.86	0.280	0.30	0.094	5%
18	7.00	0.85				0.68	0.180	0.17	0.130	1.00	0.35	0.85	0.155	0.30	0.046	3%
19	7.35	0.76				0.61	0.220	0.15	0.140	1.00	0.35	0.76	0.180	0.27	0.048	3%
20	7.70	0.72	0.43	0.170						1.00	0.35	0.72	0.170	0.25	0.043	3%
21	8.05	0.68	0.41	0.150						1.00	0.35	0.68	0.150	0.24	0.036	2%
22	8.40	0.57	0.34	0.070						1.00	0.35	0.57	0.070	0.20	0.014	1%
23	8.75	0.42	0.25	0.060						1.00	0.20	0.42	0.060	0.08	0.005	0%
RB	8.80	0.00	0.00		0.00		0.00		0.00	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.68</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:30
Meas. End Time (MST):	8:53
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 24°C

**Flow characteristics:**

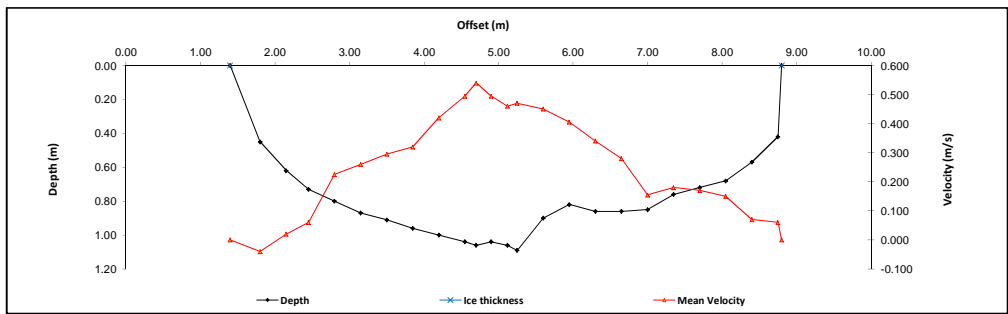
Total Flow:	1.68	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.85	(m <sup>2</sup> )
Wetted Width:	6.65	(m)
Hydraulic Depth:	0.88	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.957	0.955
Water (°C):	13.4	13.4
Datalogger Clock:	08:14	09:00
Laptop Clock:	08:14	09:00
Battery (Main):	13.9	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S62-01
S62-01	1.114	101.114		100.000	100.000	3/4" Pipe 2 m N of Station	S62-02
S62-02			1.165	99.949	99.949	3/4" Pipe 5 m W of Station	S62-03
S62-03			1.082	100.032	100.034	3/4" Pipe 8 m W of Station	WL
Ice/PT:							WL
Water Level:			3.425	97.689		Time WL Surveyed: 8:23	S62-03
Other:							S62-02
<b>Setup #2</b>							S62-01
S62-01			1.103	99.998	100.000	3/4" Pipe 2 m N of Station	
S62-02			1.154	99.947	99.949	3/4" Pipe 5 m W of Station	
S62-03	1.069	101.101		100.032	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:							
Water Level:			3.410	97.691		Time WL Surveyed: 8:25	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.103	101.103	100.000			
Water Level:			3.408	97.695		Time WL Surveyed: 8:56	
Water Level:			3.397	97.695		Time WL Surveyed: 8:58	
BM:	S62-01	1.092	101.092	100.000			

**WL Survey Summary**

	Before	After
Average WL:	97.690	97.695
Transducer Elevation:	96.733	96.740
Closing Error:	0.002	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	1.68
Expected Discharge:	1.69
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	0%

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	25-Jun-13
Data Check Personnel:	SM	Date:	25-Jun-13
Entered Digitally in the Field:	TR	Date:	19-Aug-13

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492232E 6163213N

Site Visit Date: August 17, 2013  
 Site Visit Time (MST): 15:05

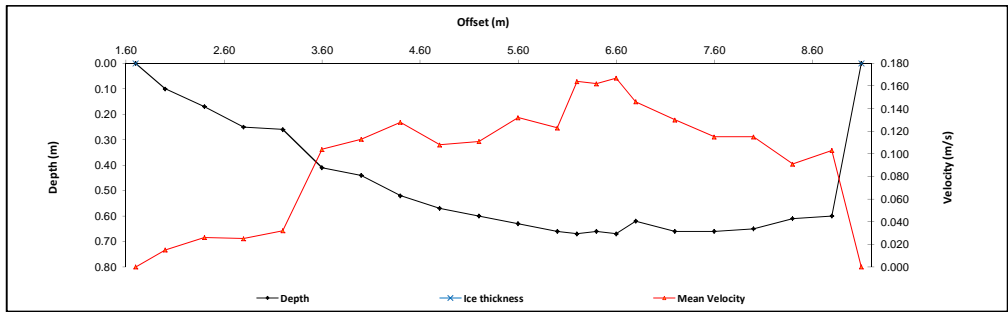


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.00	0.10		0.06	0.015					1.00	0.35	0.10	0.015	0.04	0.001	0%
2	2.40	0.17		0.10	0.026					1.00	0.40	0.17	0.026	0.07	0.002	0%
3	2.80	0.25		0.15	0.025					1.00	0.40	0.25	0.025	0.10	0.003	1%
4	3.20	0.26		0.16	0.032					1.00	0.40	0.26	0.032	0.10	0.003	1%
5	3.60	0.41		0.25	0.104					1.00	0.40	0.41	0.104	0.16	0.017	4%
6	4.00	0.44		0.26	0.113					1.00	0.40	0.44	0.113	0.18	0.020	5%
7	4.40	0.52		0.31	0.128					1.00	0.40	0.52	0.128	0.21	0.027	6%
8	4.80	0.57		0.34	0.108					1.00	0.40	0.57	0.108	0.23	0.025	6%
9	5.20	0.60		0.36	0.111					1.00	0.40	0.60	0.111	0.24	0.027	6%
10	5.60	0.63		0.38	0.132					1.00	0.40	0.63	0.132	0.25	0.033	8%
11	6.00	0.66		0.40	0.123					1.00	0.30	0.66	0.123	0.20	0.024	6%
12	6.20	0.67		0.40	0.164					1.00	0.20	0.67	0.164	0.13	0.022	5%
13	6.40	0.66		0.40	0.162					1.00	0.20	0.66	0.162	0.13	0.021	5%
14	6.60	0.67		0.40	0.167					1.00	0.20	0.67	0.167	0.13	0.022	5%
15	6.80	0.62		0.37	0.146					1.00	0.30	0.62	0.146	0.19	0.027	7%
16	7.20	0.66		0.40	0.130					1.00	0.40	0.66	0.130	0.26	0.034	8%
17	7.60	0.66		0.40	0.115					1.00	0.40	0.66	0.115	0.26	0.030	7%
18	8.00	0.65		0.39	0.115					1.00	0.40	0.65	0.115	0.26	0.030	7%
19	8.40	0.61		0.37	0.091					1.00	0.40	0.61	0.091	0.24	0.022	5%
20	8.80	0.60		0.36	0.103					1.00	0.35	0.60	0.103	0.21	0.022	5%
LB	9.10	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.412</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	16:03
Meas. End Time (MST):	16:22
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 26°C



**Flow characteristics:**

Total Flow:	0.412	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.60	(m <sup>2</sup> )
Wetted Width:	7.40	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.95	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.865	0.865
Water (°C):	14.7	14.9
Datalogger Clock:	15:10	16:31
Laptop Clock:	15:10	16:31
Battery (Main):	13.6	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed an OMNI
- Modem RSSI: -95

**General Notes:**

- Some beaver activity in the area

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S62-01	1.125	101.125		100.000	100.000	3/4" Pipe 2 m N of Station	S62-01
S62-02			1.178	99.947	99.949	3/4" Pipe 5 m W of Station	S62-02
S62-03			1.091	100.034	100.034	3/4" Pipe 8 m W of Station	WL
Ice/PT:							WL
Water Level:			3.523	97.602		Time WL Surveyed: 15:53	S62-03
Other:							S62-02
<b>Setup #2</b>							S62-01
S62-01			1.119	100.000	100.000	3/4" Pipe 2 m N of Station	
S62-02			1.171	99.948	99.949	3/4" Pipe 5 m W of Station	
S62-03	1.085	101.119		100.034	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:							
Water Level:			3.517	97.602		Time WL Surveyed: 15:54	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.119	101.119	100.000		Time WL Surveyed: 16:25	
Water Level:			3.518	97.601		Time WL Surveyed: 16:27	
Water Level:			3.514	97.600			
BM:	S62-01	1.114	101.114	100.000			

**WL Survey Summary**

	Before	After
Average WL:	97.602	97.601
Transducer Elevation:	96.737	96.736
Closing Error:	0.000	-
WL Check:	0.000	0.001

**Site Rating Information**

Measured Discharge:	0.412
Expected Discharge:	1.32
Shift from Existing Rating (m <sup>3</sup> /s):	0.90
Shift from Existing Rating (%):	219%

**Field Personnel:**

	DW, TR	Trip Date:	17-Aug-13
Data Entry Personnel:	DW	Date:	17-Aug-13
Data Check Personnel:	TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: September 20, 2013  
 Site Visit Time (MST): 14:40

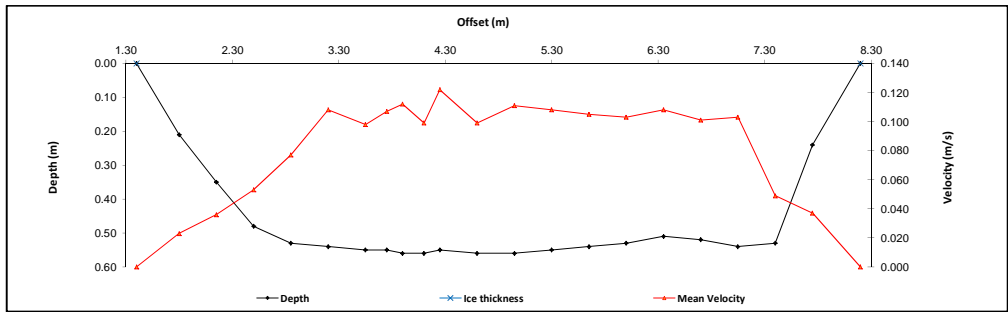


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	1.80	0.21		0.13	0.023					1.00	0.38	0.21	0.023	0.08	0.002	1%
2	2.15	0.35		0.21	0.036					1.00	0.35	0.35	0.036	0.12	0.004	2%
3	2.50	0.48		0.29	0.053					1.00	0.35	0.48	0.053	0.17	0.009	3%
4	2.85	0.53		0.32	0.077					1.00	0.35	0.53	0.077	0.19	0.014	5%
5	3.20	0.54		0.32	0.108					1.00	0.35	0.54	0.108	0.19	0.020	7%
6	3.55	0.55		0.33	0.098					1.00	0.28	0.55	0.098	0.15	0.015	5%
7	3.75	0.55		0.33	0.107					1.00	0.18	0.55	0.107	0.10	0.010	4%
8	3.90	0.56		0.34	0.112					1.00	0.18	0.56	0.112	0.10	0.011	4%
9	4.10	0.56		0.34	0.099					1.00	0.18	0.56	0.099	0.10	0.010	3%
10	4.25	0.55		0.33	0.122					1.00	0.25	0.55	0.122	0.14	0.017	6%
11	4.60	0.56		0.34	0.099					1.00	0.35	0.56	0.099	0.20	0.019	7%
12	4.95	0.56		0.34	0.111					1.00	0.35	0.56	0.111	0.20	0.022	8%
13	5.30	0.55		0.33	0.108					1.00	0.35	0.55	0.108	0.19	0.021	7%
14	5.65	0.54		0.32	0.105					1.00	0.35	0.54	0.105	0.19	0.020	7%
15	6.00	0.53		0.32	0.103					1.00	0.35	0.53	0.103	0.19	0.019	7%
16	6.35	0.51		0.31	0.108					1.00	0.35	0.51	0.108	0.18	0.019	7%
17	6.70	0.52		0.31	0.101					1.00	0.35	0.52	0.101	0.18	0.018	6%
18	7.05	0.54		0.32	0.103					1.00	0.35	0.54	0.103	0.19	0.019	7%
19	7.40	0.53		0.32	0.049					1.00	0.35	0.53	0.049	0.19	0.009	3%
20	7.75	0.24		0.14	0.037					1.00	0.40	0.24	0.037	0.10	0.004	1%
RB	8.20	0.00	0.00		0.00		0.00		0.00	1.00	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.283</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
15 m DS of bridge

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:15
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy



**Flow characteristics:**

Total Flow:	0.283	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.11	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.94	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.321	1.323
Water (°C):	8.7	8.8
Datalogger Clock:	14:37	15:27
Laptop Clock:	14:37	15:27
Battery (Main):	13.7	13.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Beaver dam located 30 m DS of Station, US of culvert under HWY, crew removed some of the dam after station visit

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S62-01	1.078	101.078		100.000	100.000	3/4" Pipe 2 m N of Station	S62-01
S62-02			1.129	99.949	99.949	3/4" Pipe 5 m W of Station	S62-02
S62-03			1.044	100.034	100.034	3/4" Pipe 8 m W of Station	WL
Ice/PT:							WL
Water Level:			3.023	98.055		Time WL Surveyed: 14:42	S62-03
Other:							S62-02
<b>Setup #2</b>							S62-01
S62-01			1.062	99.999	100.000	3/4" Pipe 2 m N of Station	
S62-02			1.112	99.949	99.949	3/4" Pipe 5 m W of Station	
S62-03	1.027	101.061		100.034	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:							
Water Level:			3.009	98.052		Time WL Surveyed: 14:44	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.062	101.062	100.000		Time WL Surveyed: 15:23	
Water Level:			3.008	98.054		Time WL Surveyed: 15:25	
Water Level:			2.991	98.054			
BM:	S62-01	1.045	101.045	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.054	98.054
Transducer Elevation:	96.733	96.731
Closing Error:	0.001	-
WL Check:	0.003	0.000

**Site Rating Information**

Measured Discharge:	0.283
Expected Discharge:	3.66
Shift from Existing Rating (m <sup>3</sup> /s):	3.37
Shift from Existing Rating (%):	1192%

**Field Personnel:**

SM, TR	Trip Date:	20-Sep-13
SM	Date:	20-Sep-13
TR	Date:	1-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: October 24, 2013  
 Site Visit Time (MST): 07:30

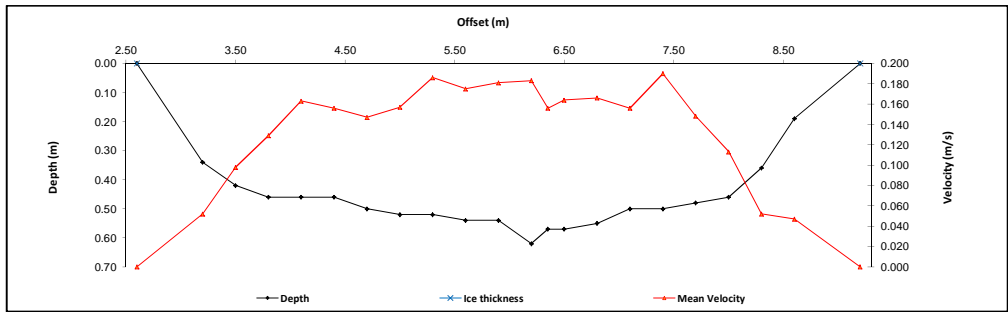


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.60	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.20	0.34		0.20	0.052					1.00	0.45	0.34	0.052	0.15	0.008	2%
2	3.50	0.42		0.25	0.098					1.00	0.30	0.42	0.098	0.13	0.012	3%
3	3.80	0.46		0.28	0.129					1.00	0.30	0.46	0.129	0.14	0.018	4%
4	4.10	0.46		0.28	0.163					1.00	0.30	0.46	0.163	0.14	0.022	6%
5	4.40	0.46		0.28	0.156					1.00	0.30	0.46	0.156	0.14	0.022	5%
6	4.70	0.50		0.30	0.147					1.00	0.30	0.50	0.147	0.15	0.022	5%
7	5.00	0.52		0.31	0.157					1.00	0.30	0.52	0.157	0.16	0.024	6%
8	5.30	0.52		0.31	0.186					1.00	0.30	0.52	0.186	0.16	0.029	7%
9	5.60	0.54		0.32	0.175					1.00	0.30	0.54	0.175	0.16	0.028	7%
10	5.90	0.54		0.32	0.181					1.00	0.30	0.54	0.181	0.16	0.029	7%
11	6.20	0.62		0.37	0.183					1.00	0.23	0.62	0.183	0.14	0.026	6%
12	6.35	0.57		0.34	0.156					1.00	0.15	0.57	0.156	0.09	0.013	3%
13	6.50	0.57		0.34	0.164					1.00	0.23	0.57	0.164	0.13	0.021	5%
14	6.80	0.55		0.33	0.166					1.00	0.30	0.55	0.166	0.16	0.027	7%
15	7.10	0.50		0.30	0.156					1.00	0.30	0.50	0.156	0.15	0.023	6%
16	7.40	0.50		0.30	0.190					1.00	0.30	0.50	0.190	0.15	0.029	7%
17	7.70	0.48		0.29	0.148					1.00	0.30	0.48	0.148	0.14	0.021	5%
18	8.00	0.46		0.28	0.113					1.00	0.30	0.46	0.113	0.14	0.016	4%
19	8.30	0.36		0.22	0.052					1.00	0.30	0.36	0.052	0.11	0.006	1%
20	8.60	0.19		0.11	0.047					1.00	0.45	0.19	0.047	0.09	0.004	1%
LB	9.20	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.401</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5 m DS of bridge

Meas. Start Time (MST):	7:48
Meas. End Time (MST):	8:08
Equipment:	ADV
Method:	Wading
River Condition:	Low flow, high water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Mostly sunny, 0°C



**Flow characteristics:**

Total Flow:	0.401	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.77	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.300	1.299
Water (°C):	4.0	3.9
Datalogger Clock:	07:32	08:16
Laptop Clock:	07:32	08:16
Battery (Main):	12.8	12.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Large beaver damn remain just US of bridge

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S62-01	1.137	101.137		100.000	100.000	3/4" Pipe 2 m N of Station	S62-03
S62-02			1.188	99.949	99.949	3/4" Pipe 5 m W of Station	S62-02
S62-03			1.104	100.033	100.034	3/4" Pipe 8 m W of Station	WL
Ice/PT:							WL
Water Level:			3.105	98.032		Time WL Surveyed: 7:39	S62-01
Other:							S62-02
<b>Setup #2</b>							S62-03
S62-01			1.127	99.999	100.000	3/4" Pipe 2 m N of Station	
S62-02	1.177	101.126		99.949	99.949	3/4" Pipe 5 m W of Station	
S62-03			1.093	100.033	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:							
Water Level:			3.093	98.033		Time WL Surveyed: 7:40	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.126	101.126	100.000		Time WL Surveyed: 8:17	
Water Level:			3.092	98.034		Time WL Surveyed: 8:19	
Water Level:			3.085	98.033			
BM:	S62-01	1.118	101.118	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.033	98.034
Transducer Elevation:	96.733	96.735
Closing Error:	0.001	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	0.401
Expected Discharge:	3.52
Shift from Existing Rating (m <sup>3</sup> /s):	3.12
Shift from Existing Rating (%):	779%

**Field Personnel:**

	DW, TR	Trip Date:	24-Oct-13
Data Entry Personnel:	DW	Date:	24-Oct-13
Data Check Personnel:	TR	Date:	29-Oct-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: November 30, 2013  
 Site Visit Time (MST): 11:10

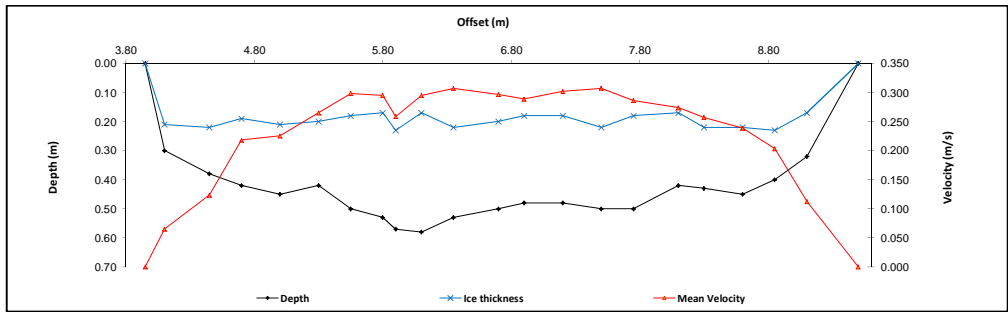


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.95	0.00	0.00		0.000				0.000	0.88	0.07	0.00	0.000	0.00	0.000	
1	4.10	0.30	0.21	0.26	0.074					0.88	0.25	0.09	0.065	0.02	0.001	0%
2	4.45	0.38	0.22	0.30	0.140					0.88	0.30	0.16	0.123	0.05	0.006	2%
3	4.70	0.42	0.19	0.31	0.248					0.88	0.27	0.23	0.218	0.06	0.014	4%
4	5.00	0.45	0.21	0.33	0.256					0.88	0.30	0.24	0.225	0.07	0.016	5%
5	5.30	0.42	0.20	0.31	0.301					0.88	0.27	0.22	0.265	0.06	0.016	5%
6	5.55	0.50	0.18	0.34	0.339					0.88	0.25	0.32	0.298	0.08	0.024	7%
7	5.80	0.53	0.17	0.35	0.335					0.88	0.18	0.36	0.295	0.06	0.019	5%
8	5.90	0.57	0.23	0.40	0.294					0.88	0.15	0.34	0.259	0.05	0.013	4%
9	6.10	0.58	0.17	0.38	0.335					0.88	0.23	0.41	0.295	0.09	0.027	8%
10	6.35	0.53	0.22	0.38	0.349					0.88	0.30	0.31	0.307	0.09	0.029	8%
11	6.70	0.50	0.20	0.35	0.337					0.88	0.28	0.30	0.297	0.08	0.024	7%
12	6.90	0.48	0.18	0.33	0.328					0.88	0.25	0.30	0.289	0.08	0.022	6%
13	7.20	0.48	0.18	0.33	0.343					0.88	0.30	0.30	0.302	0.09	0.027	8%
14	7.50	0.50	0.22	0.36	0.349					0.88	0.28	0.28	0.307	0.08	0.024	7%
15	7.75	0.50	0.18	0.34	0.325					0.88	0.30	0.32	0.286	0.10	0.027	8%
16	8.10	0.42	0.17	0.30	0.311					0.88	0.27	0.25	0.274	0.07	0.019	5%
17	8.30	0.43	0.22	0.33	0.292					0.88	0.25	0.21	0.257	0.05	0.013	4%
18	8.60	0.45	0.22	0.34	0.271					0.88	0.28	0.23	0.238	0.06	0.015	4%
19	8.85	0.40	0.23	0.32	0.231					0.88	0.25	0.17	0.203	0.04	0.009	2%
20	9.10	0.32	0.17	0.25	0.128					0.88	0.33	0.15	0.113	0.05	0.005	2%
RB	9.50	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.351</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:45
Meas. End Time (MST):	12:08
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, -7°C



**Flow characteristics:**

Total Flow:	0.351	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.34	(m <sup>2</sup> )
Wetted Width:	0.25	(m)
Hydraulic Depth:	5.37	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.349	1.350
Water (°C):	0.4	0.4
Datalogger Clock:	11:19	12:17
Laptop Clock:	11:19	12:17
Battery (Main):	11.6	12.5
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S62-01	1.184	101.184		100.000	100.000	3/4" Pipe 2 m N of Station	S62-03
S62-02			1.235	99.949	99.949	3/4" Pipe 5 m W of Station	S62-01
S62-03			1.152	100.032	100.034	3/4" Pipe 8 m W of Station	WL
Ice/PT:			3.130	98.054			Ice
Water Level:			3.100	98.084		Time WL Surveyed:	11:35
Other:							Ice
<b>Setup #2</b>							
S62-01			1.172	99.999	100.000	3/4" Pipe 2 m N of Station	S62-02
S62-02	1.222	101.171		99.949	99.949	3/4" Pipe 5 m W of Station	S62-03
S62-03			1.137	100.034	100.034	3/4" Pipe 8 m W of Station	
Ice/PT:			3.116	98.055			
Water Level:			3.087	98.084		Time WL Surveyed:	11:37
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S62-01	1.171	101.171		100.000		
Water Level:			3.087	98.084		Time WL Surveyed:	12:14
Water Level:			3.073	98.084		Time WL Surveyed:	12:15
BM:	S62-01	1.157	101.157		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.084	98.084
Transducer Elevation:	96.735	96.734
Closing Error:	0.001	-
WL Check:	0.000	0.000

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	30-Nov-13
SM	Date:	30-Nov-13
TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: May 6, 2013  
 Site Visit Time (MST): 15:00

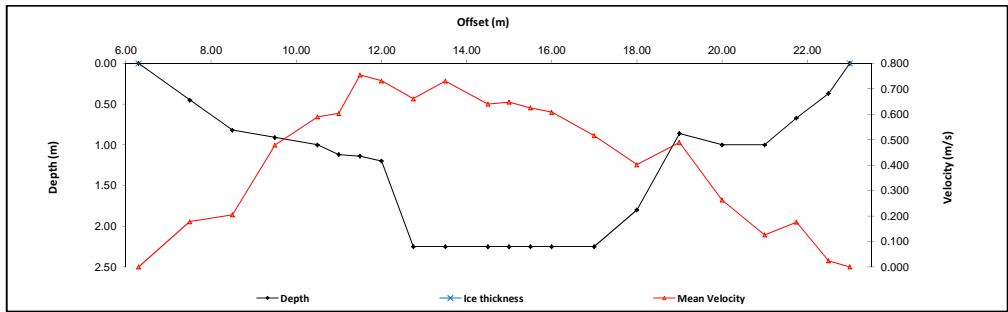


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	6.30	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	7.50	0.45		0.27	0.178					1.00	1.10	0.45	0.178	0.50	0.088	1%
2	8.50	0.82				0.66	0.025	0.16	0.385	1.00	1.00	0.82	0.205	0.82	0.168	1%
3	9.50	0.91				0.73	0.349	0.18	0.610	1.00	1.00	0.91	0.480	0.91	0.436	4%
4	10.50	1.00				0.80	0.423	0.20	0.756	1.00	0.75	1.00	0.590	0.75	0.442	4%
5	11.00	1.12				0.90	0.523	0.22	0.683	1.00	0.50	1.12	0.603	0.56	0.338	3%
6	11.50	1.14				0.91	0.650	0.23	0.860	1.00	0.50	1.14	0.755	0.57	0.430	4%
7	12.00	1.20				0.96	0.656	0.24	0.807	1.00	0.63	1.20	0.732	0.75	0.549	5%
8	12.75	2.25				1.80	0.312	0.45	1.010	1.00	0.75	2.25	0.661	1.69	1.115	10%
9	13.50	2.25				1.80	0.735	0.45	0.727	1.00	0.88	2.25	0.731	1.97	1.439	13%
10	14.50	2.25				1.80	0.677	0.45	0.603	1.00	0.75	2.25	0.640	1.69	1.080	10%
11	15.00	2.25				1.80	0.576	0.45	0.719	1.00	0.50	2.25	0.648	1.13	0.728	6%
12	15.50	2.25				1.80	0.632	0.45	0.618	1.00	0.50	2.25	0.625	1.13	0.703	6%
13	16.00	2.25				1.80	0.531	0.45	0.685	1.00	0.75	2.25	0.608	1.69	1.026	9%
14	17.00	2.25				1.80	0.466	0.45	0.565	1.00	1.00	2.25	0.516	2.25	1.160	10%
15	18.00	1.80				1.44	0.075	0.36	0.729	1.00	1.00	1.80	0.402	1.80	0.724	6%
16	19.00	0.86				0.69	0.427	0.17	0.551	1.00	1.00	0.86	0.489	0.86	0.421	4%
17	20.00	1.00			0.263	0.80		0.20		1.00	1.00	1.00	0.263	1.00	0.263	2%
18	21.00	1.00			0.126	0.80		0.20		1.00	0.88	1.00	0.126	0.88	0.110	1%
19	21.75	0.67		0.40	0.176	0.80		0.20		1.00	0.75	0.67	0.176	0.50	0.088	1%
20	22.50	0.37		0.22	0.024					1.00	0.63	0.37	0.024	0.23	0.006	0%
RB	23.00	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>11.3</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	15:00
Meas. End Time (MST):	16:13
Equipment:	ADV
Method:	Fishcat
River Condition:	Very high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, breezy, 25°C



**Flow characteristics:**

Total Flow:	11.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	21.66	(m <sup>2</sup> )
Wetted Width:	16.70	(m)
Hydraulic Depth:	1.30	(m)
Mean Velocity:	0.52	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.169	1.172
Water (°C):	5.7	5.7
Datalogger Clock:	15:08	16:20
Laptop Clock:	15:08	16:20
Battery (Main):	13.9	13.8
Battery Condition:	New	
Battery Serial #:	-	-
Enclosure Dessicant:	New	
Vent Tube Dessicant:	New	
PT# (if replaced):	298684	-
Logger# (if replaced):	25574	-

**Datalogger / Station Notes:**

- Station installed, no telemetry

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S63-01	0.533	100.533		100.000	100.000	Pipe 5 m NE of Station	S63-01
S63-02			0.703	99.830	99.830	Pipe 7 m E of Station	S63-02
S63-03			1.089	99.444	99.444	Pipe 10 m E of Station	WL
Ice/PT:							WL
Water Level:			2.163	98.370		Time WL Surveyed: 15:16	S63-03
Other:							S63-02
<b>Setup #2</b>							S63-01
S63-01			0.522	99.999	100.000	Pipe 5 m NE of Station	
S63-02			0.692	99.829	99.830	Pipe 7 m E of Station	
S63-03	1.077	100.521		99.444	99.444	Pipe 10 m E of Station	
Ice/PT:							
Water Level:			2.152	98.369		Time WL Surveyed: 15:17	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S63-02	0.692	100.522		99.830			
Water Level:			2.158	98.364		Time WL Surveyed: -	
Water Level:			2.144	98.365		Time WL Surveyed: -	
BM: S63-02	0.679	100.509		99.830			

**WL Survey Summary**

	Before	After
Average WL:	98.370	98.365
Transducer Elevation:	97.201	97.193
Closing Error:	0.001	-
WL Check:	0.001	-0.001

**Site Rating Information**

Measured Discharge:	11.3
Expected Discharge:	11.31
Shift from Existing Rating (m <sup>3</sup> /s):	0.01
Shift from Existing Rating (%):	0%

**Field Personnel:**

SM, DW	Trip Date:	6-May-13
SM	Date:	6-May-13
TR	Date:	19-Aug-13
Yes	Entered Digitally in the Field:	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: June 25, 2013  
 Site Visit Time (MST): 09:20

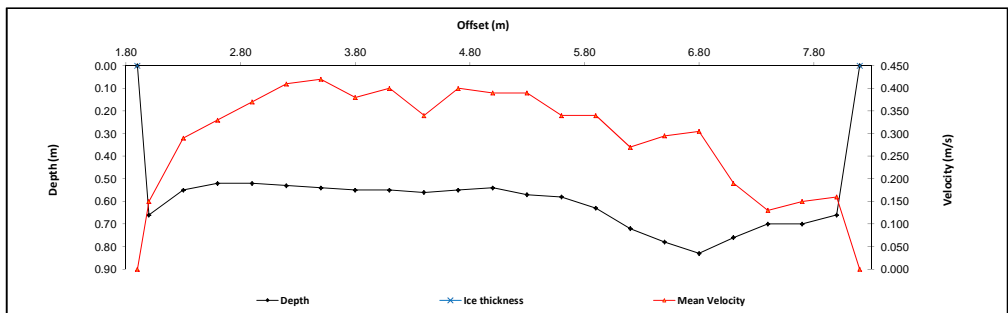


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	2.00	0.66		0.40	0.150					1.00	0.20	0.66	0.150	0.13	0.020	2%
2	2.30	0.55		0.33	0.290					1.00	0.30	0.55	0.290	0.17	0.048	4%
3	2.60	0.52		0.31	0.330					1.00	0.30	0.52	0.330	0.16	0.051	4%
4	2.90	0.52		0.31	0.370					1.00	0.30	0.52	0.370	0.16	0.058	5%
5	3.20	0.53		0.32	0.410					1.00	0.30	0.53	0.410	0.16	0.065	6%
6	3.50	0.54		0.32	0.420					1.00	0.30	0.54	0.420	0.16	0.068	6%
7	3.80	0.55		0.33	0.380					1.00	0.30	0.55	0.380	0.17	0.063	5%
8	4.10	0.55		0.33	0.400					1.00	0.30	0.55	0.400	0.17	0.066	6%
9	4.40	0.56		0.34	0.340					1.00	0.30	0.56	0.340	0.17	0.057	5%
10	4.70	0.55		0.33	0.400					1.00	0.30	0.55	0.400	0.16	0.066	6%
11	5.00	0.54		0.32	0.390					1.00	0.30	0.54	0.390	0.16	0.063	5%
12	5.30	0.57		0.34	0.390					1.00	0.30	0.57	0.390	0.17	0.067	6%
13	5.60	0.58		0.35	0.340					1.00	0.30	0.58	0.340	0.17	0.059	5%
14	5.90	0.63		0.40	0.340					1.00	0.30	0.63	0.340	0.19	0.064	6%
15	6.20	0.72		0.43	0.270					1.00	0.30	0.72	0.270	0.22	0.058	5%
16	6.50	0.78				0.62	0.200	0.16	0.390	1.00	0.30	0.78	0.295	0.23	0.069	6%
17	6.80	0.83				0.61	0.260	0.17	0.350	1.00	0.30	0.83	0.305	0.25	0.076	7%
18	7.10	0.76					0.110	0.15	0.270	1.00	0.30	0.76	0.190	0.23	0.043	4%
19	7.40	0.70	0.42		0.130					1.00	0.30	0.70	0.130	0.21	0.027	2%
20	7.70	0.70	0.42		0.150					1.00	0.30	0.70	0.150	0.21	0.031	3%
21	8.00	0.66	0.40		0.160					1.00	0.25	0.66	0.160	0.17	0.026	2%
LB	8.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.15</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:43
Meas. End Time (MST):	10:00
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 22°C



**Flow characteristics:**

Total Flow:	1.15	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.80	(m <sup>2</sup> )
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.126	1.127
Water (°C):	17.7	16.5
Datalogger Clock:	09:30	10:07
Laptop Clock:	09:30	10:07
Battery (Main):	13.7	13.7
Battery Condition:	Good	Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	Replaced
Vent Tube Desiccant:	Good	Good
PT# (if replaced):	-	298684
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT was out of water upon arrival., relocated to a depth of 1.12 m

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S63-01
S63-01	0.634	100.634		100.000	100.000	3/4" Pipe 5 m NE of Station	S63-02
S63-02			0.804	99.830	99.830	3/4" Pipe 7 m E of Station	S63-03
S63-03			1.189	99.445	99.444	3/4" Pipe 10 m E of Station	WL
Ice/PT:							WL
Water Level:			3.805	96.829		Time WL Surveyed: 9:37	S63-03
Other:							S63-02
<b>Setup #2</b>							S63-01
S63-01			0.622	100.001	100.000	3/4" Pipe 5 m NE of Station	
S63-02			0.792	99.831	99.830	3/4" Pipe 7 m E of Station	
S63-03	1.178	100.623		99.445	99.444	3/4" Pipe 10 m E of Station	
Ice/PT:							
Water Level:			3.797	96.826		Time WL Surveyed: 9:40	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S63-01	0.622	100.622	100.000			
Water Level:			3.790	96.832		Time WL Surveyed: 10:05	
Water Level:			3.780	96.830		Time WL Surveyed: 10:06	
BM:	S63-01	0.610	100.610	100.000			

**WL Survey Summary**

	Before	After
Average WL:	96.828	96.831
Transducer Elevation:	95.702	95.704
Closing Error:	-0.001	-
WL Check:	0.003	0.002

**Site Rating Information**

Measured Discharge:	1.15
Expected Discharge:	1.13
Shift from Existing Rating (m <sup>3</sup> /s):	-0.02
Shift from Existing Rating (%):	-2%

**Field Personnel:**

SM, TR	Trip Date:	25-Jun-13
SM	Date:	25-Jun-13
TR	Date:	19-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: August 17, 2013  
 Site Visit Time (MST): 13:05

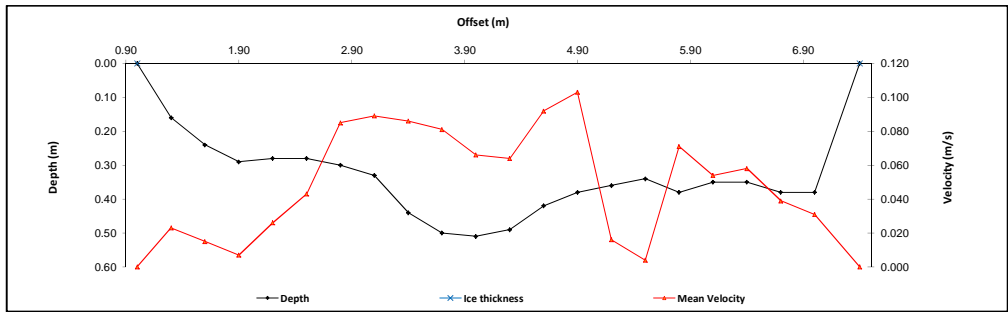


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.30	0.16		0.10	0.023					1.00	0.30	0.16	0.023	0.05	0.001	1%
2	1.60	0.24		0.14	0.015					1.00	0.30	0.24	0.015	0.07	0.001	1%
3	1.90	0.29		0.17	0.007					1.00	0.30	0.29	0.007	0.09	0.001	0%
4	2.20	0.28		0.17	0.026					1.00	0.30	0.28	0.026	0.08	0.002	2%
5	2.50	0.28		0.17	0.043					1.00	0.30	0.28	0.043	0.08	0.004	3%
6	2.80	0.30		0.18	0.085					1.00	0.30	0.30	0.085	0.09	0.008	6%
7	3.10	0.33		0.20	0.089					1.00	0.30	0.33	0.089	0.10	0.009	7%
8	3.40	0.44		0.26	0.086					1.00	0.30	0.44	0.086	0.13	0.011	9%
9	3.70	0.50		0.30	0.081					1.00	0.30	0.50	0.081	0.15	0.012	10%
10	4.00	0.51		0.31	0.066					1.00	0.30	0.51	0.066	0.15	0.010	8%
11	4.30	0.49		0.29	0.064					1.00	0.30	0.49	0.064	0.15	0.009	8%
12	4.60	0.42		0.25	0.092					1.00	0.30	0.42	0.092	0.13	0.012	10%
13	4.90	0.38		0.23	0.103					1.00	0.30	0.38	0.103	0.11	0.012	10%
14	5.20	0.36		0.22	0.016					1.00	0.30	0.36	0.016	0.11	0.002	1%
15	5.50	0.34		0.20	0.004					1.00	0.30	0.34	0.004	0.10	0.000	0%
16	5.90	0.38		0.23	0.071					1.00	0.30	0.38	0.071	0.11	0.008	7%
17	6.10	0.35		0.21	0.054					1.00	0.30	0.35	0.054	0.11	0.006	5%
18	6.40	0.35		0.21	0.058					1.00	0.30	0.35	0.058	0.11	0.006	5%
19	6.70	0.38		0.23	0.039					1.00	0.30	0.38	0.039	0.11	0.004	4%
20	7.00	0.38		0.23	0.031					1.00	0.35	0.38	0.031	0.13	0.004	3%
LB	7.40	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.122</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5 m DS of PLS

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:05
Equipment:	ADV
Method:	Wading
River Condition:	Damed
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. cloudy, light breeze, 20°C



**Flow characteristics:**

Total Flow:	0.122	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.17	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.649	0.650
Water (°C):	16.6	16.9
Datalogger Clock:	13:09	14:13
Laptop Clock:	13:09	14:13
Battery (Main):	13.6	-
Battery Condition:	Good	-
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vent Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed an OMNI
- Modem RSSI: -93

**General Notes:**

- Two beaver dams located US, one 5 m US of PLS and another much larger one 40 m US

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S63-01	0.543	100.543		100.000	100.000	3/4" Pipe 5 m NE of Station	S63-01
S63-02			0.712	99.831	99.830	3/4" Pipe 7 m E of Station	S63-02
S63-03			1.099	99.444	99.444	3/4" Pipe 10 m E of Station	WL
Ice/PT:							WL
Water Level:			4.103	96.440		Time WL Surveyed: 13:33	S63-02
Other:							S63-03
<b>Setup #2</b>							S63-01
S63-01			0.527	100.001	100.000	3/4" Pipe 5 m NE of Station	
S63-02	0.697	100.528		99.831	99.830	3/4" Pipe 7 m E of Station	
S63-03			1.082	99.446	99.444	3/4" Pipe 10 m E of Station	
Ice/PT:							
Water Level:			4.087	96.441		Time WL Surveyed: 13:34	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S63-01	0.527	100.527	100.000		Time WL Surveyed: 14:08	
Water Level:			4.088	96.439		Time WL Surveyed: 14:09	
Water Level:			4.063	96.439			
BM	S63-01	0.502	100.502	100.000			

**WL Survey Summary**

	Before	After
Average WL:	96.441	96.439
Transducer Elevation:	95.792	95.789
Closing Error:	-0.001	-
WL Check:	0.001	0.000

**Site Rating Information**

Measured Discharge:	0.122
Expected Discharge:	0.12
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	-1%

**Field Personnel:**

Field Personnel:	TR, DW	Trip Date:	17-Aug-13
Data Entry Personnel:	DW	Date:	17-Aug-13
Data Check Personnel:	TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes		

START  
↓  
END



# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

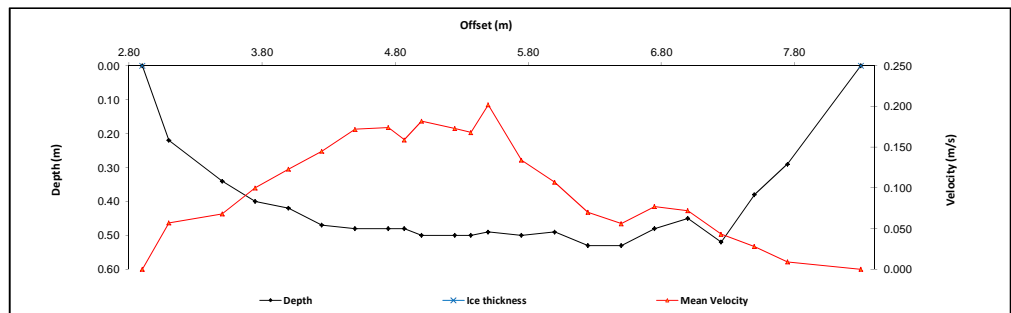
Site Visit Date: September 20, 2013  
 Site Visit Time (MST): 13:35



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.10	0.22		0.13	0.057					1.00	0.30	0.22	0.057	0.07	0.004	2%
2	3.50	0.34		0.20	0.068					1.00	0.33	0.34	0.068	0.11	0.008	3%
3	3.75	0.40		0.24	0.100					1.00	0.25	0.40	0.100	0.10	0.010	4%
4	4.00	0.42		0.25	0.123					1.00	0.25	0.42	0.123	0.11	0.013	6%
5	4.25	0.47		0.28	0.145					1.00	0.25	0.47	0.145	0.12	0.017	7%
6	4.50	0.48		0.29	0.172					1.00	0.25	0.48	0.172	0.12	0.021	9%
7	4.75	0.48		0.29	0.174					1.00	0.19	0.48	0.174	0.09	0.015	7%
8	4.87	0.48		0.29	0.159					1.00	0.13	0.48	0.159	0.06	0.010	4%
9	5.00	0.50		0.30	0.182					1.00	0.19	0.50	0.182	0.09	0.017	7%
10	5.25	0.50		0.30	0.173					1.00	0.19	0.50	0.173	0.09	0.016	7%
11	5.37	0.50		0.30	0.168					1.00	0.13	0.50	0.168	0.06	0.011	5%
12	5.50	0.49		0.29	0.202					1.00	0.19	0.49	0.202	0.09	0.019	8%
13	5.75	0.50		0.30	0.134					1.00	0.25	0.50	0.134	0.13	0.017	7%
14	6.00	0.49		0.29	0.107					1.00	0.25	0.49	0.107	0.12	0.013	6%
15	6.25	0.53		0.32	0.070					1.00	0.25	0.53	0.070	0.13	0.009	4%
16	6.50	0.53		0.32	0.056					1.00	0.25	0.53	0.056	0.13	0.007	3%
17	6.75	0.48		0.29	0.077					1.00	0.25	0.48	0.077	0.12	0.009	4%
18	7.00	0.45		0.27	0.072					1.00	0.25	0.45	0.072	0.11	0.008	3%
19	7.25	0.52		0.31	0.043					1.00	0.25	0.52	0.043	0.13	0.006	2%
20	7.50	0.38		0.23	0.028					1.00	0.25	0.38	0.028	0.10	0.003	1%
21	7.75	0.29		0.17	0.009					1.00	0.40	0.29	0.009	0.12	0.001	0%
RB	8.30	0.00	0.00		0.00		0.00		0.00	1.00	0.28	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.233</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	13:44
Meas. End Time (MST):	14:04
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 20°C



**Flow characteristics:**

Total Flow:	0.233	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.20	(m <sup>2</sup> )
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.698	0.696
Water (°C):	11.1	11.5
Datalogger Clock:	13:28	14:11
Laptop Clock:	13:28	14:11
Battery (Main):	13.7	13.7
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S63-01
S63-01	0.677	100.677		100.000	100.000	3/4" Pipe 5 m NE of Station	S63-02
S63-02			0.846	99.831	99.830	3/4" Pipe 7 m E of Station	S63-03
S63-03			1.233	99.444	99.444	3/4" Pipe 10 m E of Station	WL
Ice/PT:							WL
Water Level:			4.188	96.489		Time WL Surveyed: 13:35	S63-03
Other:							S63-02
<b>Setup #2</b>							S63-01
S63-01			0.665	99.999	100.000	3/4" Pipe 5 m NE of Station	
S63-02			0.834	99.830	99.830	3/4" Pipe 7 m E of Station	
S63-03	1.220	100.664		99.444	99.444	3/4" Pipe 10 m E of Station	
Ice/PT:							
Water Level:			4.178	96.486		Time WL Surveyed: 13:37	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S63-01	0.665	100.665		100.000		
Water Level:			4.179	96.486		Time WL Surveyed: 14:08	
Water Level:			4.164	96.488		Time WL Surveyed: 14:10	
BM:	S63-01	0.652	100.652		100.000		

**WL Survey Summary**

	Before	After
Average WL:	96.488	96.487
Transducer Elevation:	95.790	95.791
Closing Error:	0.001	-
WL Check:	0.003	-0.002

**Site Rating Information**

Measured Discharge:	0.233
Expected Discharge:	0.20
Shift from Existing Rating (m <sup>3</sup> /s):	-0.04
Shift from Existing Rating (%):	-15%

**Field Personnel:**

SM, TR	Trip Date:	20-Sep-13
SM	Date:	20-Sep-13
TR	Date:	1-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: October 24, 2013  
 Site Visit Time (MST): 08:40

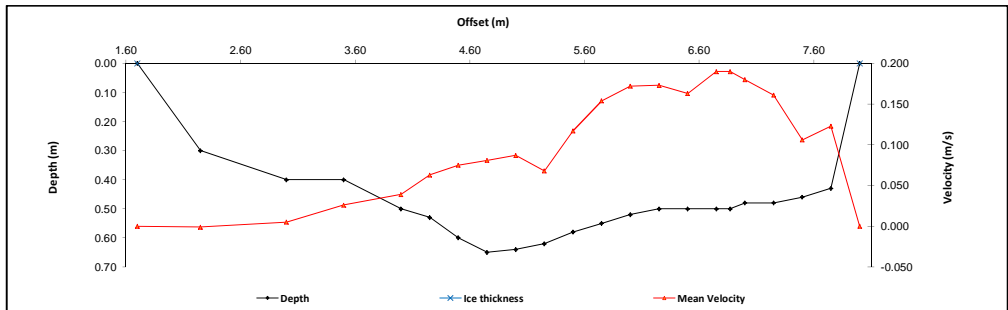


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.70	0.00	0.00		0.000				0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	2.25	0.30		0.18	-0.001					1.00	0.65	0.30	-0.001	0.20	0.000	0%
2	3.00	0.40		0.24	0.005					1.00	0.63	0.40	0.005	0.25	0.001	0%
3	3.50	0.40		0.24	0.026					1.00	0.50	0.40	0.026	0.20	0.005	2%
4	4.00	0.50		0.30	0.039					1.00	0.38	0.50	0.039	0.19	0.007	3%
5	4.25	0.53		0.32	0.063					1.00	0.25	0.53	0.063	0.13	0.008	3%
6	4.50	0.60		0.36	0.075					1.00	0.25	0.60	0.075	0.15	0.011	4%
7	4.75	0.65		0.39	0.081					1.00	0.25	0.65	0.081	0.16	0.013	5%
8	5.00	0.64		0.38	0.087					1.00	0.25	0.64	0.087	0.16	0.014	5%
9	5.25	0.62		0.37	0.068					1.00	0.25	0.62	0.068	0.16	0.011	4%
10	5.50	0.58		0.35	0.117					1.00	0.25	0.58	0.117	0.15	0.017	6%
11	5.75	0.55		0.33	0.154					1.00	0.25	0.55	0.154	0.14	0.021	8%
12	6.00	0.52		0.31	0.172					1.00	0.25	0.52	0.172	0.13	0.022	8%
13	6.25	0.50		0.30	0.173					1.00	0.25	0.50	0.173	0.13	0.022	8%
14	6.50	0.50		0.30	0.163					1.00	0.25	0.50	0.163	0.13	0.020	8%
15	6.75	0.50		0.30	0.190					1.00	0.19	0.50	0.190	0.09	0.018	7%
16	6.87	0.50		0.30	0.190					1.00	0.13	0.50	0.190	0.06	0.012	4%
17	7.00	0.48		0.29	0.180					1.00	0.19	0.48	0.180	0.09	0.016	6%
18	7.25	0.48		0.29	0.161					1.00	0.25	0.48	0.161	0.12	0.019	7%
19	7.50	0.46		0.28	0.106					1.00	0.25	0.46	0.106	0.12	0.012	5%
20	7.75	0.43		0.26	0.123					1.00	0.25	0.43	0.123	0.11	0.013	5%
LB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.264</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10 m DS of PT

Meas. Start Time (MST):	8:55
Meas. End Time (MST):	9:17
Equipment:	ADV
Method:	Wading
River Condition:	Good
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 6°C



**Flow characteristics:**

Total Flow:	0.264	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.84	(m <sup>2</sup> )
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.94	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.776	0.782
Water (°C):	3.9	3.9
Datalogger Clock:	08:42	09:22
Laptop Clock:	08:42	09:22
Battery (Main):	14.5	14.7
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S63-01	0.503	100.503		100.000	100.000	3/4" Pipe 5 m NE of Station	S63-01
S63-02			0.673	99.830	99.830	3/4" Pipe 7 m E of Station	S63-02
S63-03			1.060	99.443	99.444	3/4" Pipe 10 m E of Station	WL
Ice/PT:							WL
Water Level:			3.939	96.564		Time WL Surveyed: 8:49	S63-02
Other:							S63-03
<b>Setup #2</b>							S63-01
S63-01			0.467	100.000	100.000	3/4" Pipe 5 m NE of Station	
S63-02	0.637	100.467		99.830	99.830	3/4" Pipe 7 m E of Station	
S63-03			1.023	99.444	99.444	3/4" Pipe 10 m E of Station	
Ice/PT:							
Water Level:			3.901	96.566		Time WL Surveyed: 8:51	(must close survey loop on survey starting point)
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S63-01	0.467	100.467	100.000		Time WL Surveyed: 9:19	
Water Level:			3.902	96.565		Time WL Surveyed: 9:20	
Water Level:			3.881	96.565			
BM:	S63-01	0.446	100.446	100.000			

**WL Survey Summary**

	Before	After
Average WL:	96.565	96.565
Transducer Elevation:	95.789	95.783
Closing Error:	0.000	-
WL Check:	0.002	0.000

**Site Rating Information**

Measured Discharge:	0.264
Expected Discharge:	0.35
Shift from Existing Rating (m <sup>3</sup> /s):	0.09
Shift from Existing Rating (%):	34%

**Field Personnel:**

TR, DW	Trip Date:	24-Oct-13
TR	Date:	24-Oct-13
TR	Date:	29-Oct-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

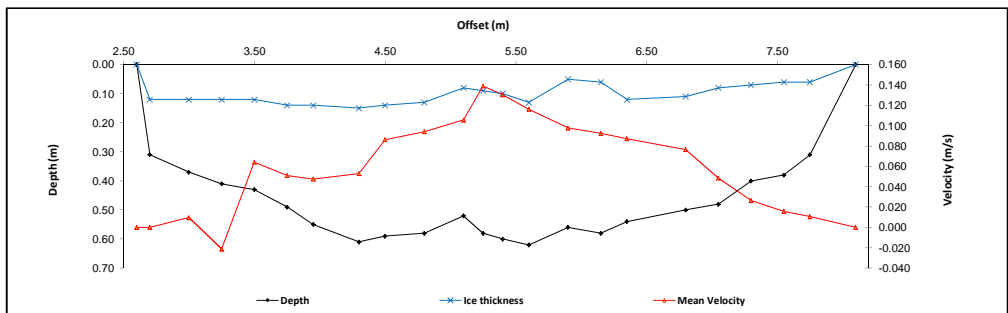
Site Visit Date: November 30, 2013  
 Site Visit Time (MST): 09:35



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.60	0.00	0.00		0.000		0.000		0.000	0.88	0.05	0.00	0.000	0.00	0.000	
1	2.70	0.31	0.12	0.22	0.000					0.88	0.20	0.19	0.000	0.04	0.000	0%
2	3.00	0.37	0.12	0.25	0.011					0.88	0.28	0.25	0.010	0.07	0.001	0%
3	3.25	0.41	0.12	0.27	-0.024					0.88	0.25	0.29	-0.021	0.07	-0.002	-1%
4	3.50	0.43	0.12	0.28	0.073					0.88	0.25	0.31	0.064	0.08	0.005	3%
5	3.75	0.49	0.14	0.32	0.058					0.88	0.23	0.35	0.051	0.08	0.004	3%
6	3.95	0.55	0.14	0.35	0.054					0.88	0.28	0.41	0.048	0.11	0.005	4%
7	4.30	0.61	0.15	0.38	0.060					0.88	0.28	0.46	0.053	0.13	0.007	5%
8	4.50	0.59	0.14	0.37	0.098					0.88	0.25	0.45	0.086	0.11	0.010	7%
9	4.80	0.58	0.13	0.36	0.107					0.88	0.30	0.45	0.094	0.14	0.013	9%
10	5.10	0.52	0.08	0.30	0.120					0.88	0.23	0.44	0.106	0.10	0.010	7%
11	5.25	0.58	0.09	0.34	0.158					0.88	0.15	0.49	0.139	0.07	0.010	7%
12	5.40	0.60	0.10	0.35	0.148					0.88	0.18	0.50	0.130	0.09	0.011	8%
13	5.60	0.62	0.13	0.38	0.132					0.88	0.25	0.49	0.116	0.12	0.014	10%
14	5.90	0.56	0.05	0.31	0.111					0.88	0.28	0.51	0.098	0.14	0.014	9%
15	6.15	0.58	0.06	0.32	0.105					0.88	0.23	0.52	0.092	0.12	0.011	7%
16	6.35	0.54	0.12	0.33	0.099					0.88	0.32	0.42	0.087	0.14	0.012	8%
17	6.80	0.50	0.11	0.31	0.087					0.88	0.35	0.39	0.077	0.14	0.010	7%
18	7.05	0.48	0.08	0.28	0.055					0.88	0.25	0.40	0.048	0.10	0.005	3%
19	7.30	0.40	0.07	0.24	0.030					0.88	0.25	0.33	0.026	0.08	0.002	2%
20	7.55	0.38	0.06	0.22	0.018					0.88	0.23	0.32	0.016	0.07	0.001	1%
21	7.75	0.31	0.06	0.19	0.012					0.88	0.27	0.25	0.011	0.07	0.001	1%
LB	8.10	0.00	0.00		0.00		0.00		0.00	0.88	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.145</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:43
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -7°C



**Flow characteristics:**

Total Flow:	0.145	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.06	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.702	0.702
Water (°C):	0.3	0.3
Datalogger Clock:	09:47	10:49
Laptop Clock:	09:47	10:49
Battery (Main):	13.2	14.8
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV test good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S63-01	0.704	100.704		100.000	100.000	3/4" Pipe 5 m NE of Station	S63-01
S63-02			0.874	99.830	99.830	3/4" Pipe 7 m E of Station	S63-02
S63-03			1.260	99.444	99.444	3/4" Pipe 10 m E of Station	S63-03
Ice/PT:			4.201	96.503			WL
Water Level:			4.223	96.481			Ice
Other:							WL
<b>Setup #2</b>							S63-03
S63-01			0.688	100.000	100.000	3/4" Pipe 5 m NE of Station	S63-02
S63-02			0.859	99.829	99.830	3/4" Pipe 7 m E of Station	S63-01
S63-03	1.244	100.688		99.444	99.444	3/4" Pipe 10 m E of Station	
Ice/PT:			4.187	96.501			
Water Level:			4.206	96.482			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S63-03	1.244	100.688		99.444		
Water Level:			4.210	96.478			
Water Level:			4.195	96.480			
BM:	S63-03	1.231	100.675		99.444		

**WL Survey Summary**

	Before	After
Average WL:	96.482	96.479
Transducer Elevation:	95.780	95.777
Closing Error:	0.000	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	-
Expected Discharge:	-
Shift from Existing Rating (m <sup>3</sup> /s):	-
Shift from Existing Rating (%):	-

**Field Personnel:**

SM, TR	Trip Date:	30-Nov-13
SM	Date:	30-Nov-13
TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: May 15, 2013  
 Site Visit Time (MST): 11:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	8.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	9.50	0.74		0.44	0.131					1.00	1.00	0.74	0.131	0.74	0.097	3%
2	10.00	0.71		0.43	0.201					1.00	0.50	0.71	0.201	0.36	0.071	2%
3	10.50	0.64		0.38	0.281					1.00	0.50	0.64	0.281	0.32	0.090	3%
4	11.00	0.63		0.38	0.310					1.00	0.50	0.63	0.310	0.32	0.098	3%
5	11.50	0.74		0.44	0.345					1.00	0.50	0.74	0.345	0.37	0.128	4%
6	12.00	0.87				0.70	0.299	0.17	0.240	1.00	0.50	0.87	0.270	0.44	0.117	4%
7	12.50	1.01				0.81	0.375	0.20	0.358	1.00	0.50	1.01	0.367	0.51	0.185	6%
8	13.00	1.33				1.06	0.418	0.27	0.355	1.00	0.50	1.33	0.387	0.67	0.257	9%
9	13.50	1.43				1.14	0.424	0.29	0.401	1.00	0.38	1.43	0.413	0.54	0.221	8%
10	13.75	1.46				1.17	0.336	0.29	0.357	1.00	0.25	1.46	0.347	0.37	0.126	4%
11	14.00	1.43				1.14	0.411	0.29	0.383	1.00	0.38	1.43	0.397	0.54	0.213	7%
12	14.50	1.64				1.31	0.452	0.33	0.391	1.00	0.38	1.64	0.422	0.62	0.259	9%
13	14.75	1.63				1.30	0.363	0.33	0.381	1.00	0.25	1.63	0.372	0.41	0.152	5%
14	15.00	1.70				1.36	0.386	0.34	0.425	1.00	0.25	1.70	0.406	0.43	0.172	6%
15	15.25	1.83				1.46	0.392	0.37	0.374	1.00	0.25	1.83	0.383	0.46	0.175	6%
16	15.50	1.85				1.48	0.349	0.37	0.400	1.00	0.25	1.85	0.375	0.46	0.173	6%
17	15.75	1.72				1.38	0.299	0.34	0.412	1.00	0.25	1.72	0.356	0.43	0.153	5%
18	16.00	1.80				1.44	0.275	0.36	0.367	1.00	0.25	1.80	0.321	0.45	0.144	5%
19	16.25	0.94				0.75	0.118	0.19	0.493	1.00	0.50	0.94	0.306	0.47	0.144	5%
20	17.00	0.30		0.18	0.053					1.00	1.38	0.30	0.053	0.41	0.022	1%
21	19.00	0.45		0.27	0.023					1.00	2.50	0.45	0.023	1.13	0.026	1%
22	22.00	0.42		0.25	-0.002					1.00	3.00	0.42	-0.002	1.26	-0.003	0%
23	25.00	0.34		0.20	-0.128					1.00	3.00	0.34	-0.128	1.02	-0.131	-5%
LB	28.00	0.00	0.00		0.00		0.00		0.00	1.00	1.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.89</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	13:15
Meas. End Time (MST):	14:25
Equipment:	ADV
Method:	Fishcat
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	P. cloudy, breezy, 15°C

**Flow characteristics:**

Total Flow:	2.89	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	12.68	(m <sup>2</sup> )
Wetted Width:	11.00	(m)
Hydraulic Depth:	1.15	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.07	

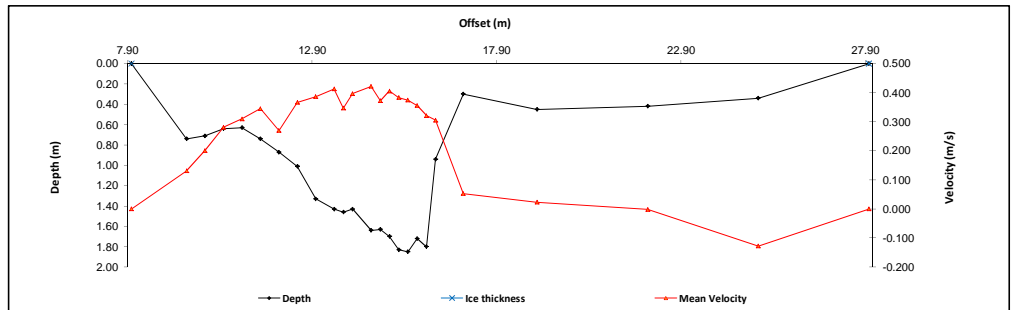
**Logger Details:**

	Before	After
Transducer Reading (m):	0.935	0.933
Water (°C):	9.6	10.1
Datalogger Clock:	12:31	14:24
Laptop Clock:	12:31	14:24
Battery (Main):	13.3	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	New	
Vent Tube Dessicant:	New	
PT# (if replaced):	322936	-
Logger# (if replaced):	25578	-

**Datalogger / Station Notes:**

- Banks are flooded, visible flow through grass
- ADV Test, all good

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							S64-01
S64-01	1.043	101.043		100.000	100.000	3/4" pipe 6 m SE	S64-03
S64-02			1.242	99.801	99.801	3/4" pipe 11 m E	S64-02
S64-03			1.194	99.849	99.849	3/4" pipe 8 m E	WL
Ice/PT:							WL
Water Level:			1.842	99.201			S64-02
Time WL Surveyed:						13:02	S64-03
Other:							S64-01
<b>Setup #2</b>							
S64-01			1.012	100.000	100.000	3/4" pipe 6 m SE	
S64-02	1.211	101.012		99.801	99.801	3/4" pipe 11 m E	
S64-03			1.163	99.849	99.849	3/4" pipe 8 m E	
Ice/PT:							
Water Level:			1.812	99.200			
Time WL Surveyed:						13:03	
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S64-01	1.011	101.011		100.000			
Water Level:			1.812	99.199			
Water Level:			1.794	99.201			
BM: S64-01	0.995	100.995		100.000			
Time WL Surveyed:						14:31	
Time WL Surveyed:						14:33	

**WL Survey Summary**

	Before	After
Average WL:	99.201	99.200
Transducer Elevation:	98.266	98.267
Closing Error:	0.000	-
WL Check:	0.001	-0.002

**Site Rating Information**

Measured Discharge:	2.89
Expected Discharge:	2.89
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	0%

**Field Personnel:**

Field Personnel:	TR, DW	Trip Date:	15-May-13
Data Entry Personnel:	TR	Date:	15-May-13
Data Check Personnel:	DW	Date:	12-Jun-13
Entered Digitally in the Field:	Yes		

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: July 2, 2013  
 Site Visit Time (MST): 11:00

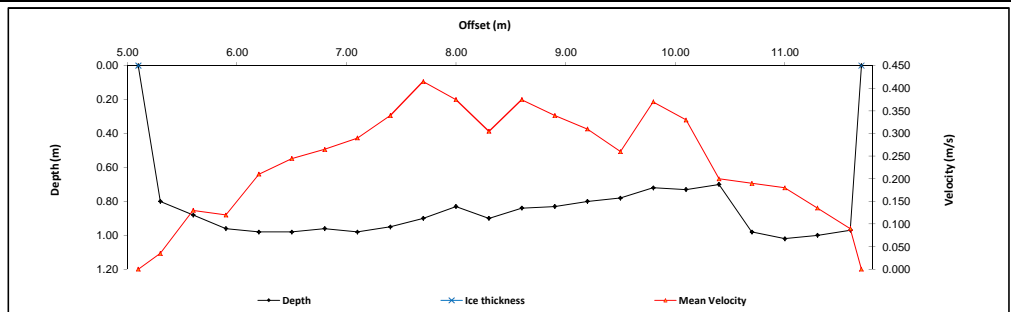


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.10	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	5.30	0.80			0.64	-0.010	0.16	0.080	1.00	0.25	0.80	0.035	0.20	0.007	0%	
2	5.60	0.88			0.70	0.000	0.18	0.260	1.00	0.30	0.88	0.130	0.26	0.034	2%	
3	5.90	0.96			0.77	0.030	0.19	0.210	1.00	0.30	0.96	0.120	0.29	0.035	2%	
4	6.20	0.98			0.78	0.050	0.20	0.370	1.00	0.30	0.98	0.210	0.29	0.062	4%	
5	6.50	0.98			0.78	0.060	0.20	0.430	1.00	0.30	0.98	0.245	0.29	0.072	5%	
6	6.80	0.96			0.77	0.050	0.19	0.480	1.00	0.30	0.96	0.265	0.29	0.076	5%	
7	7.10	0.98			0.78	0.090	0.20	0.490	1.00	0.30	0.98	0.290	0.29	0.085	6%	
8	7.40	0.95			0.76	0.180	0.19	0.500	1.00	0.30	0.95	0.340	0.29	0.097	7%	
9	7.70	0.90			0.72	0.340	0.18	0.490	1.00	0.30	0.90	0.415	0.27	0.112	8%	
10	8.00	0.83			0.66	0.260	0.17	0.490	1.00	0.30	0.83	0.375	0.25	0.093	7%	
11	8.30	0.90			0.72	0.160	0.18	0.450	1.00	0.30	0.90	0.305	0.27	0.082	6%	
12	8.60	0.84			0.67	0.290	0.17	0.460	1.00	0.30	0.84	0.375	0.25	0.095	7%	
13	8.90	0.83			0.66	0.230	0.17	0.450	1.00	0.30	0.83	0.340	0.25	0.085	6%	
14	9.20	0.80			0.64	0.180	0.16	0.440	1.00	0.30	0.80	0.310	0.24	0.074	5%	
15	9.50	0.78			0.62	0.090	0.16	0.430	1.00	0.30	0.78	0.260	0.23	0.061	4%	
16	9.90	0.72		0.43	0.370				1.00	0.30	0.72	0.370	0.22	0.080	6%	
17	10.10	0.73		0.44	0.330				1.00	0.30	0.73	0.330	0.22	0.072	5%	
18	10.40	0.70		0.42	0.200				1.00	0.30	0.70	0.200	0.21	0.042	3%	
19	10.70	0.98			0.78	0.100	0.20	0.280	1.00	0.30	0.98	0.190	0.29	0.056	4%	
20	11.00	1.02			0.82	0.110	0.20	0.250	1.00	0.30	1.02	0.180	0.31	0.055	4%	
21	11.30	1.00			0.80	0.090	0.20	0.180	1.00	0.30	1.00	0.135	0.30	0.040	3%	
22	11.60	0.97			0.78	0.060	0.19	0.120	1.00	0.20	0.97	0.090	0.19	0.017	1%	
RB	11.70	0.00	0.00		0.00	0.00	0.00	0.00	1.00	0.05	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.43</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	11:01
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Med flow
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Clear, windy, 23°C



**Flow characteristics:**

Total Flow:	1.43	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.71	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.92	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.605	0.603
Water (°C):	21.3	21.8
Datalogger Clock:	10:09	11:10
Laptop Clock:	10:09	11:10
Battery (Main):	13.6	13.5
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S64-01	1.284	101.284		100.000	100.000	3/4" pipe 6 m SE	S64-01
S64-02			1.485	99.799	99.801	3/4" pipe 11 m E	S64-02
S64-03			1.437	99.847	99.849	3/4" pipe 8 m E	S64-03
Water Level:			2.426	98.858		Time WL Surveyed: 10:24	WL
Other:							
<b>Setup #2</b>							
S64-01			1.272	100.000	100.000	3/4" pipe 6 m SE	S64-01
S64-02			1.472	99.800	99.801	3/4" pipe 11 m E	S64-02
S64-03	1.425	101.272		99.847	99.849	3/4" pipe 8 m E	S64-03
Water Level:			2.413	98.859		Time WL Surveyed: 10:25	WL
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S64-01	1.272	101.272	100.000			
Water Level:			2.415	98.857		Time WL Surveyed: 11:07	
Water Level:			2.398	98.856		Time WL Surveyed: 11:08	
BM:	S64-01	1.254	101.254	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.859	98.857
Transducer Elevation:	98.254	98.254
Closing Error:	0.000	-
WL Check:	0.001	0.001

**Site Rating Information**

Measured Discharge:	1.43
Expected Discharge:	1.19
Shift from Existing Rating (m <sup>3</sup> /s):	-0.24
Shift from Existing Rating (%):	-16%

**Field Personnel:**

SM, TR	Trip Date:	2-Jul-13
SM	Date:	2-Jul-13
TR	Date:	19-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: August 20, 2013  
 Site Visit Time (MST): 10:00

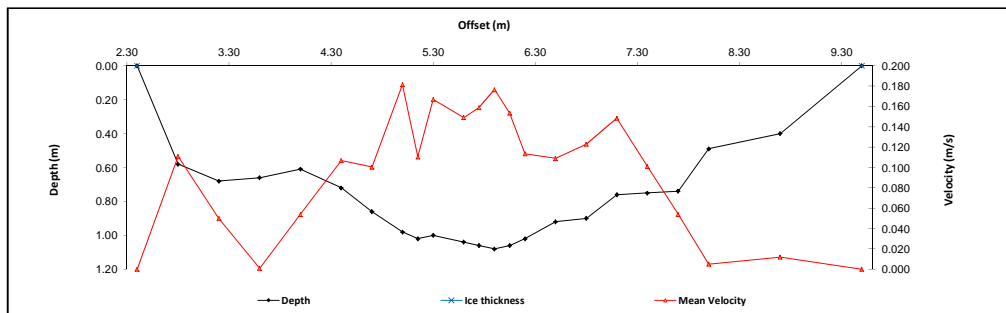


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.80	0.58		0.35	0.111					1.00	0.40	0.58	0.111	0.23	0.026	5%
2	3.20	0.68		0.41	0.050					1.00	0.40	0.68	0.050	0.27	0.014	3%
3	3.60	0.66		0.40	0.001					1.00	0.40	0.66	0.001	0.26	0.000	0%
4	4.00	0.61		0.37	0.054					1.00	0.40	0.61	0.054	0.24	0.013	3%
5	4.40	0.72		0.43	0.107					1.00	0.35	0.72	0.107	0.25	0.027	6%
6	4.70	0.86				0.69	0.020	0.17	0.181	1.00	0.30	0.86	0.101	0.26	0.026	5%
7	5.00	0.98				0.78	0.165	0.20	0.198	1.00	0.23	0.98	0.182	0.22	0.040	8%
8	5.15	1.02				0.82	0.026	0.20	0.195	1.00	0.15	1.02	0.111	0.15	0.017	4%
9	5.30	1.00				0.80	0.145	0.20	0.189	1.00	0.23	1.00	0.167	0.23	0.038	8%
10	5.60	1.04				0.83	0.126	0.21	0.172	1.00	0.23	1.04	0.149	0.23	0.035	7%
11	5.75	1.06				0.85	0.141	0.21	0.177	1.00	0.15	1.06	0.159	0.16	0.025	5%
12	5.90	1.08				0.86	0.184	0.22	0.169	1.00	0.15	1.08	0.177	0.16	0.029	6%
13	6.05	1.06				0.85	0.143	0.21	0.164	1.00	0.15	1.06	0.154	0.16	0.024	5%
14	6.20	1.02				0.82	0.073	0.20	0.154	1.00	0.23	1.02	0.114	0.23	0.026	5%
15	6.50	0.92				0.74	0.062	0.18	0.156	1.00	0.30	0.92	0.109	0.28	0.030	6%
16	6.80	0.90				0.72	0.081	0.18	0.165	1.00	0.30	0.90	0.123	0.27	0.033	7%
17	7.10	0.76				0.61	0.097	0.15	0.200	1.00	0.30	0.76	0.149	0.23	0.034	7%
18	7.40	0.75	0.45	0.101						1.00	0.30	0.75	0.101	0.23	0.023	5%
19	7.70	0.74	0.44	0.054						1.00	0.30	0.74	0.054	0.22	0.012	3%
20	8.00	0.49	0.29	0.005						1.00	0.50	0.49	0.005	0.25	0.001	0%
21	8.70	0.40	0.24	0.012						1.00	0.75	0.40	0.012	0.30	0.004	1%
LB	9.50	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.476</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:32
Meas. End Time (MST):	11:12
Equipment:	ADV
Method:	Wading
River Condition:	Normal flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Windy, sunny, 18°C



**Flow characteristics:**

Total Flow:	0.476	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.83	(m <sup>2</sup> )
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.84	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.387	0.444
Water (°C):	16.9	17.3
Datalogger Clock:	09:34	11:26
Laptop Clock:	09:34	11:26
Battery (Main):	14.0	14.0
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PLS deeper, 0.444 m

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S64-01	1.239	101.239		100.000	100.000	3/4" pipe 6 m SE	S64-01
S64-02			1.440	99.799	99.801	3/4" pipe 11 m E	S64-03
S64-03			1.383	99.846	99.849	3/4" pipe 8 m E	S64-02
Ice/PT:							WL
Water Level:			2.605	98.634			WL
Other:							S64-02
<b>Setup #2</b>							S64-03
S64-01			1.223	99.999	100.000	3/4" pipe 6 m SE	S64-01
S64-02	1.423	101.222		99.799	99.801	3/4" pipe 11 m E	
S64-03			1.375	99.847	99.849	3/4" pipe 8 m E	
Ice/PT:							
Water Level:			2.588	98.634			
Other:							
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM: S64-01	1.223	101.223		100.000			
Water Level:			2.593	98.630			
Water Level:			2.575	98.626			
BM: S64-01	1.201	101.201		100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.634	98.628
Transducer Elevation:	98.247	98.184
Closing Error:	0.001	-
WL Check:	0.000	0.004

**Site Rating Information**

Measured Discharge:	0.476
Expected Discharge:	0.48
Shift from Existing Rating (m <sup>3</sup> /s):	0.00
Shift from Existing Rating (%):	1%

**Field Personnel:**

SM, DW	Trip Date:	20-Aug-13
SM	Date:	20-Aug-13
TR	Date:	28-Aug-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: September 9, 2013  
 Site Visit Time (MST): 11:10



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.20	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	1.80	0.29		0.17	0.006					1.00	0.50	0.29	0.006	0.15	0.001	0%
2	2.20	0.42		0.25	0.006					1.00	0.40	0.42	0.006	0.17	0.001	0%
3	2.60	0.46		0.28	0.044					1.00	0.40	0.46	0.044	0.18	0.008	2%
4	3.00	0.57		0.34	0.024					1.00	0.40	0.57	0.024	0.23	0.005	2%
5	3.40	0.59		0.35	0.057					1.00	0.30	0.59	0.057	0.18	0.010	3%
6	3.60	0.84				0.67	0.039	0.17	0.109	1.00	0.20	0.84	0.074	0.17	0.012	4%
7	3.80	0.93				0.74	0.067	0.19	0.143	1.00	0.30	0.93	0.105	0.28	0.029	8%
8	4.20	1.04				0.83	0.029	0.21	0.137	1.00	0.30	1.04	0.083	0.31	0.026	7%
9	4.40	1.08				0.86	0.027	0.22	0.130	1.00	0.15	1.08	0.079	0.16	0.013	4%
10	4.50	1.12				0.90	0.051	0.22	0.129	1.00	0.10	1.12	0.090	0.11	0.010	3%
11	4.60	1.16				0.93	0.096	0.23	0.138	1.00	0.15	1.16	0.117	0.17	0.020	6%
12	4.80	1.16				0.93	0.093	0.23	0.138	1.00	0.20	1.16	0.116	0.23	0.027	8%
13	5.00	1.12				0.90	0.062	0.22	0.155	1.00	0.20	1.12	0.109	0.22	0.024	7%
14	5.20	1.08				0.86	0.068	0.22	0.164	1.00	0.20	1.08	0.116	0.22	0.025	7%
15	5.40	1.06				0.85	0.078	0.21	0.172	1.00	0.20	1.06	0.125	0.21	0.026	7%
16	5.60	1.03				0.82	0.074	0.21	0.162	1.00	0.20	1.03	0.118	0.21	0.024	7%
17	5.90	1.04				0.83	-0.002	0.21	0.169	1.00	0.30	1.04	0.084	0.31	0.026	7%
18	6.20	0.91				0.83	0.021	0.18	0.158	1.00	0.40	0.91	0.090	0.36	0.033	9%
19	6.60	0.64		0.38	0.038	0.73				1.00	0.40	0.64	0.038	0.26	0.010	3%
20	7.00	0.62		0.37	0.011					1.00	0.40	0.62	0.011	0.25	0.003	1%
21	7.40	0.62		0.37	0.009					1.00	0.40	0.62	0.009	0.25	0.002	1%
22	7.80	0.61		0.37	0.005					1.00	0.40	0.61	0.005	0.24	0.001	0%
23	8.20	0.53		0.32	0.066					1.00	0.45	0.53	0.066	0.24	0.016	4%
RB	8.70	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.354</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:56
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 20°C

**Flow characteristics:**

Total Flow:	0.354	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.11	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.82	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.02	

**Logger Details:**

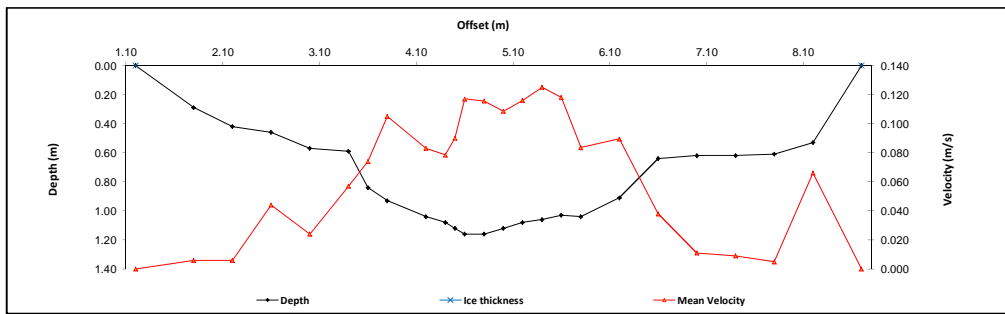
	Before	After
Transducer Reading (m):	0.396	0.398
Water (°C):	16.0	16.5
Datalogger Clock:	09:30	11:05
Laptop Clock:	09:30	11:05
Battery (Main):	14.0	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Telemetry installed, RSSI -90

**General Notes:**

- Weeds in channel along right and left banks
- Channel bottom very soft, top set rod sinks 2-3 cm



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
<b>Setup #1</b>							
S64-01	0.752	100.752		100.000	100.000	3/4" Pipe 6 m SE	S64-01
S64-02			0.951	99.801	99.801	3/4" Pipe 11 m E	S64-02
S64-03			0.903	99.849	99.849	3/4" Pipe 8 m E	S64-03
Ice/PT:							WL
Water Level:			2.163	98.589		Time WL Surveyed: 10:00	WL
Other:							S64-03
<b>Setup #2</b>							S64-02
S64-01			0.728	100.001	100.000	3/4" Pipe 6 m SE	S64-01
S64-02			0.927	99.802	99.801	3/4" Pipe 11 m E	S64-02
S64-03	0.880	100.729		99.849	99.849	3/4" Pipe 8 m E	S64-03
Ice/PT:							
Water Level:			2.138	98.591		Time WL Surveyed: 10:02	
Other:							(must close survey loop on survey starting point)
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
BM:	S64-01	0.728	100.728	100.000			
Water Level:			2.139	98.589		Time WL Surveyed: 11:01	
Water Level:			2.127	98.588		Time WL Surveyed: 11:03	
BM:	S64-01	0.715	100.715	100.000			

**WL Survey Summary**

	Before	After
Average WL:	98.590	98.589
Transducer Elevation:	98.194	98.191
Closing Error:	-0.001	-
WL Check:	0.002	0.001

**Site Rating Information**

Measured Discharge:	0.354
Expected Discharge:	0.38
Shift from Existing Rating (m <sup>3</sup> /s):	0.02
Shift from Existing Rating (%):	7%

**Field Personnel:**

SM, TR	Trip Date:	9-Sep-13
Data Entry Personnel:	SM	Date: 9-Sep-13
Data Check Personnel:	TR	Date: 12-Sep-13
Entered Digitally in the Field:	Yes	

START  
↓  
END

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517384E 6163640N

Site Visit Date: October 26, 2020  
 Site Visit Time (MST): 09:20

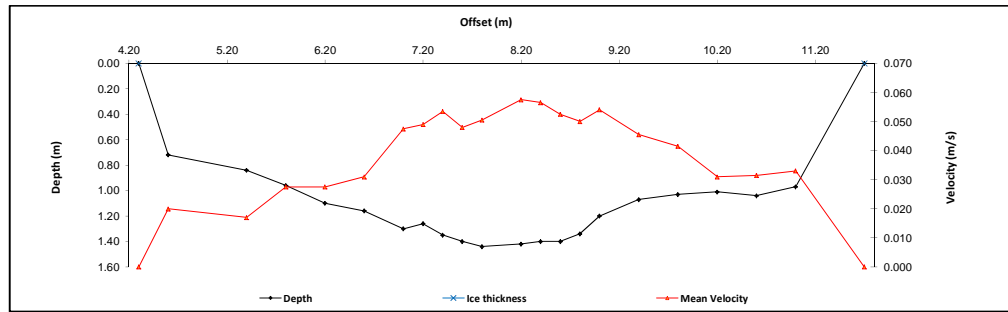


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.30	0.00			0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.60	0.72		0.43	0.020					1.00	0.55	0.72	0.020	0.40	0.008	3%
2	5.40	0.84				0.67	0.000	0.17	0.034	1.00	0.60	0.84	0.017	0.50	0.009	3%
3	5.80	0.96				0.77	0.009	0.19	0.046	1.00	0.40	0.96	0.028	0.38	0.011	3%
4	6.20	1.10				0.88	0.000	0.22	0.055	1.00	0.40	1.10	0.028	0.44	0.012	4%
5	6.60	1.16				0.93	0.013	0.23	0.049	1.00	0.40	1.16	0.031	0.46	0.014	5%
6	7.00	1.30				1.04	0.049	0.26	0.046	1.00	0.30	1.30	0.048	0.39	0.019	6%
7	7.20	1.26				1.01	0.052	0.25	0.046	1.00	0.20	1.26	0.049	0.25	0.012	4%
8	7.40	1.35				1.08	0.056	0.27	0.051	1.00	0.20	1.35	0.054	0.27	0.014	5%
9	7.60	1.40				1.12	0.052	0.28	0.044	1.00	0.20	1.40	0.048	0.28	0.013	4%
10	7.80	1.44				1.15	0.051	0.29	0.050	1.00	0.30	1.44	0.051	0.43	0.022	7%
11	8.20	1.42				1.14	0.060	0.28	0.055	1.00	0.30	1.42	0.058	0.43	0.024	8%
12	8.40	1.40				1.12	0.048	0.28	0.065	1.00	0.20	1.40	0.057	0.28	0.016	5%
13	8.60	1.40				1.12	0.045	0.28	0.060	1.00	0.20	1.40	0.053	0.28	0.015	5%
14	8.80	1.34				1.07	0.050	0.27	0.050	1.00	0.20	1.34	0.050	0.27	0.013	4%
15	9.00	1.20				0.96	0.051	0.24	0.057	1.00	0.30	1.20	0.054	0.36	0.019	6%
16	9.40	1.07				0.86	0.034	0.21	0.057	1.00	0.40	1.07	0.046	0.43	0.019	6%
17	9.80	1.03				0.82	0.029	0.21	0.054	1.00	0.40	1.03	0.042	0.41	0.017	6%
18	10.20	1.01				0.81	0.002	0.20	0.060	1.00	0.40	1.01	0.031	0.40	0.013	4%
19	10.60	1.04				0.83	0.004	0.21	0.059	1.00	0.40	1.04	0.032	0.42	0.013	4%
20	11.00	0.97				0.78	0.031	0.19	0.035	1.00	0.55	0.97	0.033	0.53	0.018	6%
RB	11.70	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.302</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:50
Equipment:	ADV
Method:	Fishcat
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, 8°C



**Flow characteristics:**

Total Flow:	0.302	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.62	(m <sup>2</sup> )
Wetted Width:	7.40	(m)
Hydraulic Depth:	1.03	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.833	0.832
Water (°C):	2.3	2.4
Datalogger Clock:	09:29	10:53
Laptop Clock:	09:29	10:53
Battery (Main):	13.4	14.4
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- WL has risen dramatically

**General Notes:**

- Ran ADV test, all results good  
 - Grass present along banks

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	Survey Loop Order
Setup #1							
S64-01	1.083	101.083		100.000	100.000	3/4" Pipe 6 m SE	S64-01
S64-02			1.282	99.801	99.801	3/4" Pipe 11 m E	S64-03
S64-03			1.234	99.849	99.849	3/4" Pipe 8 m E	WL
Ice/PT:							WL
Water Level:			2.050	99.033		Time WL Surveyed: 9:41	S64-02
Other:							S64-03
Setup #2							S64-01
S64-01			1.057	99.999	100.000	3/4" Pipe 6 m SE	
S64-02	1.255	101.056		99.801	99.801	3/4" Pipe 11 m E	
S64-03			1.208	99.848	99.849	3/4" Pipe 8 m E	
Ice/PT:							
Water Level:			2.027	99.029		Time WL Surveyed: 9:43	(must close survey loop on survey starting point)
Other:							
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)							
BM: S64-01	1.057	101.057		100.000		Time WL Surveyed: 10:55	
Water Level:			2.025	99.032		Time WL Surveyed: 10:56	
Water Level:			2.004	99.032			
BM: S64-01	1.036	101.036		100.000			

**WL Survey Summary**

	Before	After
Average WL:	99.031	99.032
Transducer Elevation:	98.198	98.200
Closing Error:	0.001	-
WL Check:	0.004	0.000

**Site Rating Information**

Measured Discharge:	0.302
Expected Discharge:	1.96
Shift from Existing Rating (m <sup>3</sup> /s):	1.66
Shift from Existing Rating (%):	548%

**Field Personnel:**

TR, DW	Trip Date:	26-Oct-13
TR	Date:	26-Oct-13
TR	Date:	29-Oct-13
Yes	Entered Digitally in the Field:	

START  
↓  
END



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**Appendix D**

**Benthic Invertebrate  
Communities and  
Sediment Quality Component**

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## **D BENTHIC INVERTEBRATE COMMUNITIES AND SEDIMENT QUALITY COMPONENT**

### **D.1 BENTHIC INVERTEBRATE COMMUNITIES**

The objective of this appendix is to provide technical details on laboratory methods used for the processing and identification of the benthic samples. This appendix also documents the calculations used to estimate the normal ranges of variability for measurement endpoints of benthic invertebrate communities that were used in Section 5 as a measure against which to assess the significance of temporal trends in *test* reaches.

#### **D.1.1 Sample Processing Procedures**

##### **D.1.1.1 Laboratory Methods**

In preparation for laboratory processing, samples were checked upon arrival to the laboratory to ensure that they were adequately sealed, labeled and that the preservative had effectively penetrated the entire sample. Samples were then rinsed of the residual fine debris and preservative (provided a minimum exposure of 72 hours to formalin occurred). Samples were either sorted immediately, or transferred to 80% ethanol, prior to sorting and taxonomic work. After sorting and identification, freshwater macro-invertebrates were stored in a solution of 70 to 80% ethanol, and 5% glycerin in vials or jars with airtight lids.

To expedite the sorting process, samples with large pieces of organic matter were divided in the laboratory into appropriate size fractions. The most commonly used fractions were coarse (>1.00 mm) and fine (250 µm to 1.00 mm), which corresponded to the divisions used to define coarse and fine particulate organic matter (CPOM and FPOM), respectively. Where there were very large pieces of organic material or large invertebrates, they were separated from the rest of the sample with a 4.00-mm sieve. All fractions were sorted. If warranted by large numbers of organisms, the fractions were sub-sampled (as described below). After the initial washing and fractionation of samples, the invertebrates were sorted from the debris by trained technicians on a gridded tray or petri dish under a dissecting microscope at 10X to 20X magnification. Samples that contained large amounts of debris, or large numbers of animals were further sub-sampled as per Figure D.1-1.

##### **D.1.1.2 Coarse Fraction**

The coarse fraction (contents of the 2-mm and 1-mm sieves) was transferred into individual containers and 70 % alcohol added, prior to sorting. At least ¼ of the coarse fraction was sorted, with the amount of material sorted determined either by volume or weight.

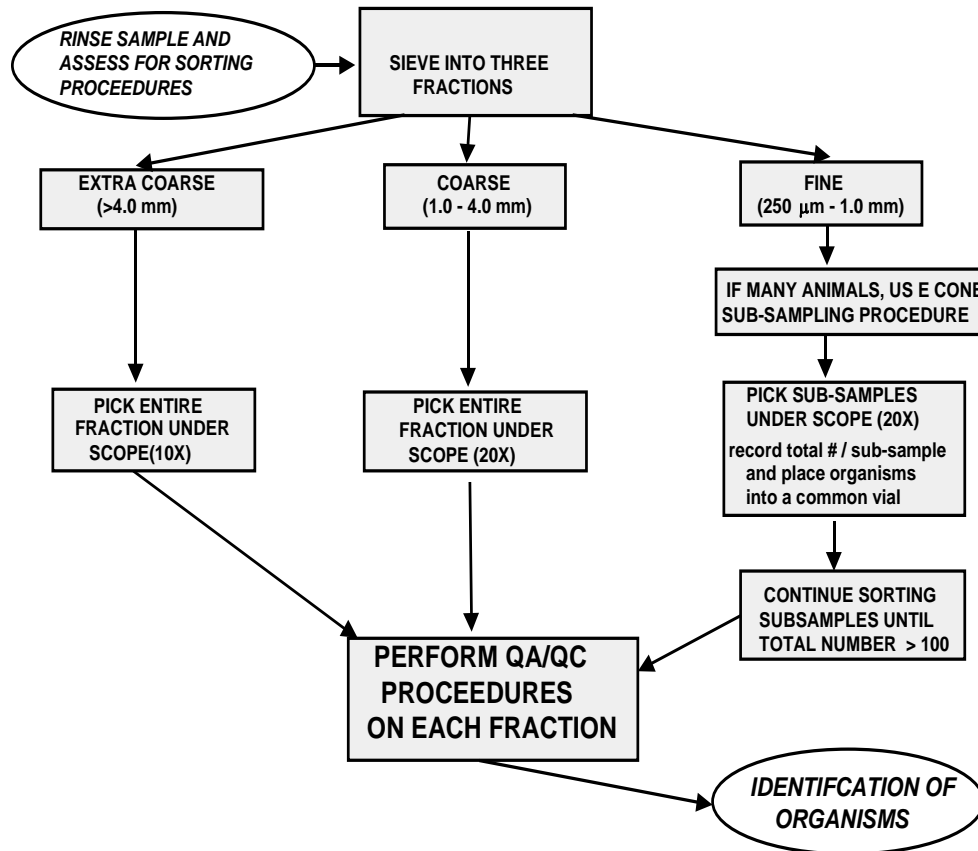
##### **D.1.1.3 Fine Fraction**

The fine fraction (contents of 0.180-mm sieve) was transferred into a 2-L container for decanting. Warm water was added to the 2-L container, swirled and decanted to mobilize organic material into a 0.180 mm sieve. This was repeated until all organic material was washed out of the sand. The sand was scanned under a magnifying glass for heavy-shelled or stone-cased animals.

When there was a lot of organic material in the fine fractions and/or large numbers of organisms, a sub-sampling of the fine fractions was done as described below.

The fine fraction was sorted in its entirety when possible. When there were large amounts of the fine fraction, the material was sub-sampled using an Imhoff Cone and bubbler (Wrona et al. 1982). Either ¼ of the sample was sorted, or at least 100 animals were removed from the debris. The fine fraction was stained with haematoxylin or rose Bengal to improve sorting.

**Figure D.1-1 Benthic invertebrate sorting and sub-sampling protocol, applicable for samples with large detrital material and large numbers of small organisms**



#### D.1.1.4 Identification

Invertebrates were identified using recognized taxonomic keys (Brooks and Kelton 1967; Teskey 1969; Edmunds et al. 1976; Oliver and Roussel 1983; Currie 1986; Wiederholm 1986; McCafferty and Randolph 1988; Stewart and Stark 1988; Brinkhurst 1989; Pennak 1989; Clifford 1991; Merritt and Cummins 1996; Westfall and May 1996; Wiggins 1996; Zloty and Pritchard 1997; Epler 2001). Animals were identified to the lowest practical level, typically genus with the exception of Oligochaeta, which were identified to family (see Table D.1-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

**Table D.1-1 Level of taxonomic identification.**

<b>Group</b>	<b>Level</b>
Nematoda	Phylum
Oligochaeta	Family
Gastropoda	Genus/Species
Turbellaria	Family
Hirudinea	Species
Mollusca	Genus/Species
Acari	Subclass
Cladocera	Genus/Species
Copepoda	Order
Ostracoda	Class
Amphipoda	Genus
Insecta	Genus/Species

Organisms that required detailed microscopic examination for identification (e.g., Chironomidae and Oligochaeta) were mounted onto microscope slides using an appropriate mounting media (e.g., Canada balsam, Permount, Hohers's). The most common species that were distinguishable on the basis of gross morphology were mounted less frequently as double checks. All rare or less commonly occurring species are mounted for identification.

### **D.1.2 Calculation of Measurement Endpoints**

Total abundance, richness, equitability, and %EPT were calculated from the counts of organisms. Taxa were typically identified to genus, and at times to species. Some small or immature specimens were identified to Family, Order, or other applicable (but lowest possible) higher taxonomic level. Taxa richness was; therefore, the total number of taxa determined using lowest practical taxonomic level.

Equitability was calculated using:

$$\text{Equitability} = \left( \frac{1}{\sum p_i} \right), [1]$$

Where,

- $p_i$  was the fraction of the total count in a sample accounted for by taxon  $i$ , and  $S$  was the number of taxa.

Percent EPT (i.e., % EPT) is the percentage of the fauna as Ephemeroptera, Trichoptera, and Plecoptera.

A multivariate ordination (Correspondence Analysis, CA; Gauch 1982) was also calculated in addition to these conventional measures of community composition. The

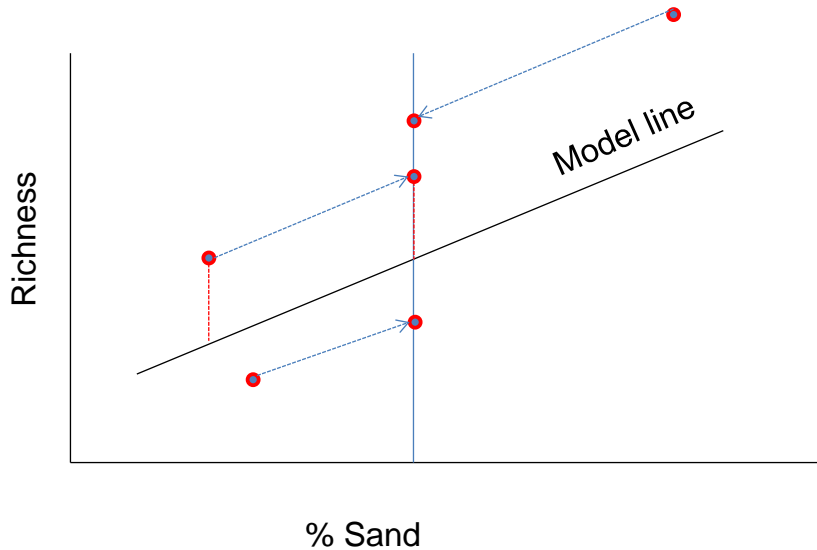
CA was carried out using the logarithms of abundances ( $\log$  of  $x_i+1$ , where  $x$  is the number of individuals of taxon  $i$  per sample) of taxa that comprised a minimum of 0.5% of the total number of organisms in the dataset under examination (Gauch 1982). Four separate ordinations were carried out: (1) erosional reaches; (2) depositional reaches; (3) delta Channels; and (4) lakes. Two CA axes were 'kept' and used as measurement endpoints, from each of the four ordinations, with 'scores' on those two axes being the endpoint values used in subsequent analyses similar to analyses for abundance, richness, %EPT, and equitability.

### **D.1.3 Calculation of Adjusted Measurement Endpoints**

Values of measurement endpoints can be influenced by a variety of factors, including those that can be somewhat selected/chosen at that time of sampling (within limits of the location being sampled) (e.g., depth of water, current velocity, and substrate texture). Hatfield and Kilgour (2014) demonstrated that current velocity explained significant variation in measurement endpoints of benthic invertebrate communities in erosional and depositional rivers, but the amount of variation was trivial (i.e., usually <3% of the total variation), while not making adjustments to those measurement endpoints had no influence on the conclusions from statistical analyses of measurement endpoints. One of the challenges in the execution of RAMP is that there are times when, for various reasons, not all of the modifying factors are recorded (e.g., equipment failure). In the assessment of erosional and depositional reaches, there were several instances in 2013 when water depth, or current velocity were not provided for replicate samples; therefore, adjustments to measurement endpoints were not conducted in this report (similar to previous years). However, given how little these variables explain noise in the data, it was considered that the conclusions would be the same whether the data were adjusted or not.

Prior analyses of data from the delta have demonstrated that percent sand has a significant influence on measurement endpoints. Total abundance has been significantly higher in delta substrates that have less coarse sand and more fine silt and clay. Substrate texture is assumed to be related to discharge, such that high flows are thought to mobilize finer materials, leaving sand, while low flows are thought to be unable to mobilize fine materials. Here, percent sand was used as a covariable. Models of the relationships between each measurement endpoint and percent sand was developed and used to 'adjust' the measurement endpoints to a standardized substrate with 50% sand (see Figure D.1-2). Subsequent analyses of variance were carried out with adjusted values of measurement endpoints. The associations between depth and measurement endpoints in the lake samples collected over the years are illustrated in Figure D.1-3.

**Figure D.1-2 Schematic illustrating how a ‘model’ of the relationship between richness and percent sand could be used to standardize richness to a standard substrate texture**



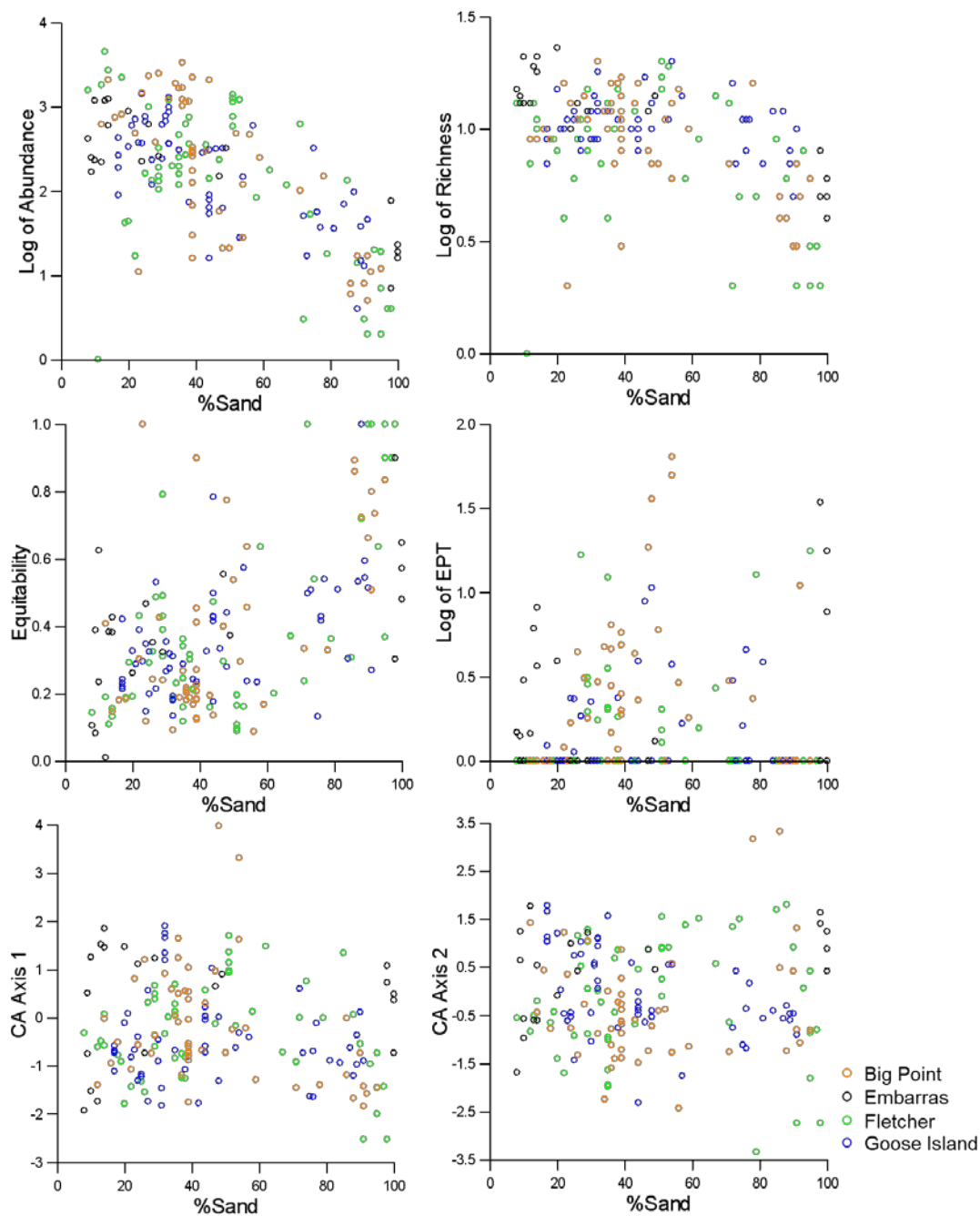
Multiple regression was used to test whether percent sand, and water depth at the point of sampling, explained variation in measurement endpoints. The regression modeling was carried out using all of the data for the lakes. ‘Lake’ was used as a categorical model in the analysis, so that the analysis was testing for a depth and percent sand influences would be consistent across lakes. For all measurement endpoints, water depth was the single significant factor explaining variation (between <1 and 5%; Table D.1-2). The associations between key measurement endpoints and water depth in lakes are illustrated in Figure D.1-4. Sampled water depths typically varied between about 0.5 and 2 m, but did approach 3 m at times. All measurement endpoints were adjusted to a common depth of 2 m, prior to subsequent analysis.

**Table D.1-2 Variance explained by depth (for lakes) and percent sand (for delta channels) from ANOVAs testing for the influence of template variables on benthic measurement endpoints.**

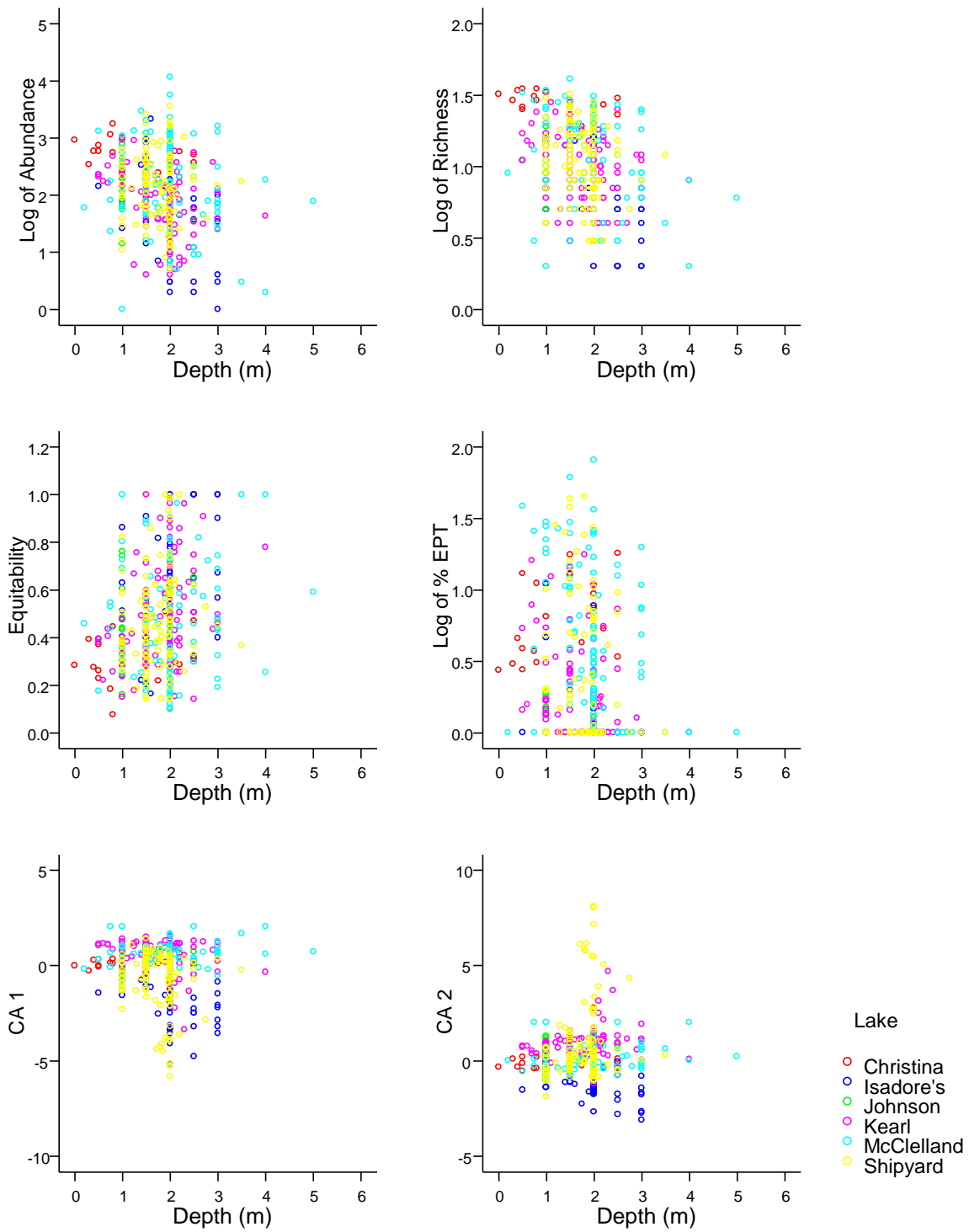
Measurement Endpoint	Variance Explained (%)	
	Lakes	Delta
Log of Abundance	<b>3.8</b>	<b>44.1</b>
Log of Richness	<b>4.9</b>	<b>18.8</b>
Equitability	<b>2.8</b>	<b>31.9</b>
Log of EPT	<b>1.6</b>	1.0
CA Axis 1	<b>0.9</b>	1.7
CA Axis 2	0.6	<0.1

Note: Values in bold were significant at  $p < 0.05$ .

**Figure D.1-3 Relationship between benthic measurement endpoints and important variables used in the adjustment model for reaches in the Athabasca River Delta.**



**Figure D.1-4 Relationship between benthic measurement endpoints and important variables used in the adjustment model for Lakes in the RAMP FSA.**





#### D.1.4 Calculation of Normal Ranges

Though rigorous analyses of variance can be used to test for effects of oil sands operations by comparison of potentially influenced watercourses to those that are not, the RAMP design has considerable statistical power, and thus the potential to detect statistical differences that are negligible in magnitude. The 'normal range of variation' is an alternative complimentary approach to determining if significant differences in measurement endpoints are unusual. Use of the 'normal range of variation' of a reference or *baseline* condition as an ecological criterion implies that some fraction of a *baseline* data set is used to define the expected range of values for a measurement endpoint. The use of normal ranges for the assessment of benthic invertebrate communities has precedence (e.g., see numerous chapters in Davis and Simon 1995; numerous chapters in Simon 1998; and Bailey et al. 2004). Measurement endpoints inside the normal range are considered an indication of an acceptable condition; values outside the range indicate potential or likely impairment. Different authors have used different 'fractions' of the *baseline* data to define the normal range. Reynoldson et al. (1995; 1999; 2003; 2004) and Bailey et al. (2004) indicated that values inside the 90<sup>th</sup> percentile were 'acceptable', values between the 90<sup>th</sup> and 99<sup>th</sup> percentiles were potentially impaired, and values outside the 99<sup>th</sup> percentile indicated impaired benthic communities. Kilgour et al. (1998) suggested that the 95% region provided a general rule of thumb that could be used to denote a reach that is 'in' its expected range of reference values, compared to a community that is potentially unusual. Other authors using the 95% region as the normal range of variation for a target ecological reference condition have included Bloom (1980); Kersting (1991); Yan et al. (1996); and Findlay and Kasian (1996).

The limits of the normal range, based on 95% of possible observations, can be approximated using:

$$\bar{x} \pm 2SD$$

Where,

- SD is the standard deviation of observations.

With a relatively large number of samples,  $\bar{x} \pm 2SD$  includes approximately 95% of possible observations. Standard deviations, like any statistic, are estimated with error. When sample sizes are small, that quantity may enclose considerably more or less than 95% of possible observations.

Like a mean, the 5<sup>th</sup> and 95<sup>th</sup> percentiles are estimated imprecisely from a sample of the data (Berthouex and Hau 1991). Tolerance limits are confidence regions for extreme percentiles. Tolerance limits were computed for the p<sup>th</sup> percentile of the *baseline* data (per Hunt et al. 2001; Smith 2002; Krishnamoorthy and Mathew 2009) as.

$$\bar{x} \pm k \cdot sd$$

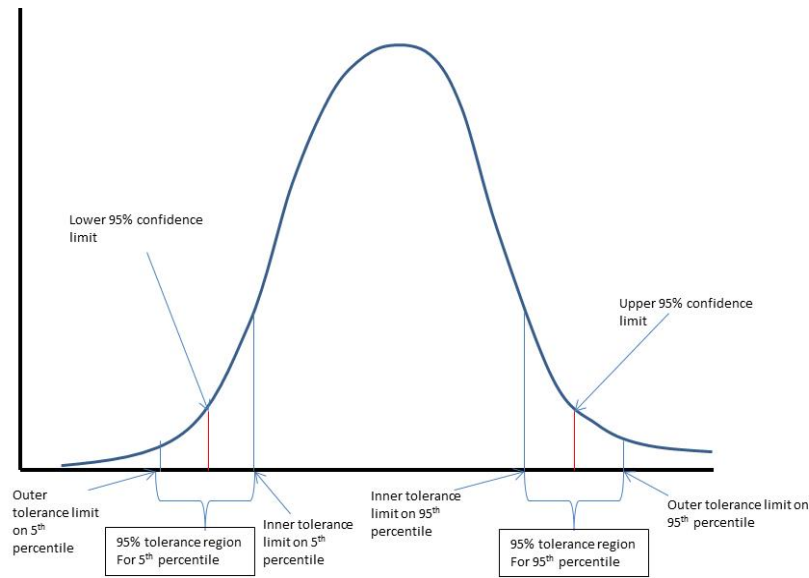
Where,

- $k = \frac{t_{\gamma, N-1, \delta}}{\sqrt{N}}$
- $t_{\gamma, N-1, \delta}$  is a non-central t-statistic (where  $\delta$  is set and determines the lower 5<sup>th</sup> or upper 95<sup>th</sup> percentile of the non-central t distribution);
- $\delta = z_p \sqrt{N}$ ; and
- $Z_p$  is the Z-statistic at the p<sup>th</sup> percentile (5<sup>th</sup> or 95<sup>th</sup>).

Here, and for the 95<sup>th</sup> percentile of the data,  $Z = 1.96$ . The value for  $\delta$  depends on sample size, as then does the non-central t statistic and ultimately  $k$ .

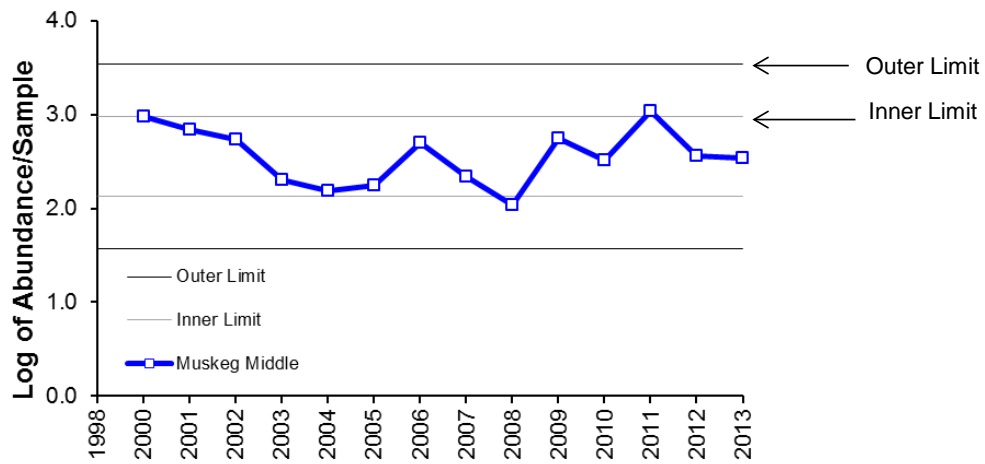
There are two intrinsic benefits of using confidence limits on percentiles. Values inside the inner tolerance limit clearly are not unusual, while values outside the outer tolerance limit clearly are unusual relative to the 'normal range' (see also Figure D.1-5). Values that fall between the inner and outer tolerance limits are in a grey zone of uncertainty that may or may not truly be unusual depending on what would be determined from the collection of more data. Values in the 'grey' zone might be considered a trigger for further examination (or monitoring). Industry is often criticized for trying to keep sample sizes low, because doing so reduces the likelihood of detecting changes particularly when conventional statistical approaches are being used (e.g., two-sample contrasts). The concern of using small sample sizes diminishes when 'one-sample' contrasts are used for inner and outer tolerance limits because small sample sizes will lead to broad limits on extreme percentiles, resulting in more observations being classified as 'potentially' unusual, and an incentive for industry to collect more data.

**Figure D.1-5 Schematic of a normal distribution showing the relationship between inner and outer tolerance limits on the lower 5<sup>th</sup> and upper 95<sup>th</sup> percentiles.**

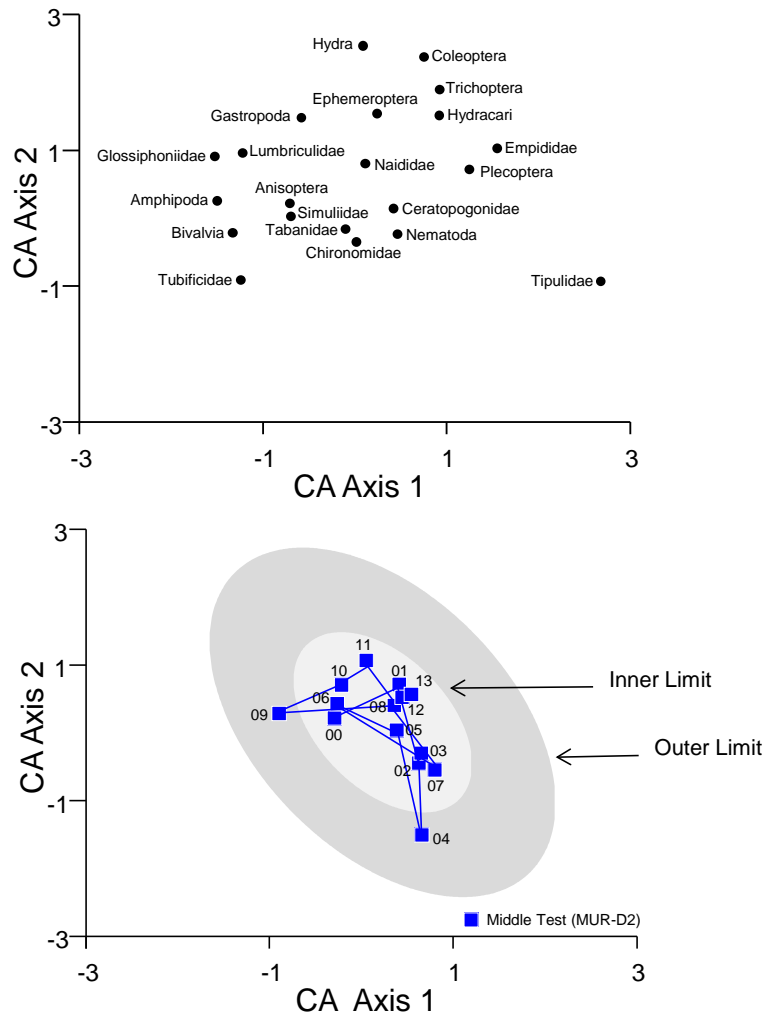


Three sets of normal ranges were calculate for possible comparison to *test* reaches (or lakes or delta channels). The first normal range was for annual means within the *test* reach being assessed. Normal ranges were calculated for any given year of assessment using the data for all previous years (Table D.1-3). The within-reach normal range for the middle Muskeg River in 2013, for example, was calculated using annual means of measurement endpoints from samples collected from the middle Muskeg River reach from 1998 to 2012. This method was used only if the reach had more than eight years of historical data (Figure D.1-6 and Figure D.1-7).

**Figure D.1-6 Example time trend chart for abundance of the benthic invertebrate community in relation to the normal range of variation, in this case, for the middle reach of the Muskeg River (MUR-D2).**



**Figure D.1-7 Example bi-plot showing a time trend of benthic invertebrate CA Axis scores in relation to the normal range of variation, in this case, for samples from the middle Muskeg River reach (MUR-D2).**



Note: The ellipses were generated in SYSTAT, and were approximates of the inner 5<sup>th</sup> and outer 95<sup>th</sup> tolerance limits on the 95<sup>th</sup> percentile.

The second set of normal ranges was the regional normal ranges using available *baseline* data. The inner and outer tolerance limits on the lower 5<sup>th</sup> and upper 95<sup>th</sup> percentiles of the normal ranges were calculated, per methods described above (Table D.1-3). These normal ranges were used to assess *test* reaches with less than eight years of historical data. These normal ranges, because they do not account for modifying factors, are an expression of the full range of values that measurement endpoint values would fall within.

The third set of normal ranges were 'modeled' reach-specific normal ranges, specifically for erosional reaches. All measurement endpoints for erosional reaches varied with catchment area (and the square of catchment area). Removing or accounting for variation related to catchment area amounts to further development of reference condition models that predict conditions (from regional data) for specific reaches. Models that describe the

relationships between catchment area and measurement endpoints were; therefore, used to estimate a predicted value and range of values for each *test* reach. Catchment area models for erosional reaches are provided in Table D.1-4. The relationships between abundance, richness, equitability, and percent EPT in relation to catchment area are illustrated in Figure D.1-8. The normal range for any *baseline* or *test* reach was based on the estimated mean  $\pm k \times SD$ 's, as above, where the mean measurement endpoint for a *test* reach was estimated given the relationship with catchment area (Table D.1-4, Figure D.1-8). Reach-specific normal ranges are provided in Table D.1-5. These normal ranges, because they have accounted for variation in measurement endpoints due to catchment area, will be somewhat tighter than the 'among-*baseline*-reach' normal ranges, and are more appropriate for testing whether a reach is in an unusual condition than the regional normal ranges.

**Table D.1-3      Calculated within-reach and regional normal ranges of measurement endpoints of benthic invertebrate communities.**

Log of Abundance/Sample					
Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	3.82	3.47	2.30	1.96
	MacKay Lower (MAR-E1)	3.53	3.06	2.44	1.97
	MacKay Middle (MAR-E2)	3.80	3.25	2.52	1.97
	Muskeg Lower (MUR-E1)	3.82	3.34	2.56	2.08
	Steepbank Lower (STR-E1)	1.71	1.52	1.23	1.03
Depositional Rivers	Regional <i>Baseline</i>	3.12	2.77	1.45	1.10
	Lower Ells River (ELR-D1)	3.00	2.53	2.09	1.63
	Fort Creek (FOC-D1)	3.67	2.43	0.94	-0.31
	Lower Jackpine Creek (JAC-D2)	3.80	2.88	1.69	0.78
	Middle Muskeg River (MUR-D2)	3.54	2.98	2.13	1.57
	Upper Muskeg River (MUR-D3)	2.77	2.43	2.00	1.67
	Lower Tar River (TAR-D1)	4.04	2.79	1.29	0.04
Delta	Regional	3.24	2.80	1.50	1.07
Lake	Isadore's (ISL-1)	3.34	2.84	2.42	1.92
	Johnson (JOL-1)	2.93	2.52	2.51	2.10
	Kearl (KEL-1)	3.03	2.77	2.41	2.15
	McClelland (MCL-1)	3.23	2.74	2.16	1.68
	Shipyard (SHL-1)	3.02	2.71	2.24	1.93

**Table D.1-3 (Cont'd.)**

<b>Log of Richness</b>					
<b>Habitat Class</b>	<b>Reach</b>	<b>Upper Outer Limit</b>	<b>Upper Inner Limit</b>	<b>Lower Inner Limit</b>	<b>Lower Outer Limit</b>
Erosional Rivers	Regional <i>Baseline</i>	1.76	1.66	1.34	1.25
	Lower MacKay River (MAR-E1)	1.68	1.54	1.35	1.20
	Middle MacKay River (MAR-E2)	1.75	1.61	1.42	1.28
	Lower Muskeg River (MUR-E1)	1.69	1.60	1.46	1.36
	Steepbank River (STR-E1)	3.60	3.01	2.11	1.52
Depositional Rivers	Regional <i>Baseline</i>	1.45	1.31	0.78	0.64
	Lower Ells River (ELR-D1)	1.47	1.18	0.90	0.61
	Fort Creek (FOC-D1)	1.55	1.10	0.57	0.12
	Lower Jackpine Creek (JAC-D2)	1.74	1.38	0.92	0.56
	Middle Muskeg River (MUR-D2)	1.71	1.47	1.10	0.85
	Upper Muskeg River (MUR-D3)	1.39	1.18	0.91	0.71
	Tar Lower (TAR-D1)	1.80	1.28	0.65	0.13
Delta	Regional	1.30	1.16	0.73	0.59
Lake	Isadore's (ISL-1)	2.08	1.05	0.20	-0.83
	Johnson (JOL-1)	3.92	1.09	0.95	-1.88
	Kearl (KEL-1)	1.49	1.17	0.71	0.38
	McClelland (MCL-1)	1.84	1.34	0.74	0.23
	Shipyard (SHL-1)	1.81	1.39	0.77	0.36

**Table D.1-3 (Cont'd.)**

<b>Equitability</b>					
<b>Habitat Class</b>	<b>Reach</b>	<b>Upper Outer Limit</b>	<b>Upper Inner Limit</b>	<b>Lower Inner Limit</b>	<b>Lower Outer Limit</b>
Erosional Rivers	Regional <i>Baseline</i>	0.46	0.40	0.18	0.11
	Lower MacKay River (MAR-E1)	0.51	0.39	0.23	0.11
	Middle MacKay River (MAR-E2)	0.58	0.39	0.14	-0.05
	Lower Muskeg River (MUR-E1)	0.45	0.34	0.17	0.06
	Lower Steepbank River (STR-E1)	0.57	0.42	0.19	0.04
Depositional Rivers	Regional <i>Baseline</i>	0.72	0.63	0.28	0.19
	Lower Ells River (ELR-D1)	0.78	0.52	0.26	-0.01
	Fort Creek (FOC-D1)	1.17	0.78	0.32	-0.08
	Lower Jackpine Creek (JAC-D2)	0.73	0.55	0.32	0.14
	Middle Muskeg River (MUR-D2)	0.58	0.42	0.19	0.03
	Upper Muskeg River (MUR-D3)	0.66	0.52	0.35	0.21
	Lower Tar River (TAR-D1)	0.89	0.60	0.25	-0.05
Delta	Regional	0.75	0.61	0.17	0.03
Lake	Isadore's (ISL-1)	1.42	0.82	0.32	-0.28
	Johnson (JOL-1)	1.21	0.48	0.45	-0.29
	Kearl (KEL-1)	0.83	0.63	0.35	0.15
	McClelland (MCL-1)	1.00	0.65	0.24	-0.10
	Shipyard (SHL-1)	0.86	0.64	0.31	0.09

**Table D.1-3 (Cont'd.)**

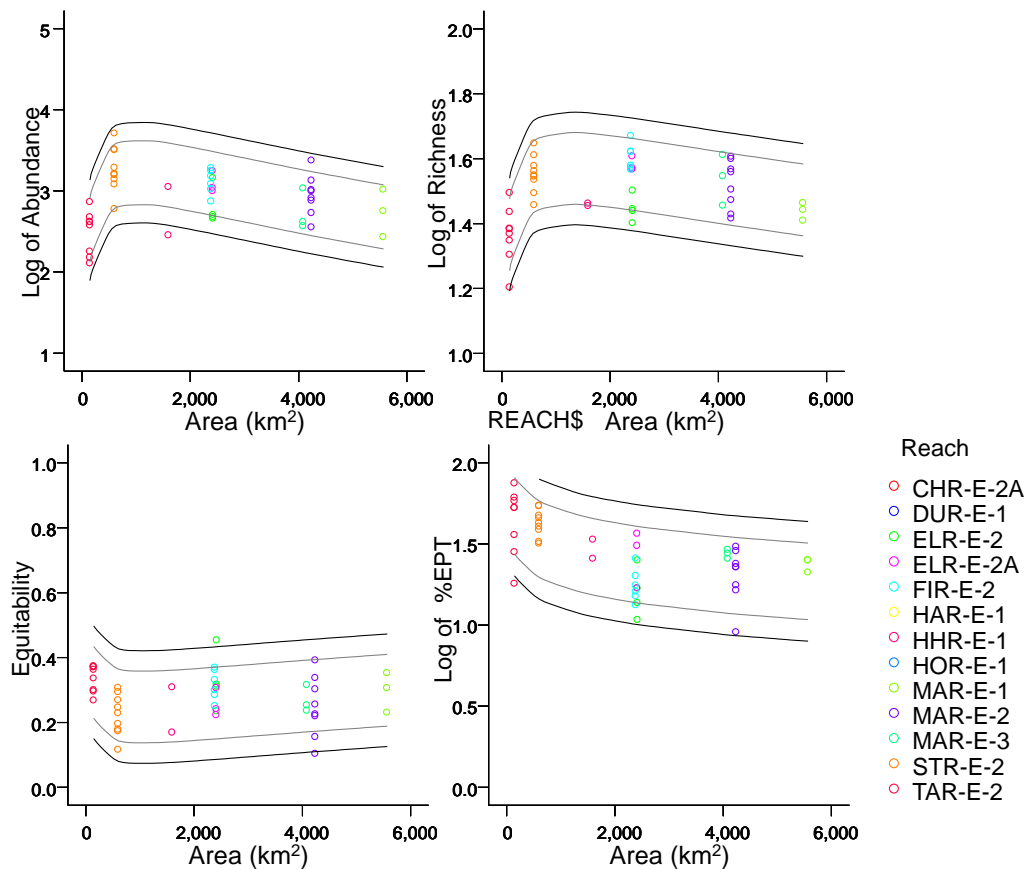
Log EPT					
Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	2.56	2.10	0.51	0.04
	Lower MacKay River (MAR-E1)	1.99	1.55	0.98	0.54
	Middle MacKay River (MAR-E2)	1.80	1.51	1.14	0.85
	Lower Muskeg River (MUR-E1)	2.01	1.69	1.17	0.84
	Steepbank River (STR-E1)	2.10	1.69	1.08	0.68
Depositional Rivers	Regional <i>Baseline</i>	0.93	0.71	-0.12	-0.33
	Lower Ells River (ELR-D1)	0.78	0.52	0.26	-0.01
	Fort Creek (FOC-D1)	1.46	0.83	0.08	-0.55
	Lower Jackpine Creek (JAC-D2)	0.85	0.53	0.12	-0.20
	Middle Muskeg River (MUR-D2)	1.06	0.67	0.08	-0.31
	Upper Muskeg River (MUR-D3)	1.01	0.59	0.05	-0.37
	Lower Tar River (TAR-D1)	0.53	0.28	-0.01	-0.25
Delta	Regional	0.88	0.64	-0.10	-0.35
Lake	Isadore's (ISL-1)	0.82	0.30	-0.12	-0.64
	Johnson (JOL-1)	1.01	0.06	0.01	-0.94
	Kearl (KEL-1)	0.69	0.39	-0.02	-0.31
	McClelland (MCL-1)	1.29	0.79	0.19	-0.31
	Shipyard (SHL-1)	1.70	0.93	-0.24	-1.01



**Table D.1-4 Catchment area models predicting measurement endpoints in erosional *baseline* reaches.**

Variable	Source	Type III SS	df	Mean Squares	F-Ratio	p-Value	Model Coefficients			Residual Noise (SD)
							Constant	Log of Area	Log of Area	
Log of Abundance	Regression	2.63	2	1.313	19.98	0.000	-5.94	6.10	-1.02	0.256
	Residual	2.76	42	0.066						
Log of Richness	Regression	0.21	2	0.103	18.92	0.000	-0.67	1.45	-0.23	0.073
	Residual	0.23	42	0.005						
Equitability	Regression	0.03	2	0.014	2.74	0.076	1.18	-0.62	0.10	0.072
	Residual	0.22	42	0.005						
Log of EPT	Regression	0.85	2	0.428	15.64	0.000	2.04	-0.12	-0.02	0.165
	Residual	1.15	42	0.027						
CA 1	Regression	33.87	2	16.936	53.25	0.000	17.26	-13.97	2.59	0.564
	Residual	13.36	42	0.318						
CA 2	Regression	52.06	2	26.032	70.47	0.000	30.81	-20.01	3.16	0.608
	Residual	15.51	42	0.369						

**Figure D.1-8 Scatterplots of abundance, richness, equitability, and percent EPT in relation to upstream catchment area.**



Note: Grey lines indicate inner tolerance limits; black lines indicate outer tolerance limits.

**Table D.1-5 Reach-specific normal ranges for each measurement endpoint of benthic invertebrate communities, adjusted to catchment area.**

**Log of Abundance**

River	Reach	Code	Area (km <sup>2</sup> )	Log of Abundance	Outer Lower	Inner Lower	Inner Upper	Outer Upper
Beaver	Upper	BER-D2	188	2.69	2.05	2.28	3.10	3.33
Calumet	lower	CAR-D1	175	2.64	2.01	2.24	3.05	3.28
Calumet	Upper	CAR-D2	56	1.64	1.00	1.23	2.04	2.27
Christina	Lower	CHR-D1	13,403	1.96	1.32	1.55	2.37	2.59
Christina	Middle	CHR-D2	5,206	2.72	2.09	2.31	3.13	3.36
Clearwater	Lower	CLR-D1	30,962	1.00	0.36	0.59	1.40	1.63
Clearwater	Upper	CLR-D2	17,123	1.70	1.07	1.30	2.11	2.34
Ells	Lower	ELR-D1	2,709	3.05	2.41	2.64	3.46	3.69
Ells	Middle	ELR-E2	2,419	3.09	2.45	2.68	3.50	3.73
Ells	Upper	ELR-E2A	2,412	3.09	2.45	2.68	3.50	3.73
Firebag	Lower	FIR-D1	6,466	2.58	1.94	2.17	2.98	3.21
Firebag	Upper	FIR-E2	2,384	3.09	2.46	2.69	3.50	3.73
Fort	Lower	FOC-D1	66	1.81	1.18	1.40	2.22	2.45
High Hills	Lower	HHR-E1	1,596	3.19	2.56	2.79	3.60	3.83
Jackpine	Lower	JAC-D1	357	3.03	2.39	2.62	3.43	3.66
Jackpine	Upper	JAC-D2	125	2.39	1.76	1.99	2.80	3.03
Jackfish	Lower	JAR-E1	1,288	3.22	2.59	2.82	3.63	3.86
MackKay	Lower	MAR-E1	5,567	2.68	2.04	2.27	3.09	3.31
MackKay	Middle	MAR-E2	4,240	2.84	2.21	2.43	3.25	3.48
MackKay	Upper	MAR-E3	4,087	2.86	2.23	2.45	3.27	3.50
Muskeg	Middle	MUR-D2	1,361	3.22	2.58	2.81	3.63	3.85
Muskeg	Upper	MUR-D3	378	3.05	2.41	2.64	3.46	3.68
Muskeg	Lower	MUR-E1	1,434	3.21	2.58	2.80	3.62	3.85
Poplar	Lower	POC-D1	472	3.12	2.49	2.71	3.53	3.76
Sawbones	Lower	SAC-D1	110	2.29	1.65	1.88	2.69	2.92
Steepbank	Lower	STR-E1	1,365	3.22	2.58	2.81	3.62	3.85
Steepbank	Upper	STR-E2	597	3.18	2.54	2.77	3.59	3.82
Sunday	Lower	SUC-D1	380	3.05	2.41	2.64	3.46	3.68
Tar	Lower	TAR-D1	333	3.00	2.36	2.59	3.40	3.63
Tar	Upper	TAR-E2	146	2.51	1.88	2.11	2.92	3.15

**Table D.1-5 (Cont'd.)****Log of Richness**

River	Reach	Code	Area (km <sup>2</sup> )	Richness	Outer Lower	Inner Lower	Inner Upper	Outer Upper
Beaver	Upper	BER-D2	188	2.690	2.51	2.57	2.81	2.87
Calumet	lower	CAR-D1	175	2.644	2.46	2.53	2.76	2.83
Calumet	Upper	CAR-D2	56	1.146	0.96	1.03	1.26	1.33
Christina	Lower	CHR-D1	13,403	1.323	1.14	1.21	1.44	1.51
Christina	Middle	CHR-D2	5,206	1.481	1.30	1.36	1.60	1.66
Clearwater	Lower	CLR-D1	30,962	1.118	0.94	1.00	1.23	1.30
Clearwater	Upper	CLR-D2	17,123	1.270	1.09	1.15	1.39	1.45
Ells	Lower	ELR-D1	2,709	1.544	1.36	1.43	1.66	1.73
Ells	Middle	ELR-E2	2,419	1.551	1.37	1.43	1.67	1.73
Ells	Upper	ELR-E2A	2,412	1.551	1.37	1.43	1.67	1.73
Firebag	Lower	FIR-D1	6,466	1.452	1.27	1.34	1.57	1.63
Firebag	Upper	FIR-E2	2,384	1.552	1.37	1.44	1.67	1.73
Fort	Lower	FOC-D1	66	1.189	1.01	1.07	1.31	1.37
High Hills	Lower	HHR-E1	1,596	1.568	1.39	1.45	1.68	1.75
Jackpine	Lower	JAC-D1	357	1.500	1.32	1.38	1.62	1.68
Jackpine	Upper	JAC-D2	125	1.336	1.15	1.22	1.45	1.52
Jackfish	Lower	JAR-E1	1,288	1.570	1.39	1.45	1.69	1.75
MacKay	Lower	MAR-E1	5,567	1.473	1.29	1.36	1.59	1.65
MacKay	Middle	MAR-E2	4,240	1.505	1.32	1.39	1.62	1.69
MacKay	Upper	MAR-E3	4,087	1.509	1.33	1.39	1.63	1.69
Muskeg	Middle	MUR-D2	1,361	1.570	1.39	1.45	1.69	1.75
Muskeg	Upper	MUR-D3	378	1.507	1.32	1.39	1.62	1.69
Muskeg	Lower	MUR-E1	1,434	1.569	1.39	1.45	1.69	1.75
Poplar	Lower	POC-D1	472	1.528	1.35	1.41	1.64	1.71
Sawbones	Lower	SAC-D1	110	1.308	1.13	1.19	1.42	1.49
Steepbank	Lower	STR-E1	1,365	1.570	1.39	1.45	1.69	1.75
Steepbank	Upper	STR-E2	597	1.546	1.36	1.43	1.66	1.73
Sunday	Lower	SUC-D1	380	1.507	1.32	1.39	1.62	1.69
Tar	Lower	TAR-D1	333	1.492	1.31	1.38	1.61	1.67
Tar	Upper	TAR-E2	146	1.366	1.18	1.25	1.48	1.55

**Table D.1-5 (Cont'd.)****Equitability**

<b>River</b>	<b>Reach</b>	<b>Code</b>	<b>Area (km<sup>2</sup>)</b>	<b>Equitability</b>	<b>Outer Lower</b>	<b>Inner Lower</b>	<b>Inner Upper</b>	<b>Outer Upper</b>
Beaver	Upper	BER-D2	188	0.305	0.13	0.19	0.42	0.48
Calumet	lower	CAR-D1	175	0.310	0.13	0.20	0.42	0.49
Calumet	Upper	CAR-D2	56	0.414	0.23	0.30	0.53	0.59
Christina	Lower	CHR-D1	13,403	0.369	0.19	0.25	0.48	0.55
Christina	Middle	CHR-D2	5,206	0.295	0.12	0.18	0.41	0.47
Clearwater	Lower	CLR-D1	30,962	0.463	0.28	0.35	0.58	0.64
Clearwater	Upper	CLR-D2	17,123	0.394	0.22	0.28	0.51	0.57
Ells	Lower	ELR-D1	2,709	0.264	0.08	0.15	0.38	0.44
Ells	Middle	ELR-E2	2,419	0.260	0.08	0.15	0.37	0.44
Ells	Upper	ELR-E2A	2,412	0.260	0.08	0.15	0.37	0.44
Firebag	Lower	FIR-D1	6,466	0.309	0.13	0.19	0.42	0.49
Firebag	Upper	FIR-E2	2,384	0.259	0.08	0.14	0.37	0.44
Fort	Lower	FOC-D1	66	0.396	0.22	0.28	0.51	0.57
High Hills	Lower	HHR-E1	1,596	0.250	0.07	0.14	0.36	0.43
Jackpine	Lower	JAC-D1	357	0.270	0.09	0.16	0.39	0.45
Jackpine	Upper	JAC-D2	125	0.336	0.16	0.22	0.45	0.51
Jackfish	Lower	JAR-E1	1,288	0.248	0.07	0.13	0.36	0.43
MacKay	Lower	MAR-E1	5,567	0.299	0.12	0.18	0.41	0.48
MacKay	Middle	MAR-E2	4,240	0.283	0.10	0.17	0.40	0.46
MacKay	Upper	MAR-E3	4,087	0.281	0.10	0.17	0.40	0.46
Muskeg	Middle	MUR-D2	1,361	0.248	0.07	0.13	0.36	0.43
Muskeg	Upper	MUR-D3	378	0.268	0.09	0.15	0.38	0.45
Muskeg	Lower	MUR-E1	1,434	0.249	0.07	0.13	0.36	0.43
Poplar	Lower	POC-D1	472	0.260	0.08	0.15	0.37	0.44
Sawbones	Lower	SAC-D1	110	0.347	0.17	0.23	0.46	0.53
Steepbank	Lower	STR-E1	1,365	0.248	0.07	0.13	0.36	0.43
Steepbank	Upper	STR-E2	597	0.254	0.07	0.14	0.37	0.43
Sunday	Lower	SUC-D1	380	0.268	0.09	0.15	0.38	0.45
Tar	Lower	TAR-D1	333	0.274	0.09	0.16	0.39	0.45
Tar	Upper	TAR-E2	146	0.324	0.14	0.21	0.44	0.50

**Table D.1-5 (Cont'd.)**

% EPT								
River	Reach	Code	Area (km <sup>2</sup> )	Equitability	Outer Lower	Inner Lower	Inner Upper	Outer Upper
Beaver	Upper	BER-D2	188	0.305	0.13	0.19	0.42	0.48
Calumet	lower	CAR-D1	175	0.310	0.13	0.20	0.42	0.49
Calumet	Upper	CAR-D2	56	0.414	0.23	0.30	0.53	0.59
Christina	Lower	CHR-D1	13,403	0.369	0.19	0.25	0.48	0.55
Christina	Middle	CHR-D2	5,206	0.295	0.12	0.18	0.41	0.47
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Clearwater	Upper	CLR-D2	17,123	0.394	0.22	0.28	0.51	0.57
Ells	Lower	ELR-D1	2,709	0.264	0.08	0.15	0.38	0.44
Ells	Middle	ELR-E2	2,419	0.260	0.08	0.15	0.37	0.44
Ells	Upper	ELR-E2A	2,412	0.260	0.08	0.15	0.37	0.44
Firebag	Lower	FIR-D1	6,466	0.309	0.13	0.19	0.42	0.49
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Jackfish	Lower	JAR-E1	1,288	0.248	0.07	0.13	0.36	0.43
MacKay	Lower	MAR-E1	5,567	0.299	0.12	0.18	0.41	0.48
MacKay	Middle	MAR-E2	4,240	0.283	0.10	0.17	0.40	0.46
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Muskeg	Lower	MUR-E1	1,434	0.249	0.07	0.13	0.36	0.43
Poplar	Lower	POC-D1	472	0.260	0.08	0.15	0.37	0.44
Sawbones	Lower	SAC-D1	110	0.347	0.17	0.23	0.46	0.53
Steepbank	Lower	STR-E1	1,365	0.248	0.07	0.13	0.36	0.43
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Sunday	Lower	SUC-D1	380	0.268	0.09	0.15	0.38	0.45
Tar	Lower	TAR-D1	333	0.274	0.09	0.16	0.39	0.45
Tar	Upper	TAR-E2	146	0.324	0.14	0.21	0.44	0.50

### D.1.5 Order of Comparisons

The approach used this year in the assessment of the RAMP benthos data was slightly modified compared to previous years. For those *test* reaches producing large statistical differences (i.e., linear contrasts accounting for >20% of the variation in annual means of measurement endpoints among years), a comparison of annual means to normal ranges was conducted. For each reach (lake or channel) for which there were eight or more years of data, a within-reach normal range was calculated. For those reaches (channels) for which there were less than eight years of data, a regional normal range was used for further assessment. The regional normal range was considered appropriate for testing whether an annual mean was unusual. An exceedance of a regional normal range would

be cause for potential concern (Hatfield and Kilgour 2014). Exceedances of the within-reach normal range would not be a cause for concern, because this range is tighter than the regional normal range, and the regional normal ranges include the full range of variability that can be associated with natural phenomena.

## D.2 SEDIMENT QUALITY

### D.2.1 Predicted PAH Toxicity

PAH toxicity in sediments was estimated using an equilibrium-partitioning method described by Neff et al. (2005). Hydrocarbons are present in sediments as complex mixtures of compounds with widely varying physical, chemical, and toxicological properties. PAHs found in aquatic environments originate from three possible sources, and can generally be identified by the composition of the PAH mixture within the sediments (Neff et al. 2005; USEPA 2004):

- *Pyrogenic PAHs*, which result from the incomplete but high-temperature, short duration combustion of organic matter, and are most abundant in non-alkylated (parent) form;
- *Petrogenic PAHs*, which are created by the application of relatively low temperatures over geologic time scales, and are most abundant in alkylated form; and
- *Diagenic / Biogenic PAHs*, which are formed from biological precursors such as plants, bacteria, fungi, and animals, and result in the production of compounds such as retene, perylene and derivatives of phenanthrene and chrysene.

PAHs present in the Athabasca oil sands region can be categorized as being derived from petrogenic sources, as indicated by the significantly higher concentrations of alkylated PAHs relative to parent PAHs.

During development of this report, the method employed by the US Environmental Protection Agency (USEPA) and described in USEPA (2004) for calculating potential PAH toxicity of sediments also was considered as a comparison to hazard index values obtained using the Neff et al. (2005) method. Calculations used for both methods are similar in that they compare measured PAH concentrations to PAH-specific toxicities, estimate bioavailability, and use these individual toxicity and bioavailability estimates to produce an aggregate hazard value for the sum of all PAHs in a sample. However, the USEPA method normalizes PAHs to the total organic fraction of sediment (rather than the total non-aqueous-phase-liquids [NAPL] fraction), and uses fewer individual PAH measurements than the Neff et al. method. Additionally, the USEPA method focuses heavily on the contribution of parent PAHs to sediment toxicity, given it was developed for assessment of sediments containing predominantly pyrogenic PAHs. Given sediments in the Athabasca oil sands region are primarily petrogenic and dominated by alkylated PAHs rather than parent species, the USEPA method may underestimate potential toxicity of oil-sands-affected sediments. Additionally, the standard PAH package employed by RAMP does not include the entire list of PAHs required to accurately calculate toxicity using the USEPA method. For these reasons, results obtained from the USEPA method were not considered in this report.

Estimation of PAH toxicity in sediments was conducted using methods described by Neff et al. (2005). This method incorporates 41 individual PAH compounds into the PAH toxicity calculation. PAH concentrations are distributed between three phases in sediments: dissolved (pore water), particulate (sediment and organic matter), and non-

aqueous-phase-liquids (NAPL: an oil coating associated with sediment particles and comprised of hydrocarbons such as petroleum). The fraction of PAHs in solution are much more bioavailable and toxic than those complexed to sediment particles via the other two phases. Neff et al. (2005) stated that PAHs have a higher affinity to NAPL (estimated by RAMP using total recoverable hydrocarbons measured in each sample) than to the other two phases of sediments and are; therefore, quickly deposited into sediments. Consequently, each individual PAH concentration measured in a sediment sample is first normalized to total recoverable hydrocarbons to produce an estimate of the combined PAH concentration available within the pore water and particulate fractions of sediments:

$$PAH_{(normalized)} = \frac{PAH \text{ concentration}}{\text{total recoverable hydrocarbons}}$$

Where,

- PAH<sub>(normalized)</sub> refers to the estimate of PAHs available in pore water and complexed to the particulate fraction of sediment;
- PAH concentration refers to the absolute concentration of specific PAH species; and
- Total recoverable hydrocarbons (TRH) refer to the total amount of hydrocarbons representing NAPL. TRH was measured directly by RAMP from 1997 to 2004, and replaced in 2005 by the more detailed, higher-resolution measure, CCME total hydrocarbons, with both methods overlapping in 2004. To allow long-term comparisons using data from 2005 onward, TRH in each sample was estimated using the concentration of CCME total hydrocarbons adjusted using the following equation, which was based on direct within-sample comparisons made using 2004 data:

$$TRH = \text{total CCME hydrocarbons} * 2.183$$

Where,

- Total CCME hydrocarbons are equal to the sum of CCME Fractions 2 to 4.

PAH<sub>(normalized)</sub> concentrations then are divided by the octanol/water partition coefficient ( $K_{ow}$ ) to estimate the concentration of each PAH that is bioavailable in the dissolved (pore water) phase of sediment. These estimates are divided by a chronic toxicity value (compiled from Mackay et al. 1992; Neff and Burns 1996; Ran et al. 2002; and references cited in Neff et al. 2005) to produce a hazard quotient (HQ) for each PAH measured in the sediment sample:

$$PAH_{(normalized)} = \frac{PAH \text{ concentration}}{\text{total recoverable hydrocarbons}}$$

Finally, all HQs calculated using this method are summed to produce a hazard index (HI) for total PAHs in sediment pore water:

$$HI = \sum HQ$$

Sediments with a calculated hazard index value greater than 1.0 have the potential to be toxic to aquatic organisms (Neff et al. 2005).

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**Appendix E**  
**Fish Populations Component**

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## E FISH POPULATIONS COMPONENT

### E.1 NOMENCLATURE OF FISH SPECIES OF THE OIL SANDS REGION

Table E.1-1 summarizes the common and scientific names of fish species captured in the oil sands region during fish monitoring activities undertaken by RAMP in 2013.

**Table E.1-1 Common and scientific names of fish species captured during fish monitoring activities undertaken by RAMP, 2013.**

Common Name	Scientific Name	Code
Arctic grayling	<i>Thymallus arcticus</i>	ARGR
brook stickleback	<i>Culaea inconstans</i>	BRST
burbot	<i>Lota lota</i>	BURB
cisco	<i>Coregonus artedii</i>	CISC
emerald shiner	<i>Notropis atherinoides</i>	EMSH
fathead minnow	<i>Pimephales promelas</i>	FTMN
flathead chub	<i>Platygobio gracilis</i>	FLCH
finescaled dace	<i>Phoxinus neogaeus</i>	FNDC
goldeye	<i>Hiodon alosoides</i>	GOLD
lake chub	<i>Couesius plumbeus</i>	LKCH
lake trout	<i>Salvelinus namaycush</i>	LKTR
lake whitefish	<i>Coregonus clupeaformis</i>	LKWH
longnose dace	<i>Rhinichthys cataractae</i>	LNDC
longnose sucker	<i>Catostomus catostomus</i>	LNSC
mountain whitefish	<i>Prosopium williamsoni</i>	MNWH
ninespine stickleback	<i>Pungitius pungitius</i>	NNST
northern pike	<i>Esox Lucius</i>	NRPK
northern redbelly dace	<i>Phoxinus eos</i>	NRDC
slimy sculpin	<i>Cottus cognatus</i>	SLSC
spoonhead sculpin	<i>Cottus ricei</i>	SPSC
spottail shiner	<i>Notropis hudsonius</i>	SPSH
trout-perch	<i>Percopsis omiscomaycus</i>	TRPR
walleye	<i>Sander vitreus</i>	WALL
white sucker	<i>Catostomus commersoni</i>	WHSC
yellow perch	<i>Perca flavescens</i>	YLPR

## E.2 HEALTH ASSESSMENT CODES FOR FISH EXAMINATION

Fish body part and abnormality codes were developed to rapidly assess the health of captured fish in an effort to minimize the fish holding time in the field prior to release (Table E.2-1). These codes were also developed to assess the internal health of fish captured for dissection and tissue analyses. For each abnormality that was observed, the severity of the abnormality was recorded (1-mild; 2-moderate; 3-severe) as well as the location of the abnormality (Table E.2-2).

**Table E.2-1 External and internal health assessment codes for fish examinations.**

Variable	Variable Code	Variable Condition	Variable Condition Code
eyes	EYE	no aberrations; good "clear" eye	N
		exophthalmia (popeye)	EX
		blind; an opaque eye (one or both)	BL
		cloudy cornea	CC
		lens deformed	LD
		lens parasites	LP
		lens cataract	LC
		hemorrhaging or bleeding in the eye (one or both)	HM
		missing one or both eyes	MI
		other; any condition not covered above	OT
gills	GIL	normal; no apparent aberrations	N
		frayed; erosion of tips of gill lamellae resulting in "ragged" gills	FR
		clubbed; swelling of the tips of gill lamellae	CL
		marginate; gills with light, discoloured margin along tips the lamellae	MA
		pale; very light in colour	DI
		parasites	PA
		gas bubbles	GB
		other; any condition not covered above	OT
pseudobranchs	PSD	normal; flat, containing no aberrations	N
		swollen; convex in aspect	SW
		lithic; mineral deposits, white, somewhat amorphous spots	LI
		other; any condition not covered above	OT
thymus	THY	no hemorrhage	0
		hemorrhagic	HM
		other; any condition not covered above	OT

**Table E.2-1 (Cont'd.)**

<b>Variable</b>	<b>Variable Code</b>	<b>Variable Condition</b>	<b>Variable Condition Code</b>
skin	BOS	normal; no skin aberrations	N
		lesion	LE
		raised or missing scales	RM
		reoriented scales	RS
		swollen	SW
		exceeds mucus	EX
		growths and/or tumours	GR
		parasites	PA
		wounds and/or scars	WO
		other; any condition not covered above	OT
fins	FIN	no active erosion	N
		frayed-eroded	FE
		parasites	PA
		hemorrhagic	HM
		gas bubbles	GB
		other; any condition not covered above	OT
opercle	OPR	no shortening	N
		incomplete	IN
		other; any condition not covered above	OT
hindgut	ANU	normal; no inflammation or reddening	N
		inflamed	IN
		other; any condition not covered above	OT
body deformities	BOF	none	N
		emaciated	EM
		truncate	TR
		scoliosis	SC
		lordosis	LO
		other; any condition not covered above	OT
mesenteric fat	MF	none	0
		< 50 % coverage of mesentery	1
		50 % coverage of mesentery	2
		> 50 % coverage of mesentery	3
		100% of mesentery covered	4

**Table E.2-1 (Cont'd.)**

<b>Variable</b>	<b>Variable Code</b>	<b>Variable Condition</b>	<b>Variable Condition Code</b>
liver	LI	normal; solid red or light red colour	A
		"fatty" liver; "coffee with cream" colour	C
		nodules in the liver; cysts or nodules	D
		focal discolouration; distinct localized colour changes	E
		general discolouration; colour change in whole liver	F
		other; any condition not covered above	OT
spleen	SP	normal; black, very dark red, or red	B
		granular; rough appearance of spleen	G
		nodular; containing fistulas or nodules of varying sizes	D
		enlarged; noticeable enlarged	E
		other; any condition not covered above	OT
gall bladder	GA	normal	0
		enlarged	1
		parasites	2
kidney	KI	normal; firm dark red colour, lying relatively flat along vertebral column	N
		swollen; enlarged or swollen wholly or in part	S
		mottled; gray discolouration	M
		granular; granular appearance and texture	G
		urolithiasis/nephrocalcinosis; white/cream mineral material in tubules	U
		other; any condition not covered above	OT
parasites	PA	no observed parasites	0
		few observed parasites	1
		moderate parasite infestation	2
		numerous parasites	3

**Table E.2-2 Codes for the location of external fish abnormalities.**

Variable	Location	Code
Body surface	fins	1
	head	2
	eyes	3
	mouth	4
	peduncle	5
	ventral	6
	dorsal	7
	lateral	8
Fins	dorsal	1
	pectoral	2
	pelvic	3
	anal	4
	adipose	5
	caudal	6
Eyes	right	1
	left	2

### **E.3 ANALYSIS OF FISH ASSEMBLAGE DATA**

The analysis of the RAMP fish assemblage data involved four steps to determine if fish measurement endpoints varied in relation to physical or chemical habitat descriptors, and to identify which habitat variables would help to classify *baseline* reaches to calculate the normal ranges of variability in measurement endpoints:

1. A Principal Component Analysis (PCA) was conducted on habitat variables from *baseline* reaches to examine the variability of each characteristic within reaches.
2. Correlation of key physical and chemical habitat data from the PCA with measurement endpoints to identify habitat variables that strongly relate to the variability in measurement endpoints.
3. A cluster analysis to group each reach-year combination based on similarities in key habitat variables.
4. Calculation of normal ranges of variability for all regional *baseline* reaches of similar habitat characteristics for comparison to data from *test* reaches.

#### **E.3.1 Principal Components Analysis of Habitat Data**

A PCA was conducted on habitat variables using the 34 *baseline* reach-year combinations to summarize the variability in habitat conditions. Data for all

habitat variables were scaled by unit variance prior to conducting the PCA to ensure that all data were comparable. Principal component axes explaining >10% of the total variance (Jackson 1993) were used in subsequent correlation analyses with habitat variables. Pearson correlations (i.e., Pearson r-values) between individual variables and PCA axes that were  $> |0.6|$  were considered strongly correlated with an axis.

PCA axes 1, 2, and 3 explained 16.7%, 14.2%, and 12.9%, respectively, of the variance in habitat variables (Table E.3-1). Scores on the first axis were strongly correlated with upstream catchment area, flow at mid-channel, wetted and bankful width, instream cover as boulders and big tree canopy cover (RDB). The first PCA axis, therefore, indicated that the greatest variation among reach-year combinations was mostly in stream size. PCA2 scores strongly correlated with canopy cover (LWD RDB) and (SWD RDB), canopy cover as small trees (LDB) and undershrubs (LDB and RDB). Therefore, PCA 2 indicated a large amount of variation in stream vegetation cover between reach-years. Scores on the third PCA axis were strongly correlated with maximum depth, depth at mid channel, instream cover as macrophytes and canopy cover (SWD LDB). The third axis therefore, indicated a large amount of variation in stream depth. All variables that were strongly correlated with PCA axes were carried forward in subsequent correlation analyses with the measurement endpoints.

### **E.3.2 Correlation Analyses**

Spearman rank correlations were calculated between habitat variables that were highly correlated with PCA axes 1, 2 and 3 and measurement endpoints (CPUE, total abundance, richness, diversity and ATI). This step identified which habitat characteristics were driving changes in measurement endpoints.

CPUE was significantly (i.e., Spearman  $r > |0.27|$ ) correlated with maximum depth, mid-channel water depth, and wetted width (Table E.3-2). Total abundance was significantly correlated with maximum and mid-channel depth and boulders. Richness was correlated with upstream catchment area, maximum and mid-channel depth, bankful and wetted width and boulders. Diversity was significantly correlated with upstream catchment area and boulders. ATI was significantly correlated with upstream catchment area, maximum and mid-channel depth, flow at mid-channel, instream cover as macrophytes, boulders and canopy cover as big trees RDB.

**Table E.3-1 Principal Component axes correlated with habitat variables for baseline fish assemblages reaches, 2009 to 2013.**

Habitat Variable	PC1	PC2	PC3
Upstream catchment area	<b>0.802</b>	-0.259	0.138
Maximum depth	-0.088	0.088	<b>0.627</b>
Depth at mid-channel	-0.205	-0.058	<b>0.630</b>
Flow at mid-channel	<b>0.681</b>	-0.015	-0.139
Bankfull width	<b>0.675</b>	-0.283	0.584
Wetted width	<b>0.613</b>	-0.308	<b>0.624</b>
Bank height LDB	0.146	0.403	-0.269
Bank height RDB	0.153	0.393	-0.257
Bank angle LDB	-0.229	-0.446	-0.252
Bank angle RDB	-0.079	-0.124	-0.405
Instream algae	0.399	-0.260	-0.145
Instream macrophytes	-0.248	-0.247	<b>0.646</b>
Instream LWD	0.173	0.361	0.494
Instream SWD	-0.348	-0.031	0.440
Live trees	-0.401	0.341	0.160
Undercut banks	-0.385	-0.016	-0.125
Boulders	<b>0.669</b>	-0.244	-0.098
Canopy LWD RDB	0.333	<b>0.667</b>	-0.021
Canopy LWD LDB	0.330	0.571	0.003
Canopy SWD LDB	0.002	0.573	<b>0.619</b>
Canopy SWD RDB	0.056	<b>0.714</b>	0.211
Big tree canopy LDB	0.574	0.434	-0.115
Big tree canopy RDB	<b>0.709</b>	0.039	-0.063
Small tree canopy LDB	0.030	<b>0.603</b>	0.522
Small tree canopy RDB	0.422	0.442	0.157
Undershrub LDB	-0.044	<b>0.725</b>	-0.311
Undershrub RDB	-0.027	<b>0.623</b>	-0.402
Dissolved oxygen (mg/L)	0.059	0.220	-0.501
Conductivity (µs/cm)	-0.478	-0.091	0.106
pH	0.348	-0.104	-0.355
Temperature (°C)	0.319	-0.263	-0.063
<b>% of Variance Explained</b>	16.7	14.2	12.9

Note: Values are Pearson Correlations (r); values in bold >|0.6| indicate strong associations with the PC axis.

LWD – large woody debris; SWD – small woody debris; LDB – left downstream bank; RDB – right downstream bank.

**Table E.3-2 Spearman correlations between measurement endpoints and habitat variables for baseline fish assemblages reaches, 2009 to 2013.**

	CPUE	Total Abundance	Richness	Diversity	ATI
Upstream Catchment	-0.058	0.019	<b>0.435</b>	<b>0.311</b>	<b>-0.295</b>
Maximum Depth	<b>-0.296</b>	<b>-0.296</b>	<b>-0.284</b>	-0.097	<b>0.445</b>
Depth at mid-channel	<b>-0.508</b>	<b>-0.488</b>	<b>-0.310</b>	-0.094	<b>0.540</b>
BankfulWidth	-0.073	-0.027	<b>0.302</b>	0.201	-0.165
WettedWidth	<b>-0.315</b>	-0.260	<b>0.290</b>	0.242	0.030
Flow at mid-channel	0.028	0.085	0.255	0.161	<b>-0.451</b>
Instream Macrophytes	-0.051	-0.123	0.027	0.246	<b>0.587</b>
Boulders	0.224	<b>0.297</b>	<b>0.460</b>	<b>0.363</b>	<b>-0.425</b>
Big Tree Canopy RDB	0.164	0.206	0.182	0.089	<b>-0.352</b>
Big Tree Canopy LDB	0.106	0.070	-0.239	-0.159	0.025
Undershubs LDB	0.148	0.145	-0.112	-0.101	0.012
Undershubs RDB	0.151	0.118	0.007	-0.114	-0.146
Canopy SWD RDB	-0.013	0.033	0.126	-0.066	-0.084
Canopy SWD LDB	-0.115	-0.074	-0.137	-0.252	-0.076
Canopy LWD RDB	0.168	0.158	0.050	0.018	-0.043

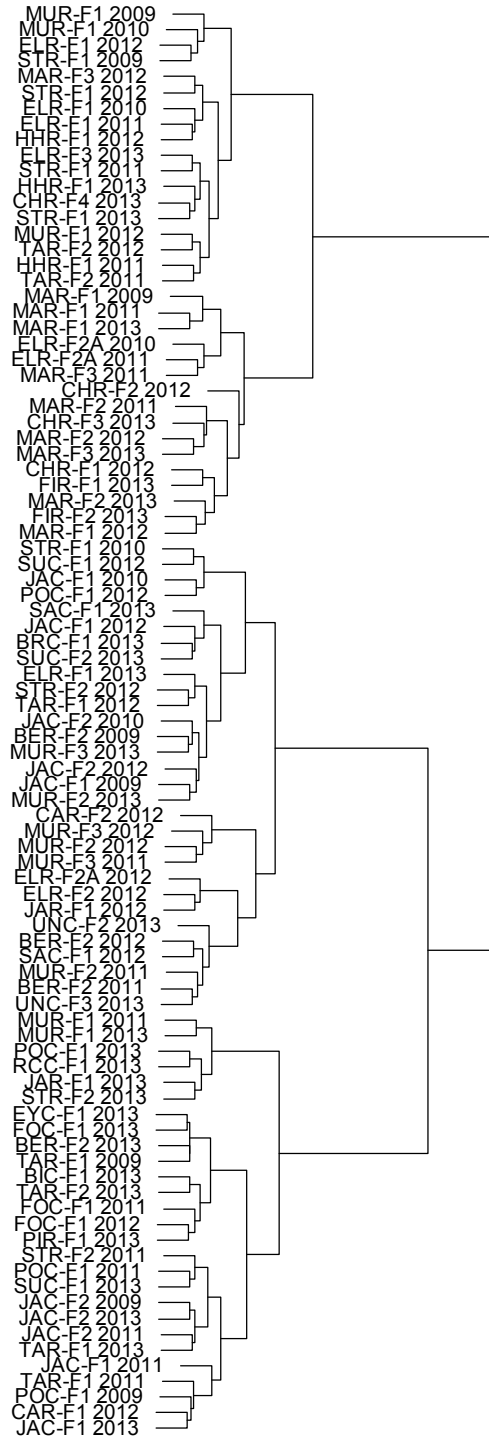
### E.3.3 Cluster Analysis of Habitat Data

A cluster analysis was conducted using significant habitat variables identified in the PCA to group the 93 reach x year (*baseline and test*) combinations based on similar habitat conditions. Ward's hierarchical clustering using Euclidean distances was used in the cluster analysis. Prior to clustering, data for each variable was scaled by unit variance to ensure that data for every descriptor was comparable. Habitat variables that were highly correlated (Spearman  $r > 0.9$ ) with other habitat variables were excluded from the cluster analysis given that the inclusion of several highly correlated variables would result in clusters being overly influenced by what is essentially the same descriptor (Mooi and Sastedt 2011). Only bankful width was removed from the analysis based on this criterion.

Two major clusters were identified in the cluster analysis based on the habitat class (erosional and depositional) (Figure E.3-1). This result was not unexpected given many of the habitat variables used in the clustering procedure also described differences in erosional and depositional habitat. For example, erosional areas tend to be shallower, with a faster velocity, and a larger proportion of boulders and hard substrate compared to depositional areas.



**Figure E.3-1 Dendrogram based on cluster analysis of all reach-year combinations of measurement endpoints based on significant habitat variables.**



### E.3.4 Calculation of Normal *Baseline* Ranges

Based on the results of the cluster analysis, *baseline* reaches were grouped by substrate class (erosional vs. depositional) to develop normal *baseline* ranges of variability for all measurement endpoints (Table E.3-3). As more data are collected over time, analysis of habitat variables and their influence on fish assemblages will be refined.

**Table E.3-3 Summary of normal *baseline* ranges, classified by depositional or erosional habitat.**

Habitat Type	Measurement Endpoint	Outer Tolerance Limit on 5 <sup>th</sup> Percentile	5 <sup>th</sup> Percentile	Inner Tolerance Limit on 5 <sup>th</sup> Percentile	Inner Tolerance Limit on 95 <sup>th</sup> Percentile	95 <sup>th</sup> Percentile	Outer Tolerance Limit on 95 <sup>th</sup> Percentile
Depositional	CPUE	0.00	0.00	0.48	6.41	8.19	10.07
	Abundance	0.00	0.00	0.01	0.39	0.50	0.62
	ATI	3.39	4.37	5.30	8.39	9.32	10.00
	Richness	0.00	0.84	2.14	6.48	7.79	9.16
	Diversity	0.00	0.00	0.10	0.62	0.78	0.94
Erosional	CPUE	0.00	0.00	1.26	8.90	11.00	13.20
	Abundance	0.00	0.00	0.04	0.65	0.82	1.00
	ATI	1.51	2.52	3.46	6.76	7.69	8.71
	Richness	0.69	2.05	3.36	8.09	9.39	10.76
	Diversity	0.00	0.04	0.19	0.73	0.87	1.00

### E.3.5 Sources of Variability at *Baseline* Reaches

In addition to the development of *baseline* ranges, sources of *baseline* variability in measurement endpoints of fish assemblages were explored using stepwise multiple regression. Habitat variables that explained variation in measurement endpoint values are provided in Table E.3-4. When a measurement endpoint value at a *test* reach exceeded the normal range of *baseline* variability, the data were adjusted to explore whether habitat variables explained the exceedance. There were no adjustments that provided any explanation of the exceedances observed; therefore, only raw data were presented in graphs in the Section 5 of the report.

**Table E.3-4 Significant regressions between fish assemblage measurement endpoints and habitat variables.**

<b>Substrate Class</b>	<b>Measurement Endpoint</b>	<b>Predictor Variable</b>	<b>P-Value</b>	<b>Predictor Coefficient</b>
Depositional	Abundance	maximum depth	0.0658	-0.196
	CPUE	maximum depth	0.0298	-3.505
	ATI	presence of macrophytes	0.001	0.686
		canopy cover as big trees (RDB)	0.013	-1.078
	Diversity	-	-	-
	Richness	depth at mid-channel	0.03	-2.617
Erosional	Abundance	flow at mid-channel	0.001	-0.712
		wetted width	0.016	-0.010
		canopy cover as big trees (RDB)	0.031	0.236
	CPUE	presence of macrophytes	0.001	3.228
		wetted width	0.001	-0.256
	ATI	canopy cover as big trees (RDB)	0.003	2.111
		depth at mid-channel	0.006	2.844
		presence of macrophytes	0.052	0.777
	Diversity	presence of macrophytes	0.038	0.171
	Richness	-	-	-

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**Appendix F**  
**Acid-Sensitive Lakes Component**

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## F ACID-SENSITIVE LAKES COMPONENT

Appendix F presents the descriptive portions of the Acid-Sensitive Lakes (ASL) component for 2013. Summary statistics on the chemistry of the ASL component lakes (RAMP lakes), results of between-year comparisons of measurement endpoints, calculations of critical loads of acidity for each lake, and trend analyses on the measurement endpoints can be found in Section 5.14. Appendix F includes the following:

- Water yields and runoff estimates for the individual RAMP lakes;
- Calculation of the  $ANC_{lim}$  in the critical load calculations;
- Calculations of the original base cation concentrations in the RAMP lakes for the critical load calculations;
- The chemistry of the 50 RAMP lakes in 2013 compared to that in 450 lakes within the oil sands region reported by the  $NO_xSO_x$  Management Working Group (NSMWG);
- The characterization of the ion chemistry of the RAMP lakes in 2013 using Piper plots;
- A summary of trace metal concentrations in the RAMP lakes (2003 to 2013), and the relationship between trace metals, lake location, and guideline exceedances;
- A summary of low-level mercury and methylmercury concentrations in the RAMP lakes; and
- Mann-Kendall trend analysis on selected metals to determine whether increases in these metals have occurred in the RAMP lakes over eleven years of monitoring.

### F.1 RUNOFF CALCULATIONS FOR EACH RAMP LAKE

The runoff (Q) to each lake, was calculated by Dr. John Gibson (University of Victoria) from analyses of heavy isotopes of oxygen ( $^{18}O$ ) and ( $^2H$ ) in each lake. With this technique, the natural evaporative enrichment of  $^{18}O$  and  $^2H$  in each lake is used to partition water losses between evaporation and liquid outflow and hence derive an estimate of runoff (Gibson 2002; Gibson et al. 2002; Gibson and Edwards 2002; Gibson et al. 2010). This isotopic mass balance technique (IMB) utilizes a different set of assumptions from traditional hydrometric methods, which extrapolate water yields from one or more gauged catchments to the ungauged lake catchments.

The water yields for each lake catchment and the runoff to each lake are provided in Table F.1-1 and Table F.1-2. The runoff is calculated from the water yield by incorporating the lake catchment areas and represents the discharge that would be measured at the lake outlet. In 2011, 2012, and 2013, the runoff values using the IMB method were unavailable. The mean yield and runoff values from 2002 to 2010 were applied in calculating the critical loads for these years. The runoff estimates for the RAMP lakes ranged from 0.001  $m^3/s$  to 2.43  $m^3/s$ , with a median of 0.077  $m^3/s$ . As evident in Table F.1-2, the runoff for an individual lake can vary considerably between years. The median coefficient of variation of the runoff over all 50 RAMP lakes from 2002 to 2010 was 36.4%. Annual variability in the yield and runoff to a lake will have a direct effect on its critical load and acid sensitivity (Gibson et al. 2010).

**Table F.1-1 Water yields to the RAMP lakes, 2002 to 2013<sup>1</sup>.**

Lake ID No.	AESRD Label	Water Yields (mm/y)										Lake Area (km <sup>2</sup> )	Catchment Area (km <sup>2</sup> )
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2013 <sup>2</sup>		
168	SM10	95	124	136	135	149	90	195	197	154	142	1.4	18.18
169	SM9	156	205	204	412	259	225	289	266	256	253	1.1	8.28
170	SM6	39	51	60	84	69	53	86	84	74	67	0.7	13.06
167	SM5	241	258	260	347	274	218	587	525	506	357	1.1	3.67
166	SM7	56	117	142	193	171	116	295	338	263	188	1.5	6.94
287	SM8	144	213	230	323	256	70	326	314	278	239	1.9	9.63
289	SM3	182	260	236	433	296	211	359	428	374	309	1.9	7.39
290	SM4	29	73	57	72	69	58	88	97	86	70	0.5	11.74
342	SM2	31	33	72	126	65	10	129	141	118	80	2.0	15.36
354	SM1	132	181	230	277	143	49	387	383	314	233	2.4	9.61
165	WF1	98	235	252	305	218	200	523	427	311	285	3.2	10.43
171	WF2	46	96	81	182	69	-	232	161	119	123	0.8	4.30
172	WF3	19	35	51	91	43	34	101	88	44	56	2.2	51.55
223	WF4	9	8	10	78	17	9	29	28	16	23	0.0	1.79
225	WF5	14	38	30	156	49	34	62	68	81	59	0.2	5.04
226	WF6	27	99	77	196	81	61	78	133	121	97	0.2	4.19
227	WF7	34	138	73	214	105	62	115	174	173	121	0.1	1.59
267	WF8	20	42	38	93	61	25	-	95	39	52	2.0	23.08
452	NE1	197	194	133	265	180	98	383	201	88	193	0.7	16.75
470	NE2	153	111	79	152	161	66	146	130	94	121	0.3	15.13
471	NE3	88	132	112	232	248	58	140	136	104	139	0.6	23.98
400	NE4	606	503	449	869	409	260	587	708	369	529	1.2	3.17
268	NE5	267	488	379	480	303	101	410	560	426	379	1.9	7.32
182	NE6	156	148	91	260	101	192	42	155	282	159	0.4	8.34
185	NE7	166	125	101	162	126	132	172	121	140	138	0.1	5.91
209	NE8	753	586	373	861	461	349	985	669	831	652	0.1	0.82
270	NE9	176	245	255	339	319	106	279	491	354	285	3.2	11.21
271	NE10	132	128	230	373	246	189	245	426	240	246	4.2	17.09
418	NE11	-	167	140	239	112	47	129	144	96	134	5.8	77.17
436	BM2	353	536	472	410	487	263	551	577	518	463	44.0	165.55
442	BM9	179	288	246	295	326	239	278	311	248	268	3.5	33.26
444	BM1	431	660	595	435	607	343	703	697	615	565	17.0	58.72
447	BM6	393	455	285	733	407	284	429	570	520	453	1.3	13.67
448	BM7	430	444	531	514	287	245	351	509	365	408	0.7	4.66
454	BM8	121	168	101	289	151	69	115	213	114	149	1.2	32.49
455	BM4	167	232	119	455	274	112	303	422	270	262	4.3	37.33
457	BM5	141	244	118	455	232	92	262	322	162	225	2.6	30.59
464	BM3	77	141	87	168	112	59	134	182	97	117	1.0	29.75
175	BM10	30	25	27	92	51	33	76	192	50	64	0.4	5.15
199	BM11	75	117	121	133	116	69	79	130	87	103	0.1	0.57
473	S4	23	30	24	57	38	38	42	39	28	35	1.4	114.65
118	S1	425	482	387	389	452	349	502	438	424	428	3.4	13.40
84	S2	43	51	42	65	39	-	54	71	33	50	1.0	112.59
88	S5	113	122	108	116	127	-	118	144	81	116	0.3	4.48
90	S3	112	159	130	140	148	139	150	187	115	142	1.4	37.89
146	CM1	240	310	235	378	455	551	728	603	545	449	1.6	24.11
152	CM2	304	328	234	447	404	328	401	485	452	376	9.6	46.77
89	CM3	189	162	111	331	275	249	220	346	285	241	2.3	27.95
97	CM4	242	275	182	219	228	308	394	503	383	304	2.6	38.05
91	CM5	225	212	136	697	704	175	212	391	408	351	0.6	2.78
	Min	8.6	7.5	9.5	56.6	16.7	9.0	28.9	28.4	16.0	23.0		
	Max	753	660	595	869	704	551	985	708	831	652		
	Mean	171	209	177	295	220	150	276	300	243	226		
	Median	141	165	131	263	176	106	232	240	207	191		

<sup>1</sup> Data provided by Dr. John Gibson.

<sup>2</sup> Water yields were not available from 2011 to 2013; therefore, the mean value from 2002 to 2010 was used for each lake.

**Table F.1-2 Runoff to the RAMP lakes, 2002 to 2013.**

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 to 2013 <sup>1</sup>
		Runoff (m <sup>3</sup> /s)									
168	SM10	0.055	0.071	0.078	0.078	0.086	0.052	0.112	0.114	0.089	0.082
169	SM9	0.041	0.054	0.054	0.108	0.068	0.059	0.076	0.070	0.067	0.066
170	SM6	0.016	0.021	0.025	0.035	0.029	0.022	0.036	0.035	0.031	0.028
167	SM5	0.028	0.030	0.030	0.040	0.032	0.025	0.068	0.061	0.059	0.042
166	SM7	0.012	0.026	0.031	0.042	0.038	0.025	0.065	0.074	0.058	0.041
287	SM8	0.044	0.065	0.070	0.099	0.078	0.021	0.100	0.096	0.085	0.073
289	SM3	0.043	0.061	0.055	0.101	0.069	0.049	0.084	0.100	0.088	0.072
290	SM4	0.011	0.027	0.021	0.027	0.026	0.022	0.033	0.036	0.032	0.026
342	SM2	0.015	0.016	0.035	0.062	0.032	0.005	0.063	0.069	0.057	0.039
354	SM1	0.040	0.055	0.070	0.084	0.044	0.015	0.118	0.117	0.096	0.071
165	WF1	0.032	0.078	0.083	0.101	0.072	0.066	0.173	0.141	0.103	0.094
171	WF2	0.006	0.013	0.011	0.025	0.009	-	0.032	0.022	0.016	0.017
172	WF3	0.031	0.057	0.083	0.149	0.070	0.056	0.165	0.144	0.072	0.092
223	WF4	0.0005	0.0004	0.0005	0.0044	0.0009	0.0005	0.0016	0.0016	0.0009	0.001
225	WF5	0.002	0.006	0.005	0.025	0.008	0.005	0.010	0.011	0.013	0.009
226	WF6	0.004	0.013	0.010	0.026	0.011	0.008	0.010	0.018	0.016	0.013
227	WF7	0.002	0.007	0.004	0.011	0.005	0.003	0.006	0.009	0.009	0.006
267	WF8	0.015	0.031	0.028	0.068	0.045	0.018	-	0.070	0.029	0.038
452	NE1	0.105	0.103	0.070	0.141	0.096	0.052	0.204	0.107	0.047	0.103
470	NE2	0.073	0.053	0.038	0.073	0.077	0.032	0.070	0.062	0.045	0.058
471	NE3	0.067	0.100	0.085	0.176	0.188	0.044	0.107	0.103	0.079	0.106
400	NE4	0.061	0.051	0.045	0.087	0.041	0.026	0.059	0.071	0.037	0.053
268	NE5	0.062	0.113	0.088	0.112	0.070	0.024	0.095	0.130	0.099	0.088
182	NE6	0.041	0.039	0.024	0.069	0.027	0.051	0.011	0.041	0.075	0.042
185	NE7	0.031	0.023	0.019	0.030	0.024	0.025	0.032	0.023	0.026	0.026
209	NE8	0.020	0.015	0.010	0.022	0.012	0.009	0.026	0.017	0.022	0.017
270	NE9	0.062	0.087	0.090	0.121	0.113	0.038	0.099	0.174	0.126	0.101
271	NE10	0.072	0.069	0.125	0.202	0.133	0.103	0.133	0.231	0.130	0.133
418	NE11	-	0.409	0.342	0.584	0.273	0.115	0.315	0.353	0.235	0.328
436	BM2	1.851	2.815	2.476	2.155	2.557	1.383	2.890	3.029	2.719	2.431
442	BM9	0.189	0.304	0.259	0.311	0.344	0.253	0.294	0.328	0.262	0.282
444	BM1	0.803	1.229	1.107	0.810	1.130	0.638	1.309	1.297	1.145	1.052
447	BM6	0.170	0.197	0.123	0.318	0.177	0.123	0.186	0.247	0.225	0.196
448	BM7	0.064	0.066	0.078	0.076	0.042	0.036	0.052	0.075	0.054	0.060
454	BM8	0.125	0.174	0.104	0.298	0.155	0.071	0.119	0.220	0.117	0.154
455	BM4	0.198	0.274	0.141	0.538	0.324	0.133	0.358	0.500	0.320	0.310
457	BM5	0.137	0.237	0.115	0.441	0.225	0.089	0.254	0.312	0.157	0.219
464	BM3	0.072	0.133	0.082	0.159	0.105	0.055	0.127	0.172	0.092	0.111
175	BM10	0.005	0.004	0.004	0.015	0.008	0.005	0.012	0.031	0.008	0.010
199	BM11	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002
473	S4	0.082	0.110	0.089	0.206	0.138	0.139	0.152	0.143	0.102	0.129
118	S1	0.180	0.205	0.165	0.165	0.192	0.148	0.213	0.186	0.180	0.182
84	S2	0.153	0.182	0.149	0.232	0.139	-	0.191	0.253	0.118	0.177
88	S5	0.016	0.017	0.015	0.016	0.018	-	0.017	0.020	0.012	0.016
90	S3	0.135	0.191	0.156	0.169	0.178	0.167	0.180	0.225	0.138	0.171
146	CM1	0.184	0.237	0.180	0.289	0.348	0.421	0.556	0.461	0.417	0.344
152	CM2	0.452	0.487	0.347	0.662	0.599	0.487	0.594	0.720	0.670	0.558
89	CM3	0.168	0.144	0.099	0.293	0.244	0.220	0.195	0.307	0.253	0.214
97	CM4	0.292	0.332	0.220	0.264	0.275	0.371	0.476	0.607	0.462	0.366
91	CM5	0.020	0.019	0.012	0.061	0.062	0.015	0.019	0.034	0.036	0.031
	Min	0.0005	0.0004	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001
	Max	1.851	2.815	2.476	2.155	2.557	1.383	2.890	3.029	2.719	2.431
	Mean	0.128	0.181	0.151	0.204	0.181	0.122	0.214	0.233	0.187	0.178
	Median	0.055	0.065	0.074	0.101	0.071	0.049	0.100	0.105	0.082	0.077

<sup>1</sup> Water yields were not available in 2011 or 2012; therefore, the mean runoff value from 2002 to 2010 was used for each lake.

## F.2 CALCULATION OF THE ORIGINAL BASE CATION CONCENTRATIONS IN THE RAMP LAKES TO DETERMINE CRITICAL LOADS

In order to be consistent with international methodologies, the original base cation concentration in each RAMP lake,  $[BC_o]$ , was calculated using the equations published in the “Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads” (CLRTAP 2004) and Henriksen et al. (2002) where:

$$[BC_o] = [BC_T] - F(SO_{4,T} - SO_{4,o} + NO_{3,T} - NO_{3,o})$$

Where,

- $[BC_T]$  is the current base cation concentration;
- F is the “F factor” describing the ratio of the change in base cations to the addition of strong acids to each lake from acid deposition;
- $SO_{4,T}$  and  $SO_{4,o}$  are the current and original sulphate concentrations in each lake, respectively; and
- $NO_{3,T}$  and  $NO_{3,o}$  are the current and original nitrate concentrations in each lake, respectively.

The F factor is defined as follows:

$$F = \sin(\Pi/2 \cdot Q[BC_T]/S)$$

Where,

- Q is the runoff and S is the base cation flux when all of the acid deposition is neutralized in the catchment (F=1); and
- S is assumed to be 400 meq/m<sup>2</sup>/y.

The original sulphate concentration ( $SO_{4,o}$ ) for each lake was assumed to be the 5<sup>th</sup> percentile of sulphate concentrations from all RAMP lakes.

The predicted original base concentrations  $[BC_o]$  are tabulated in Table F.2-1. The final column of the table indicates the percent difference between the  $[BC_T]$  (i.e., the current 2013 base cation concentration) and  $[BC_o]$ . The mean difference between the two estimates was 3.2%, with only three test lakes having a difference greater than 10%. These three lakes were found in the Birch Mountains subregion and had relatively high sulphate concentrations. As shown in Figure F.2-1, the greater the sulphate concentration in a lake the greater the difference between the  $BC_T$  and  $BC_o$ . This relationship occurred because the estimate of  $SO_{4,o}$  as the 5<sup>th</sup> percentile of sulphate concentration for all RAMP lakes was not really applicable and far too low for lakes with relatively high sulphate concentrations. The high sulphate concentrations in these lakes were likely natural in origin rather than from acid deposition given that the Birch Mountains subregion is remote from major sources of acidic emission.

In applying the Henriksen model in previous years, it was assumed that base cations have not increased in the RAMP lakes as a result of acidic deposition; that is, the current base cation concentrations  $[BC_T]$  are equivalent to the original base cations concentrations  $[BC_o]$ . Based on Table F.2-1, the assumption of using the current base cation concentrations for the original base cation concentrations appeared to have been valid. The assumption is further supported by a study by Whitfield et al. (2010) in which the



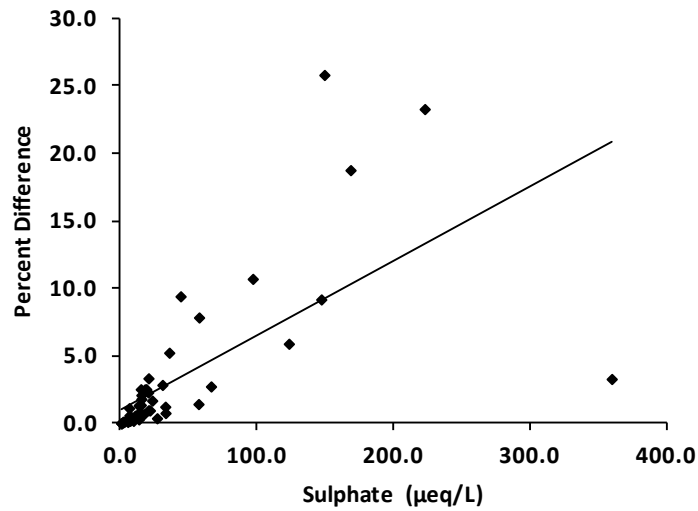
Magic Model was applied to soils in the oil sands region. This study concluded that, to date, sulphate deposition in the oil sands region has resulted in a limited removal of base cations from the soil.

**Table F.2-1 Comparison of the calculated BC<sub>0</sub> to the current BC<sub>T</sub> in the RAMP lakes in 2013.**

Lake GIS No.	AESRD Label	Sulphate (mg/L)	Sulphate (µeq/L)	Runoff (m/y)	F Factor	BC <sub>T</sub> (µeq/L)	BC <sub>0</sub> (Predicted) (µeq/L)	% Difference between BC <sub>T</sub> and BC <sub>0</sub>
168	SM10	0.67	14.0	0.142	0.059	106	105.6	0.8
169	SM9	0.30	6.3	0.253	0.082	83.2	82.7	0.6
170	SM6	0.62	12.9	0.067	0.025	94.9	95	0.3
167	SM5	0.72	15.0	0.357	0.126	89.8	88	2.1
166	SM7	1.10	22.9	0.188	0.220	301	296	1.7
287	SM8	0.70	14.6	0.239	0.066	70.1	69	1.3
289	SM3	0.72	15.0	0.309	0.201	167	164	1.8
290	SM4	0.32	6.7	0.070	0.047	172	172	0.2
342	SM2	0.02	0.4	0.080	0.092	292	292	0.0
354	SM1	0.02	0.4	0.233	0.412	465	465	0.0
165	WF1	0.07	1.5	0.285	0.681	669	668	0.1
171	WF2	0.97	20.2	0.123	0.194	403	399	1.0
172	WF3	0.63	13.1	0.056	0.056	254	253	0.3
223	WF4	17.27	360	0.023	0.138	1,563	1,514	3.3
225	WF5	1.57	32.7	0.059	0.212	917	910	0.8
226	WF6	1.56	32.5	0.097	0.272	725	716	1.2
227	WF7	1.02	21.3	0.121	0.547	1,219	1,207	0.9
267	WF8	0.24	5.0	0.052	0.182	901	900	0.1
452	NE1	0.02	0.4	0.193	0.186	246	246	0.0
470	NE2	3.17	66.0	0.121	0.830	2,054	2,000	2.7
471	NE3	0.33	6.9	0.139	0.227	421	419	0.4
400	NE4	0.97	20.2	0.529	0.925	568	550	3.3
268	NE5	0.84	17.5	0.379	0.473	331	323	2.5
182	NE6	0.61	12.7	0.159	0.590	1,014	1007	0.7
185	NE7	0.13	2.7	0.138	0.156	288	287	0.1
209	NE8	0.29	6.0	0.652	0.945	483	478	1.1
270	NE9	0.02	0.4	0.285	0.986	1,257	1257	0.0
271	NE10	0.65	13.5	0.246	0.322	340	336	1.3
418	NE11	0.09	1.9	0.134	0.698	1,467	1466	0.1
436	BM2	7.16	149	0.463	0.949	688	546	25.8
442	BM9	0.63	13.1	0.268	0.309	298	294	1.3
444	BM1	2.10	43.8	0.565	0.723	364	333	9.4
447	BM6	0.70	14.6	0.453	0.386	223	217	2.5
448	BM7	0.02	0.4	0.408	0.075	46.9	47	0.0
454	BM8	7.05	147	0.149	0.331	577	529	9.2
455	BM4	8.08	168	0.262	0.657	698	588	18.8
457	BM5	10.69	223	0.225	0.467	549	445	23.3
464	BM3	5.91	123	0.117	0.307	678	640	5.9
175	BM10	2.73	56.9	0.064	0.294	1,186	1169	1.4
199	BM11	0.80	16.7	0.103	0.116	286	285	0.7
473	S4	1.27	26.5	0.035	0.090	645	643	0.4
118	S1	0.89	18.5	0.428	0.894	659	643	2.5
84	S2	0.44	9.2	0.050	0.130	669	668	0.2
88	S5	0.33	6.9	0.116	0.207	456	455	0.3
90	S3	0.50	10.4	0.142	0.288	524	521	0.6
146	CM1	4.64	96.7	0.449	1.000	995	899	10.7
152	CM2	1.70	35.4	0.376	0.467	329	313	5.2
89	CM3	1.46	30.4	0.241	0.401	436	424	2.8
97	CM4	0.96	20.0	0.304	0.499	438	428	2.3
91	CM5	2.75	57.3	0.351	0.621	486	450	7.8
							Mean	3.2

Note: BC<sub>T</sub>=current (2013) base cation concentration; BC<sub>0</sub>=original base cation concentration predicted from F factor.

**Figure F.2-1 Percent difference between  $BC_T$  and  $BC_o$  vs. sulphate concentration in each RAMP lake.**

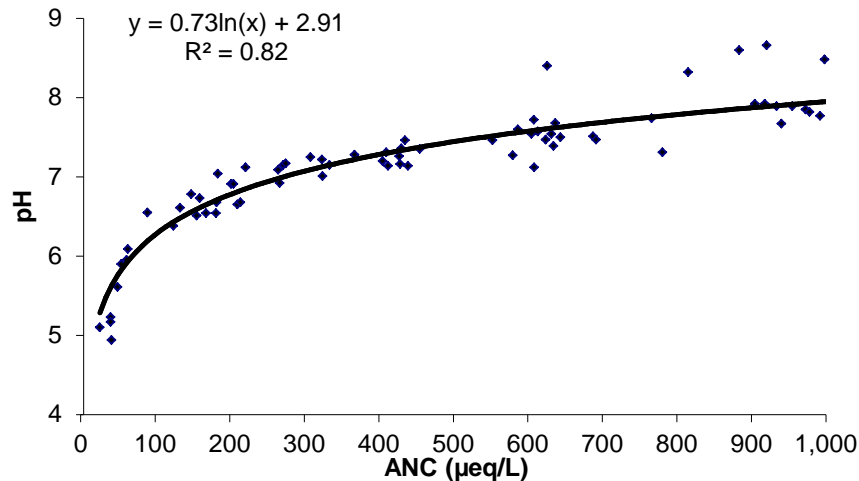


### F.3 CALCULATION OF $ANC_{LIM}$ IN THE CALCULATION OF CRITICAL LOADS OF ACIDITY

The limiting critical load ( $ANC_{lim}$ ) of 75  $\mu\text{eq/L}$ , used to calculate the critical loads of acidity to each RAMP lake, was derived in a study by WRS (2001) from data on 180 regional lakes. The critical load concept assumes a dose-response relationship between a water quality variable and an aquatic indicator organism. In this case, the water quality variable is the acid neutralizing capacity (ANC) required to maintain a healthy fish population. In applying the Henriksen model in Europe, a critical threshold ANC ( $ANC_{lim}$ ) was set to protect brown trout, the most common European salmonid, to ensure that no toxic acidic episodes occur to this species during the year. The  $ANC_{lim}$  was derived from a survey of water chemistry data, critical load exceedances, and fish population status in 1,000 lakes in Norway in 1986 (Henriksen et al. 1988; Lien et al. 1991). A value of 20  $\mu\text{eq/L}$  seemed to be the most appropriate for evaluating critical loads in Norway and this value has been adapted by most of the Scandinavian countries (Henriksen et al. 1992).

In North America, the effects of acidification on fish have been historically related to pH rather than ANC. Research on pH tolerance of a wide range of aquatic organisms has shown that a  $\text{pH} > 6$  is required to maintain aquatic ecosystem function and protect both fish and other organisms (RMCC 1990; Environment Canada 1997; Jeffries and Lam 1993). Within a given region, lake pH has been empirically and theoretically related to ANC (alkalinity) as an inverse hyperbolic sine function (Small and Sutton 1986) and this relationship has been used to equate the two variables for the purpose of critical load modelling (e.g., Jeffries and Lam 1993). A similar approach was taken in the WRS study to estimate  $ANC_{lim}$ . The relationship between pH and Gran alkalinity was derived for 180 lakes surveyed by ALPAC in 1998 (Figure F.3-1). For simplicity, a logarithmic function was fitted to the data. Interpolation indicated that for all lakes, a pH of 6.0 was associated with an alkalinity of approximately 75  $\mu\text{eq/L}$ . This value was; therefore, chosen for  $ANC_{lim}$ .

**Figure F.3-1 Lake pH vs. Gran alkalinity for 180 regional lakes.**



#### **F.4 COMPARISON OF RAMP LAKE CHEMISTRY IN 2013 TO REGIONAL LAKES**

In order to determine how representative the RAMP lakes are of regional lake chemistry, water chemistry in 2013 in the RAMP lakes was compared to a database of 450 lakes within the oil sands region reported by the NO<sub>x</sub>SO<sub>x</sub> Management Working Group (NSMWG). The two populations were compared statistically in Table F.4-1 and selected variables are presented graphically in boxplots (Figure F.4-1). Key results were as follows:

- The RAMP lakes covered a slightly narrower pH range (4.38 to 8.03), with a lower median value (7.04 vs. 7.70) than the regional lakes. The median pH of the RAMP lakes was significantly less than that of the NSMWG regional database ( $p < 0.05$ );
- Total alkalinity in the RAMP lakes ranged from 20 µeq/L to 1,643 µeq/L, with a median of 258 µeq/L, which was much lower than the regional median of 1,020 µeq/L. The median total alkalinity across the RAMP lakes in 2013 was significantly lower than median of the regional lakes ( $p < 0.05$ );
- Conductivity was relatively low in the RAMP lakes and ranged from 8.4 µS/cm to 162 µS/cm (median: 33.5 µS/cm). The median conductivity in the regional database was 125 µS/cm. The median conductivity of the RAMP lakes was significantly lower than the median of the regional lakes ( $p < 0.05$ );
- Consistent with lower conductivity in the RAMP lakes, the mean and median concentrations of the principal cations (calcium, magnesium, sodium, and potassium) and the sum of base cations (SBC) were all less than the values from the regional lakes dataset. The median SBC in the RAMP lakes in 2013 was 460 µeq/L compared to 1,247 µeq/L in the regional lakes. The median values of all these variables, with the exception of potassium, were significantly lower in the RAMP lakes ( $p < 0.05$ );
- The mean and median concentrations of the major anions (chloride, sulphate, and bicarbonate) were lower than the regional lakes;

- Total phosphorus was quite variable in the RAMP lakes and regional lakes, with individual lakes attaining concentrations that would classify them as eutrophic or hypereutrophic (Wetzel 2001). The highest concentration of phosphorus observed in the RAMP lakes in 2013 was 248 µg/L in Lake 454/BM 8 in the Birch Mountains subregion. The highest phosphorus concentration in the regional lakes was 495 µg/L. The median concentration of phosphorus in the RAMP lakes was 34.5 µg/L compared to 49 µg/L in the regional lakes. There was no significant difference in the median concentration of total phosphorus between the RAMP lakes in 2013 and the regional lakes ( $p < 0.05$ );
- Concentrations of nitrate in the RAMP lakes were generally low (median: 5 µg/L), although several lakes had values two orders of magnitude greater than the median (e.g., 253 µg/L in Lake 452/NE1 in the Northeast of Fort McMurray sub-region). Concentrations of nitrate in the regional lakes database were similarly variable with a median of 2 µg/L and a maximum concentration of 1,860 µg/L. There was no significant difference in the median nitrate concentration between the RAMP lakes in 2013 and the regional lakes ( $p < 0.05$ ); and
- There was no significant difference between the median concentration of total dissolved nitrogen between the RAMP lakes in 2013 and the regional lakes ( $p < 0.05$ ).

The chemical differences in water between the RAMP lakes and the regional lakes reflected the bias in the selection process for lakes in the RAMP ASL component. In the initial stages of the program, the RAMP lakes were selected for their acid sensitivity which, in practice, meant selecting lakes with the lowest pH, alkalinity, conductivity, and base cation concentrations. These types of lakes are often the smallest lakes and are often located in the upland regions where catchments are dominated by fens and organic soils.

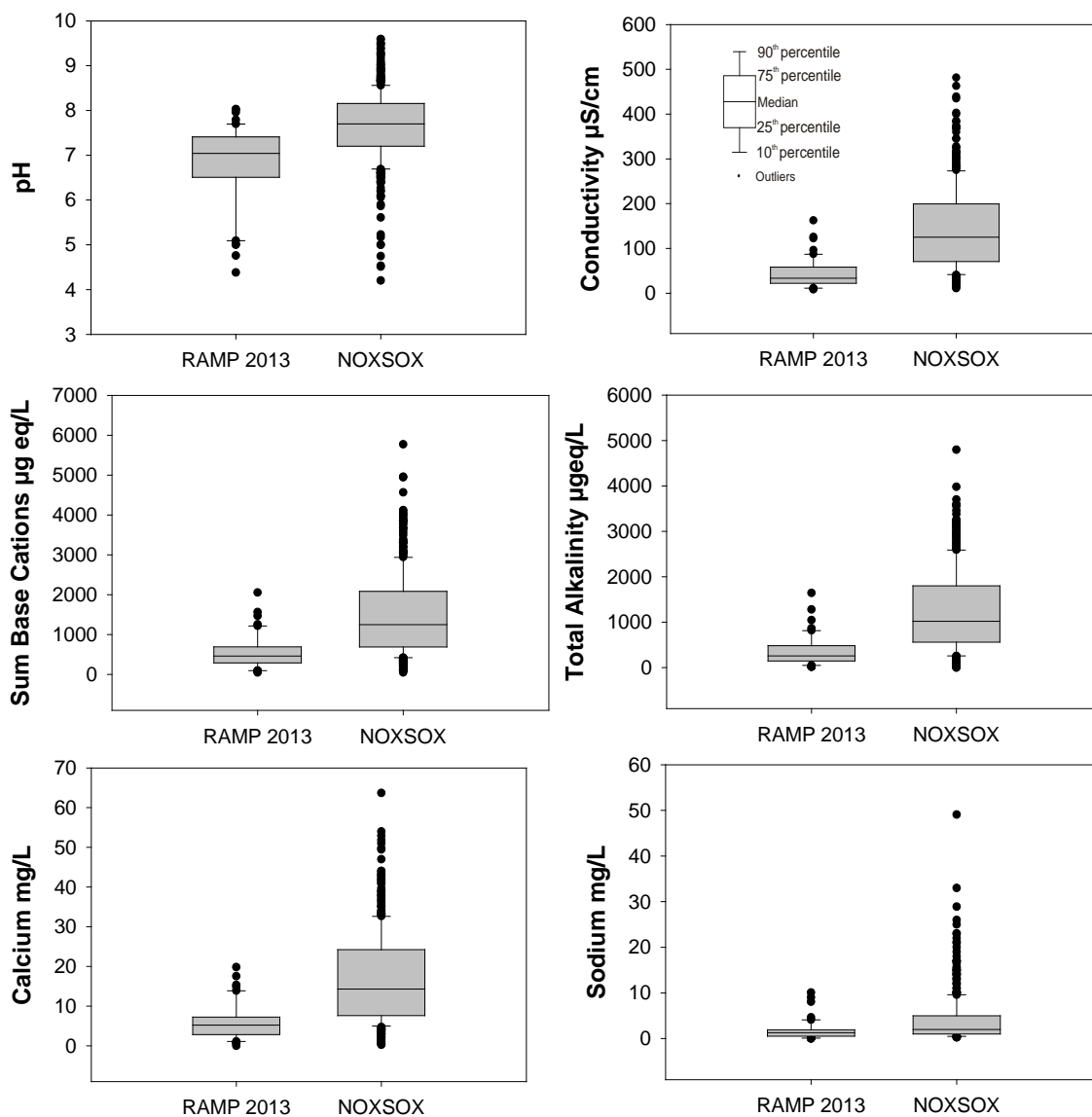
**Table F.4-1 Comparison between RAMP lakes in 2013 and 450 regional lakes in the NSMWG<sup>1</sup> database.**

Variable	Units	RAMP Lakes (2013)				Regional Lakes				
		Min	Max	Median	Mean	No.	Min	Max	Median	Mean
Lake Area	km <sup>2</sup>	0.031	43.4	1.30	2.86	431	0.01	214	1.60	6.26
Catchment Area	km <sup>2</sup>	0.700	224	15.3	28.1	432	0.08	1769	17.4	89.3
Drainage Ratio	ratio	0.220	88.6	10.1	15.7	431	1.43	1178	13.0	26.2
Runoff	m <sup>3</sup> /s	0.001	2.431	0.077	0.178	432	0.0002	4.67	0.043	0.258
Lab pH		4.38	8.03	7.04	6.78	432	4.20	10.0	7.70	7.66
Total Alkalinity	µeq/L	20	1643	258	360	432	0.00	4797	1020	1241
Specific Conductivity	µS/cm	8.4	162.4	33.5	43.9	399	11.0	481	125	144
Dissolved Organic Carbon	mg/L	7.2	52.3	23.9	25.2	383	0.2	60.0	19.4	20.4
Sodium	mg/L	0.02	10.07	1.29	1.84	432	0.28	49.0	2.00	4.07
Potassium	mg/L	0.05	1.90	0.43	0.62	432	0.05	14.0	0.620	0.943
Calcium	mg/L	0.01	19.82	5.21	6.11	432	0.25	64.0	14.3	17.0
Magnesium	mg/L	0.15	7.32	1.54	1.98	432	0.05	28.0	4.3	5.34
Sum of Base Cations	µeq/L	47	2054	460	564	432	46.0	5770	1247	1487
Chloride	mg/L	0.02	2.24	0.11	0.26	429	0.01	18.0	0.490	1.09
Sulphate	mg/L	0.02	17.27	0.72	1.93	431	0.025	99.0	2.50	6.73
Nitrate + Nitrite	µg/L	1.0	253.0	5.0	14.8	445	0.02	1860	2.00	21.0
Ammonia	µg/L	1.5	637.0	13.0	29.8	320	0.22	650	11.4	31.8
Total Dissolved Nitrogen	µg/L	343	2024	806	883	150	183	1904	861	869
Total Phosphorus	µg/L	4.0	248.0	34.5	49.7	426	3.00	495	49.0	66.6

Note: Shading denotes significantly different median concentrations using a non-parametric Mann-Whitney test ( $p < 0.05$ ).

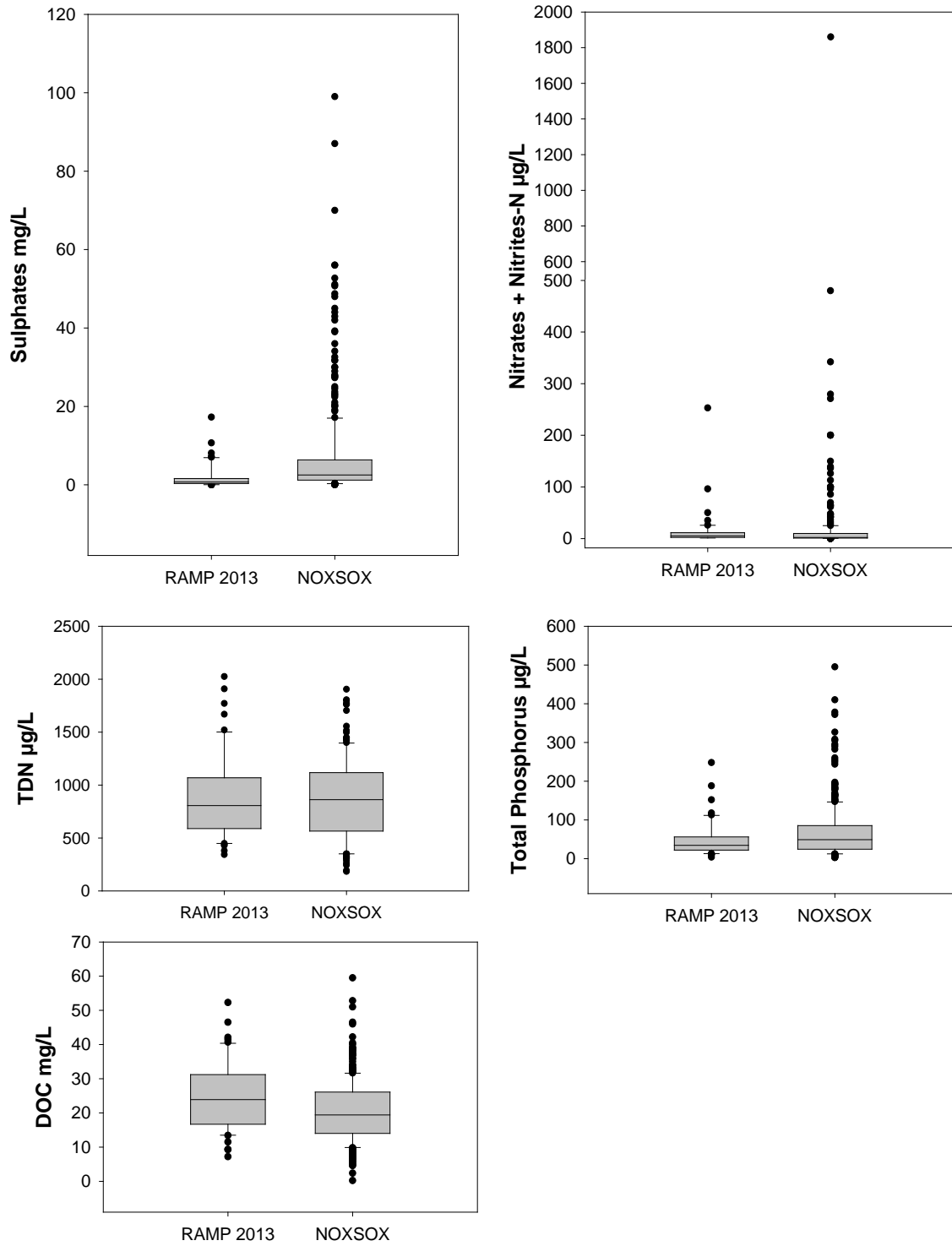
<sup>1</sup>NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group

**Figure F.4-1 Box plots of selected chemical variables for the RAMP lakes in 2013 versus 432 regional lakes reported by the NSMWG<sup>1</sup> (WRS 2004).**



<sup>1</sup>NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group.

Figure F.4-1 (Cont'd.)



<sup>1</sup> NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group.

## F.5 CHARACTERIZATION OF ION CHEMISTRY IN THE RAMP LAKES

In order to characterize water in the RAMP lakes, the major anions and cations were displayed in Piper plots (Figure F.5-1). A Piper diagram is a multivariate graphical technique that is used to divide the lakes into four water types on the basis of major cation constituents (Güler et al. 2002; Freeze and Cherry 1979; Back and Hanshaw 1965):

- Type I  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{HCO}_3^-$ ;
- Type II  $\text{Na}^+$  -  $\text{K}^+$  -  $\text{HCO}_3^-$ ;
- Type III  $\text{Na}^+$  -  $\text{K}^+$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ ; and
- Type IV  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ .

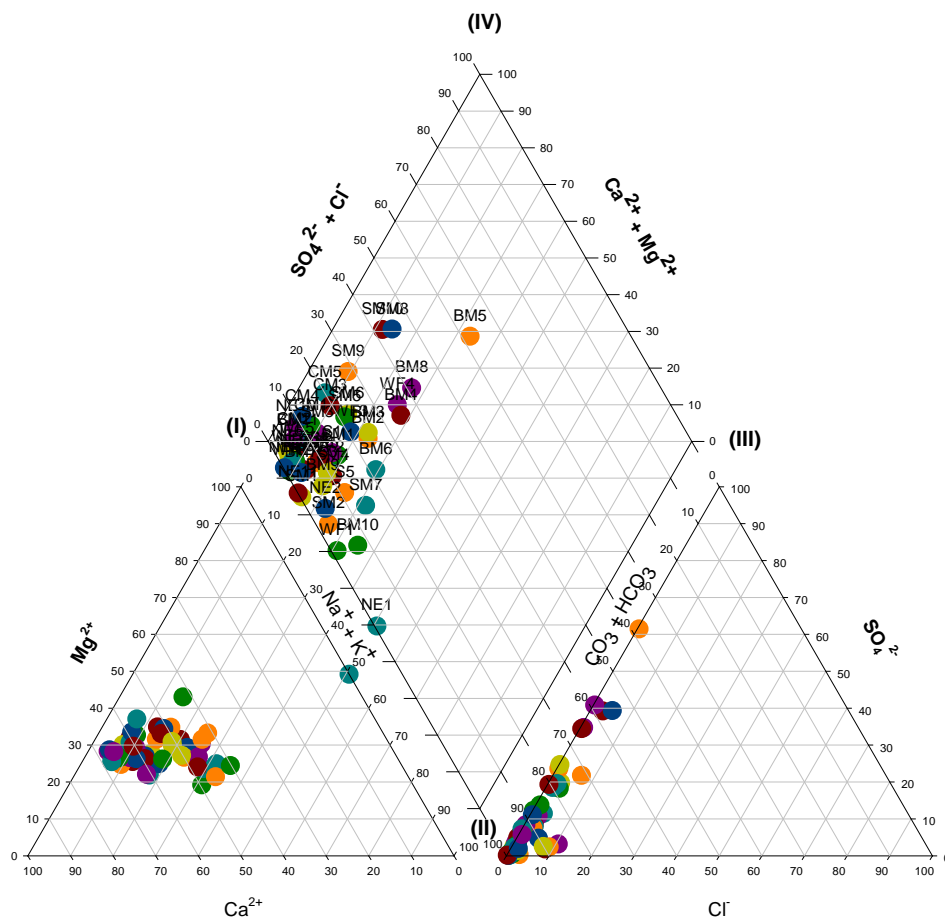
As in previous years, the Piper diagrams showed that the majority of the lakes were designated as Type I, dominated by calcium and magnesium bicarbonates. Six lakes had greater than 35% of their anionic charge attributed to sulphate and chloride rather than bicarbonates and carbonates and tended towards a Type IV designation (Table F.5-1). A total of five lakes had at least 30% of their cation charge attributable to sodium and potassium rather than magnesium and calcium and tended towards a Type II designation (Table F.5-2). Most of the lakes tending towards Type IV were found in the Birch and Stony Mountain subregions and were characterized with high DOC and low Gran alkalinity. The range in water types shown in Figure F.5-1 indicates a significant variability in source waters to the RAMP lakes (e.g., groundwater vs. surface runoff).

**Table F.5-1 Key chemical characteristics of RAMP lakes with greater than 35% of anion charge attributed to sulphate and chloride.**

Lake	AESRD Label	pH	Gran Alkalinity ( $\mu\text{eq/L}$ )	Conductivity ( $\mu\text{S/cm}$ )	DOC (mg/L)	Lake Area ( $\text{km}^2$ )
<b>Stony Mountains Subregion</b>						
168	SM10	5.01	10.8	10.3	20.4	1.4
287	SM8	5.09	12.2	9.2	15.4	1.9
<b>West of Fort McMurray</b>						
223	WF4	7.24	666	123	52.3	0.034
<b>Birch Mountains Subregion</b>						
454	BM8	6.72	9.39	48.9	28.9	1.2
455	BM4	7.18	298	55.9	29.4	4.3
457	BM5	6.38	119	50.5	27.2	2.6



**Figure F.5-1 Piper plot showing the proportion of major cations and anions in the RAMP lakes in 2013.**



**Table F.5-2 Key chemical characteristics of RAMP lakes with at least 30% of cation charge attributed to sodium and potassium.**

Lake	AESRD Name	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km <sup>2</sup> )
<b>Stony Mountains Sub-Region</b>						
166	SM7	6.78	140	23.0	15.7	1.5
<b>West of Fort McMurray Sub-Region</b>						
165	WF1	7.20	279	35.5	41.5	3.2
<b>Northeast of Fort McMurray Sub-Region</b>						
452	NE1	6.11	19	42.9	33.1	0.7
<b>Birch Mountains Sub-Region</b>						
457	BM5	6.38	118	50.5	27.2	2.6
175	BM10	7.41	759	87.4	37.6	0.4

## F.6 ANALYSIS OF METALS IN THE RAMP LAKES

Elevated metal concentrations, in particular aluminum, have served as important indicators of lake acidification. Historical concentrations of metals in the RAMP lakes are provided in the RAMP database and summarized in Table F.6-1 and Table F.6-2 for total and dissolved fractions, respectively. Table F.6-3 presents the mean concentration of each trace metal for lakes in each subregion.

In general, concentrations of trace metals were quite low and many were less than the detection limit. Table F.6-3 shows that the highest concentrations of trace metals were found in lakes located in the upland regions (the Birch, Caribou, Stony Mountains and Muskeg River Uplands). The mean concentrations of most dissolved metals including silver, aluminum, arsenic, barium, beryllium, cadmium, cobalt, selenium, vanadium, and zinc were greatest in lakes of the Birch Mountains subregion. In the Birch Mountains, 46 individual metals in eleven lakes had mean concentrations greater than the 95<sup>th</sup> percentile for all RAMP lakes (Table F.6-4). Maps of dissolved aluminum, lead, iron, and cobalt in the RAMP lakes clearly show the higher concentrations of trace metals in the upland regions, especially the Birch and Stony Mountains (Figure F.6-1 to Figure F.6-4). The lakes with the highest concentrations of metals included those identified in the Piper plot as having more than 35% of the anionic charge attributed to chloride and sulphate rather than bicarbonates.

A reason for the higher concentrations of metals in the upland regions, especially the Birch Mountains, was unclear but may be related to the relatively low mean pH in these lakes (Table F.6-4). The high concentrations of metals in lakes of the Birch Mountains subregion may also be related to the known presence of poly-metallic black shales in the Birch Mountains (DNI 2012). The high concentrations of chlorides and sulphates, as well as high concentrations of barium in lakes of the Birch Mountains subregion suggested a potential groundwater source for these metals. The relatively high concentrations of metals in these lakes are natural in origin rather than the result of emissions from regional industry.

To determine whether metal concentrations are increasing in the RAMP lakes, a Mann-Kendall trend analysis was conducted on dissolved aluminum, arsenic, cobalt, iron, and lead in all RAMP lakes from 2003 to 2013. Significant increases in concentrations of these metals included:

- Arsenic in lakes 169/SM9, 455/BM4, 436/BM2, 152/CM2, and 97/CM4;
- Cobalt in Lake 223/WF4;
- Aluminum in lakes 452/NE1, and 91/CM5; and
- Iron in lakes 225/WF5, 227/WF7, and 199/BM11.

These variables were plotted in control plots in Figure F.6-5 to Figure F.6-7; *baseline* lakes in the Caribou Mountains, remote from oil sands emissions, were excluded. When the rules for interpreting control charts are applied (Section 3.2.5.2), only iron in lakes 225/WF5 and 199/BM11 showed significant increases largely because of high concentrations in 2013 that exceeded the 3SD limit. High concentrations of iron were observed in all subregions in 2013. The median iron concentration in 2013 across all RAMP lakes (274 µg/L) was more than twice that observed across all previous monitoring years (127 µg/L; Table F.6-2). It is unknown why values in 2013 were so high but the fact that these high values were observed in all regions including the *baseline* lakes, suggested that it was not related to acidification.

### **F.6.1 Guideline Exceedances of Metals in the RAMP Lakes**

The number of exceedances of CCME and AESRD Surface Water Quality Guidelines for the protection of aquatic life in 2013 and the associated lakes are provided in Figure F.6-5. Exceedances were observed in concentrations of aluminum, iron, cadmium, copper, lead, and mercury. The guideline exceedances were scattered throughout the various subregions, with a large number in lakes in the Birch Mountains subregion, which was consistent with the higher concentrations of metals found in lakes in this subregion. The AESRD guideline for mercury was exceeded in one lake (Lake 454). Exceedances of the cadmium guideline were observed in 14 lakes. Given that the CCME guideline for cadmium (0.018 µg/L; hardness of 50 mg/L) is extremely low, exceedances of this metal occur occasionally in surface waters in the Athabasca oil sands region. The exceedances in Table F.6-5 were considered to be natural occurrences.

### **F.6.2 Analysis of Low-Level Mercury and Methylmercury in the RAMP Lakes**

In 2013, low level mercury and methylmercury analyses were conducted on water from the RAMP lakes (Table F.6-6). Concentrations of inorganic mercury ranged from 0.41 ng/L to 5.1 ng/L (median: 1.8 ng/L). Concentrations of methylmercury ranged from 0.016 ng/L to 0.528 ng/L (median: 0.064 ng/L). There were no guideline exceedances for methylmercury. A regression of methylmercury against inorganic mercury showed no significant relationship between the two variables.

**Table F.6-1 Statistical summary of total trace metals in the RAMP lakes, 2001 to 2013.**

Metal (µg/L)	All Years (2001 to 2013)						2013					
	Maximum	Minimum	Mean	Median	95 <sup>th</sup> Percentile	N	Maximum	Minimum	Mean	Median	95 <sup>th</sup> Percentile	% Non-Detects
Ag	0.103	0.00025	0.00753	0.0025	0.0294	569	0.0473	0.0071	0.0263	0.0266	0.0414	0
Al	8690	0.25	188	62.7	719	569	1250	5.85	146	60.2	637	0
As	2.9	0.13	0.516	0.395	1.32	568	2.36	0.16	0.544	0.371	1.52	0
Ba	83.2	1.24	14.7	12.0	34.6	569	39.4	1.26	14.1	12.5	31.8	0
Be	55.7	0.0015	1.07	0.0128	7.86	569	0.0811	0.0015	0.0166	0.0125	0.0605	28
Bi	0.359	0.0005	0.00624	0.0025	0.02	569	0.0278	0.0005	0.00416	0.0005	0.0219	58
B	71.2	0.0005	11.9	8.2	32.1	569	56.9	4.51	12.1	8.74	25.4	0
Cd	9.94	0.001	0.0359	0.01	0.0616	569	0.0628	0.001	0.0102	0.00555	0.0331	8
Co	2.2	0.0005	0.166	0.0877	0.53	569	0.676	0.011	0.176	0.0898	0.562	0
Cr	7.3	0.015	0.398	0.252	1.34	569	1.65	0.116	0.423	0.327	0.933	0
Cu	23.6	0.025	0.662	0.338	1.89	569	23.6	0.0677	0.909	0.261	1.54	0
Fe	6530	2.37	634	381	2270	569	4210	17	733	484	2410	0
Hg (ng/L)	1220	0.326	10.3	5.0	6.02	219	5.1	0.41	2	1.8	4.3	0
Li	16.9	0.01	2.61	1.7	8.28	569	12.3	0.01	2.42	1.49	8.41	6
MeHg (ng/L)	0.528	0.008	0.107	0.0635	0.242	50	0.528	0.008	0.107	0.0635	0.242	4
Mn	260	3.24	44.6	31.8	124	569	236	3.26	56.5	43.7	142	0
Mo	1.1	0.0005	0.118	0.0829	0.37	569	0.572	0.0005	0.0992	0.0682	0.302	2
Ni	46	0.0025	0.725	0.293	3.24	569	4.83	0.0397	0.634	0.225	2.89	0
Pb	95.3	0.0005	0.377	0.118	0.69	569	1.32	0.0107	0.152	0.0756	0.596	0
Sb	0.2	0.00025	0.0284	0.0196	0.0861	569	0.118	0.00025	0.0221	0.0151	0.0736	10
Se	0.9	0.02	0.113	0.05	0.25	569	0.263	0.05	0.065	0.05	0.175	88
Sn	3.02	0.015	0.088	0.015	0.0938	569	0.291	0.015	0.0333	0.015	0.0604	56
Sr	109	3	24.1	19.3	58.7	569	73.5	2.81	24	20.3	54.8	0
Th	0.72	0.00015	0.0323	0.01	0.137	569	0.283	0.00015	0.029	0.00905	0.145	24
Ti	79	0.1	2.94	1.11	13	569	21.5	0.214	2.18	1.23	7.54	0
Tl	0.077	0.00015	0.00372	0.0021	0.012	569	0.0105	0.00015	0.00264	0.0017	0.00951	12
U	0.432	0.0004	0.0417	0.0138	0.173	569	0.388	0.0015	0.0384	0.0127	0.151	0
V	15.5	0.0025	0.749	0.363	3.04	569	3.88	0.0656	0.566	0.336	2.08	0
Zn	34.4	0.131	3.53	2.64	9.02	569	17.8	0.272	2.92	1.94	7.37	0

Note: For the purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory. Shaded values are non-detectable with the value in each cell equivalent to one-half of the detection limit.

**Table F.6-2 Statistical summary of dissolved trace metals in the RAMP lakes, 2003 to 2013.**

Metal (µg/L)	All Years (2003 to 2013)						2013					
	Maximum	Minimum	Mean	Median	95 <sup>th</sup> Percentile	N	Maximum	Minimum	Mean	Median	95 <sup>th</sup> Percentile	% Non-Detects
Ag	0.102	0.00025	0.00252	0.00025	0.00938	466	0.0138	0.00025	0.00111	0.00025	0.00745	52
Al	850	0.1	72.9	25.2	333	466	850	2.67	94	35.7	454	0
As	2	0.08	0.443	0.339	1.13	466	1.84	0.138	0.484	0.347	1.3	0
Ba	41	0.754	11.5	9.83	25.2	466	33.2	0.894	12.1	11.2	27.6	0
Be	0.3	0.0015	0.0147	0.00715	0.0552	466	0.0802	0.0015	0.0128	0.00645	0.0511	32
Bi	0.053	0.0005	0.00404	0.0022	0.014	466	0.0275	0.0005	0.00407	0.0005	0.0216	96
B	62.3	1.8	11	7.24	27.4	466	54.2	3.17	11.1	8.08	24.6	0
Cd	5.82	0.001	0.0238	0.005	0.0391	466	0.0446	0.001	0.00794	0.00355	0.0294	28
Co	1.27	0.0005	0.115	0.0441	0.451	466	0.649	0.0109	0.154	0.0774	0.468	6
Cr	1.88	0.015	0.253	0.19	0.691	466	1.48	0.115	0.404	0.323	0.924	0
Cu	2.13	0.005	0.416	0.272	1.35	466	1.53	0.067	0.364	0.243	1.29	0
Fe	3130	0.01	392	127	1720	466	2930	3.83	537	274	1910	14
Li	16.4	0.01	2.44	1.53	7.85	422	12.2	0.01	2.32	1.48	7.71	0
Mn	248	0.07	18.8	3.98	76.9	466	214	0.163	29.6	9.4	100	0
Mo	1.43	0.0005	0.0995	0.0666	0.324	466	0.566	0.0005	0.0864	0.0588	0.285	6
Ni	4.18	0.0025	0.493	0.198	2.57	466	4.18	0.0161	0.552	0.202	2.59	30
Pb	16.3	0.0005	0.131	0.0444	0.391	466	0.571	0.0069	0.0841	0.0411	0.337	26
Sb	0.179	0.00025	0.0272	0.0189	0.0812	466	0.117	0.00025	0.0219	0.0149	0.0728	0
Se	0.9	0.005	0.0866	0.05	0.25	466	0.205	0.05	0.0599	0.05	0.152	96
Sn	0.0889	0.015	0.0207	0.015	0.05	466	0.0889	0.015	0.0229	0.015	0.0514	92
Sr	101	2.32	22.9	18.1	56.1	466	69.9	2.66	23.3	19.6	54.2	0
Th	0.438	0.00015	0.0266	0.0094	0.12	466	0.239	0.00015	0.0279	0.00895	0.143	74
Ti	15.9	0.02	1.25	0.479	6.12	466	10.9	0.02	1.33	0.641	5.39	2
Tl	0.043	0.00015	0.0027	0.00165	0.00788	466	0.008	0.00015	0.00208	0.0014	0.00734	30
U	0.365	0.0002	0.0303	0.00875	0.128	466	0.304	0.0005	0.0328	0.009	0.139	0
V	3.94	0.011	0.387	0.202	1.55	466	2.78	0.0247	0.388	0.207	1.53	0
Zn	29.5	0.13	2.74	2.06	6.73	466	6.87	0.269	2.28	1.32	6.05	0

Note: For the purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory. Shaded values are non-detectable with the value in each cell equivalent to one-half of the detection limit.

**Table F.6-3 Mean concentrations of total and dissolved trace metals in the RAMP lakes in each subregion, 2001 to 2013.**

Metal	Dissolved Metals (µg/L)						Total Metals (µg/L)					
	SM	WFM	NEFM	BM	CS	CM	SM	WFM	NEFM	BM	CS	CM
Ag	0.00129	0.00215	0.00118	0.00472	0.00377	0.00238	0.00648	0.00674	0.00647	0.0102	0.00665	0.00797
Al	79.7	18.5	36.2	164	16.3	63.4	237	46.7	62.6	443	38	140
As	0.333	0.339	0.402	0.735	0.182	0.501	0.39	0.398	0.437	0.882	0.2	0.595
Ba	7.66	9.79	10.6	17.5	6.09	15.7	9.74	14.1	13.2	22.9	7.28	17.9
B	6.45	12.5	11.3	18.2	6.07	5.36	0.674	1.35	1.2	1.55	0.589	0.538
Be	0.0155	0.00479	0.00827	0.0271	0.0143	0.0134	0.00655	0.00566	0.00669	0.00804	0.00256	0.00514
Bi	0.00457	0.00391	0.00374	0.00465	0.00205	0.00419	7.28	14.4	12.2	18.5	7.38	6.62
Cd	0.0156	0.00947	0.0657	0.0169	0.00334	0.00905	0.0232	0.0175	0.0937	0.026	0.0062	0.0171
Co	0.169	0.0492	0.073	0.209	0.0179	0.0641	0.221	0.0854	0.102	0.308	0.0379	0.121
Cr	0.227	0.165	0.207	0.388	0.221	0.26	0.335	0.211	0.279	0.767	0.252	0.37
Cu	0.352	0.198	0.237	0.703	0.347	0.684	0.739	0.48	0.468	0.916	0.394	0.882
Fe	288	118	234	874	161	485	451	294	453	1280	340	730
Hg (ng/L)	-	-	-	-	-	-	3.64	3.58	28.3	3.9	3.27	11.7
Li	0.797	2.72	2.02	5.16	1.15	1.52	0.853	2.91	2.03	5.47	1.33	1.68
MeHg (ng/L)	-	-	-	-	-	-	0.0918	0.161	0.0815	0.136	0.0462	0.103
Mn	28.5	21.7	15	23.3	1.94	6.53	43.5	68.6	47.2	47.7	25.8	17.7
Mo	0.0889	0.0386	0.0426	0.174	0.147	0.124	0.0982	0.0574	0.0595	0.195	0.175	0.142
Ni	0.321	0.122	0.15	1.31	0.114	0.643	0.86	0.237	0.213	1.64	0.142	0.779
Pb	0.0988	0.0605	0.21	0.19	0.0275	0.102	0.205	0.144	0.912	0.361	0.148	0.19
Sb	0.0215	0.0184	0.0162	0.054	0.01	0.0312	0.0224	0.0197	0.0168	0.0568	0.0103	0.0317
Se	0.0813	0.0719	0.0732	0.116	0.0916	0.0755	0.106	0.0899	0.0967	0.154	0.113	0.104
Sn	0.0201	0.0199	0.0212	0.0214	0.0209	0.0208	0.0763	0.0244	0.0525	0.119	0.139	0.159
Sr	8.81	33.3	25.3	27.5	31	13.2	9.45	35.3	25.7	29.1	32.5	13.7
Th	0.0201	0.00602	0.00926	0.064	0.0146	0.0346	0.0235	0.0094	0.0103	0.0827	0.0149	0.0347
Ti	1.04	0.381	0.563	3.1	0.426	1.01	2.57	1.07	1.18	7.4	0.849	2.3
Tl	0.00416	0.00142	0.00157	0.00359	0.0025	0.00202	0.00465	0.00223	0.00165	0.00701	0.00209	0.00277
U	0.0123	0.00473	0.00578	0.0471	0.104	0.055	0.0203	0.00823	0.0081	0.0637	0.133	0.0648
V	0.332	0.197	0.302	0.803	0.0899	0.299	0.614	0.351	0.477	1.72	0.173	0.577
Zn	3.22	2.41	2.34	3.82	0.817	2.37	3.96	2.91	3.29	4.99	1.1	3.19

Note: SM = Stony Mountains, WFM = west of Fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains

Note: For purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

**Table F.6-4 Number of lakes in each subregion with mean concentrations of trace metals greater than the 95<sup>th</sup> percentile.**

Sub-Region	No. of Lakes in Region	No. of Trace Metals Where Mean > 95 <sup>th</sup> Percentile <sup>1</sup>	Ratio of No. of Trace Metals > 95 <sup>th</sup> Percentile to No. of Lakes <sup>2</sup>	Mean pH (2013)
Stony Mountains	10	1	0.20	5.90
West of Fort McMurray	8	2	0.18	6.97
North-East of Fort McMurray	11	7	0.64	7.08
Birch Mountains	11	46	4.60	6.65
Canadian Shield	5	4	0.50	7.49
Caribou Mountains	5	0	0.00	7.14
<b>Sum</b>	<b>50</b>	<b>60</b>	<b>6.12</b>	<b>41.23</b>

<sup>1</sup> Mean metal concentration for each lake calculated over all years.

<sup>2</sup> 95<sup>th</sup> percentile calculated for each metal over all lakes and years.

**Table F.6-5 RAMP lakes with exceedances of CCME and AESRD surface water quality guidelines for total metals in 2013.**

Metal	Number of Exceedances	Lakes with Exceedances
Al	20	88, 89, 91, 167, 168, 169, 170, 172, 175, 185, 271, 287, 290, 400, 447, 448, 454, 455, 457, 470
Fe	35	84, 88, 89, 90, 91, 97, 146, 152, 165, 166, 167, 168, 169, 170, 172, 175, 182, 185, 199, 209, 225, 268, 271, 287, 290, 400, 442, 447, 448, 452, 454, 455, 457, 464, 470
Cd	25	89, 91, 97, 152, 165, 167, 168, 169, 170, 172, 185, 199, 209, 287, 289, 290, 342, 442, 447, 448, 454, 455, 457, 464, 471
Cu	2	175, 287
Pb	1	287
Hg <sup>1</sup>	1	454

<sup>1</sup> Mercury concentrations exceeded the Alberta surface water quality guideline (0.005 µg/L).

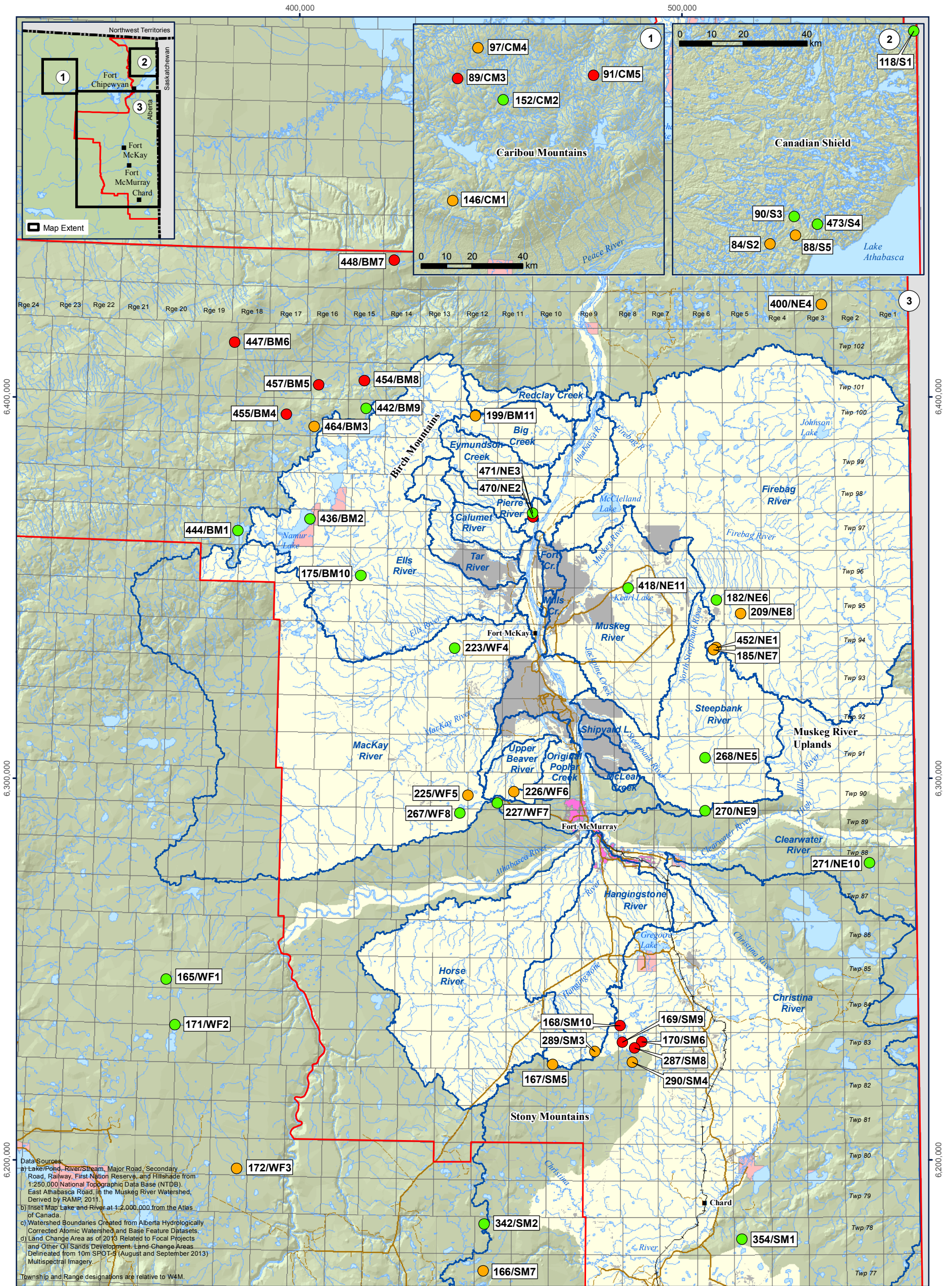
**Table F.6-6 Results of low level analysis of inorganic mercury and methylmercury in the ASL Lakes in 2013.**

	Inorganic Mercury (ng/L)	Methylmercury (ng/L)
Min	0.4	0.016
Max	5.1	0.528
Mean	2.0	0.111
Median	1.8	0.064
No of Exceedances	1	0
CCME PAL Guideline	26	4
AESRD Guideline	5	1

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Figure F.6-1 Concentrations of dissolved aluminum in the RAMP lakes, 2013.



Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nations Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land-Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

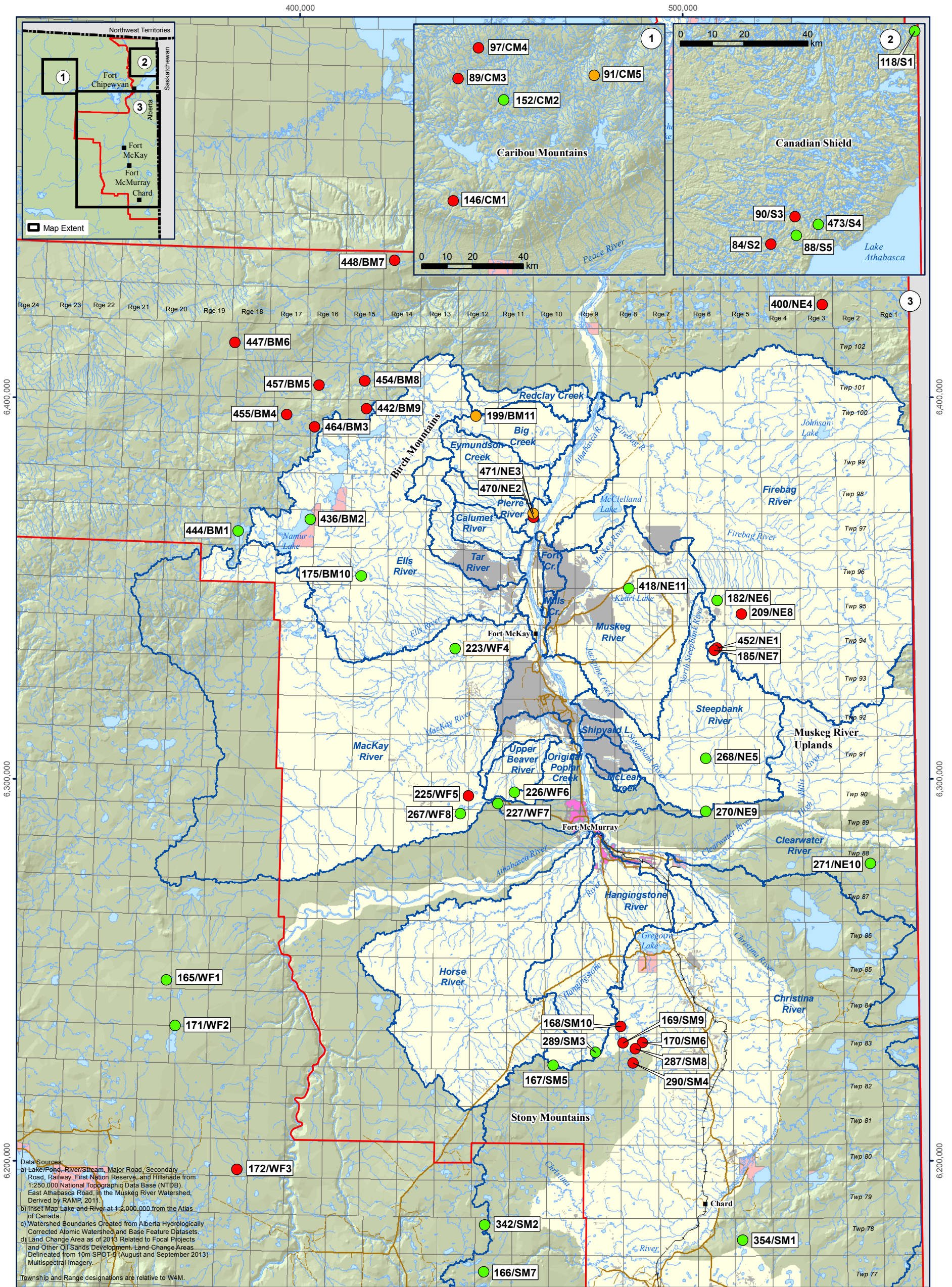
- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - RAMP Regional Study Area Boundary
  - RAMP Focus Study Area
  - Town of Fort McMurray
  - Land Change Area as of 2013<sup>d</sup>

- Dissolved Aluminum Concentration**
- Low (< 24.9 µg/L)
  - Medium (25 to 99 µg/L)
  - High (≥ 100 µg/L)

0 5 10 20 km  
 Scale: 1:1,000,000  
 Projection: NAD 1983 UTM Zone 12N



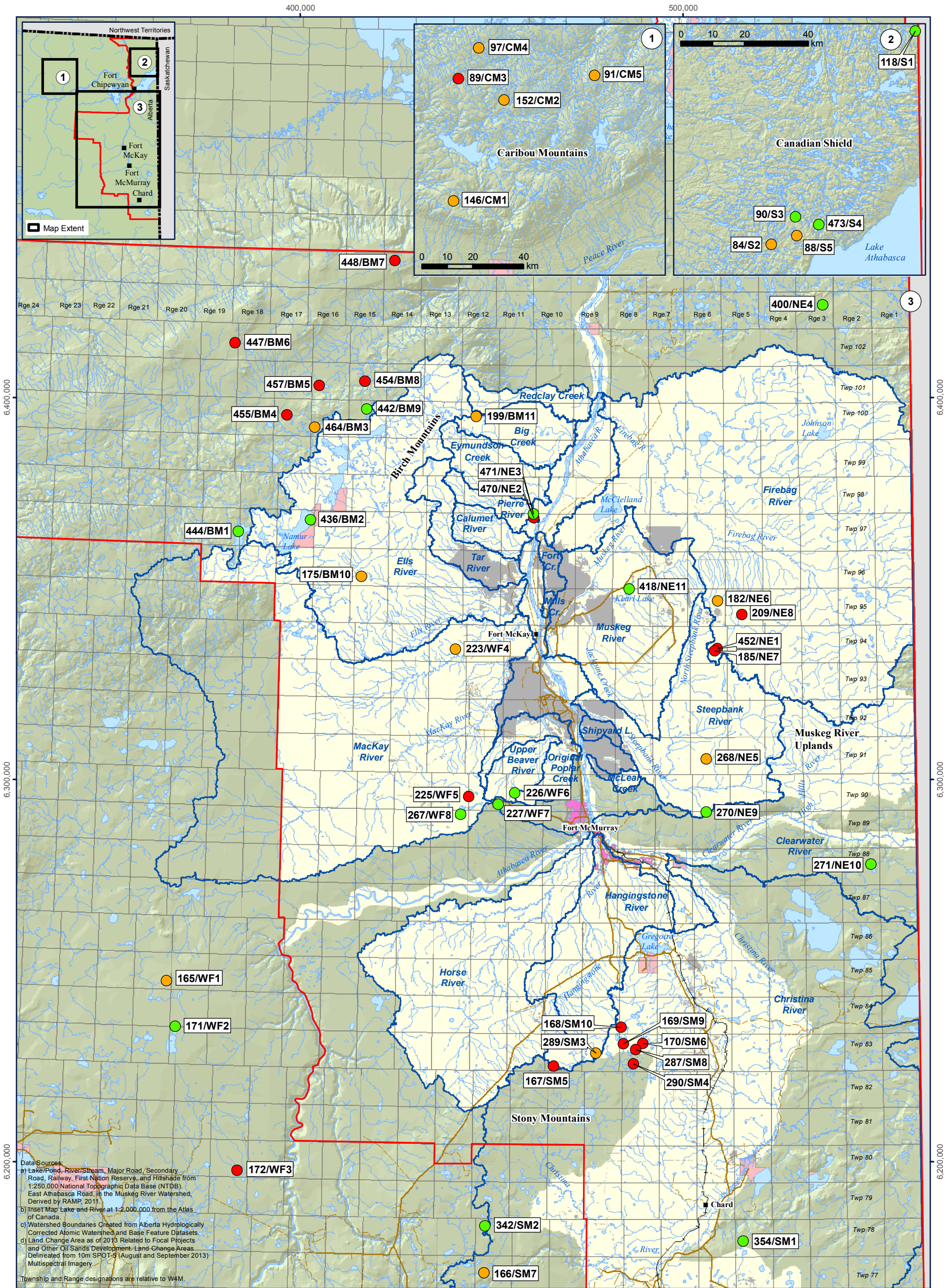
Figure F.6-2 Concentrations of dissolved iron in the RAMP lakes, 2013.



0 5 10 20 km  
Scale: 1:1,000,000  
Projection: NAD 1983 UTM Zone 12N



Figure F.6-3 Concentrations of dissolved cobalt in the RAMP lakes, 2013.



Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land-Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

**Legend**

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- RAMP Regional Study Area Boundary
- RAMP Focus Study Area
- Town of Fort McMurray
- Land Change Area as of 2013<sup>d</sup>

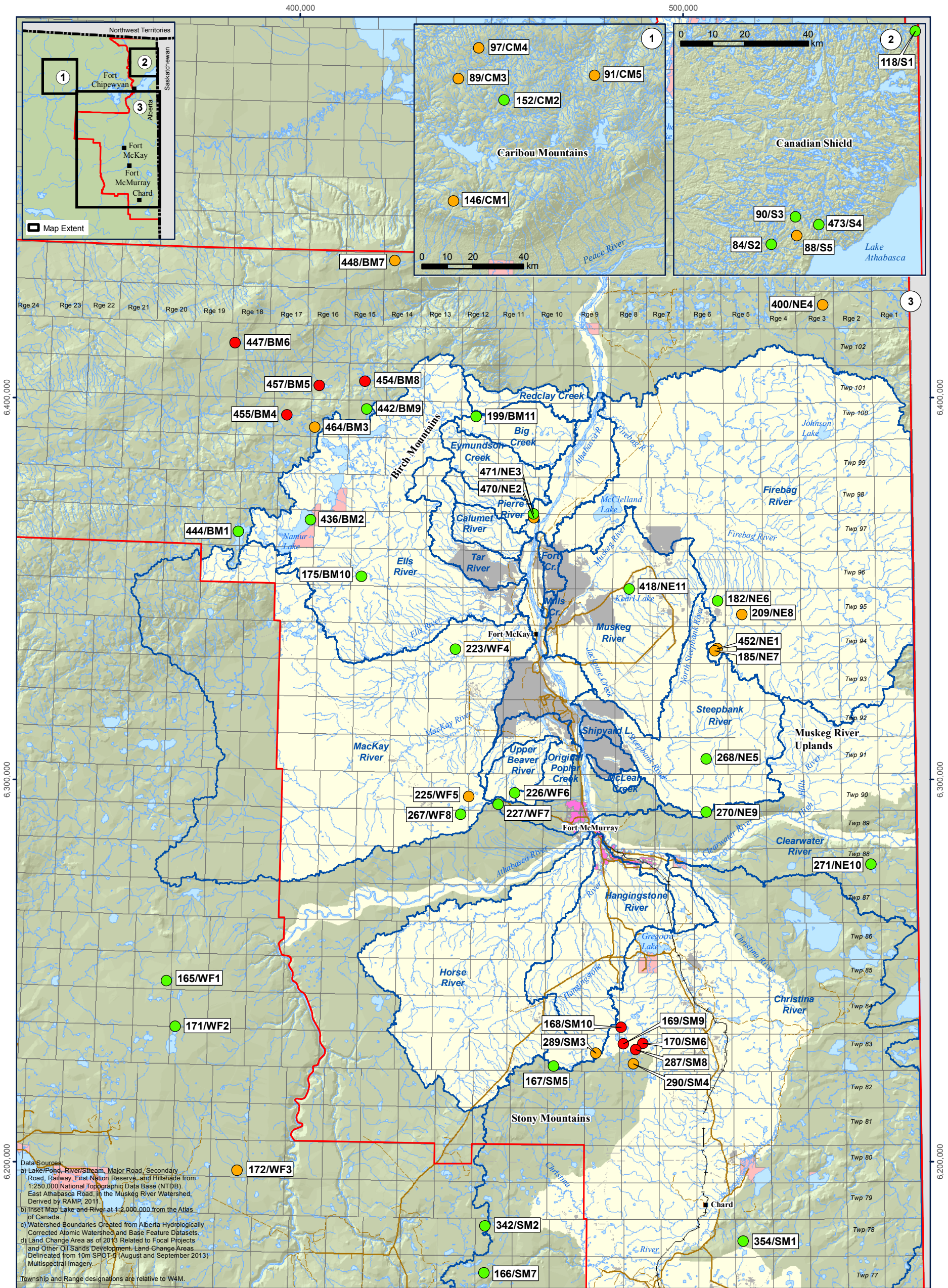
**Dissolved Cobalt Concentration**

- Low (< 0.049 µg/L)
- Medium (0.05 to 0.149 µg/L)
- High (≥ 0.150 µg/L)

0 5 10 20 km  
 Scale: 1:1,000,000  
 Projection: NAD 1983 UTM Zone 12N



Figure F.6-4 Concentrations of dissolved lead in the RAMP lakes, 2013.



Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nations Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Area as of 2013 Related to Focal Projects and Other Oil Sands Development. Land-Change Areas Delineated from 10m SPOT-5 (August and September 2013) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

**Legend**

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- RAMP Regional Study Area Boundary
- RAMP Focus Study Area
- Town of Fort McMurray
- Land Change Area as of 2013<sup>d</sup>

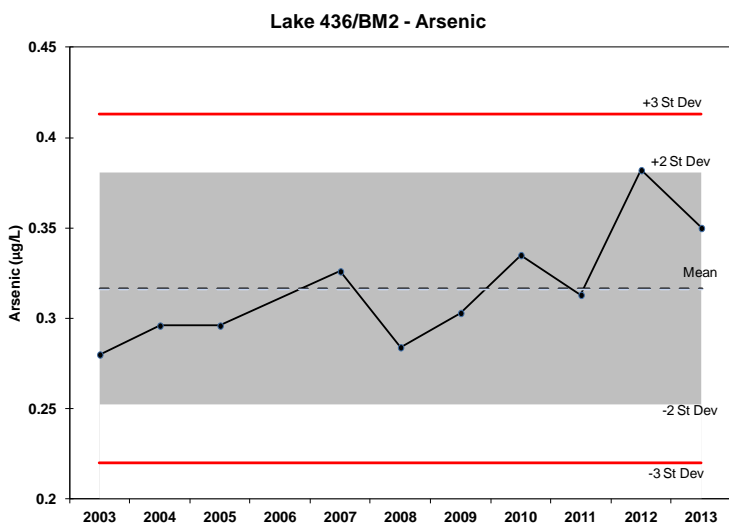
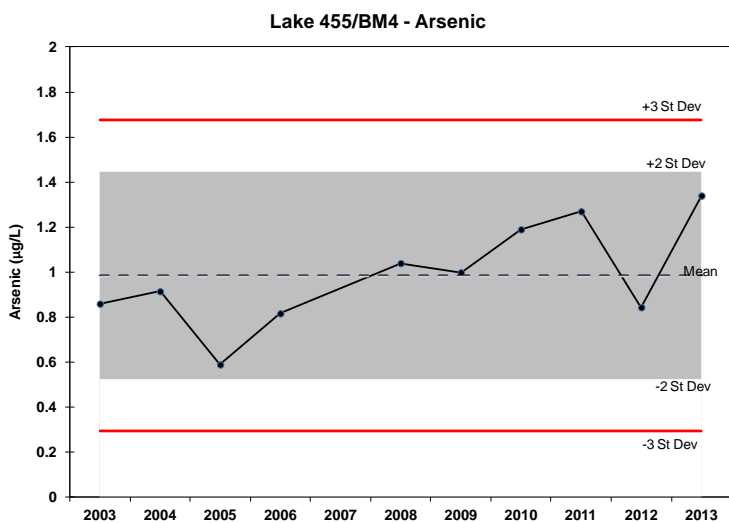
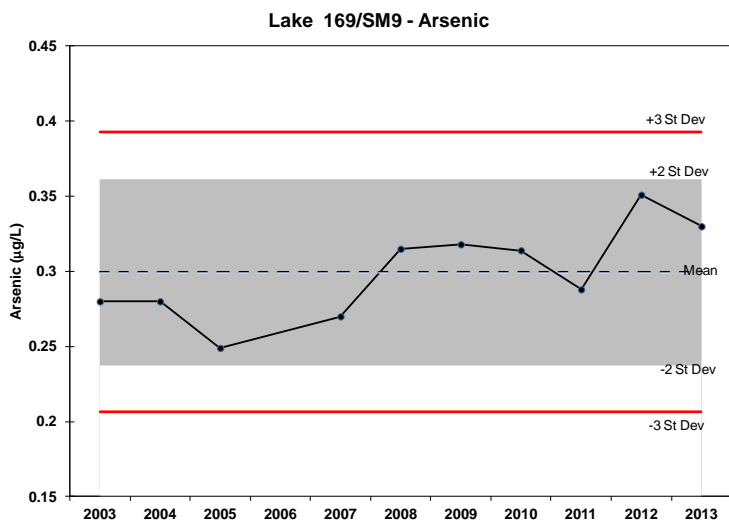
**Dissolved Lead Concentration**

- Low (< 0.049 µg/L)
- Medium (0.05 to 0.149 µg/L)
- High (≥ 0.150 µg/L)

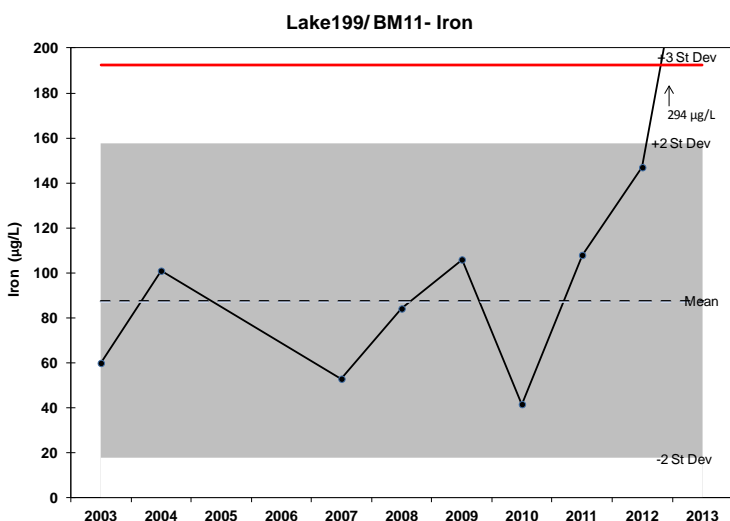
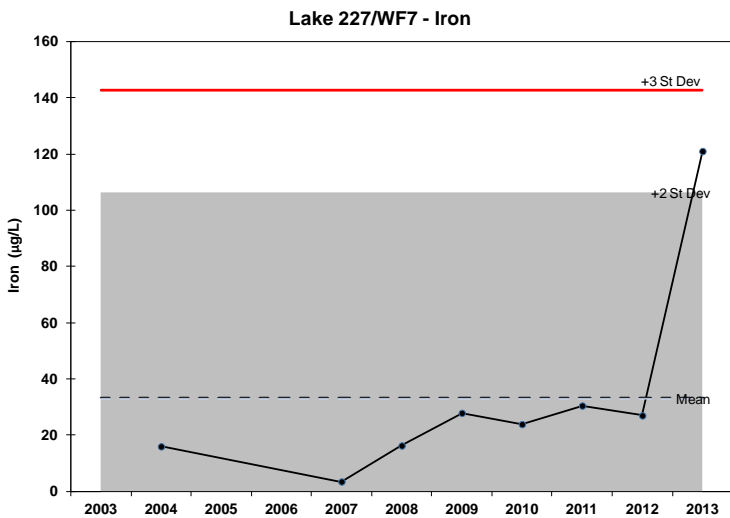
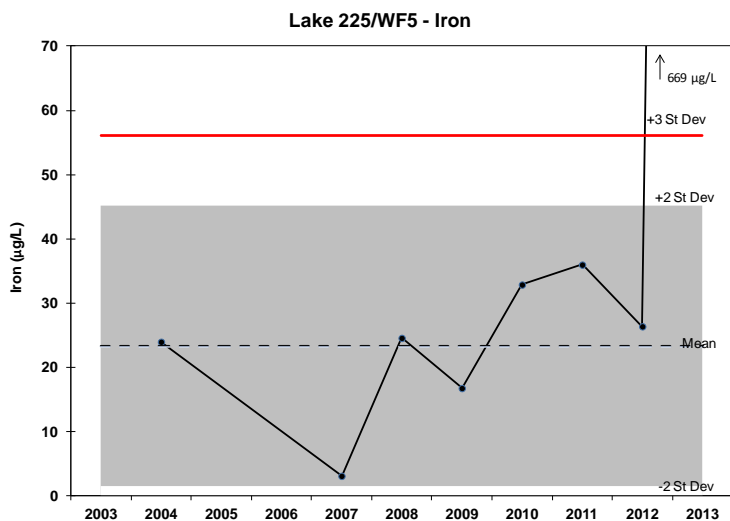
0 5 10 20 km  
 Scale: 1:1,000,000  
 Projection: NAD 1983 UTM Zone 12N



**Figure F.6-5 Control charts for RAMP lakes showing significant increases in concentrations of arsenic, 2003 to 2013.**



**Figure F.6-6 Control charts for RAMP lakes showing significant increases in concentrations of iron, 2003 to 2013.**



**Figure F.6-7 Control charts for RAMP lakes showing significant increases in cobalt and aluminum concentrations, 2003 to 2013.**

