

# **RAMP**

**Regional Aquatics  
Monitoring Program**



## **2012 TECHNICAL REPORT APPENDICES**



# REGIONAL AQUATICS MONITORING PROGRAM

## 2012 Technical Report – Appendices

*FINAL*

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- Appendix B Quality Assurance and Quality Control Procedures for 2012
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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 2012 related to:

- focal projects (i.e., those projects owned by 2012 RAMP industry members, which were under construction or operational in 2012 in the RAMP FSA); and
- oil sands projects within the RAMP FSA that were under active development in 2012 by companies that were not members of RAMP in 2012.

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 thirteen SPOT-5 10-meter resolution scenes (seven north of Fort McMurray and six south of Fort McMurray) were obtained by RAMP (Figure A.2-1); these images were acquired on June 7, June 21, June 26, July 7, July 8, August 18, and September 3, 2012. Two Landsat-7 30 m resolution scenes were also obtained by RAMP; these images (one south and one north of Fort McMurray) were acquired on June 26 and September 28, 2012 (Figure A.2-1).

#### **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.

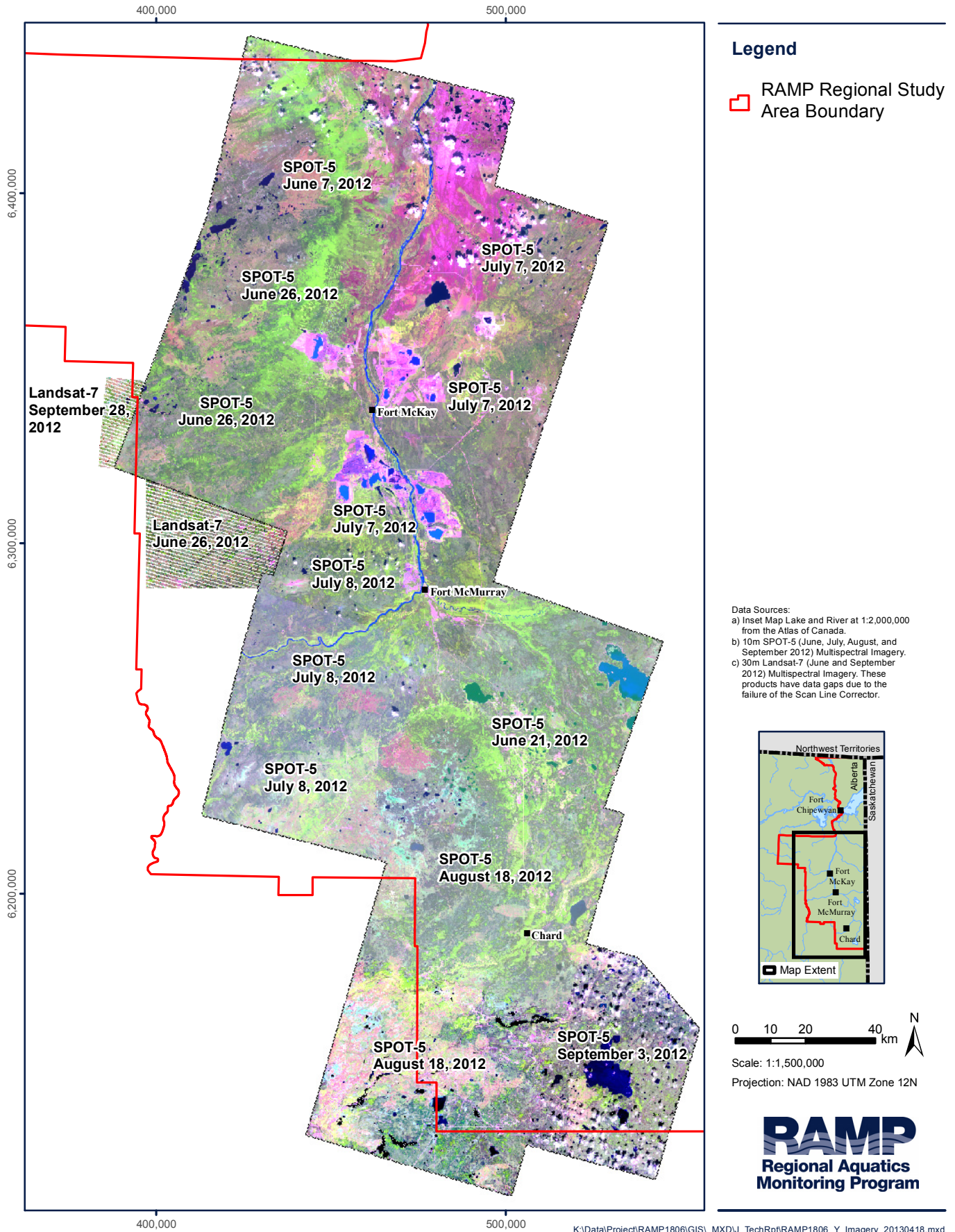
The procedure for ortho-rectifying the image data to a map projection involved the application of previously-collected control points, topographic maps, existing ortho-rectified satellite imagery<sup>1</sup> and a digital elevation model (DEM)<sup>2</sup> to identify common ground control points (GCPs, 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 Landsat 7 ETM+ ortho-rectified images from 1999, 2000, and 2001.

<sup>2</sup> Geobase 1:50,000 scale Digital Elevation Model.

**Figure A.2-1 Illustration of the SPOT-5 and Landsat-7 scenes acquired, 2012.**



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

Atmospheric correction<sup>3</sup> was applied to the SPOT-5 and Landsat-7 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 2012 areas of land change were digitized beginning with the results of the 2011 classification (RAMP 2012, Appendix A). New land change areas were added and changed areas were modified based on 2012 SPOT-5 and Landsat-7 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 the RAMP Technical Program Committee in fall 2012 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 2012 within the RAMP FSA was estimated at approximately 105,700 ha for focal projects and 400 ha for oil sands projects operated by oil sands companies that were not members of RAMP in 2012, for a total of approximately 106,100 ha. This represents approximately 3.0% of the area of the RAMP FSA. The percentage of the area of watersheds with land change as of 2012 varied from less than 1% for many watersheds (MacKay, Christina, Hangingstone, Horse, and Firebag rivers), to 1% to 5% for the Calumet, Ells, Poplar, and Steepbank watersheds, to 5% to 10% for the Upper Beaver watershed, to more than 10% for the Muskeg River, Fort Creek, Mills Creek, Tar River, Shipyard Lake, and McLean Creek watersheds, as well as for the smaller Athabasca River tributaries from Fort McMurray to the confluence of the Firebag River.

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<sup>3</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 2012, summarized by land change type.**

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)							
		Focal Projects		Other Oil Sands Projects		Total		Watershed Total (ha and %)	
		Not-Closed Circuited (ha)	Closed-Circuited (ha)	Not-Closed Circuited (ha)	Closed-Circuited (ha)	Not-Closed Circuited (ha)	Closed-Circuited (ha)		
Muskeg	146,000	8,854	12,619			8,854	12,619	21,473	14.71
Steepbank	135,491	4,529	488			4,529	488	5,017	3.70
MacKay	557,000	3,185	619			3,185	619	3,804	0.68
Tar	33,261	1,248	9,576			1,248	9,576	10,825	32.54
Calumet	17,354	130	68			130	68	198	1.14
Firebag	568,174	3,995	1,360			3,995	1,360	5,355	0.94
Ells	245,000	2,273	342			2,273	342	2,614	1.07
Christina	1,303,805	6,507	785	158		6,665	785	7,450	0.57
Hangingstone	106,641	9	47			9	47	56	0.05
Mills Creek	890	58	235			58	235	293	32.93
Shipyard Lake	4,047	15	3,739			15	3,739	3,753	92.75
Fort Creek	3,193	2,042	33			2,042	33	2,075	64.99
Horse	215,741	232	38	163	76	395	114	509	0.24
McLean	4,712	146	1,109			146	1,109	1,255	26.64
Original Poplar <sup>1</sup>	13,856	182	310			182	310	492	3.55
Upper Beaver <sup>1</sup>	28,711	861	1,928			861	1,928	2,790	9.72
Minor Athabasca River Tributaries <sup>2</sup>	160,730	7,423	30,715			7,423	30,715	38,137	23.73
<b>Total</b>	<b>3,544,606</b>	<b>41,688</b>	<b>64,013</b>	<b>322</b>	<b>76</b>	<b>42,009</b>	<b>64,089</b>	<b>106,098</b>	<b>2.99</b>
Slave <sup>3</sup>	863,473	378				378	0	378	0.04

<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 Slave watershed was added in 2011 given that a portion of the Canadian Natural Kirby project is located within this watershed. The Slave watershed is not part of the RAMP FSA.

**Table A.3-2 Percentage of total watershed area with land change as of 2012, summarized by type of land change.**

Watershed	Total Watershed Area (ha)	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	146,000	6.06	8.64	-	-	6.06	8.64	14.71
Steepbank	135,491	3.34	0.36	-	-	3.34	0.36	3.70
Mackay	557,000	0.57	0.11	-	-	0.57	0.11	0.68
Tar	33,261	3.75	28.79	-	-	3.75	28.79	32.54
Calumet	17,354	0.75	0.39	-	-	0.75	0.39	1.14
Firebag	568,174	0.70	0.24	-	-	0.70	0.24	0.94
Ells	245,000	0.93	0.14	-	-	0.93	0.14	1.07
Christina	1,303,805	0.50	0.06	0.01	-	0.51	0.06	0.57
Hangingstone	106,641	0.01	0.04	-	-	0.01	0.04	0.05
Mills Creek	890	6.52	26.41	-	-	6.52	26.41	32.93
Shipyard Lake	4,047	0.37	92.38	-	-	0.37	92.38	92.75
Fort Creek	3,193	63.95	1.04	-	-	63.95	1.04	64.99
Horse	215,741	0.11	0.02	0.08	0.04	0.18	0.05	0.24
McLean	4,712	3.10	23.54	-	-	3.10	23.54	26.64
Original Poplar <sup>1</sup>	13,856	1.32	2.24	-	-	1.32	2.24	3.55
Upper Beaver <sup>1</sup>	28,711	3.00	6.72	-	-	3.00	6.72	9.72
Minor Athabasca River Tributaries <sup>2</sup>	160,730	4.62	19.11	-	-	4.62	19.11	23.73
<b>Total</b>	<b>3,544,606</b>	<b>1.18</b>	<b>1.81</b>	<b>0.01</b>	<b>0.00</b>	<b>1.19</b>	<b>1.81</b>	<b>2.99</b>
Slave <sup>3</sup>	863,473	0.04	-	-	-	0.04	-	0.04

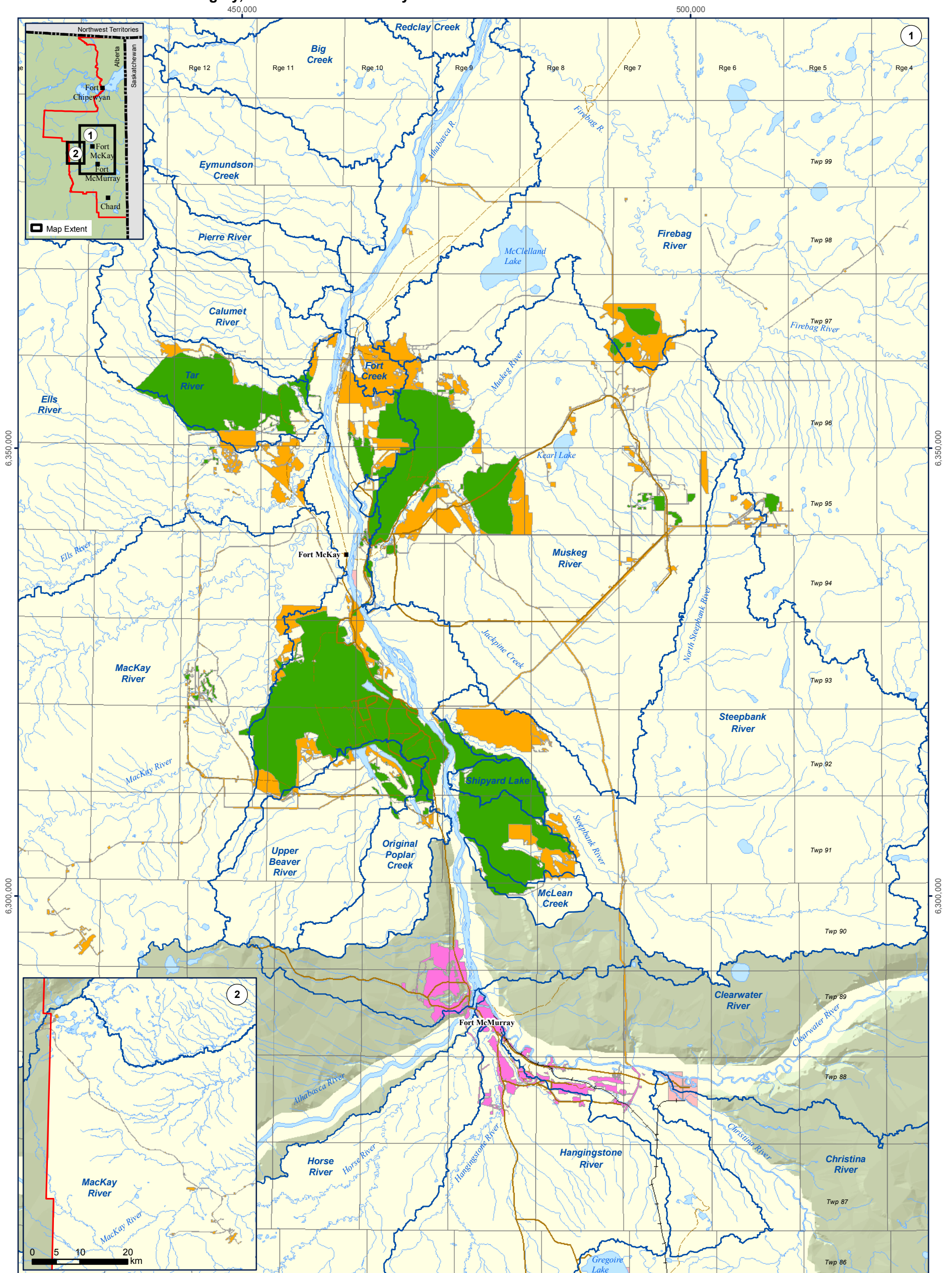
<sup>1</sup> Original Poplar refers to the Poplar Creek watershed prior to the Beaver Creek diversion, while "Upper Beaver" refers to that part of the Beaver Creek drainage that now drains into Poplar Creek as a result of the Beaver Creek diversion. Drainage boundaries were estimated from maps provided 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 Slave watershed was added in 2011 given that a portion of the Canadian Natural Kirby project is located within this watershed. The Slave watershed is not part of the RAMP FSA.

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**Figure A.3-1 RAMP land change classes derived from SPOT-5 (June and July 2012) and Landsat-7 (June and September 2012) satellite imagery, north of Fort McMurray.**



**Legend**

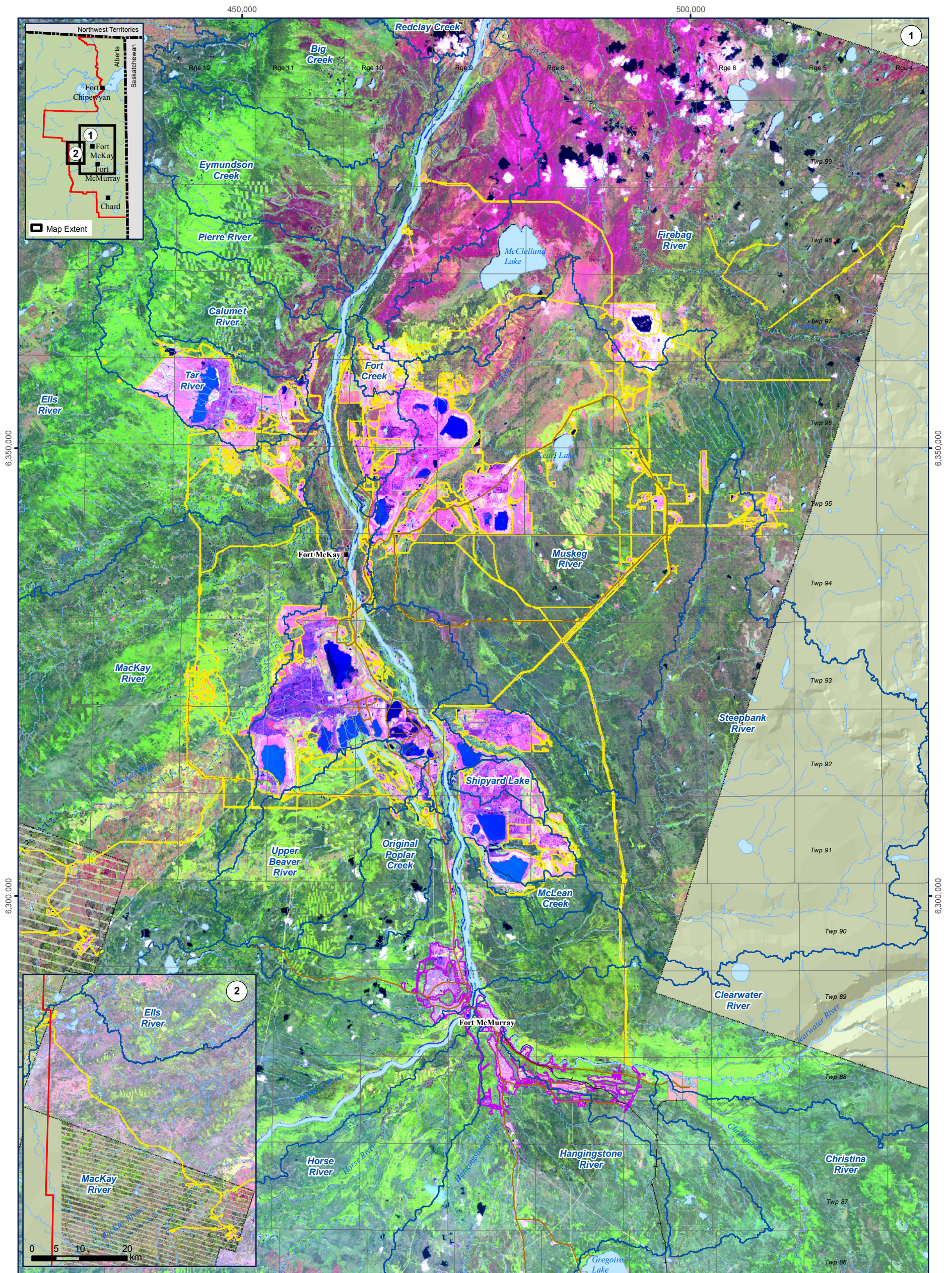
- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- RAMP Regional Study Area Boundary
- RAMP Focus Study Area
- Town of Fort McMurray
- Land Change Area as of 2012<sup>d</sup>**
  - Not Hydrologically Closed-Circuited
  - Hydrologically Closed-Circuited

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 Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) 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 a mosaic of SPOT-5 (June and July 2012) and Landsat-7 (June and September 2012) 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 2012<sup>d</sup>

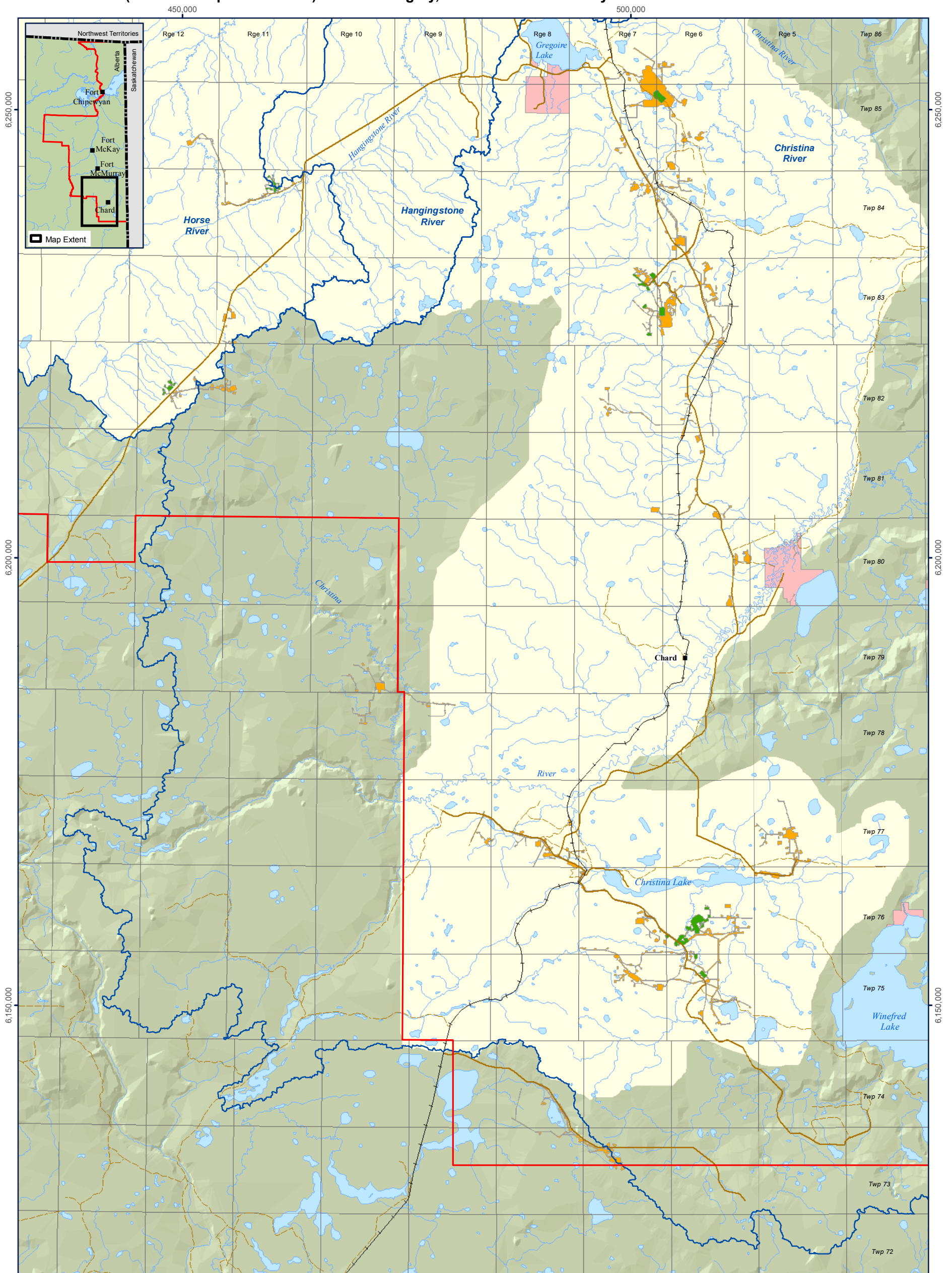
Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

0 2.5 5 10 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N





**Figure A.3-3 RAMP land change classes derived from SPOT-5 (June, July, August, and September 2012) and Landsat-7 (June and September 2012) 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 2012<sup>d</sup>
- Not Hydrologically Closed-Circuited
- Hydrologically Closed-Circuited

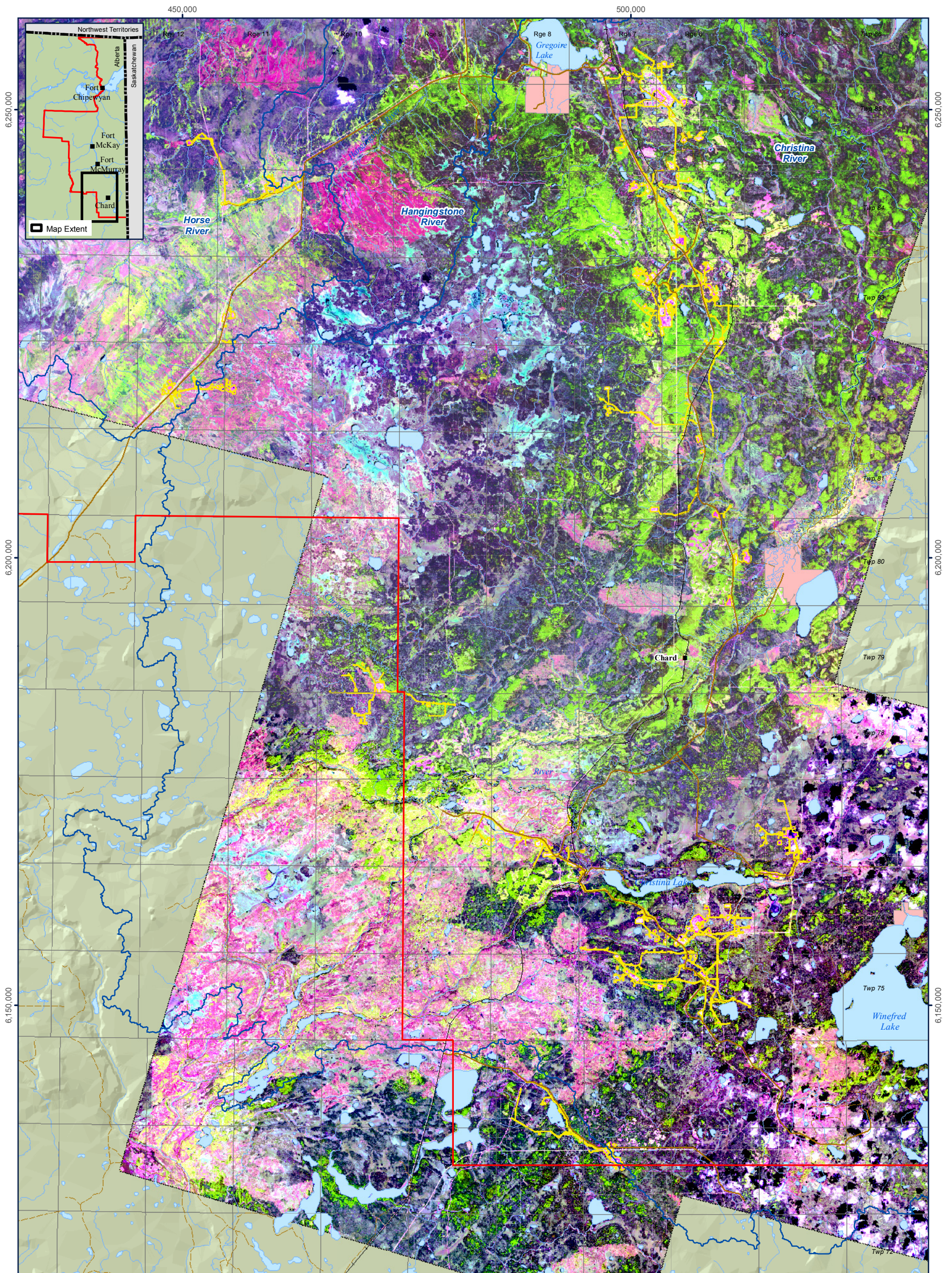
Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) 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 (June, July, August, and September 2012) and Landsat-7 (June and September 2012) 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
-  Land Change Area as of 2012<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 Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) Multispectral Imagery.

Township and Range designations are relative to W4M.

0 2.5 5 10 km  
 Scale: 1:425,000  
 Projection: NAD 1983 UTM Zone 12N



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**Appendix B**

**Quality Assurance and Quality  
Control Procedures for 2012**

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## **B QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2012**

### **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 2012 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 2012 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).

2012 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 Operators (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, current 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**

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 2012 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 is observed at which time sensors are 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 site 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 Van Dorn bottle was used to collect water and grab samples were taken directly from the bottle. 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 four seasons 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 Program.

Field and trip blank analytical results 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.

Duplicate samples were collected from the Ells River upstream of Fort McKay water intake (ELR-2A, winter), Athabasca River at the east bank upstream of Donald Creek (ATR-DC-E, spring and summer), upper Beaver River (BER-2, fall), and Christina Lake (CHL-1, fall). 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 / average 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 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 except 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 winter, spring, summer, and fall sampling seasons – one field and one trip blank was filled in winter, spring, and summer, and two field and trip blanks were filled in fall. 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 in 2012 (Table B.2-1).

### ***Duplicate Samples***

Duplicate samples were taken at four stations in 2012: ELR-2A in winter, ATR-DC-E in spring and summer, and BER-2 and CHL-1 in fall. Conventional variables, major ions, nutrients, and hydrocarbon concentrations were generally quite similar in the 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.2-7), with the exception of total suspended solids (TSS); AITF naphthenic acids; total phenolics at ATR-DC-E (spring); TSS, TDS, and total phenolics at ATR-DC-E (summer); and AITF naphthenic acids at CHL-1 (fall).

The RPD for most conventional variables, major ions, nutrients, and hydrocarbons was less than 20% for those analytes where concentrations in one or both samples were less than five times the detection limit (Table B.2-3 to Table B.2-7), with the exception of TSS and total phenolics at ELR-2A (winter), sulphide at ATR-DC-E (summer), and TSS and sulphide at BER-2 (fall).

The number of metals concentrations with RPD >20% in duplicate samples varied among stations, suggesting that different rivers or seasons exhibited varying degrees of environmental heterogeneity, or that analytical precision differed among sampling campaigns. Additionally, differences in total metals (and other variables, e.g., PAHs) may relate to variations in total suspended solids measured between the duplicates. 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:

- ELR-2A (winter): dissolved manganese, total aluminum, total iron, total titanium, total vanadium, and total zinc;
- ATR-DC-E (spring): dissolved aluminum, total and dissolved manganese, and total cobalt; and
- CHL-1 (fall): total titanium.

The RPD was less than 20% for all analytes where one or both samples were less than five times the detection limit, with the following exceptions:

- ELR-2A (winter): dissolved chromium, dissolved nickel, total cobalt, and total lead;
- ATR-DC-E (spring and summer): dissolved zinc;
- CHL-1 (fall): total mercury (ultra-trace), and total vanadium; and
- BER-2 (fall): dissolved zinc, and total cadmium.

The RPD of many PAHs in duplicate samples was high in the winter sample from ELR-2A, spring and summer samples from ATR-DC-E, and fall sample from CHL-1 (Table B.2-3 to Table B.2-6). In the fall sample from BER-2, the RPD of most PAHs was below 20% (Table B.2-7).

### **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. The analysis of duplicate samples indicated some variability within stations, likely related to local-scale heterogeneity among samples.

**Table B.2-1 Results of analysis of field blanks prepared during RAMP Water quality surveys in winter, spring, summer and fall, 2012.**

Variable	Unit	Detection Limit	Concentration in Field Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Conventional Variables</b>							
Conductivity	µS/cm	0.2	2.27	0.89	0.41	0.90	<0.20
Dissolved Organic Carbon	mg/L	1	<1	<1	1.1	<1	<1
Hardness (as CaCO <sub>3</sub> )	mg/L	-	<1	<1	<1	<1	<1
pH	pH units	0.1	5.50	5.86	6.1	6.31	5.77
Total Alkalinity	mg/L	5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	12	<12	-	<12	-	<12
Total Dissolved Solids	mg/L	10	-	<10	-	<10	-
Total Organic Carbon	mg/L	1	1.2	<1	<1	<1	<1
Total Suspended Solids	mg/L	3	3	<3	4	<3	<3
True Colour	T.C.U.	2	<2	<2	<2	<2	<2
<b>Major Ions</b>							
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	<1	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
<b>Nutrients and BOD</b>							
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2
Chlorophyll a	mg/L	0.01	-	-	-	-	<0.01
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.071
Phosphorus, dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<b>Hydrocarbons</b>							
Naphthenic Acids	mg/L	0.02	0.00	0.03	0.00	<0.02	<0.02
OilSands Acid Extractable	mg/L	0.1	0.00	0.13	0.00	0.15	<0.1
Total Phenolics	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Rec. Hydrocarbons	mg/L	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
CCME Fraction 1 (BTEX)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 1 (C6-C10)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 2 (C10-C16)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 3 (C16-C34)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 4 (C34-C50)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m+p-Xylene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.00078	<0.0005	<0.0005
Xylenes	mg/L	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.2-1 (Cont'd.)**

Variable	Unit	Detection Limit	Concentration in Field Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Dissolved Metals</b>							
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	mg/L	0.1	<0.100	0.321	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.0001	<0.000100	0.000124	<0.0001	<0.0001	<0.0001
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Strontium (Sr)	mg/L	0.0001	<0.0001	0.000169	<0.0001	<0.0001	<0.0001
Sulphur (S)	mg/L	2	<2	<2	<2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<b>Total Metals</b>							
Aluminum (Al)	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg/L	0.0008	<0.000800	0.000802	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	mg/L	0.1	<0.100	0.325	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	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.2-1 (Cont'd.)**

Variable	Unit	Detection Limit	Concentration in Field Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Total Metals (cont'd.)</b>							
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00010	0.00029	0.00014	<0.00010	<0.00010	<0.00010
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Strontium (Sr)	mg/L	0.00010	<0.00010	0.00017	<0.00010	<0.00010	<0.00010
Sulphur (S)	mg/L	2	<2	<2	<2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	mg/L	0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00034
<b>PAHs<sup>1</sup></b>							
Acenaphthene	ng/L	-	<0.619	<0.619	<0.619	0.692	0.714
Acenaphthylene	ng/L	-	<0.343	<0.343	<0.343	<0.244	<0.253
Anthracene	ng/L	-	<0.186	<0.186	<0.186	<0.138	<0.188
Benz[a]anthracene	ng/L	-	<0.291	<0.291	<0.291	<0.379	<0.379
Benzo[a]pyrene	ng/L	-	<0.229	<0.233	<0.229	<0.245	<0.245
Benzo[b,j,k]fluoranthene	ng/L	-	<0.168	<0.168	<0.168	<0.148	<0.188
Benzo[g,h,i]perylene	ng/L	-	<0.187	<0.187	<0.187	<0.160	<0.188
Biphenyl	ng/L	-	<2.046	<2.046	<2.046	<2.090	<2.090
C1-Acenaphthenes	ng/L	-	<0.327	<0.327	<0.327	<0.188	<0.219
C1-Benzo[a]anthracenes/Chrysenes	ng/L	-	<0.579	<0.579	<0.579	<0.690	<0.690
C1-Benzofluoranthenes/Benzopyrenes	ng/L	-	<0.706	<0.706	<0.706	1.230	<0.671
C1-Biphenyls	ng/L	-	<19.294	<19.294	<19.294	<21.541	<21.541
C1-Dibenzothiophenes	ng/L	-	<5.591	<5.591	<5.591	<0.132	<0.150
C1-Fluoranthenes/Pyrenes	ng/L	-	<1.004	<1.004	<1.004	<1.005	<1.005
C1-Fluorenes	ng/L	-	<8.435	<8.435	<8.435	<9.857	<9.857
C1-Naphthalenes	ng/L	-	<3.071	<3.071	3.420	<2.248	5.370
C1-Phenanthrenes/Anthracenes	ng/L	-	<1.733	<1.733	<1.733	<0.852	<0.852
C2-Benzo[a]anthracenes/Chrysenes	ng/L	-	<0.378	<0.378	<0.378	<0.313	<0.313
C2-Benzofluoranthenes/Benzopyrenes	ng/L	-	<1.063	<1.063	<1.063	<1.221	<1.221
C2-Biphenyls	ng/L	-	<86.336	<86.336	<86.336	<99.118	<99.118
C2-Dibenzothiophenes	ng/L	-	<26.420	<26.420	<26.420	<1.557	<1.557
C2-Fluoranthenes/Pyrenes	ng/L	-	<1.621	<1.621	<1.621	<1.727	<1.727
C2-Fluorenes	ng/L	-	<1.712	3.110	<1.712	<1.651	<1.651
C2-Naphthalenes	ng/L	-	<3.883	<3.883	<3.883	<3.683	<3.683
C2-Phenanthrenes/Anthracenes	ng/L	-	<1.915	<1.915	<1.915	<0.716	<0.716
C3-Dibenzothiophenes	ng/L	-	<1.135	<1.135	<1.135	<1.355	<1.355
C3-Fluoranthenes/Pyrenes	ng/L	-	<0.998	<0.998	<0.998	0.997	<0.739
C3-Fluorenes	ng/L	-	<3.761	<3.761	<3.761	<4.592	<4.592

<sup>1</sup> PAH detection limits were variable and therefore are not displayed

#

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

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

Variable	Unit	Detection Limit	Concentration in Field Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>PAHs cont'd.<sup>1</sup></b>							
C3-Naphthalenes	ng/L	-	<2.689	<2.689	<2.689	<2.941	<2.941
C3-Phenanthrenes/Anthracenes	ng/L	-	<0.968	<0.968	1.180	<1.113	<1.113
C4-Dibenzothiophenes	ng/L	-	<1.947	<1.947	<1.947	<1.878	<1.878
C4-Naphthalenes	ng/L	-	<5.805	<5.805	<5.805	<2.298	2.340
C4-Phenanthrenes/Anthracenes	ng/L	-	<5.273	<5.273	<5.273	<3.935	<3.935
Chrysene	ng/L	-	<0.432	<0.432	<0.432	<0.589	<0.589
Dibenz[a,h]anthracene	ng/L	-	<0.319	<0.319	<0.319	<0.406	<0.406
Dibenzothiophene	ng/L	-	<0.210	<0.210	<0.212	<0.207	<0.207
Fluoranthene	ng/L	-	<0.653	<0.653	<0.653	<0.927	<0.927
Fluorene	ng/L	-	<0.304	<0.304	<0.304	<0.283	<0.283
Indeno[1,2,3-c,d]-pyrene	ng/L	-	<0.232	<0.232	<0.232	<0.248	<0.248
Naphthalene	ng/L	-	<8.756	<8.756	<8.756	12.800	16.200
Phenanthrene	ng/L	-	<1.072	<1.072	<1.072	1.180	<1.043
Pyrene	ng/L	-	<0.570	<0.570	<0.570	<0.877	<0.877
Retene	ng/L	-	<0.509	<0.509	<0.509	<0.346	<0.346

<sup>1</sup> PAH detection limits were variable and therefore are not displayed

# 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 in winter, spring, summer and fall, 2012.**

Variable	Unit	Detection Limit	Concentration in Trip Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Conventional Variables</b>							
Conductivity	µS/cm	0.2	3.03	0.92	0.4	<0.2	<0.2
Dissolved Organic Carbon	mg/L	1	1.1	<1	<1	<1	<1
Hardness (as CaCO <sub>3</sub> )	mg/L	-	<1	<1	<1	<1	<1
pH	pH units	0.1	5.47	6.08	5.83	5.92	6.13
Total Alkalinity	mg/L	5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	12	<12	-	<12	-	<12
Total Dissolved Solids	mg/L	10	-	<10	-	<10	-
Total Organic Carbon	mg/L	1	1.2	<1.0	<1.0	<1.0	<1.0
Total Suspended Solids	mg/L	3	<3	<3	5	<3	<3
True Colour	T.C.U.	2	<2	<2	<2	<2	<2
<b>Major Ions</b>							
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	<1	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
<b>Nutrients and BOD</b>							
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2
Chlorophyll a	mg/L	0.01	-	-	-	-	<0.01
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.071
Phosphorus, dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<b>General Organics</b>							
Naphthenic Acids	mg/L	0.02	0.00	0.03	0.00	<0.02	0.04
OilSands Acid Extractable	mg/L	0.1	0.00	0.00	0.00	0.28	0.12
Total Phenolics	mg/L	0.0010	<0.0010	0.0031	<0.0010	<0.0010	<0.0010
Total Rec. Hydrocarbons	mg/L	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
CCME Fraction 1 (BTEX)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 1 (C6-C10)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 2 (C10-C16)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 3 (C16-C34)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 4 (C34-C50)	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m+p-Xylene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylenes	mg/L	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	Unit	Detection Limit	Concentration in Trip Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Dissolved Metals</b>							
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	mg/L	0.1	<0.1	0.349	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Strontium (Sr)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sulphur (S)	mg/L	2	<2	<2	<2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<b>Total Metals</b>							
Aluminum (Al)	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	0.00098	<0.0008	0.00087
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium (Ca)	mg/L	0.10	<0.10	0.35	<0.10	<0.10	<0.10
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	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	Unit	Detection Limit	Concentration in Trip Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>Total Metals (cont'd.)</b>							
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	0.6	<0.6	<0.6	<0.6	0.8	<0.6
Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Strontium (Sr)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sulphur (S)	mg/L	2	<2	<2	<2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc (Zn)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
<b>PAHs<sup>1</sup></b>							
Acenaphthene	ng/L	-	<0.619	<0.619	<0.619	<0.619	<0.619
Acenaphthylene	ng/L	-	<0.343	<0.343	<0.343	<0.343	<0.343
Anthracene	ng/L	-	<0.186	<0.186	<0.186	<0.186	<0.186
Benz[a]anthracene	ng/L	-	<0.291	<0.291	<0.291	<0.291	<0.291
Benz[a]anthracene	ng/L	-	<0.229	<0.229	<0.229	<0.229	<0.229
Benzo[a]pyrene	ng/L	-	<0.168	<0.168	<0.168	<0.168	<0.168
Benzo[b,j,k]fluoranthene	ng/L	-	<0.187	<0.187	<0.187	<0.187	<0.187
Benzo[g,h,i]perylene	ng/L	-	<2.046	<2.046	<2.046	<2.046	<2.046
Benzo[g,h,i]perylene	ng/L	-	<0.327	<0.327	<0.327	<0.327	<0.327
Biphenyl	ng/L	-	<0.579	<0.579	<0.579	<0.579	<0.579
C1-Acenaphthenes	ng/L	-	<0.706	<0.706	<0.706	<0.706	<0.706
C1-Benzo[a]anthracenes/Chrysenes	ng/L	-	<19.294	<19.294	<19.294	<19.294	<19.294
C1-Benzofluoranthenes/Benzopyrenes	ng/L	-	<5.591	<5.591	<5.591	<5.591	<5.591
C1-Biphenyls	ng/L	-	<1.004	<1.004	<1.004	<1.004	<1.004
C1-Dibenzothiophenes	ng/L	-	<8.435	<8.435	<8.435	<8.435	<8.435
C1-Fluoranthenes/Pyrenes	ng/L	-	<3.071	<3.071	<3.071	<3.071	<3.071
C1-Fluorenes	ng/L	-	<1.733	<1.733	<1.733	<1.733	<1.733
C1-Naphthalenes	ng/L	-	<0.378	<0.378	<0.378	<0.378	<0.378
C1-Phenanthrenes/Anthracenes	ng/L	-	<1.063	<1.063	<1.063	<1.063	<1.063
C2-Benzo[a]anthracenes/Chrysenes	ng/L	-	<86.336	<86.336	<86.336	<86.336	<86.336
C2-Benzofluoranthenes/Benzopyrenes	ng/L	-	<26.420	<26.420	<26.420	<26.420	<26.420
C2-Biphenyls	ng/L	-	<1.621	<1.621	<1.621	<1.621	<1.621
C2-Dibenzothiophenes	ng/L	-	<1.712	<1.712	<1.712	<1.712	<1.712
C2-Fluoranthenes/Pyrenes	ng/L	-	<3.883	<3.883	<3.883	<3.883	<3.883
C2-Fluorenes	ng/L	-	<1.915	<1.915	<1.915	<1.915	<1.915
C2-Naphthalenes	ng/L	-	<1.135	<1.135	<1.135	<1.135	<1.135
C2-Phenanthrenes/Anthracenes	ng/L	-	<0.998	<0.998	<0.998	<0.998	<0.998
C3-Dibenzothiophenes	ng/L	-	<3.761	<3.761	<3.761	<3.761	<3.761
C3-Fluoranthenes/Pyrenes	ng/L	-	<0.619	<0.619	<0.619	<0.619	<0.619

<sup>1</sup> PAH detection limits were variable and therefore are not displayed

#

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

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

Variable	Unit	Detection Limit	Concentration in Trip Blank				
			15-Mar-12	20-May-12	14-Jul-12	4-Sep-12	7-Sep-12
<b>PAHs cont'd. <sup>1</sup></b>							
C3-Fluorenes	ng/L	-	<0.343	<0.343	<0.343	<0.343	<0.343
C3-Naphthalenes	ng/L	-	<2.689	<2.689	<2.689	<2.689	<2.689
C3-Phenanthrenes/Anthracenes	ng/L	-	<0.968	<0.968	<0.968	<0.968	<0.968
C4-Dibenzothiophenes	ng/L	-	<1.947	<1.947	<1.947	<1.947	<1.947
C4-Naphthalenes	ng/L	-	<5.805	<5.805	<5.805	<5.805	<5.805
C4-Phenanthrenes/Anthracenes	ng/L	-	<5.273	<5.273	<5.273	<5.273	<5.273
Chrysene	ng/L	-	<0.432	<0.432	<0.432	<0.432	<0.432
Dibenz[a,h]anthracene	ng/L	-	<0.319	<0.319	<0.319	<0.319	<0.319
Dibenzothiophene	ng/L	-	<0.210	<0.210	<0.210	<0.210	<0.210
Fluoranthene	ng/L	-	<0.653	<0.653	<0.653	<0.653	<0.653
Fluorene	ng/L	-	<0.304	<0.304	<0.304	<0.304	<0.304
Indeno[1,2,3-c,d]-pyrene	ng/L	-	<0.232	<0.232	<0.232	<0.232	<0.232
Naphthalene	ng/L	-	<8.756	<8.756	<8.756	<8.756	<8.756
Phenanthrene	ng/L	-	<1.072	<1.072	<1.072	<1.072	<1.072
Pyrene	ng/L	-	<0.570	<0.570	<0.570	<0.570	<0.570
Retene	ng/L	-	<0.509	<0.509	<0.509	<0.509	<0.509

<sup>1</sup> PAH detection limits were variable and therefore are not displayed

#

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 ELLS River (ELR-2A), winter 2012.**

Analyte	Unit	Detection Limit	ELR-2A 15-Mar-12	Duplicate 15-Mar-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	347	342	1.5
Dissolved Organic Carbon	mg/L	1	13.7	13.8	0.7
Hardness (as CaCO <sub>3</sub> )	mg/L	-	138	132	4.4
pH	pH units	0.1	7.97	7.97	0.0
Total Alkalinity	mg/L	5	142	143	0.7
Total Dissolved Solids	mg/L	12	217	207	4.7
Total Organic Carbon	mg/L	1	14.0	14.6	4.2
Total Suspended Solids	mg/L	3	<3	4	<b>28.6</b>
True Colour	T.C.U.	2	20.1	20.2	0.5
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	173	174	0.6
Calcium (Ca)	mg/L	0.5	37.3	35.9	3.8
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	0.5	2.41	2.42	0.4
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	11.0	10.4	5.6
Potassium (K)	mg/L	0.5	1.86	1.90	2.1
Sodium (Na)	mg/L	1	22.7	22.4	1.3
Sulfate (SO <sub>4</sub> )	mg/L	0.5	32.7	30.1	8.3
Sulphide (S <sub>2</sub> )	mg/L	0.0020	0.0021	0.0023	9.1
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.071	0.340	0.333	2.1
Phosphorus, dissolved	mg/L	0.001	0.0128	0.0154	18.4
Phosphorus, total	mg/L	0.001	0.0317	0.0300	5.5
Total Kjeldahl Nitrogen	mg/L	0.2	0.40	0.46	14.0
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	0.02	0.66	-	n/a
OilSands Acid Extractable	mg/L	0.1	3.33	-	n/a
Total Phenolics	mg/L	0.001	0.0046	0.0035	<b>27.2</b>
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>					
Benzene	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	mg/L	0.25	<0.25	<0.25	0.0
m+p-Xylene	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.2-3 (Cont'd.)**

Analyte	Unit	Detection Limit	ELR-2A 15-Mar-12	Duplicate 15-Mar-12	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (cont'd.)</b>					
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.00491	0.00515	4.8
Antimony (Sb)	mg/L	0.00005	0.0000627	0.0000591	5.9
Arsenic (As)	mg/L	0.0001	0.000430	0.000449	4.3
Barium (Ba)	mg/L	0.0001	0.0391	0.0409	4.5
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0947	0.0976	3.0
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	40.2	40.6	1.0
Chlorine (Cl)	mg/L	0.3	2.78	2.75	1.1
Chromium (Cr)	mg/L	0.0003	0.00038	<0.00030	23.3
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	mg/L	0.0001	0.000646	0.000707	9.0
Iron (Fe)	mg/L	0.004	0.094	0.111	16.4
Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	mg/L	0.0002	0.0191	0.0195	2.1
Manganese (Mn)	mg/L	0.0001	0.01210	0.00627	63.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.0001	0.000593	0.000621	4.6
Nickel (Ni)	mg/L	0.0001	0.00024	<0.00010	82.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.119	0.124	4.1
Sulphur (S)	mg/L	2	10.30	9.48	8.3
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00113	0.00123	8.5
Uranium (U)	mg/L	0.0001	0.000153	0.000169	9.9
Vanadium (V)	mg/L	0.0001	0.000126	0.000121	4.0
Zinc (Zn)	mg/L	0.0002	0.000870	0.000716	19.4
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.003	0.172	0.134	24.8
Antimony (Sb)	mg/L	0.00005	0.0000634	0.0000598	5.8
Arsenic (As)	mg/L	0.0001	0.000639	0.000607	5.1
Barium (Ba)	mg/L	0.0001	0.0428	0.0448	4.6
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.096	0.102	6.3

<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.2-3 (Cont'd.)**

Analyte	Unit	Detection Limit	ELR-2A 15-Mar-12	Duplicate 15-Mar-12	Relative Percent Difference (%)
<b>Total Metals (cont'd.)</b>					
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	40.4	41.7	3.2
Chlorine (Cl)	mg/L	0.3	3.00	2.83	5.8
Chromium (Cr)	mg/L	0.0003	0.000383	0.000356	7.3
Cobalt (Co)	mg/L	0.0001	0.000162	<0.0001	47.3
Copper (Cu)	mg/L	0.0001	0.00082	0.00086	4.8
Iron (Fe)	mg/L	0.004	0.568	0.418	30.4
Lead (Pb)	mg/L	0.0001	0.000140	0.000101	32.4
Lithium (Li)	mg/L	0.0002	0.0194	0.0199	2.5
Manganese (Mn)	mg/L	0.0001	0.0122	0.0102	17.9
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	0.6	1.2	1.0	18.2
Molybdenum (Mo)	mg/L	0.00010	0.00060	0.00064	6.1
Nickel (Ni)	mg/L	0.00010	0.00024	0.00022	9.5
Selenium (Se)	mg/L	0.00030	<0.00030	0.00031	1.7
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.121	0.130	7.2
Sulphur (S)	mg/L	2	10.40	9.79	6.0
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00469	0.00284	49.1
Uranium (U)	mg/L	0.0001	0.000178	0.000180	1.1
Vanadium (V)	mg/L	0.0001	0.000670	0.000492	30.6
Zinc (Zn)	mg/L	0.0002	0.00164	0.00101	47.5
<b>PAHs<sup>2</sup></b>					
Acenaphthene	mg/L	0.619	<0.619	<0.619	0.0
Acenaphthylene	mg/L	0.343	0.761	<0.343	75.8
Anthracene	mg/L	-	<0.199	<0.299	40.2
Benz[a]anthracene	mg/L	0.291	0.336	<0.291	14.3
Benzo[a]pyrene	mg/L	-	0.314	<0.369	16.1
Benzo[b,j,k]fluoranthene	mg/L	-	<0.168	<0.218	26.1
Benzo[g,h,i]perylene	mg/L	-	0.436	<0.196	75.9
Biphenyl	mg/L	2.046	<2.046	<2.046	0.0
C1-Acenaphthenes	mg/L	-	<0.438	<0.579	27.7
C1-Benzo[a]anthracenes/Chrysenes	mg/L	0.579	2.220	1.600	32.5
C1-Benzofluoranthenes/Benzopyrenes	mg/L	0.706	1.070	<0.706	41.0
C1-Biphenyls	mg/L	19.294	<19.294	<19.294	0.0
C1-Dibenzothiophenes	mg/L	5.591	<5.591	<5.591	0.0
C1-Fluoranthenes/Pyrenes	mg/L	1.004	3.340	2.640	23.4
C1-Fluorenes	mg/L	8.435	<8.435	<8.435	0.0
C1-Naphthalenes	mg/L	3.071	73.400	18.400	119.8
C1-Phenanthrenes/Anthracenes	mg/L	1.733	<1.733	<1.733	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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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	Unit	Detection Limit	ELR-2A 15-Mar-12	Duplicate 15-Mar-12	Relative Percent Difference (%)
<b>PAHs cont'd.<sup>2</sup></b>					
C2-Benzo[a]anthracenes/Chrysenes	mg/L	-	1.560	0.559	<b>94.5</b>
C2-Benzofluoranthenes/Benzopyrenes	mg/L	1.063	<1.063	1.080	1.6
C2-Biphenyls	mg/L	86.336	<86.336	<86.336	0.0
C2-Dibenzothiophenes	mg/L	26.420	<26.420	<26.420	0.0
C2-Fluoranthenes/Pyrenes	mg/L	1.621	5.420	4.150	<b>26.5</b>
C2-Fluorenes	mg/L	1.712	3.930	4.020	2.3
C2-Naphthalenes	mg/L	3.883	19.000	7.280	<b>89.2</b>
C2-Phenanthrenes/Anthracenes	mg/L	1.915	3.200	<1.915	<b>50.2</b>
C3-Dibenzothiophenes	mg/L	1.135	7.980	6.740	16.8
C3-Fluoranthenes/Pyrenes	mg/L	0.998	1.810	2.120	15.8
C3-Fluorenes	mg/L	3.761	5.290	4.810	9.5
C3-Naphthalenes	mg/L	2.689	8.590	4.450	<b>63.5</b>
C3-Phenanthrenes/Anthracenes	mg/L	0.968	2.760	2.440	12.3
C4-Dibenzothiophenes	mg/L	1.947	2.660	3.190	18.1
C4-Naphthalenes	mg/L	5.805	7.630	<5.805	<b>27.2</b>
C4-Phenanthrenes/Anthracenes	mg/L	5.273	12.300	9.430	<b>26.4</b>
Chrysene	mg/L	0.432	0.751	0.458	<b>48.5</b>
Dibenz[a,h]anthracene	mg/L	0.319	<0.319	<0.319	0.0
Dibenzothiophene	mg/L	-	0.298	<0.302	1.3
Fluoranthene	mg/L	0.653	<0.653	<0.653	0.0
Fluorene	mg/L	0.304	0.332	<0.335	0.9
Indeno[1,2,3-c,d]-pyrene	mg/L	-	<0.249	<0.232	6.9
Naphthalene	mg/L	8.756	55.300	15.700	<b>111.5</b>
Phenanthrene	mg/L	1.072	<1.072	<1.072	0.0
Pyrene	mg/L	0.570	<0.570	<0.570	0.0
Retene	mg/L	-	1.080	0.954	12.4

<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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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 Athabasca River (ATR-DC-E), spring 2012.**

Analyte	Unit	Detection Limit	ATR-DC-E 20-May-12	Duplicate 20-May-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	185	184	0.5
Dissolved Organic Carbon	mg/L	1	12.1	11.9	1.7
Hardness (as CaCO <sub>3</sub> )	mg/L	-	57	57.3	0.5
pH	pH units	0.1	7.95	7.91	0.5
Total Alkalinity	mg/L	5	60.9	61.4	0.8
Total Dissolved Solids	mg/L	10	130	130	0.0
Total Organic Carbon	mg/L	1	11.5	11.8	2.6
Total Suspended Solids	mg/L	3	137	107	<b>24.6</b>
True Colour	T.C.U.	2	46.8	50.4	7.4
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	74.3	74.9	0.8
Calcium (Ca)	mg/L	0.5	15.1	15.2	0.7
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	0.5	14.2	13.2	7.3
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	4.68	4.7	0.4
Potassium (K)	mg/L	0.5	1.17	1.05	10.8
Sodium (Na)	mg/L	1	13.5	13.3	1.5
Sulfate (SO <sub>4</sub> )	mg/L	0.5	6.92	6.07	13.1
Sulphide (S <sub>2</sub> )	mg/L	0.002	0.0047	0.005	6.2
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	mg/L	0.001	0.0199	0.02	0.5
Phosphorus, total	mg/L	0.001	0.149	0.138	7.7
Total Kjeldahl Nitrogen	mg/L	0.2	0.61	0.61	0.0
Total Nitrogen	mg/L	-	0.681	0.681	0.0
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	0.02	0.18	0.22	<b>20.0</b>
OilSands Acid Extractable	mg/L	0.1	0.46	0.45	2.2
Total Phenolics	mg/L	0.001	0.0043	0.0053	<b>20.8</b>
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>					
Benzene	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	mg/L	0.0005	<0.0005	<0.0005	0.0
F1(C6-C10)	mg/L	0.1	<0.1	<0.1	0.0
F1-BTEX	mg/L	0.1	<0.1	<0.1	0.0
F2 (>C10-C16)	mg/L	0.25	<0.25	<0.25	0.0
F3 (C16-C34)	mg/L	0.25	<0.25	<0.25	0.0
F4 (C34-C50)	mg/L	0.25	<0.0005	<0.0005	0.0
m+p-Xylene	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.2-4 (Cont'd.)**

Analyte	Unit	Detection Limit	ATR-DC-E 20-May-12	Duplicate 20-May-12	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (cont'd).</b>					
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0699	0.0933	<b>28.7</b>
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.000333	0.000376	12.1
Barium (Ba)	mg/L	0.0001	0.0183	0.0186	1.6
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0345	0.0352	2.0
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	14.6	14.5	0.7
Chlorine (Cl)	mg/L	0.3	12.5	12.3	1.6
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	mg/L	0.0001	0.000622	0.000579	7.2
Iron (Fe)	mg/L	0.004	0.33	0.364	9.8
Lead (Pb)	mg/L	0.0001	<0.0001	0.000105	4.9
Lithium (Li)	mg/L	0.0002	0.00621	0.00648	4.3
Manganese (Mn)	mg/L	0.0001	0.00478	0.00623	<b>26.3</b>
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.0001	0.000187	0.000194	3.7
Nickel (Ni)	mg/L	0.0001	0.00051	0.000491	3.8
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.0768	0.0775	0.9
Sulphur (S)	mg/L	2	2.76	2.76	0.0
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00508	0.00606	17.6
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	mg/L	0.0001	0.000416	0.000465	11.1
Zinc (Zn)	mg/L	0.0002	0.000601	0.000273	<b>75.1</b>
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.003	1.36	1.38	1.5
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.00105	0.000973	7.6
Barium (Ba)	mg/L	0.0001	0.0414	0.0358	14.5
Beryllium (Be)	mg/L	0.0001	0.000136	0.000112	19.4
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0375	0.0375	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	Unit	Detection Limit	ATR-DC-E 20-May-12	Duplicate 20-May-12	Relative Percent Difference (%)
<b>Total Metals (cont'd).</b>					
Cadmium (Cd)	mg/L	0.0001	0.0000304	0.0000307	1.0
Calcium (Ca)	mg/L	0.1	16.4	15.5	5.6
Chlorine (Cl)	mg/L	0.3	12.5	12.4	0.8
Chromium (Cr)	mg/L	0.0003	0.00173	0.00169	2.3
Cobalt (Co)	mg/L	0.0001	0.00128	0.000995	<b>25.1</b>
Copper (Cu)	mg/L	0.0001	0.0022	0.00206	6.6
Iron (Fe)	mg/L	0.004	2.87	2.46	15.4
Lead (Pb)	mg/L	0.0001	0.00157	0.00131	18.1
Lithium (Li)	mg/L	0.0002	0.0079	0.00765	3.2
Manganese (Mn)	mg/L	0.0001	0.15	0.116	<b>25.6</b>
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	0.6	8	8.3	3.7
Molybdenum (Mo)	mg/L	0.0001	0.000189	0.000196	3.6
Nickel (Ni)	mg/L	0.0001	0.00254	0.00215	16.6
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.0777	0.0777	0.0
Sulphur (S)	mg/L	2	2.87	2.78	3.2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	0.000271	0.000234	14.7
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.0297	0.0299	0.7
Uranium (U)	mg/L	0.0001	0.000236	0.000197	18.0
Vanadium (V)	mg/L	0.0001	0.00387	0.00363	6.4
Zinc (Zn)	mg/L	0.0002	0.00757	0.00693	8.8
<b>PAHs<sup>2</sup></b>					
Acenaphthene	mg/L	-	0.749	<0.967	<b>25.4</b>
Acenaphthylene	mg/L	0.343	<0.343	<0.343	0.0
Anthracene	mg/L	-	0.262	0.229	13.4
Benz[a]anthracene	mg/L	0.291	0.570	0.449	<b>23.7</b>
Benzo[a]pyrene	mg/L	-	1.640	1.290	23.9
Benzo[b,j,k]fluoranthene	mg/L	-	4.300	3.270	27.2
Benzo[g,h,i]perylene	mg/L	-	2.830	2.330	19.4
Biphenyl	mg/L	2.046	<2.046	<2.046	0.0
C1-Acenaphthenes	mg/L	0.327	<0.327	<0.327	0.0
C1-Benzo[a]anthracenes/Chrysenes	mg/L	0.579	18.700	15.500	18.7
C1-Benzofluoranthenes/Benzopyrenes	mg/L	0.706	19.900	15.000	<b>28.1</b>
C1-Biphenyls	mg/L	19.294	<19.294	<19.294	0.0
C1-Dibenzothiophenes	mg/L	5.591	<5.591	<5.591	0.0
C1-Fluoranthenes/Pyrenes	mg/L	1.004	36.600	31.300	15.6
C1-Fluorenes	mg/L	8.435	<8.435	<8.435	0.0
C1-Naphthalenes	mg/L	3.071	3.470	4.510	<b>26.1</b>
C1-Phenanthrenes/Anthracenes	mg/L	1.733	7.410	6.190	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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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	Unit	Detection Limit	ATR-DC-E 20-May-12	Duplicate 20-May-12	Relative Percent Difference (%)
<b>PAHs cont'd.<sup>2</sup></b>					
C2-Benzo[a]anthracenes/Chrysenes	mg/L	-	29.400	20.800	<b>34.3</b>
C2-Benzofluoranthenes/Benzopyrenes	mg/L	1.063	8.270	7.720	6.9
C2-Biphenyls	mg/L	86.336	<86.336	<86.336	0.0
C2-Dibenzothiophenes	mg/L	26.420	32.300	29.800	8.1
C2-Fluoranthenes/Pyrenes	mg/L	1.621	76.800	61.700	<b>21.8</b>
C2-Fluorenes	mg/L	1.712	12.900	11.000	15.9
C2-Naphthalenes	mg/L	3.883	6.260	6.220	0.6
C2-Phenanthrenes/Anthracenes	mg/L	1.915	17.500	15.200	14.1
C3-Dibenzothiophenes	mg/L	1.135	55.900	45.500	<b>20.5</b>
C3-Fluoranthenes/Pyrenes	mg/L	-	71.000	53.800	<b>27.6</b>
C3-Fluorenes	mg/L	3.761	24.300	26.300	7.9
C3-Naphthalenes	mg/L	2.689	11.000	9.340	16.3
C3-Phenanthrenes/Anthracenes	mg/L	0.968	30.700	25.800	17.3
C4-Dibenzothiophenes	mg/L	1.947	48.800	41.400	16.4
C4-Naphthalenes	mg/L	5.805	23.800	17.600	<b>30.0</b>
C4-Phenanthrenes/Anthracenes	mg/L	5.273	116.000	104.000	10.9
Chrysene	mg/L	0.432	6.570	5.000	<b>27.1</b>
Dibenz[a,h]anthracene	mg/L	-	0.499	0.384	<b>26.0</b>
Dibenzothiophene	mg/L	-	0.452	0.466	3.1
Fluoranthene	mg/L	0.653	1.510	1.130	<b>28.8</b>
Fluorene	mg/L	-	0.517	<1.170	<b>77.4</b>
Indeno[1,2,3-c,d]-pyrene	mg/L	-	1.970	1.710	14.1
Naphthalene	mg/L	8.756	<8.756	<8.756	0.0
Phenanthrene	mg/L	1.072	2.270	2.110	7.3
Pyrene	mg/L	-	3.680	2.720	<b>30.0</b>
Retene	mg/L	-	10.000	11.600	14.8

<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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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 Athabasca River (ATR-DC-E), summer 2012.**

Analyte	Unit	Detection Limit	ATR-DC-E 14-July-12	Duplicate 14-July-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	200	200	0.0
Dissolved Organic Carbon	mg/L	1	15.1	15.4	2.0
Hardness (as CaCO <sub>3</sub> )	mg/L	-	72.5	71.8	1.0
pH	pH units	0.1	8.08	8.06	0.2
Total Alkalinity	mg/L	5	72.3	72	0.4
Total Dissolved Solids	mg/L	10	203	160	23.7
Total Organic Carbon	mg/L	1	14.9	15	0.7
Total Suspended Solids	mg/L	3	113	86	27.1
True Colour	T.C.U.	2	82	82.7	0.9
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	88.2	87.9	0.3
Calcium (Ca)	mg/L	0.5	19.7	19.5	1.0
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	0.5	11.7	11.7	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	5.67	5.62	0.9
Potassium (K)	mg/L	0.5	0.67	0.61	9.4
Sodium (Na)	mg/L	1	12.1	12	0.8
Sulfate (SO <sub>4</sub> )	mg/L	0.5	7.71	7.71	0.0
Sulphide (S <sub>2</sub> )	mg/L	0.002	0.0054	<0.002	91.9
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	mg/L	0.001	0.0221	0.0202	9.0
Phosphorus, total	mg/L	0.001	0.0994	0.099	0.4
Total Kjeldahl Nitrogen	mg/L	0.2	0.61	0.62	1.6
Total Nitrogen	mg/L	-	0.681	0.691	1.5
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	0.02	0.08	0.08	0.0
OilSands Acid Extractable	mg/L	0.1	0.15	0.15	0.0
Total Phenolics	mg/L	0.001	0.0088	0.0063	33.1
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>					
Benzene	mg/L	0.0005	<0.0005	<0.0005	0.0
Ethylbenzene	mg/L	0.0005	<0.0005	<0.0005	0.0
F1(C6-C10)	mg/L	0.1	<0.1	<0.1	0.0
F1-BTEX	mg/L	0.1	<0.1	<0.1	0.0
F2 (>C10-C16)	mg/L	0.25	<0.25	<0.25	0.0
F3 (C16-C34)	mg/L	0.25	<0.25	<0.25	0.0
F4 (C34-C50)	mg/L	0.25	<0.25	<0.25	0.0
m+p-Xylene	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.2-5 (Cont'd.)**

Analyte	Unit	Detection Limit	ATR-DC-E 14-July-12	Duplicate 14-July-12	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (cont'd).</b>					
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0369	0.0368	0.3
Antimony (Sb)	mg/L	0.00005	0.0000557	0.0000555	0.4
Arsenic (As)	mg/L	0.0001	0.000552	0.000506	8.7
Barium (Ba)	mg/L	0.0001	0.0268	0.0254	5.4
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0316	0.0294	7.2
Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	18.7	18.2	2.7
Chlorine (Cl)	mg/L	0.3	12.7	12.8	0.8
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	mg/L	0.0001	0.000917	0.000845	8.2
Iron (Fe)	mg/L	0.004	0.265	0.245	7.8
Lead (Pb)	mg/L	0.0001	0.00011	<0.0001	9.5
Lithium (Li)	mg/L	0.0002	0.00524	0.00477	9.4
Manganese (Mn)	mg/L	0.0001	0.00297	0.00262	12.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.0001	0.000312	0.000307	1.6
Nickel (Ni)	mg/L	0.0001	0.000468	0.000459	1.9
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.088	0.0861	2.2
Sulphur (S)	mg/L	2	2.04	2.01	1.5
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00321	0.00307	4.5
Uranium (U)	mg/L	0.0001	0.000142	0.000131	8.1
Vanadium (V)	mg/L	0.0001	0.000441	0.000426	3.5
Zinc (Zn)	mg/L	0.0002	0.000908	0.000617	<b>38.2</b>
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.003	1.70	1.73	1.7
Antimony (Sb)	mg/L	0.00005	0.0000563	0.0000561	0.4
Arsenic (As)	mg/L	0.0001	0.00117	0.00116	0.9
Barium (Ba)	mg/L	0.0001	0.0494	0.0504	2.0
Beryllium (Be)	mg/L	0.0001	<0.0001	0.000101	1.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0379	0.0359	5.4

<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	Unit	Detection Limit	ATR-DC-E 14-July-12	Duplicate 14-July-12	Relative Percent Difference (%)
<b>Total Metals (cont'd).</b>					
Cadmium (Cd)	mg/L	0.0001	0.0000361	0.0000341	5.7
Calcium (Ca)	mg/L	0.1	19.1	19.5	2.1
Chlorine (Cl)	mg/L	0.3	12.8	12.9	0.8
Chromium (Cr)	mg/L	0.0003	0.00269	0.00278	3.3
Cobalt (Co)	mg/L	0.0001	0.000925	0.00099	6.8
Copper (Cu)	mg/L	0.0001	0.00218	0.00219	0.5
Iron (Fe)	mg/L	0.004	2.39	2.48	3.7
Lead (Pb)	mg/L	0.0001	0.00113	0.00121	6.8
Lithium (Li)	mg/L	0.0002	0.00667	0.00663	0.6
Manganese (Mn)	mg/L	0.0001	0.0931	0.0996	6.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	0.6	5.4	5.6	3.6
Molybdenum (Mo)	mg/L	0.0001	0.000315	0.00031	1.6
Nickel (Ni)	mg/L	0.0001	0.00226	0.00233	3.1
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	0.0000115	14.0
Strontium (Sr)	mg/L	0.0001	0.089	0.0871	2.2
Sulphur (S)	mg/L	2	2.06	2.03	1.5
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	0.000434	0.000485	11.1
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.021	0.0215	2.4
Uranium (U)	mg/L	0.0001	0.000224	0.000224	0.0
Vanadium (V)	mg/L	0.0001	0.00499	0.00507	1.6
Zinc (Zn)	mg/L	0.0002	0.00764	0.00759	0.7
<b>PAHs<sup>2</sup></b>					
Acenaphthene	mg/L	0.619	<0.619	<0.619	0.0
Acenaphthylene	mg/L	0.343	<0.343	<0.343	0.0
Anthracene	mg/L	0.186	0.376	0.541	<b>36.0</b>
Benz[a]anthracene	mg/L	0.291	<0.291	0.402	<b>32.0</b>
Benzo[a]pyrene	mg/L	0.229	0.518	0.823	<b>45.5</b>
Benzo[b,j,k]fluoranthene	mg/L	0.168	1.320	2.280	<b>53.3</b>
Benzo[g,h,i]perylene	mg/L	0.187	0.777	1.240	<b>45.9</b>
Biphenyl	mg/L	2.046	2.080	2.580	<b>21.5</b>
C1-Acenaphthenes	mg/L	0.327	<0.327	<0.327	0.0
C1-Benzo[a]anthracenes/Chrysenes	mg/L	0.579	6.030	6.530	8.0
C1-Benzofluoranthenes/Benzopyrenes	mg/L	0.706	5.290	5.550	4.8
C1-Biphenyls	mg/L	19.294	<19.294	<19.294	0.0
C1-Dibenzothiophenes	mg/L	5.591	<5.591	<5.591	0.0
C1-Fluoranthenes/Pyrenes	mg/L	1.004	14.400	14.900	3.4
C1-Fluorenes	mg/L	8.435	<8.435	<8.435	0.0
C1-Naphthalenes	mg/L	3.071	4.130	5.560	<b>29.5</b>
C1-Phenanthrenes/Anthracenes	mg/L	1.733	2.590	5.120	<b>65.6</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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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	Unit	Detection Limit	ATR-DC-E 14-July-12	Duplicate 14-July-12	Relative Percent Difference (%)
<b>PAHs cont'd.<sup>2</sup></b>					
C2-Benzo[a]anthracenes/Chrysenes	mg/L	0.378	8.670	7.570	13.5
C2-Benzofluoranthenes/Benzopyrenes	mg/L	1.063	2.300	2.260	1.8
C2-Biphenyls	mg/L	86.336	<86.336	<86.336	0.0
C2-Dibenzothiophenes	mg/L	26.420	<26.420	<26.420	0.0
C2-Fluoranthenes/Pyrenes	mg/L	1.621	24.500	22.400	9.0
C2-Fluorenes	mg/L	1.712	4.470	5.750	<b>25.0</b>
C2-Naphthalenes	mg/L	3.883	6.120	8.250	<b>29.6</b>
C2-Phenanthrenes/Anthracenes	mg/L	1.915	5.410	6.680	<b>21.0</b>
C3-Dibenzothiophenes	mg/L	1.135	14.500	11.700	<b>21.4</b>
C3-Fluoranthenes/Pyrenes	mg/L	0.998	15.400	13.000	16.9
C3-Fluorenes	mg/L	3.761	11.800	10.700	9.8
C3-Naphthalenes	mg/L	2.689	6.380	7.870	<b>20.9</b>
C3-Phenanthrenes/Anthracenes	mg/L	0.968	9.040	9.720	7.2
C4-Dibenzothiophenes	mg/L	1.947	10.800	11.300	4.5
C4-Naphthalenes	mg/L	5.805	10.100	13.000	<b>25.1</b>
C4-Phenanthrenes/Anthracenes	mg/L	5.273	46.200	38.400	18.4
Chrysene	mg/L	0.432	1.970	2.490	<b>23.3</b>
Dibenz[a,h]anthracene	mg/L	0.319	<0.319	<0.319	0.0
Dibenzothiophene	mg/L	0.210	0.372	0.408	9.2
Fluoranthene	mg/L	0.653	0.811	0.953	16.1
Fluorene	mg/L	0.304	0.437	0.441	0.9
Indeno[1,2,3-c,d]-pyrene	mg/L	0.232	0.530	0.838	<b>45.0</b>
Naphthalene	mg/L	8.756	<8.756	<8.756	0.0
Phenanthrene	mg/L	1.072	1.950	3.220	<b>49.1</b>
Pyrene	mg/L	0.570	1.580	1.640	3.7
Retene	mg/L	0.655	7.000	8.100	14.6

<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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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 Christina Lake (CHL-1), fall 2012.**

Analyte	Unit	Detection Limit	CHL-1 7-Sep-12	Duplicate 7-Sept-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	206	205	0.5
Dissolved Organic Carbon	mg/L	1	13.4	13.4	0.0
Hardness (as CaCO <sub>3</sub> )	mg/L	-	88.6	89.4	0.9
pH	pH units	0.1	8.11	8.09	0.2
Total Alkalinity	mg/L	5	105	105	0.0
Total Dissolved Solids	mg/L	12	141	137	2.9
Total Organic Carbon	mg/L	1	13.7	13.4	2.2
Total Suspended Solids	mg/L	3	15	13	14.3
True Colour	T.C.U.	2	16.2	17.5	7.7
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	128	129	0.8
Calcium (Ca)	mg/L	0.5	23.6	23.8	0.8
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	0.5	1.04	1.08	3.8
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	7.21	7.29	1.1
Potassium (K)	mg/L	0.5	0.79	0.73	7.9
Sodium (Na)	mg/L	1	6.1	6.1	0.0
Sulfate (SO <sub>4</sub> )	mg/L	0.5	1.01	1.05	3.9
Sulphide (S <sub>2</sub> )	mg/L	0.002	<0.002	<0.002	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Chlorophyll a	mg/L	2	4.1	4.46	8.4
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	mg/L	0.001	0.0041	0.0048	15.7
Phosphorus, total	mg/L	0.001	0.0138	0.0148	7.0
Total Kjeldahl Nitrogen	mg/L	0.2	0.56	0.63	11.8
Total Nitrogen	mg/L	-	0.631	0.701	10.5
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	0.02	0.11	0.16	<b>37.0</b>
Oilsands Acid Extractable	mg/L	-	0.12	0.29	82.9
Total Phenolics	mg/L	0.001	0.0052	0.0047	10.1
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>					
Benzene	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	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.2-6 (Cont'd.)**

Analyte	Unit	Detection Limit	CHL-1 7-Sep-12	Duplicate 7-Sept-12	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds (cont'd).</b>					
m+p-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	0.0
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.000496	0.000529	6.4
Barium (Ba)	mg/L	0.0001	0.0241	0.0243	0.8
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.0226	0.0223	1.3
Cadmium (Cd)	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	24.9	24.2	2.9
Chlorine (Cl)	mg/L	0.3	1.24	1.18	5.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	0.0
Iron (Fe)	mg/L	0.004	<0.004	<0.004	0.0
Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	mg/L	0.0002	0.00493	0.00496	0.6
Manganese (Mn)	mg/L	0.0001	0.000444	0.00047	5.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.0001	0.000222	0.000229	3.1
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	0.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.0734	0.0727	1.0
Sulphur (S)	mg/L	2	<2	<2	0.0
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.000465	0.000564	19.2
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	0.0
Zinc (Zn)	mg/L	0.0002	0.000458	0.000448	2.2
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.003	0.0298	0.0362	19.4
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.000533	0.000564	5.7
Barium (Ba)	mg/L	0.0001	0.0248	0.0261	5.1
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	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.2-6 (Cont'd.)**

Analyte	Unit	Detection Limit	CHL-1 7-Sep-12	Duplicate 7-Sept-12	Relative Percent Difference (%)
<b>Total Metals (cont'd).</b>					
Cadmium (Cd)	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	24.9	24.8	0.4
Chlorine (Cl)	mg/L	0.3	1.25	1.19	4.9
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001	0.0
Copper (Cu)	mg/L	0.0001	0.000165	0.000144	13.6
Iron (Fe)	mg/L	0.004	0.0532	0.0475	11.3
Lead (Pb)	mg/L	0.0001	0.000118	0.000108	8.8
Lithium (Li)	mg/L	0.0002	0.00498	0.00502	0.8
Manganese (Mn)	mg/L	0.0001	0.00814	0.00802	1.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	0.6	1.2	0.9	<b>28.6</b>
Molybdenum (Mo)	mg/L	0.0001	0.000225	0.000244	8.1
Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001	0.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.0742	0.0731	1.5
Sulphur (S)	mg/L	2	<2	<2	0.0
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.000948	0.00141	<b>39.2</b>
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	0.0
Vanadium (V)	mg/L	0.0001	0.000153	0.000188	<b>20.5</b>
Zinc (Zn)	mg/L	0.0002	0.000633	0.0006	5.4
<b>PAHs <sup>2</sup></b>					
Acenaphthene	mg/L	0.454	<0.454	<0.454	0.0
Acenaphthylene	mg/L	0.244	0.951	0.400	<b>81.6</b>
Anthracene	mg/L	0.188	0.848	<0.188	<b>127.6</b>
Benz[a]anthracene	mg/L	0.379	1.130	<0.379	<b>99.6</b>
Benzo[a]pyrene	mg/L	0.245	0.450	<0.245	<b>58.9</b>
Benzo[b,i,j,k]fluoranthene	mg/L	0.188	0.691	<0.188	<b>114.6</b>
Benzo[g,h,i]perylene	mg/L	0.188	0.201	0.474	<b>80.9</b>
Biphenyl	mg/L	2.090	<2.090	<2.090	0.0
C1-Acenaphthenes	mg/L	-	<0.188	<0.355	<b>61.7</b>
C1-Benzo[a]anthracenes/Chrysenes	mg/L	0.690	<0.690	<0.690	0.0
C1-Benzofluoranthenes/Benzopyrenes	mg/L	0.671	<0.671	<0.671	0.0
C1-Biphenyls	mg/L	21.541	<21.541	<21.541	0.0
C1-Dibenzothiophenes	mg/L	-	<0.123	<0.130	5.2
C1-Fluoranthenes/Pyrenes	mg/L	1.005	1.090	<1.005	8.2
C1-Fluorenes	mg/L	9.857	<9.857	<9.857	0.0
C1-Naphthalenes	mg/L	2.248	4.000	4.580	13.5

<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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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	Detection Limit	CHL-1 7-Sep-12	Duplicate 7-Sept-12	Relative Percent Difference (%)
<b>PAHs (cont'd).<sup>2</sup></b>					
C1-Phenanthrenes/Anthracenes	mg/L	0.852	<0.852	<0.852	0.0
C2-Benzo[a]anthracenes/Chrysenes	mg/L	0.313	0.557	0.518	7.3
C2-Benzofluoranthenes/Benzopyrenes	mg/L	1.221	<1.221	<1.221	0.0
C2-Biphenyls	mg/L	99.118	<99.118	<99.118	0.0
C2-Dibenzothiophenes	mg/L	1.557	<1.557	<1.557	0.0
C2-Fluoranthenes/Pyrenes	mg/L	1.727	9.120	<1.727	<b>136.3</b>
C2-Fluorenes	mg/L	1.651	2.310	2.040	12.4
C2-Naphthalenes	mg/L	3.683	<3.683	<3.683	0.0
C2-Phenanthrenes/Anthracenes	mg/L	0.716	<0.716	<0.716	0.0
C3-Dibenzothiophenes	mg/L	1.355	<1.355	<1.355	0.0
C3-Fluoranthenes/Pyrenes	mg/L	0.739	1.510	<0.739	<b>68.6</b>
C3-Fluorenes	mg/L	4.592	7.340	<4.592	<b>46.1</b>
C3-Naphthalenes	mg/L	2.941	3.880	<2.941	<b>27.5</b>
C3-Phenanthrenes/Anthracenes	mg/L	1.113	<1.113	<1.113	0.0
C4-Dibenzothiophenes	mg/L	1.878	<1.878	<1.878	0.0
C4-Naphthalenes	mg/L	2.298	<2.298	<2.298	0.0
C4-Phenanthrenes/Anthracenes	mg/L	3.935	4.990	<3.935	<b>23.6</b>
Chrysene	mg/L	0.589	2.030	<0.589	<b>110.0</b>
Dibenz[a,h]anthracene	mg/L	0.406	<0.406	<0.406	0.0
Dibenzothiophene	mg/L	0.207	<0.207	<0.207	0.0
Fluoranthene	mg/L	0.927	2.180	<0.927	<b>80.7</b>
Fluorene	mg/L	0.283	0.357	0.318	11.6
Indeno[1,2,3-c,d]-pyrene	mg/L	0.248	0.355	<0.248	<b>35.4</b>
Naphthalene	mg/L	8.774	<8.774	<8.774	0.0
Phenanthrene	mg/L	1.043	1.700	1.520	11.2
Pyrene	mg/L	0.877	1.110	<0.877	<b>23.4</b>
Retene	mg/L	0.346	<0.346	0.499	<b>36.3</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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed if identical

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 Beaver River (BER-2), fall 2012.**

Analyte	Unit	Detection Limit	BER-2 4-Sep-12	Duplicate 4-Sep-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	462	461	0.2
Dissolved Organic Carbon	mg/L	1	20.5	21.2	3.4
Hardness (as CaCO <sub>3</sub> )	mg/L	-	116	118	1.7
pH	pH units	0.1	8.15	8.16	0.1
Total Alkalinity	mg/L	5	237	244	2.9
Total Dissolved Solids	mg/L	10	324	325	0.3
Total Organic Carbon	mg/L	5	20.6	21.6	4.7
Total Suspended Solids	mg/L	3	6	8	28.6
True Colour	T.C.U.	2	99.2	100	0.8
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	289	297	2.7
Calcium (Ca)	mg/L	0.5	29.4	29.9	1.7
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	0.5	1.26	1.24	1.6
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	10.4	10.6	1.9
Potassium (K)	mg/L	0.5	1.8	1.9	5.4
Sodium (Na)	mg/L	1	58.7	60.8	3.5
Sulfate (SO <sub>4</sub> )	mg/L	0.5	14.6	14.6	0.0
Sulphide (S <sub>2</sub> )	mg/L	0.002	0.0065	0.0040	47.6
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.071	<0.071	<0.071	0.0
Phosphorus, dissolved	mg/L	0.001	0.0642	0.0691	7.4
Phosphorus, total	mg/L	0.001	0.147	0.148	0.7
Total Kjeldahl Nitrogen	mg/L	0.2	0.88	0.9	2.2
Total Nitrogen	mg/L	-	0.951	0.971	2.1
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	0.02	0.37	0.35	5.6
Oilsands Acid Extractable	mg/L	0.1	0.87	0.79	9.6
Total Phenolics	mg/L	0.001	0.0097	0.0101	4.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Hydrocarbons and Organic Compounds</b>					
Benzene	mg/L	0.0005	<0.0005	<0.0005	0.0
CCME Fraction 1 (BTEX)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 1 (C6-C10)	mg/L	0.1	<0.1	<0.1	0.0
CCME Fraction 2 (C10-C16)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 3 (C16-C34)	mg/L	0.25	<0.25	<0.25	0.0
CCME Fraction 4 (C34-C50)	mg/L	0.25	<0.25	<0.25	0.0
Ethylbenzene	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	Unit	Detection Limit	BER-2 4-Sep-12	Duplicate 4-Sep-12	Relative Percent Difference (%)
<b>Hydrocarbons and Organic Compounds cont'd.</b>					
m+p-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
o-Xylene	mg/L	0.0005	<0.0005	<0.0005	0.0
Toluene	mg/L	0.0005	<0.0005	<0.0005	0.0
Xylenes	mg/L	0.00071	<0.00071	<0.00071	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0228	0.0222	2.7
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.00111	0.00112	0.9
Barium (Ba)	mg/L	0.0001	0.0327	0.0333	1.8
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001	0.0
Boron (B)	mg/L	0.0008	0.309	0.321	3.8
Cadmium (Cd)	mg/L	0.00001	<0.00001	<0.00001	0.0
Calcium (Ca)	mg/L	0.1	28.7	29.4	2.4
Chlorine (Cl)	mg/L	0.3	1.37	1.51	9.7
Chromium (Cr)	mg/L	0.0003	<0.0003	0.000306	2.0
Cobalt (Co)	mg/L	0.0001	0.000181	0.000186	2.7
Copper (Cu)	mg/L	0.0001	0.000446	0.000409	8.7
Iron (Fe)	mg/L	0.004	0.857	0.861	0.5
Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001	0.0
Lithium (Li)	mg/L	0.0002	0.0305	0.0324	6.0
Manganese (Mn)	mg/L	0.0001	0.0296	0.0293	1.0
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.0001	0.000442	0.000484	9.1
Nickel (Ni)	mg/L	0.0001	0.000568	0.000671	16.6
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.151	0.153	1.3
Sulphur (S)	mg/L	2	4.42	4.9	10.3
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00248	0.00258	4.0
Uranium (U)	mg/L	0.0001	0.000218	0.00023	5.4
Vanadium (V)	mg/L	0.0001	0.000925	0.000961	3.8
Zinc (Zn)	mg/L	0.0002	0.000566	0.000724	<b>24.5</b>
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.003	0.332	0.365	9.5
Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005	0.0
Arsenic (As)	mg/L	0.0001	0.00142	0.00146	2.8
Barium (Ba)	mg/L	0.0001	0.0392	0.0407	3.8
Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001	0.0
Bismuth (Bi)	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.2-7 (Cont'd.)**

Analyte	Unit	Detection Limit	BER-2 4-Sep-12	Duplicate 4-Sep-12	Relative Percent Difference (%)
<b>Total Metals (cont'd.)</b>					
Boron (B)	mg/L	0.0008	0.312	0.325	4.1
Cadmium (Cd)	mg/L	0.00001	<0.00001	0.000012	<b>20.6</b>
Calcium (Ca)	mg/L	0.1	28.7	29.5	2.7
Chlorine (Cl)	mg/L	0.3	1.39	1.53	9.6
Chromium (Cr)	mg/L	0.0003	0.000719	0.00084	15.5
Cobalt (Co)	mg/L	0.0001	0.00033	0.000345	4.4
Copper (Cu)	mg/L	0.0001	0.000696	0.000774	10.6
Iron (Fe)	mg/L	0.004	1.8	1.9	5.4
Lead (Pb)	mg/L	0.0001	0.000245	0.000277	12.3
Lithium (Li)	mg/L	0.0002	0.0308	0.0328	6.3
Manganese (Mn)	mg/L	0.0001	0.0767	0.0808	5.2
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	0.6	3.4	3.3	3.0
Molybdenum (Mo)	mg/L	0.0001	0.000447	0.000489	9.0
Nickel (Ni)	mg/L	0.0001	0.000878	0.000942	7.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001	0.0
Strontium (Sr)	mg/L	0.0001	0.153	0.159	3.8
Sulphur (S)	mg/L	2	4.47	4.95	10.2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	0.0
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	0.0
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	0.0
Titanium (Ti)	mg/L	0.0001	0.00597	0.0069	14.5
Uranium (U)	mg/L	0.0001	0.00022	0.000233	5.7
Vanadium (V)	mg/L	0.0001	0.00211	0.00226	6.9
Zinc (Zn)	mg/L	0.0002	0.00181	0.00207	13.4
<b>PAHs <sup>2</sup></b>					
Acenaphthene	mg/L	0.454	0.547	<0.454	18.6
Acenaphthylene	mg/L	0.244	0.469	<0.244	<b>63.2</b>
Anthracene	mg/L	0.188	<0.188	<0.188	0.0
Benz[a]anthracene	mg/L	0.379	<0.379	<0.379	0.0
Benzo[a]pyrene	mg/L	0.245	<0.245	<0.245	0.0
Benzo[b,j,k]fluoranthene	mg/L	0.188	0.220	<0.188	15.9
Benzo[g,h,i]perylene	mg/L	0.188	<0.188	<0.188	0.0
Biphenyl	mg/L	2.090	<2.090	<2.090	0.0
C1-Acenaphthenes	mg/L	-	<0.188	<0.299	<b>45.8</b>
C1-Benzo[a]anthracenes/Chrysenes	mg/L	0.690	<0.690	<0.690	0.0
C1-Benzofluoranthenes/Benzopyrenes	mg/L	0.671	<0.671	0.784	15.5
C1-Biphenyls	mg/L	21.541	<21.541	<21.541	0.0
C1-Dibenzothiophenes	mg/L	-	0.304	<0.125	<b>83.4</b>
C1-Fluoranthenes/Pyrenes	mg/L	1.005	1.160	<1.005	14.4
C1-Fluorenes	mg/L	9.857	<9.857	<9.857	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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed when identical.

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	Unit	Detection Limit	BER-2 4-Sep-12	Duplicate 4-Sep-12	Relative Percent Difference (%)
<b>PAHs cont'd.<sup>2</sup></b>					
C1-Naphthalenes	mg/L	2.248	<2.248	<2.248	0.0
C1-Phenanthrenes/Anthracenes	mg/L	0.852	0.911	<0.852	6.7
C2-Benzof[a]anthracenes/Chrysenes	mg/L	0.313	<0.313	<0.313	0.0
C2-Benzofluoranthenes/Benzopyrenes	mg/L	1.221	<1.221	<1.221	0.0
C2-Biphenyls	mg/L	99.118	<99.118	<99.118	0.0
C2-Dibenzothiophenes	mg/L	1.557	<1.557	<1.557	0.0
C2-Fluoranthenes/Pyrenes	mg/L	1.727	<1.727	<1.727	0.0
C2-Fluorenes	mg/L	1.651	<1.651	<1.651	0.0
C2-Naphthalenes	mg/L	3.683	<3.683	<3.683	0.0
C2-Phenanthrenes/Anthracenes	mg/L	0.716	0.740	<0.716	3.4
C3-Dibenzothiophenes	mg/L	1.355	<1.355	<1.355	0.0
C3-Fluoranthenes/Pyrenes	mg/L	0.739	1.370	0.864	<b>45.3</b>
C3-Fluorenes	mg/L	4.592	<4.592	<4.592	0.0
C3-Naphthalenes	mg/L	2.941	<2.941	2.950	0.3
C3-Phenanthrenes/Anthracenes	mg/L	1.113	<1.113	<1.113	0.0
C4-Dibenzothiophenes	mg/L	1.878	<1.878	<1.878	0.0
C4-Naphthalenes	mg/L	2.298	<2.298	<2.298	0.0
C4-Phenanthrenes/Anthracenes	mg/L	3.935	<3.935	<3.935	0.0
Chrysene	mg/L	0.589	<0.589	<0.589	0.0
Dibenz[a,h]anthracene	mg/L	0.406	<0.406	<0.406	0.0
Dibenzothiophene	mg/L	0.207	0.212	<0.207	2.3
Fluoranthene	mg/L	0.927	<0.927	<0.927	0.0
Fluorene	mg/L	0.283	<0.283	<0.283	0.0
Indeno[1,2,3-c,d]-pyrene	mg/L	0.248	<0.248	<0.248	0.0
Naphthalene	mg/L	8.774	9.580	<8.774	8.8
Phenanthrene	mg/L	1.043	1.350	<1.043	<b>25.7</b>
Pyrene	mg/L	0.877	<0.877	<0.877	0.0
Retene	mg/L	0.346	1.260	1.360	7.6

<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.

<sup>2</sup> PAH detection limits were variable and therefore are only displayed when identical.

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, current 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 2012 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2012, a total of 16 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<sup>®</sup>) 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 2012 RAMP benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-8).

Invertebrate sorting efficiency was always greater than 96%, with an average of 98.1%. 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.2-8 Results of quality control checks on sorting efficiency of benthic invertebrate samples, 2012.**

Reach	% Sorting Efficiency
STR-E2 #4	$[1-(9/(332+9))] * 100 = 97.4$
ELR-E2A #9	$[1-(19/(1163+19))] * 100 = 98.4$
MUR-D2 #4	$[1-(8/(537+8))] * 100 = 98.5$
MAR-E1 #6	$[1-(6/(342+6))] * 100 = 98.3$
MAR-E3 #9	$[1-(27/(1428+27))] * 100 = 98.2$
BER-D2 #1	$[1-(17/(809+17))] * 100 = 97.9$
CHR-D1 #6	$[1-(2/(107+2))] * 100 = 98.2$
CHL-1 #4	$[1-(10/(363+10))] * 100 = 97.3$
HHR-E1 #5	$[1-(5/(247+5))] * 100 = 98.0$
JAC-D1 #3	$[1-(8/(304+8))] * 100 = 96.2$
JAC-D2 #7	$[1-(7/(243+7))] * 100 = 97.2$
POC-D1 #9	$[1-(15/(903+15))] * 100 = 98.4$
MCL-1 #5	$[1-(5/(256+5))] * 100 = 98.1$
ISL-1 #2	$[1-(10/(618+10))] * 100 = 98.4$
GIC-1 #3	$[1-(1/(95+1))] * 100 = 99.0$
FLC-1 #1	$[1-(0/(22+0))] * 100 = 100$

Note: Average efficiency – 98.1%; 16 samples - ~5% of all samples.

## B.2.4 Sediment Quality Component

The 2012 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
- Staff 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 Muskeg River (MUR-D3) and Christina Lake (CHL-1).

Duplicate samples were taken to assess environmental heterogeneity. The relative percent difference (RPD) 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 site 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 2012. Sampling equipment (i.e., Ekman dredge, stainless-steel tray, and spoons) were 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 this rinsate (at mg/L) by AITF in Edmonton. Concentrations of metals in sediments were compared against 5 times their analytical detection limit and PAHs were assessed against 5 times the laboratory blank concentration, to assess potential sample contamination related to equipment.

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

### ***Duplicate Samples***

Concentrations of several metals and PAHs differed by over 20% between duplicate samples collected at MUR-D3 and CHL-1 (Table B.2-9, Table B.2-10). These results suggested high within-location variability in metal and PAH concentrations, which has been observed historically, in both laboratory-generated and field-collected duplicates. CCME hydrocarbon fractions and organic compounds were generally similar between duplicate samples collected at MUR-D3. Many of these analytes showed greater than 20% variability between the samples collected at CHL-1, however all analytes were reported below detection limits and the variability can be attributed to differences in analytical detection limits between the two samples.

### ***Split Samples***

Several variables in the split samples at MUR-D3 and CHL-1 differed by greater than 20% from the sample (Table B.2-9, 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, several CCME hydrocarbon fractions and organic compounds showed greater than 20% variability in the samples collected at CHL-1; however, this was again due to differences in analytical detection limits between samples. Only CCME Fraction 4 hydrocarbons, measured between the sample collected at MUR-D3 and the split sample, showed high variability; as with PAHs, this variability may be attributed to uneven distribution of hydrocarbons in sediments.

### ***Rinsate Samples***

All total and dissolved metals were detected at concentrations lower than five times the analytical detection limit in the rinsate samples collected at MUR-D3 and CHL-1 (Table B.2-9, Table B.2-10). Several PAHs were detected at concentrations greater than five times the analytical detection limit in both rinsate samples in fall 2012 (Table B.2-9, Table B.2-10). The majority of PAHs measured above (>5x) detection limits in both rinsates were lighter, more soluble species, such as C1- and C2- alkylated hydrocarbons, as well as naphthalenes, phenanthrenes, fluorenes and dibenzothiophenes. These results for PAHs were consistent with previous years' rinsate samples.

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

Results of QA/QC samples collected for sediments by the RAMP program in 2012 were consistent with those collected in previous years of the RAMP program. 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 are generally more consistent within samples and within locations, although some variability between samples from a given station may occur.

Some PAHs were present at low concentrations in rinsate blanks, which may suggest insufficient rinsing of sampling equipment with deionized waters to remove all traces of ambient (creek) waters prior to decanting of deionized waters 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 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.2-9 Relative percent difference between duplicate and split sediment quality samples, upper Muskeg River (MUR-D3), September 2012.**

Category	Analyte	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D3	
				Station	Split	Duplicate	Split	Duplicate
				MUR-D3	SIS-D1	DIS-D1	SIS-D1	DIS-D1
Organic Compounds	Benzene	mg/kg	-	<0.040	<0.045	<0.035	11.8	13.3
	CCME Fraction 1 (BTEX)	mg/kg	-	<80	<90	<70	11.8	13.3
	CCME Fraction 1 (C6-C10)	mg/kg	-	<80	<90	<70	11.8	13.3
	CCME Fraction 2 (C10-C16)	mg/kg	-	<83	<113	<97	<b>30.6</b>	15.6
	CCME Fraction 3 (C16-C34)	mg/kg	20	1,020	1,130	994	10.2	2.6
	CCME Fraction 4 (C34-C50)	mg/kg	20	427	577	463	<b>29.9</b>	8.1
	Total Hydrocarbons (C6-C50)	mg/kg	20	1,450	1,710	1,460	16.5	0.7
	Ethylbenzene	mg/kg	-	<0.12	<0.14	<0.11	15.4	8.7
	m+p-Xylene	mg/kg	-	<0.40	<0.45	<0.35	11.8	13.3
	o-Xylene	mg/kg	-	<0.40	<0.45	<0.35	11.8	13.3
	Toluene	mg/kg	-	<0.40	<0.45	<0.35	11.8	13.3
	Xylenes	mg/kg	-	<0.57	<0.64	<0.49	11.6	15.1
	PAHs <sup>2</sup>	Acenaphthene	mg/kg	-	<0.0009	<0.0006	<0.0008	<b>51.9</b>
Acenaphthylene		mg/kg	-	<0.0004	<0.0003	<0.0006	7.4	<b>44.4</b>
Anthracene		mg/kg	-	0.0011	0.0013	0.0012	18.8	15.7
Benz[a]anthracene		mg/kg	-	0.0014	0.0017	0.0022	17.1	<b>39.6</b>
Benzo[a]pyrene		mg/kg	-	0.0024	0.0021	<0.0019	15.9	<b>24.4</b>
Benzo[b,j,k]fluoranthene		mg/kg	-	0.0027	<0.0010	0.0042	<b>93.8</b>	<b>42.7</b>
Benzo[g,h,i]perylene		mg/kg	-	<0.0033	0.0030	<0.0028	9.6	16.9
Biphenyl		mg/kg	-	0.0021	0.0022	0.0027	4.7	<b>25.6</b>
C1-Acenaphthenes		mg/kg	-	<0.0005	0.0004	<0.0008	<b>32.7</b>	<b>32.7</b>
C1-Benzo[a]anthracenes/Chrysenes		mg/kg	-	0.0335	0.0337	0.0370	0.6	9.9
C1-Benzofluoranthenes/Benzopyrenes		mg/kg	-	0.0175	0.0227	0.0330	<b>25.9</b>	<b>61.4</b>
C1-Biphenyls		mg/kg	-	0.0011	0.0010	0.0008	9.4	<b>30.2</b>
C1-Dibenzothiophenes		mg/kg	-	0.0082	0.0083	0.0095	1.7	15.3
C1-Fluoranthenes/Pyrenes		mg/kg	-	0.0535	0.0522	0.0692	2.5	<b>25.6</b>
C1-Fluorenes		mg/kg	-	0.0222	0.0166	0.0218	<b>28.9</b>	1.8
C1-Naphthalenes		mg/kg	-	0.0045	0.0046	0.0048	3.3	7.4
C1-Phenanthrenes/Anthracenes		mg/kg	-	0.0166	0.0208	0.0249	<b>22.5</b>	<b>40.0</b>
C2-Benzo[a]anthracenes/Chrysenes		mg/kg	-	0.0294	0.0220	0.0333	<b>28.8</b>	12.4
C2-Benzofluoranthenes/Benzopyrenes		mg/kg	-	0.0214	0.0250	0.0316	15.5	<b>38.5</b>
C2-Biphenyls		mg/kg	-	0.0042	0.0042	0.0043	0.5	0.9
C2-Dibenzothiophenes		mg/kg	-	0.0293	0.0372	0.0298	<b>23.8</b>	1.7
C2-Fluoranthenes/Pyrenes		mg/kg	-	0.0655	0.0771	0.0961	16.3	<b>37.9</b>
C2-Fluorenes		mg/kg	-	0.0273	0.0309	0.0308	12.4	12.0
C2-Naphthalenes		mg/kg	-	0.1230	0.0897	0.0506	<b>31.3</b>	<b>83.4</b>
C2-Phenanthrenes/Anthracenes		mg/kg	-	0.0305	0.0257	0.0316	17.1	3.5
C3-Dibenzothiophenes		mg/kg	-	0.0557	0.0558	0.0589	0.2	5.6
C3-Fluoranthenes/Pyrenes		mg/kg	-	0.0480	0.0472	0.0631	1.7	<b>27.2</b>
C3-Fluorenes		mg/kg	-	0.0387	0.0361	0.0514	7.0	<b>28.2</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.

# Analytes differ by > 20% between duplicate/split and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.

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

Category	Analyte	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D3	
				Station	Split	Duplicate	Split	Duplicate
				MUR-D3	SIS-D1	DIS-D1	SIS-D1	DIS-D1
<b>PAHs</b> <b>cont'd<sup>2</sup></b>	C3-Naphthalenes	mg/kg	-	0.0148	0.0155	0.0244	4.6	<b>49.0</b>
	C3-Phenanthrenes/Anthracenes	mg/kg	-	0.0342	0.0361	0.0415	5.4	19.3
	C4-Dibenzothiophenes	mg/kg	-	0.0455	0.0558	0.0466	<b>20.3</b>	2.4
	C4-Naphthalenes	mg/kg	-	0.0062	0.0064	0.0076	2.4	19.4
	C4-Phenanthrenes/Anthracenes	mg/kg	-	0.7540	0.8430	0.9700	11.1	<b>25.1</b>
	Chrysene	mg/kg	-	0.0129	0.0131	0.0161	1.5	<b>22.1</b>
	Dibenz[a,h]anthracene	mg/kg	-	<0.0019	<0.0014	<0.0024	<b>31.9</b>	<b>24.6</b>
	Dibenzothiophene	mg/kg	-	0.0021	0.0016	0.0020	<b>29.7</b>	2.4
	Fluoranthene	mg/kg	-	0.0026	0.0021	0.0030	<b>23.6</b>	13.6
	Fluorene	mg/kg	-	0.0035	0.0034	0.0041	2.3	14.9
	Indeno[1,2,3-c,d]-pyrene	mg/kg	-	<0.0025	<0.0018	<0.0031	<b>30.8</b>	<b>21.4</b>
	Naphthalene	mg/kg	-	0.0030	0.0031	0.0040	3.6	<b>28.3</b>
	Phenanthrene	mg/kg	-	0.0088	0.0090	0.0092	2.3	4.5
	Pyrene	mg/kg	-	0.0062	0.0064	0.0080	2.1	<b>24.8</b>
	Retene	mg/kg	-	0.6260	0.6830	0.7590	8.7	19.2
<b>Total</b>	Total Aluminum (Al)	mg/kg	50	3080	2620	2590	16.1	17.3
<b>Metals</b>	Total Antimony (Sb)	mg/kg	0.1	0.14	0.12	0.11	15.4	<b>24.0</b>
	Total Arsenic (As)	mg/kg	0.1	3.48	2.98	2.92	15.5	17.5
	Total Barium (Ba)	mg/kg	0.5	289	270	253	6.8	13.3
	Total Beryllium (Be)	mg/kg	0.2	0.26	0.3	0.28	14.3	7.4
	Total Bismuth (Bi)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Cadmium (Cd)	mg/kg	0.1	0.17	0.17	0.18	0.0	5.7
	Total Calcium (Ca)	mg/kg	100	30000	26000	24300	14.3	<b>21.0</b>
	Total Chromium (Cr)	mg/kg	0.5	9.09	6.9	6.88	<b>27.4</b>	<b>27.7</b>
	Total Cobalt (Co)	mg/kg	0.1	3.1	2.63	2.66	16.4	15.3
	Total Copper (Cu)	mg/kg	0.5	6.54	5.74	5.69	13.0	13.9
	Total Iron (Fe)	mg/kg	200	73200	60400	54800	19.2	<b>28.8</b>
	Total Lead (Pb)	mg/kg	0.5	2.63	2.3	2.41	13.4	8.7
	Total Lithium (Li)	mg/kg	0.5	2.66	3.08	2.76	14.6	3.7
	Total Magnesium (Mg)	mg/kg	20	2780	2370	2200	15.9	<b>23.3</b>
	Total Manganese (Mn)	mg/kg	1	515	495	459	4.0	11.5
	Total Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Molybdenum (Mo)	mg/kg	0.1	0.46	0.47	0.44	2.2	4.4
	Total Nickel (Ni)	mg/kg	0.5	7.72	7.08	7.06	8.6	8.9
	Total Phosphorus (P)	mg/kg	100	2260	2310	2230	2.2	1.3
	Total Potassium (K)	mg/kg	100	520	340	330	<b>41.9</b>	<b>44.7</b>
	Total Selenium (Se)	mg/kg	0.2	0.72	0.63	0.58	13.3	<b>21.5</b>
	Total Silver (Ag)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Sodium (Na)	mg/kg	100	160	110	<100	<b>37.0</b>	<b>46.2</b>
	Total Strontium (Sr)	mg/kg	1	72	60.9	61.3	16.7	16.1
	Total Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Tin (Sn)	mg/kg	2	<2	<2	<2	0.0	0.0
	Total Titanium (Ti)	mg/kg	1	50.6	42.1	42	18.3	18.6
	Total Uranium (U)	mg/kg	0.05	0.359	0.314	0.333	13.4	7.5
	Total Vanadium (V)	mg/kg	0.2	17.4	14.4	14.1	18.9	<b>21.0</b>
	Total Zinc (Zn)	mg/kg	5	50.5	38	38.2	<b>28.2</b>	<b>27.7</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.

# Analytes differ by > 20% between duplicate/split and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.

**Table B.2-10 Relative percent difference between duplicate and split sediment quality samples, Christina Lake (CHL-1), September 2012.**

Category	Analyte	Unit	DLs	Sample			RPD <sup>1</sup> from CHL-1	
				Station	Split	Duplicate	Split	Duplicate
				CHL-1	SIB-D1	DIB-D1	SIB-D1	DIB-D1
<b>Organic Compounds<sup>2</sup></b>	Benzene	mg/kg	-	<0.010	<0.005	<0.005	<b>66.7</b>	<b>66.7</b>
	CCME Fraction 1 (BTEX)	mg/kg	-	<20	<10	<10	<b>66.7</b>	<b>66.7</b>
	CCME Fraction 1 (C6-C10)	mg/kg	-	<20	<10	<10	<b>66.7</b>	<b>66.7</b>
	CCME Fraction 2 (C10-C16)	mg/kg	20	<20	<20	<20	0.0	0.0
	CCME Fraction 3 (C16-C34)	mg/kg	20	<20	<20	<20	0.0	0.0
	CCME Fraction 4 (C34-C50)	mg/kg	20	<20	<20	<20	0.0	0.0
	Total Hydrocarbons (C6-C50)	mg/kg	20	<20	<20	<20	0.0	0.0
	Ethylbenzene	mg/kg	-	<0.030	<0.015	<0.015	<b>66.7</b>	<b>66.7</b>
	m+p-Xylene	mg/kg	-	<0.10	<0.05	<0.05	<b>66.7</b>	<b>66.7</b>
	o-Xylene	mg/kg	-	<0.10	<0.05	<0.05	<b>66.7</b>	<b>66.7</b>
	Toluene	mg/kg	-	<0.10	<0.05	<0.05	<b>66.7</b>	<b>66.7</b>
Xylenes	mg/kg	-	<0.14	<0.10	<0.10	<b>33.3</b>	<b>33.3</b>	
<b>PAHs<sup>2</sup></b>	% Moisture_PAH sample	mg/kg	-	20.6	19.9	20.4	3.5	1.0
	Acenaphthene	mg/kg	-	<0.00018	<0.00019	<0.00016	5.0	7.6
	Acenaphthylene	mg/kg	-	0.00018	0.00019	<0.00012	3.2	<b>43.5</b>
	Anthracene	mg/kg	-	0.00016	0.00025	0.00015	<b>45.4</b>	5.8
	Benz[a]anthracene	mg/kg	-	0.00032	0.00027	0.00047	17.1	<b>38.3</b>
	Benzo[a]pyrene	mg/kg	-	0.00041	0.00040	0.00061	2.5	<b>39.4</b>
	Benzo[b,j,k]fluoranthene	mg/kg	-	0.00080	0.00078	0.00118	1.6	<b>38.7</b>
	Benzo[g,h,i]perylene	mg/kg	-	0.00053	0.00051	0.00066	2.9	<b>22.3</b>
	Biphenyl	mg/kg	-	0.00024	0.00025	0.00021	1.2	15.0
	C1-Acenaphthenes	mg/kg	-	<0.00009	<0.00008	<0.00011	8.0	18.9
	C1-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.00113	0.00080	0.00091	<b>34.4</b>	<b>22.0</b>
	C1-Benzofluoranthenes/Benzopyrenes	mg/kg	-	0.00083	<0.00026	0.00134	<b>103.3</b>	<b>47.6</b>
	C1-Biphenyls	mg/kg	-	0.00076	0.00112	0.00064	<b>38.7</b>	16.9
	C1-Dibenzothiophenes	mg/kg	-	<0.00013	<0.00024	<0.00018	<b>58.8</b>	<b>29.3</b>
	C1-Fluoranthenes/Pyrenes	mg/kg	-	0.00163	0.00190	0.00267	15.3	<b>48.4</b>
	C1-Fluorenes	mg/kg	-	0.00089	0.00058	0.00082	<b>42.5</b>	7.4
	C1-Naphthalenes	mg/kg	-	<0.00015	<0.00024	<0.00016	<b>45.8</b>	6.5
	C1-Phenanthrenes/Anthracenes	mg/kg	-	0.00016	0.00070	0.00059	<b>126.8</b>	<b>116.0</b>
	C2-Benzo[a]anthracenes/Chrysenes	mg/kg	-	0.00187	0.00139	0.00165	<b>29.4</b>	12.5
	C2-Benzofluoranthenes/Benzopyrenes	mg/kg	-	0.00080	0.00151	0.00130	<b>61.6</b>	<b>47.7</b>
	C2-Biphenyls	mg/kg	-	0.00388	0.00496	0.00306	<b>24.4</b>	<b>23.6</b>
	C2-Dibenzothiophenes	mg/kg	-	0.00013	0.00025	0.00037	<b>63.8</b>	<b>97.0</b>
	C2-Fluoranthenes/Pyrenes	mg/kg	-	0.00154	0.00250	0.00165	<b>47.5</b>	6.9
	C2-Fluorenes	mg/kg	-	0.00207	0.00076	0.00237	<b>92.4</b>	13.5
	C2-Naphthalenes	mg/kg	-	0.00490	0.00483	0.00338	1.4	<b>36.7</b>
	C2-Phenanthrenes/Anthracenes	mg/kg	-	0.00061	0.00027	0.00054	<b>77.3</b>	13.1
	C3-Dibenzothiophenes	mg/kg	-	0.00082	0.00077	0.00080	6.0	2.7
	C3-Fluoranthenes/Pyrenes	mg/kg	-	0.00094	0.00124	0.00130	<b>27.6</b>	<b>32.2</b>
	C3-Fluorenes	mg/kg	-	0.00173	0.00093	0.00129	<b>59.9</b>	<b>29.1</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.

# Analytes differ by > 20% between duplicate/split and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.

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

Category	Analyte	Unit	DLs	Sample			RPD <sup>1</sup> from CHL-1	
				Station	Split	Duplicate	Split	Duplicate
				CHL-1	SIB-D1	DIB-D1	SIB-D1	DIB-D1
<b>PAHs</b> <b>cont'd.<sup>2</sup></b>	C3-Naphthalenes	mg/kg	-	0.00127	0.00138	0.00044	8.3	96.7
	C3-Phenanthrenes/Anthracenes	mg/kg	-	0.00038	0.00078	0.00051	69.7	29.3
	C4-Dibenzothiophenes	mg/kg	-	0.00043	0.00108	0.00082	86.5	62.4
	C4-Naphthalenes	mg/kg	-	0.00052	0.00056	0.00024	8.1	74.6
	C4-Phenanthrenes/Anthracenes	mg/kg	-	0.00550	0.00906	0.00997	48.9	57.8
	Chrysene	mg/kg	-	0.00049	0.00045	0.00068	9.5	32.0
	Dibenz[a,h]anthracene	mg/kg	-	0.00020	<0.00016	<0.00018	19.8	10.5
	Dibenzothiophene	mg/kg	-	0.00012	0.00017	0.00011	34.2	10.4
	Fluoranthene	mg/kg	-	0.00063	0.00088	0.00106	32.4	50.6
	Fluorene	mg/kg	-	0.00008	0.00020	0.00011	86.1	29.5
	Indeno[1,2,3-c,d]-pyrene	mg/kg	-	0.00047	0.00043	0.00050	10.2	5.7
	Naphthalene	mg/kg	-	0.00033	<0.00046	0.00034	31.4	3.0
	Phenanthrene	mg/kg	-	0.00048	0.00094	0.00060	64.7	22.3
	Pyrene	mg/kg	-	0.00055	0.00076	0.00090	33.2	48.5
	Retene	mg/kg	-	0.00334	0.00409	0.00744	20.2	76.1
	<b>Total</b>	Total Aluminum (Al)	mg/kg	50	513	631	643	20.6
<b>Metals</b>	Total Antimony (Sb)	mg/kg	0.1	0.23	0.12	0.12	62.9	62.9
	Total Arsenic (As)	mg/kg	0.1	0.65	0.68	0.56	4.5	14.9
	Total Barium (Ba)	mg/kg	0.5	9.11	11	11.1	18.8	19.7
	Total Beryllium (Be)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Bismuth (Bi)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Cadmium (Cd)	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
	Total Calcium (Ca)	mg/kg	100	930	970	840	4.2	10.2
	Total Chromium (Cr)	mg/kg	0.5	2.04	2	2.4	2.0	16.2
	Total Cobalt (Co)	mg/kg	0.1	0.53	0.56	0.57	5.5	7.3
	Total Copper (Cu)	mg/kg	0.5	1.22	1.23	1.12	0.8	8.5
	Total Iron (Fe)	mg/kg	200	2050	2080	1910	1.5	7.1
	Total Lead (Pb)	mg/kg	0.5	4.21	7.32	5.75	53.9	30.9
	Total Lithium (Li)	mg/kg	0.5	<0.5	<0.5	<0.5	0.0	0.0
	Total Magnesium (Mg)	mg/kg	20	393	453	347	14.2	12.4
	Total Manganese (Mn)	mg/kg	1	52.4	32.1	30.5	48.0	52.8
	Total Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Molybdenum (Mo)	mg/kg	0.1	<0.1	<0.1	<0.1	0.0	0.0
	Total Nickel (Ni)	mg/kg	0.5	1.02	1.12	1.11	9.3	8.5
	Total Phosphorus (P)	mg/kg	100	150	180	160	18.2	6.5
	Total Potassium (K)	mg/kg	100	120	170	110	34.5	8.7
	Total Selenium (Se)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Silver (Ag)	mg/kg	0.2	<0.2	<0.2	<0.2	0.0	0.0
	Total Sodium (Na)	mg/kg	100	<100	<100	<100	0.0	0.0
	Total Strontium (Sr)	mg/kg	1	4.9	5.7	5.4	15.1	9.7
	Total Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	<0.05	0.0	0.0
	Total Tin (Sn)	mg/kg	2	3.5	<2	<2	54.5	54.5
	Total Titanium (Ti)	mg/kg	1	39.3	36.5	48.6	7.4	21.2
	Total Uranium (U)	mg/kg	0.05	0.115	0.136	0.253	16.7	75.0
	Total Vanadium (V)	mg/kg	0.2	2.68	2.53	3.12	5.8	15.2
	Total Zinc (Zn)	mg/kg	5	13	12.2	12.4	6.3	4.7

<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.

# Analytes differ by > 20% between duplicate/split and concentrations are > 5 times the detection limit, or for PAHs, are both detectable.



**Table B.2-11 Concentration of metals in sediment sampling equipment rinsate blank, September 2012.**

Analyte Category	Analyte	Units	DL	Rinsate sample	
				RIS-D1	RIS-D2
<b>Dissolved Metals</b>	Aluminum (Al)	mg/L	0.001	<0.001	<0.001
	Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005
	Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001
	Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001
	Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001
	Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001
	Boron (B)	mg/L	0.0008	0.00083	<0.0008
	Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	0.1	<0.1	<0.1
	Chlorine (Cl)	mg/L	0.3	<0.3	<0.3
	Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003
	Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001
	Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001
	Iron (Fe)	mg/L	0.004	<0.004	<0.004
	Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001
	Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002
	Manganese (Mn)	mg/L	0.0001	<0.0001	<0.0001
	Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005
	Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001
	Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001
	Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003
	Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001
	Strontium (Sr)	mg/L	0.0001	<0.0001	<0.0001
	Sulphur (S)	mg/L	2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	
Zinc (Zn)	mg/L	0.0002	0.000234	<0.0002	
<b>Total Metals</b>	Aluminum (Al)	mg/L	0.003	<0.003	<0.003
	Antimony (Sb)	mg/L	0.00005	<0.00005	<0.00005
	Arsenic (As)	mg/L	0.0001	<0.0001	<0.0001
	Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001
	Beryllium (Be)	mg/L	0.0001	<0.0001	<0.0001
	Bismuth (Bi)	mg/L	0.0001	<0.0001	<0.0001
	Boron (B)	mg/L	0.0008	0.00098	<0.0008
	Cadmium (Cd)	mg/L	0.0001	<0.00001	<0.00001
	Calcium (Ca)	mg/L	0.1	<0.1	<0.1
	Chlorine (Cl)	mg/L	0.3	<0.3	<0.3
	Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003
	Cobalt (Co)	mg/L	0.0001	<0.0001	<0.0001
	Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001
	Iron (Fe)	mg/L	0.004	<0.004	<0.004
	Lead (Pb)	mg/L	0.0001	<0.0001	<0.0001
	Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002
	Manganese (Mn)	mg/L	0.0001	0.00012	<0.0001
	Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005
	Molybdenum (Mo)	mg/L	0.0001	<0.0001	<0.0001
	Nickel (Ni)	mg/L	0.0001	<0.0001	<0.0001
	Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003
	Silver (Ag)	mg/L	0.00001	<0.00001	<0.00001
	Strontium (Sr)	mg/L	0.0001	<0.0001	<0.0001
	Sulphur (S)	mg/L	2	<2	<2
Thallium (Tl)	mg/L	0.0001	<0.0001	<0.0001	
Thorium (Th)	mg/L	0.0001	<0.0001	<0.0001	
Tin (Sn)	mg/L	0.0001	<0.0001	<0.0001	
Titanium (Ti)	mg/L	0.0001	<0.0001	<0.0001	
Uranium (U)	mg/L	0.0001	<0.0001	<0.0001	
Vanadium (V)	mg/L	0.0001	<0.0001	<0.0001	
Zinc (Zn)	mg/L	0.0002	0.000328	0.000228	

# Variables are > 5 times the detection limit

**Table B.2-12 Concentration of PAHs in sediment sampling equipment rinsate blank, September 2012.**

Analyte	Units	Rinsate sample			
		RIS-D1		RIS-D2	
		DL	Rinsate	DL	Rinsate
Acenaphthene	ng/L	0.454	1.180	0.454	0.810
Acenaphthylene	ng/L	0.244	1.080	0.244	0.721
Anthracene	ng/L	0.188	0.508	0.188	0.433
Benz[a]anthracene	ng/L	0.379	<0.379	0.379	<0.379
Benzo[a]pyrene	ng/L	0.309	<0.309	0.245	<0.245
Benzo[b,j,k]fluoranthene	ng/L	0.188	<0.188	0.188	<0.188
Benzo[g,h,i]perylene	ng/L	0.226	0.342	0.188	0.284
Biphenyl	ng/L	2.090	3.730	2.090	3.440
C1-Acenaphthenes	ng/L	0.188	<0.188	0.188	<0.188
C1-Benzo[a]anthracenes/Chrysenes	ng/L	0.690	<0.690	0.690	<0.690
C1-Benzofluoranthenes/Benzopyrenes	ng/L	0.671	<0.671	0.671	5.890
C1-Biphenyls	ng/L	21.541	<21.541	21.541	<21.541
C1-Dibenzothiophenes	ng/L	0.123	0.913	0.126	0.793
C1-Fluoranthenes/Pyrenes	ng/L	1.005	<1.005	1.005	<1.005
C1-Fluorenes	ng/L	9.857	<9.857	9.857	<9.857
C1-Naphthalenes	ng/L	2.248	115.000	2.248	61.200
C1-Phenanthrenes/Anthracenes	ng/L	0.852	3.220	0.852	1.870
C2-Benzo[a]anthracenes/Chrysenes	ng/L	0.313	<0.313	0.313	<0.313
C2-Benzofluoranthenes/Benzopyrenes	ng/L	1.221	<1.221	1.221	8.360
C2-Biphenyls	ng/L	99.118	<99.118	99.118	99.500
C2-Dibenzothiophenes	ng/L	1.557	2.000	1.557	1.820
C2-Fluoranthenes/Pyrenes	ng/L	1.727	1.900	1.727	<1.727
C2-Fluorenes	ng/L	1.651	5.580	1.651	5.170
C2-Naphthalenes	ng/L	3.683	26.800	3.683	15.400
C2-Phenanthrenes/Anthracenes	ng/L	0.716	2.470	0.716	3.380
C3-Dibenzothiophenes	ng/L	1.355	<1.355	1.355	1.650
C3-Fluoranthenes/Pyrenes	ng/L	0.739	0.792	0.739	1.080
C3-Fluorenes	ng/L	4.592	5.690	4.592	14.000
C3-Naphthalenes	ng/L	2.941	10.500	2.941	8.570
C3-Phenanthrenes/Anthracenes	ng/L	1.113	1.380	1.113	<1.113
C4-Dibenzothiophenes	ng/L	1.878	<1.878	1.878	2.360
C4-Naphthalenes	ng/L	2.298	5.700	2.298	6.790
C4-Phenanthrenes/Anthracenes	ng/L	3.935	<3.935	3.935	<3.935
Chrysene	ng/L	0.589	<0.589	0.589	<0.589
Dibenz[a,h]anthracene	ng/L	0.406	<0.406	0.406	<0.406
Dibenzothiophene	ng/L	0.207	1.490	0.207	1.200
Fluoranthene	ng/L	0.927	0.983	0.927	<0.927
Fluorene	ng/L	0.283	4.060	0.283	2.630
Indeno[1,2,3-c,d]-pyrene	ng/L	0.248	<0.248	0.248	<0.248
Naphthalene	ng/L	8.774	120.000	8.774	108.000
Phenanthrene	ng/L	1.043	8.260	1.043	5.600
Pyrene	ng/L	0.877	0.989	0.877	<0.877
Retene	ng/L	0.356	0.489	0.346	0.522

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

# Indicates the sample concentration was greater than five times the concentration in the lab blank.

## **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). 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.

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, current velocity and depth) were calibrated according to recommendations from the respective manufacturer (as frequently as daily for pH and dissolved oxygen meters). Site 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 COC forms.

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

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 lab. QC results 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 is also detailed on the laboratory output. QC procedures used by Flett include laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards. Duplicate samples for mercury analyses were completed for 3 individual tissue samples (Table B.2-13).

Data were received in electronic format (Microsoft Excel<sup>®</sup>) from the analytical lab 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.2-13 Relative percent difference between duplicate mercury fish tissue samples collected from Clearwater River, fall 2012.**

Waterbody	Sample ID	Units	Sample Date	Sample	Duplicate	Relative Percent Difference	Type of Sample
Clearwater River	NRPK-239-01A	ng/g wet weight	25-Sept-12	200	197	1.52	Duplicate
	NRPK-02-03A	ng/g wet weight	27-Sept-12	112	120	6.67	Duplicate
Gregoire Lake	GL-12	ng/g wet weight	12-Oct-12	139	152	8.93	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 158 structures that had QA/QC analyses performed, 71 age estimate had a confidence rating of “good”; 63 age estimates had a confidence rating of “fair”; 24 age estimates had a confidence rating of “poor”; and one age estimate had a confidence rating of “very poor”, indicating consistent laboratory procedures for analyzing ages in fin ray samples (Table B.2-14). An explanation of the confidence index for analyzing fish ageing structures is provided in Table B.2-15.

**Table B.2-14 Ageing QA/QC for Athabasca and Clearwater Inventory, spring, summer, and fall 2012.**

Location	Season	Date	Structure	Species	Fish ID	Age	Confidence Index	QA/QC Age
<i>Athabasca River</i>								
00B	Spring	16-May-12	FR	WALL	1	8	G	9
00B	Spring	16-May-12	FR	WALL	2	7	F	8
00B	Spring	16-May-12	FR	WALL	3	10	G	10
00B	Spring	16-May-12	FR	WALL	4	10	F	7
00B	Spring	16-May-12	FR	WALL	5	5	F	5
00B	Spring	16-May-12	FR	WALL	6	5	F	5
00B	Spring	16-May-12	FR	WALL	7	8	G	9
00B	Spring	16-May-12	FR	WALL	8	5	G	5
00B	Spring	16-May-12	FR	WALL	9	5	G	5
00B	Spring	16-May-12	FR	WALL	10	10	F	11
00B	Spring	16-May-12	FR	WALL	11	7	F	6
00B	Spring	16-May-12	FR	GOLD	15	5	F	6
00B	Spring	16-May-12	FR	GOLD	16	7	F	7
00B	Spring	16-May-12	FR	GOLD	17	6	F	6
00B	Spring	16-May-12	FR	GOLD	18	3	G	3
00B	Spring	16-May-12	FR	GOLD	19	5	F	4
00B	Spring	16-May-12	FR	GOLD	20	5	F	5
00B	Spring	16-May-12	FR	GOLD	21	5	F	5
00B	Spring	16-May-12	FR	WHSC	23	1	F	1
00B	Spring	16-May-12	FR	WHSC	49	4	G	5
00B	Spring	16-May-12	FR	NRPK	50	4	P	4
01A	Spring	16-May-12	FR	WALL	1	10	F	9
01A	Spring	16-May-12	FR	WALL	2	7	F	7
01A	Spring	16-May-12	FR	WALL	3	5	P	5
01A	Spring	16-May-12	FR	WALL	4	5	F	5
01A	Spring	16-May-12	FR	WALL	5	7	P	7
01A	Spring	16-May-12	FR	WALL	6	6	G	6
01A	Spring	16-May-12	FR	WALL	7	6	P	6
01A	Spring	16-May-12	FR	WALL	10	6	F	6
01A	Spring	16-May-12	FR	GOLD	14	7	G	7
01A	Spring	16-May-12	FR	GOLD	15	4	P	5
01A	Spring	16-May-12	FR	LNSC	18	7	P	7
01A	Spring	16-May-12	FR	LNSC	19	14	P	15
01A	Spring	16-May-12	FR	GOLD	20	7	P	8
01A	Spring	16-May-12	FR	LNSC	21	10	P	10
01A	Spring	16-May-12	FR	NRPK	23	5	P	6
01A	Spring	16-May-12	FR	GOLD	24	4	F	4

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

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

Location	Season	Date	Structure	Species	Fish ID	Age	Confidence Index	QA/QC Age
<i>Athabasca River (Cont'd.)</i>								
01A	Spring	16-May-12	FR	WALL	25	8	VP	8
00B	Summer	23-Jul-12	FR	WALL	5	4	F	4
00B	Summer	23-Jul-12	FR	WALL	6	4	G	4
00B	Summer	23-Jul-12	FR	WALL	7	6	G	6
00B	Summer	23-Jul-12	FR	WALL	9	2	G	3
03B	Summer	23-Jul-12	FR	GOLD	7	6	G	5
03B	Summer	23-Jul-12	FR	GOLD	8	5	F	5
03B	Summer	23-Jul-12	FR	GOLD	9	7	G	7
03B	Summer	23-Jul-12	FR	WALL	12	2	F	3
04A	Summer	24-Jul-12	FR	GOLD	6	12	P	13
04A	Summer	24-Jul-12	FR	GOLD	8	3	F	3
04A	Summer	24-Jul-12	FR	LNSC	9	2	F	3
04A	Summer	24-Jul-12	FR	LNSC	18	9	F	10
04B	Summer	24-Jul-12	FR	LNSC	20	7	G	8
04B	Summer	24-Jul-12	FR	WHSC	21	2	G	2
04B	Summer	24-Jul-12	FR	WALL	22	3	G	3
11A	Summer	27-Jul-12	FR	WHSC	5	4	G	5
11A	Summer	27-Jul-12	FR	NRPK	6	4	G	4
11A	Summer	27-Jul-12	FR	GOLD	7	9	P	10
11A	Summer	27-Jul-12	FR	WHSC	8	4	G	4
19B	Summer	2-Aug-12	FR	WALL	1	4	G	4
19B	Summer	2-Aug-12	FR	WALL	2	2	F	3
19B	Summer	2-Aug-12	FR	WALL	3	3	F	4
19B	Summer	2-Aug-12	FR	GOLD	4	9	F	11
19B	Summer	2-Aug-12	FR	WALL	31	9	G	9
19B	Summer	2-Aug-12	FR	WHSC	32	3	G	3
19B	Summer	2-Aug-12	FR	WHSC	36	2	G	2
06A	Summer	4-Aug-12	FR	LNSC	30	10	F	9
06A	Summer	4-Aug-12	FR	WALL	32	6	G	6
06A	Summer	4-Aug-12	FR	WALL	33	3	G	3
19B	Fall	17-Sep-12	FR	GOLD	37	5	G	5
19B	Fall	17-Sep-12	FR	WHSC	39	5	G	5
19B	Fall	17-Sep-12	FR	NRPK	46	5	F	5
19B	Fall	17-Sep-12	FR	WALL	47	4	G	5
10B	Fall	18-Sep-12	FR	WHSC	22	10	F	12
10B	Fall	18-Sep-12	FR	WALL	23	12	F	11
10B	Fall	18-Sep-12	FR	WALL	24	6	F	7
10B	Fall	18-Sep-12	FR	WHSC	25	8	F	8

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

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

Location	Season	Date	Structure	Species	Fish ID	Age	Confidence Index	QA/QC Age
<b><i>Athabasca River (Cont'd.)</i></b>								
03B	Fall	19-Sep-12	FR	WHSC	5	8	G	8
03B	Fall	19-Sep-12	FR	WALL	6	4	G	4
03B	Fall	19-Sep-12	FR	LNSC	7	10	G	11
03B	Fall	19-Sep-12	FR	WALL	8	7	F	7
11A	Fall	20-Sep-12	FR	GOLD	69	4	G	4
11A	Fall	20-Sep-12	FR	GOLD	70	4	G	4
11A	Fall	20-Sep-12	FR	GOLD	71	6	G	6
11A	Fall	20-Sep-12	FR	GOLD	79	9	F	9
00B	Fall	21-Sep-12	FR	GOLD	9	9	F	8
00B	Fall	21-Sep-12	FR	GOLD	10	5	G	5
00B	Fall	21-Sep-12	FR	GOLD	11	16	F	17
00B	Fall	21-Sep-12	FR	GOLD	12	5	G	5
01A	Fall	21-Sep-12	FR	GOLD	17	7	G	7
01A	Fall	21-Sep-12	FR	GOLD	18	4	G	4
01A	Fall	21-Sep-12	FR	GOLD	19	4	G	4
01A	Fall	21-Sep-12	FR	LNSC	23	8	G	8
04A	Fall	24-Sep-12	FR	GOLD	25	2	G	2
04A	Fall	24-Sep-12	FR	GOLD	27	2	G	2
04A	Fall	24-Sep-12	FR	GOLD	30	4	G	4
04A	Fall	24-Sep-12	FR	GOLD	31	4	G	4
05B	Fall	24-Sep-12	FR	LNSC	152	3	F	4
05B	Fall	24-Sep-12	FR	WALL	153	4	F	4
05B	Fall	24-Sep-12	FR	WHSC	173	5	F	5
05B	Fall	24-Sep-12	FR	WHSC	174	5	G	5
04B	Fall	28-Sep-12	FR	WHSC	37	4	F	4
04B	Fall	28-Sep-12	FR	GOLD	38	3	G	3
04B	Fall	28-Sep-12	FR	WHSC	39	9	F	8
04B	Fall	28-Sep-12	FR	GOLD	40	5	G	5
05A	Fall	28-Sep-12	FR	GOLD	77	7	G	7
05A	Fall	28-Sep-12	FR	WHSC	78	5	F	6
05A	Fall	28-Sep-12	FR	WALL	79	8	F	8
06A	Fall	28-Sep-12	FR	WALL	35	12	G	11
06A	Fall	28-Sep-12	FR	WALL	36	6	G	6
06A	Fall	28-Sep-12	FR	WALL	37	3	F	3
06A	Fall	28-Sep-12	FR	GOLD	38	2	F	2
<b><i>Clearwater River</i></b>								
01A	Spring	29-May-12	FR	WHSC	6	4	G	4
01A	Spring	29-May-12	FR	NRPK	69	7	P	7

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

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

Location	Season	Date	Structure	Species	Fish ID	Age	Confidence Index	QA/QC Age
<i>Clearwater River (Cont'd.)</i>								
02A	Spring	29-May-12	FR	WHSC	5	3	G	3
02A	Spring	29-May-12	FR	WHSC	10	3	G	3
02C	Spring	30-May-12	FR	WHSC	4	3	G	3
02C	Spring	30-May-12	FR	WHSC	13	5	G	6
03A	Spring	30-May-12	FR	GOLD	2	12	P	14
03A	Spring	30-May-12	FR	GOLD	13	4	G	4
03A	Spring	30-May-12	FR	WHSC	19	5	F	5
03A	Spring	30-May-12	FR	WALL	62	4	P	4
03B	Spring	30-May-12	FR	WHSC	13	2	F	3
03B	Spring	30-May-12	FR	LNSC	25	3	G	3
03B	Spring	30-May-12	FR	WHSC	43	2	G	2
01A	Summer	31-Jul-12	FR	WHSC	17	10	P	11
01A	Summer	31-Jul-12	FR	WHSC	18	4	G	4
01A	Summer	31-Jul-12	FR	WHSC	19	2	G	2
01A	Summer	31-Jul-12	FR	WHSC	20	12	P	12
02A	Summer	1-Aug-12	FR	NRPK	1	6	F	6
02A	Summer	1-Aug-12	FR	WHSC	2	4	G	4
02A	Summer	1-Aug-12	FR	NRPK	3	3	G	3
02A	Summer	1-Aug-12	FR	NRPK	4	3	F	3
03A	Summer	1-Aug-12	FR	WALL	36	5	G	5
03A	Summer	1-Aug-12	FR	GOLD	38	5	G	5
03A	Summer	1-Aug-12	FR	WALL	39	5	F	5
03A	Summer	1-Aug-12	FR	LNSC	41	6	G	5
03B	Summer	1-Aug-12	FR	WHSC	35	4	G	4
03B	Summer	1-Aug-12	FR	WHSC	36	7	F	7
03B	Summer	1-Aug-12	FR	NRPK	41	3	F	4
03B	Summer	1-Aug-12	FR	LNSC	43	5	F	5
01A	Fall	25-Sep-12	FR	NRPK	231	7	P	6
01A	Fall	25-Sep-12	FR	NRPK	232	3	F	3
01A	Fall	25-Sep-12	FR	NRPK	233	3	F	3
01A	Fall	25-Sep-12	FR	NRPK	235	3	F	3
02A	Fall	26-Sep-12	FR	WHSC	99	1	G	1
02A	Fall	26-Sep-12	FR	WHSC	100	1	G	1
02A	Fall	26-Sep-12	FR	WHSC	101	2	F	1
02C	Fall	26-Sep-12	FR	NRPK	35	5	P	4
02C	Fall	26-Sep-12	FR	NRPK	36	4	P	6
02C	Fall	26-Sep-12	FR	NRPK	37	4	P	5
02C	Fall	26-Sep-12	FR	NRPK	38	2	P	3

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



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

Location	Season	Date	Structure	Species	Fish ID	Age	Confidence Index	QA/QC Age
<i>Clearwater River (Cont'd.)</i>								
03A	Fall	27-Sep-12	FR	GOLD	25	4	G	4
03A	Fall	27-Sep-12	FR	GOLD	30	5	G	5
03A	Fall	27-Sep-12	FR	GOLD	32	8	F	9
03A	Fall	27-Sep-12	FR	WALL	43	1	F	1
03B	Fall	27-Sep-12	FR	WHSC	10	6	F	6
03B	Fall	27-Sep-12	FR	WHSC	14	2	F	2
03B	Fall	27-Sep-12	FR	WHSC	16	4	F	4
03B	Fall	27-Sep-12	FR	WHSC	19	5	P	4

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

**Table B.2-15 Explanation of the index used to classify confidence in estimates of fish age.**

Confidence Indices and Abbreviations	Qualitative characteristics (pattern clarity)	Quantitative characteristics (repeatability)
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 entirely 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 2012).

### **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).

Duplicate samples were collected during the ASL component sampling program, which accounted for approximately 10% of the total number of samples collected. Variability between duplicate samples was assessed as high when the relative percent difference between sample concentrations for an analyte was greater than 20% when both concentrations were greater than or equal to five times the MDL. One duplicate sample and one field blank sample were collected during the spring acid pulse study on Rat Lake

### **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. Programs used 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.

### **B.2.6.3 Results and Discussion**

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

Duplicate samples were taken in three of the 50 lakes for conventional variables, ions, and nutrients (Table B.2-16). All of the conventional variables were compliant with the conditions stated above. The relative percent difference was greater than 20% for TSS and ammonia at NE4, where both concentrations were greater than five times the MDL. There were also a few other analytes with a relative percentage difference that exceeded 20% (Table B.2-16Table ); however, the concentrations of these analytes were less than five times the MDL.

A duplicate sample was taken at Rat Lake in spring 2012 during the spring acid pulse study. The results for the metals analyses show high variability between samples. A number of analytes exceeding a 20% RPD when both concentrations were greater than five times the detection limit, including dissolved copper, iron, lead, manganese, and zinc and total aluminum, cobalt, lead, nickel, uranium, and zinc. The high variability in the RPD these analytes suggests the possibility of either contamination of the samples or heterogeneity within the aquatic environment.

#### ***Field Blank Samples***

A field blank sample was taken at Rat Lake in spring 2012 during the spring acid pulse study. Concentrations of all conventional variables, major ions, nutrients, hydrocarbons, dissolved and total metals, and polycyclic aromatic hydrocarbons (PAHs) in the field blank were less than five times the detection limit, with the exception of dissolved barium (Table B.2-17).

**Table B.2-16 Relative percent difference between duplicate water quality samples collected for conventional variables from three lakes, 2012.**

Variable	Units	DL	Lake 400/NE4			Lake 167/SM5			Lake 442/BM9		
			29-Aug-12			30-Aug-12			31-Aug-12		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Ammonia	µg/L	2	86	49	54.8	4	4	0.0	5	4	22.2
Nitrate+Nitrite	µg/L	1	3	4	28.6	2	3	40.0	3	2	40.0
Nitrite	µg/L	1	2	3	40.0	1	2	66.7	1	1	0.0
Total nitrogen	µg/L	10	1,220	1,220	0.0	880	920	4.4	419	453	7.8
Total dissolved nitrogen	µg/L	10	541	535	1.1	626	640	2.2	343	354	3.2
Total Kjeldahl nitrogen	µg/L	10	1217	1216	0.1	878	917	4.3	416	451	8.1
Total phosphorus	µg/L	3	45	54	18.2	35	37	5.6	14	14	0.0
Total dissolved phosphorus	µg/L	3	3	4	28.6	3	4	28.6	3	4	28.6
Dissolved organic carbon	mg/L	0.2	13.3	13.5	1.5	13.7	13.8	0.7	12.2	12.0	1.7
Dissolved inorganic carbon	mg/L	0.2	3.8	3.7	2.7	0.9	1.0	10.5	1.9	1.9	0.0
Chloride	mg/L	0.03	0.36	0.36	0	0.12	0.11	9	0.07	0.07	0
Sulphate	mg/L	0.04	1.59	1.72	7.9	0.69	0.74	7.0	1.06	1.05	0.9
Sodium	mg/L	0.02	1.07	1.09	1.9	0.39	0.37	5.3	0.81	0.81	0.0
Potassium	mg/L	0.01	0.75	0.76	1.3	0.39	0.37	5.3	0.41	0.40	2.5
Calcium	mg/L	0.005	2.95	2.95	0.0	1.23	1.22	0.8	2.87	2.85	0.7
Magnesium	mg/L	0.01	1.75	1.74	0.6	0.47	0.47	0.0	1.05	1.05	0.0
Iron	mg/L	0.02	0.10	0.07	35.3	0.07	0.07	0.0	0.07	0.07	0.0
Total Alkalinity	mg/L as CaCO <sub>3</sub>	2	12.90	13.02	0.9	3.73	3.73	0.0	10.18	9.79	3.9
Bicarbonate	mg/L as HCO <sub>3</sub>		15.75	15.88	0.8	4.55	4.55	0.0	12.42	11.95	3.9
Carbonate	mg/L as CO <sub>3</sub>		0.00	0.00	0.0	0.00	0.00	0.0	0.00	0.00	0.0
Gran Alkalinity	mg/L as CaCO <sub>3</sub>	0.2	11.49	11.24	2.2	2.36	2.27	3.9	8.60	8.14	5.5
Conductivity	µS/cm		30.00	27.80	7.6	10.29	11.63	12.2	23.90	23.80	0.4
pH	pH units		7.32	7.32	0.0	6.10	6.09	0.2	7.20	7.18	0.3
True Colour	mg/L	1	74.16	78.37	5.5	66.52	66.52	0.0	37.54	37.34	0.5
Turbidity	NTU		10.80	10.70	0.9	5.43	5.65	4.0	1.50	1.40	6.9
TDS	mg/L	0.04	55.00	65.00	16.7	49.00	54.00	9.7	50.00	56.00	11.3
TSS (non-filterable residue)	mg/L	0.05	18.40	7.05	89.2	6.50	7.50	14.3	0.50	0.50	0.0
Chlorophyll a	µg/L	0.2	36.58	36.63	0.1	20.32	20.24	0.4	11.00	9.09	19.0

<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.

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

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

**Table B.2-17 Results of analysis of the field blank taken from Rat Lake, May 2012.**

Variable	Unit	Detection Limit	Concentration in Field Blank 25-May-12
<b>Conventional Variables</b>			
Conductivity	µS/cm	1	<1
Dissolved Organic Carbon	mg/L	0.5	<0.5
Hardness (as CaCO <sub>3</sub> )	mg/L	0.5	<0.5
pH	pH units	-	6.04
Total Alkalinity	mg/L	0.5	0.59
Total Dissolved Solids	mg/L	10	<10
<b>Major Ions</b>			
Bicarbonate (HCO <sub>3</sub> )	mg/L	0.5	0.72
Calcium (Ca)	mg/L	0.3	<0.30
Chloride (Cl)	mg/L	1	<1.00
Magnesium (Mg)	mg/L	0.2	<0.20
Potassium (K)	mg/L	0.3	<0.30
Sodium (Na)	mg/L	0.5	<0.50
Sulfate (SO <sub>4</sub> )	mg/L	1	<1.00
<b>Nutrients</b>			
Nitrate+Nitrite	mg/L	0.003	<0.003
<b>Dissolved Metals</b>			
Aluminum (Al)	µg/L	0.2	<0.2
Antimony (Sb)	µg/L	0.02	<0.02
Arsenic (As)	µg/L	0.02	0.049
Barium (Ba)	µg/L	0.02	0.424
Beryllium (Be)	µg/L	0.01	<0.01
Bismuth (Bi)	µg/L	0.005	<0.005
Boron (B)	µg/L	50	<50
Cadmium (Cd)	µg/L	0.005	0.011
Calcium (Ca)	µg/L	0.05	<0.05
Chromium (Cr)	µg/L	0.1	<0.1
Cobalt (Co)	µg/L	0.005	<0.005
Copper (Cu)	µg/L	0.05	<0.05
Iron (Fe)	µg/L	1	<1
Lead (Pb)	µg/L	0.005	<0.005
Lithium (Li)	µg/L	0.5	<0.5
Manganese (Mn)	µg/L	0.05	<0.05
Molybdenum (Mo)	µg/L	0.05	<0.05
Nickel (Ni)	µg/L	0.02	<0.02
Selenium (Se)	µg/L	0.04	<0.04
Silver (Ag)	µg/L	0.005	<0.005
Strontium (Sr)	µg/L	0.05	0.25
Sulphur (S)	mg/L	10	<10

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

**Table B.2-17 (Cont'd.)**

Variable	Unit	Detection Limit	Concentration in Field Blank 25-May-12
<b>Dissolved Metals (Cont'd.)</b>			
Thallium (Tl)	µg/L	0.002	<0.002
Tin (Sn)	µg/L	0.2	<0.2
Titanium (Ti)	µg/L	0.5	<0.5
Uranium (U)	µg/L	0.002	<0.002
Vanadium (V)	µg/L	0.2	<0.2
Zinc (Zn)	µg/L	0.1	<0.1
<b>Total Metals</b>			
Aluminum (Al)	µg/L	0.2	0.20
Antimony (Sb)	µg/L	0.02	<0.02
Arsenic (As)	µg/L	0.02	<0.02
Barium (Ba)	µg/L	0.02	0.031
Beryllium (Be)	µg/L	0.01	<0.01
Bismuth (Bi)	µg/L	0.005	<0.005
Boron (B)	µg/L	50	<50
Cadmium (Cd)	µg/L	0.005	<0.005
Calcium (Ca)	mg/L	0.05	<0.05
Chromium (Cr)	µg/L	0.1	<0.1
Cobalt (Co)	µg/L	0.005	<0.005
Copper (Cu)	µg/L	0.05	<0.05
Iron (Fe)	µg/L	1	<1
Lead (Pb)	µg/L	0.005	<0.005
Lithium (Li)	µg/L	0.5	<0.5
Manganese (Mn)	µg/L	0.05	<0.05
Molybdenum (Mo)	µg/L	0.05	<0.05
Nickel (Ni)	µg/L	0.02	<0.02
Selenium (Se)	µg/L	0.04	<0.04
Silver (Ag)	µg/L	0.005	<0.005
Strontium (Sr)	mg/L	10	<10
Sulphur (S)	µg/L	0.05	<0.05
Thallium (Tl)	µg/L	0.002	<0.002
Tin (Sn)	µg/L	0.2	<0.2
Titanium (Ti)	µg/L	0.5	<0.5
Uranium (U)	µg/L	0.002	<0.002
Vanadium (V)	µg/L	0.2	<0.2
Zinc (Zn)	µg/L	0.1	0.13
#	Indicates sample concentration is greater than five times the detection limit.		

**Table B.2-18 Relative percent difference between duplicate water quality samples collected from the Rat Lake (RAL-1), March 2012.**

Analyte	Unit	Detection Limit	RAL-1 5-Mar-12	Duplicate 5-Mar-12	Relative Percent Difference (%)
<b>Conventional Variables</b>					
Conductivity	µS/cm	1	320	320	0.0
Dissolved Organic Carbon	mg/L	0.5	25	26	3.9
Hardness (as CaCO <sub>3</sub> )	mg/L	0.5	150	150	0.0
pH	pH units	-	7.65	7.64	0.1
Total Alkalinity	mg/L	0.5	160	160	0.0
Total Dissolved Solids	mg/L	10	170	170	0.0
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	0.5	190	200	5.1
Calcium (Ca)	mg/L	0.3	40	39	2.5
Chloride (Cl)	mg/L	1	4.7	4.5	4.3
Magnesium (Mg)	mg/L	0.2	11	11	0.0
Potassium (K)	mg/L	0.3	2.8	2.9	3.5
Sodium (Na)	mg/L	0.5	11	11	0.0
Sulfate (SO <sub>4</sub> )	mg/L	1	<1.0	<1.0	0.0
<b>Nutrients</b>					
Nitrate+Nitrite	mg/L	0.003	<0.003	<0.003	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.2	2.8	2.3	19.6
Antimony (Sb)	mg/L	0.02	0.04	0.07	54.5
Arsenic (As)	mg/L	0.02	0.43	0.47	8.9
Barium (Ba)	mg/L	0.02	34.5	37	7.0
Beryllium (Be)	mg/L	0.01	<0.01	<0.01	0.0
Bismuth (Bi)	mg/L	0.005	<0.005	<0.005	0.0
Boron (B)	mg/L	50	<50	<50	0.0
Cadmium (Cd)	mg/L	0.005	<0.005	<0.005	0.0
Calcium (Ca)	mg/L	0.05	36.4	39.8	8.9
Chromium (Cr)	mg/L	0.1	0.2	0.1	66.7
Cobalt (Co)	mg/L	0.005	0.053	0.045	16.3
Copper (Cu)	mg/L	0.05	0.73	0.96	27.2
Iron (Fe)	mg/L	1	186	247	28.2
Lead (Pb)	mg/L	0.005	0.11	0.24	75.0
Lithium (Li)	mg/L	0.5	10.4	10.8	3.8
Manganese (Mn)	mg/L	0.05	1.8	16.8	161.3
Molybdenum (Mo)	mg/L	0.05	0.1	0.1	0.0
Nickel (Ni)	mg/L	0.02	0.47	0.48	2.1
Selenium (Se)	mg/L	0.04	0.06	0.07	15.4
Silver (Ag)	mg/L	0.005	<0.005	<0.005	0.0
Strontium (Sr)	mg/L	0.05	130	141	8.1

Undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

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

Analyte	Unit	Detection Limit	RAL-1 5-Mar-12	Duplicate 5-Mar-12	Relative Percent Difference (%)
<b>Dissolved Metals (Cont'd.)</b>					
Sulphur (S)	mg/L	10	<10.000	<10.000	0.0
Thallium (Tl)	mg/L	0.002	<0.002	<0.002	0.0
Tin (Sn)	mg/L	0.2	<0.200	0.3	<b>40.0</b>
Titanium (Ti)	mg/L	0.5	<0.500	<0.500	0.0
Uranium (U)	mg/L	0.002	0.065	0.064	1.6
Vanadium (V)	mg/L	0.2	<0.200	<0.200	0.0
Zinc (Zn)	mg/L	0.1	6.6	4.1	<b>46.7</b>
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.2	53.8	18.4	<b>98.1</b>
Antimony (Sb)	mg/L	0.02	0.04	0.08	<b>66.7</b>
Arsenic (As)	mg/L	0.02	0.49	0.43	13.0
Barium (Ba)	mg/L	0.02	41.6	39.6	4.9
Beryllium (Be)	mg/L	<0.010	<0.01	<0.01	0.0
Bismuth (Bi)	mg/L	0.005	<0.005	<0.005	0.0
Boron (B)	mg/L	50	<50	<50	0.0
Cadmium (Cd)	mg/L	0.005	0.024	0.014	<b>52.6</b>
Calcium (Ca)	mg/L	0.05	39.5	41	3.7
Chromium (Cr)	mg/L	0.1	<0	<0	0.0
Cobalt (Co)	mg/L	0.005	0.173	0.114	<b>41.1</b>
Copper (Cu)	mg/L	0.05	1.46	1.37	6.4
Iron (Fe)	mg/L	1	1070	1030	3.8
Lead (Pb)	mg/L	0.005	0.88	1.29	<b>37.8</b>
Lithium (Li)	mg/L	0.5	11.2	11.2	0.0
Manganese (Mn)	mg/L	0.05	446	428	4.1
Molybdenum (Mo)	mg/L	0.05	0.07	0.08	13.3
Nickel (Ni)	mg/L	0.02	0.63	0.46	<b>31.2</b>
Selenium (Se)	mg/L	0.04	0.07	0.06	15.4
Silver (Ag)	mg/L	0.005	<0.01	<0.01	0.0
Strontium (Sr)	mg/L	10	143	142	0.7
Sulphur (S)	mg/L	0.05	<10.00	<10.00	0.0
Thallium (Tl)	mg/L	0.002	<0.00	<0.00	0.0
Tin (Sn)	mg/L	0.2	<0.20	<0.20	0.0
Titanium (Ti)	mg/L	0.5	0.8	<0.50	<b>46.2</b>
Uranium (U)	mg/L	0.002	0.088	0.072	<b>20.0</b>
Vanadium (V)	mg/L	0.2	0.3	<0.20	<b>40.0</b>
Zinc (Zn)	mg/L	0.1	17	6.4	<b>90.6</b>

Undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

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 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.



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**Appendix C**

**Climate and Hydrology  
Component**

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## C CLIMATE AND HYDROLOGY COMPONENT

This appendix summarizes the data collected for the RAMP Climate and Hydrology component in the 2012 water year (WY). The 2012 WY was defined as the period from November 1, 2011 to October 31, 2012. The appendix presents descriptions of the climate and hydrometric stations used to collect these data, along with other station-related information.

### C.1 2012 CLIMATE AND HYDROLOGY STATIONS

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

**Table C.1-1 RAMP climate, hydrometric and snowcourse stations monitored in 2012.**

RAMP Station	Name	UTM Coordinates		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 <sup>2</sup>	water level, 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

<sup>1</sup> WSC monitors water level and discharge at these stations during the open-water season.

<sup>2</sup> Station began operation in May 2012.

<sup>3</sup> Hydrometric station S10 was relocated approximately 3 km downstream in August 2012 and designated S10A.

<sup>4</sup> Hydrometric station S47 was relocated approximately 5 km upstream in August 2012 and designated S47A. Both stations S47 and S47A were operated concurrently thereafter to provide continuity in data records.

<sup>5</sup> Hydrometric station S50 was relocated approximately 3 km upstream in April 2012 and designated S50A.

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

RAMP Station	Name	UTM Coordinates <sup>1</sup>		Operating Season	Variables Measured
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
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
S10	Wapasu Creek at Canterra Road	490276	6355968	all year <sup>3</sup>	water level, discharge, water temperature
S10A	Wapasu Creek near the mouth	488573	6358554	all year <sup>3</sup>	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
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 1,300 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
S39	Beaver River above Syncrude (07DA018)	465560	6311437	Winter <sup>1</sup>	discharge

<sup>1</sup> WSC monitors water level and discharge at these stations during the open-water season.

<sup>2</sup> Station began operation in May 2012.

<sup>3</sup> Hydrometric station S10 was relocated approximately 3 km downstream in August 2012 and designated S10A.

<sup>4</sup> Hydrometric station S47 was relocated approximately 5 km upstream in August 2012 and designated S47A. Both stations S47 and S47A were operated concurrently thereafter to provide continuity in data records.

<sup>5</sup> Hydrometric station S50 was relocated approximately 3 km upstream in April 2012 and designated S50A.

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

RAMP Station	Name	UTM Coordinates <sup>1</sup>		Operating Season	Variables Measured
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>1</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 <sup>4</sup>	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 <sup>5</sup>	water level, discharge, water temperature
S51	High Hills River near the mouth	533925	6291921	all year <sup>2</sup>	water level, discharge, water temperature
S53	Dover River near the mouth	451453	6337015	all year <sup>2</sup>	water level, discharge, water temperature
S54	Dunkirk River near Fort McKay	395815	6302066	all year <sup>2</sup>	water level, discharge, water temperature
S55	Gregoire River near the mouth	510184	6259986	all year <sup>2</sup>	water level, discharge, water temperature
S56	Jackfish River below Christina Lake	493741	6169693	all year <sup>2</sup>	water level, discharge, water temperature
S57	Sunday Creek above Christina Lake	506210	6158391	all year <sup>2</sup>	water level, discharge, water temperature
S58	Sawbones Creek above Christina Lake	511412	6167165	open-water <sup>2</sup>	water level, water temperature
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 monitors water level and discharge at these stations during the open-water season.

<sup>2</sup> Station began operation in May 2012.

<sup>3</sup> Hydrometric station S10 was relocated approximately 3 km downstream in August 2012 and designated S10A.

<sup>4</sup> Hydrometric station S47 was relocated approximately 5 km upstream in August 2012 and designated S47A. Both stations S47 and S47A were operated concurrently thereafter to provide continuity in data records.

<sup>5</sup> Hydrometric station S50 was relocated approximately 3 km upstream in April 2012 and designated S50A.

## C.2 CLIMATE DATA COLLECTED IN THE 2012 WATER YEAR

Climate data were collected in the region during the 2012 WY 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.2.1 RAMP Climate Data

In the 2012 WY, RAMP collected climate data from five comprehensive climate stations, climate sensors at two RAMP lake stations, and through the use of five additional precipitation stations located in conjunction with select RAMP hydrometric stations. The following sections of this appendix present the data collected during the 2012 WY.

#### C.2.1.1 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 2012 WY. Table C.2-1 lists the data collected at the station. Monthly observations for the 2012 WY are summarized in Table C.2-2, and daily observations are provided in the RAMP database.

**Table C.2-1 Data collected at the RAMP Aurora Climate Station (C1), 2012.**

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)	Average 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	(watts/m <sup>2</sup> )	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-19 wind vane and propeller	Average Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Average 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.2-2 Summary of monthly climate data collected at the RAMP Aurora Climate Station (C1) during the 2012 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-2011	-28.4	-8.6	8.1	10.51	10.8	82.4	17.3	4.8	175	42.6	26.8	23.1
Dec-2011	-28.4	-8.6	7.3	12.26	22.0	85.7	9.2	5.4	184	50.3	38.8	34.1
Jan-2012	-38.7	-14.1	4.9	20.30	31.2	83.5	15.5	5.1	179	44.2	31.0	27.5
Feb-2012	-30.7	-10.4	4.3	2.70	32.2	77.3	50.4	4.9	139	33.0	23.8	21.8
Mar-2012	-23.1	-5.6	11.4	34.83	23.4	74.8	106.4	6.5	142	38.0	31.0	26.2
Apr-2012	-11.4	3.0	18.1	16.22	0.0	57.6	161.1	7.3	139	43.2	33.7	30.8
May-2012	-2.0	12.3	27.0	8.60	0.0	48.3	216.5	6.1	169	57.0	34.4	26.4
Jun-2012	3.0	16.8	29.3	85.15	0.0	65.1	213.8	5.9	174	42.9	29.6	24.0
Jul-2012	8.5	20.0	34.9	77.48	0.0	70.2	203.4	5.0	179	54.6	43.6	35.9
Aug-2012	4.2	17.9	33.3	23.06	0.0	65.7	167.4	4.8	195	40.8	29.6	26.1
Sep-2012	0.0	12.3	25.8	106.17	0.0	72.0	108.5	4.4	189	48.3	34.9	28.8
Oct-2012	-13.1	0.3	14.5	50.15	17.2	82.8	41.6	6.4	191	47.5	36.8	31.5
2012 WY Annual	-15.0	2.9	17.4	447.43	-	72.1	109.3	5.5	171	57.0	43.6	35.9

Note: E = Estimated; M = Missing; P = Partial; See additional notes in sections C.2.1.1 and C.2.1.7.

### C.2.1.2 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 2012 WY. Table C.2-3 lists the data collected at the station. Monthly observations for 2012 WY are summarized in Table C.2-4, and daily observations are provided in the RAMP database.

**Table C.2-3 Data collected at the RAMP Horizon Climate Station (C2), 2012.**

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 -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)	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 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Average Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Average 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 CDMA Cellular Modem	

**Table C.2-4 Summary of monthly climate data collected at the RAMP Horizon Climate Station (C2) during the 2012 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)	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-2011	-27.5	-8.9	7.4	7.11	6.1	82.5	33.2	95.72	6.7	211	60.4	47.3	34.3
Dec-2011	-23.7	-8.4	9.1	11.71	17.5	86.0	15.9	95.84	8.6	218	64.8	46.4	39.7
Jan-2012	-38.1	-13.5	7.5	11.46	24.2	82.3	26.0	95.78	7.7	216	58.6	44.5	41.7
Feb-2012	-28.2	-9.8	5.6	22.01	25.4	79.4	61.5	96.47	7.3	194	45.5	35.0	32.9
Mar-2012	-22.8	-5.8	11.1	25.29	5.0	74.0	123.5	95.60	7.9	156	41.2	29.1	24.7
Apr-2012	-11.6	2.3	17.1	13.34	0.0	56.9	184.3	96.44	10.0	161	56.7	33.8	29.6
May-2012	-1.7	11.5	26.1	18.54	0.0	48.7	244.0	96.14	10.4	209	62.2	42.7	33.4
Jun-2012	2.8	16.1	28.1	55.57	0.0	62.5	233.1	95.82	8.6	175	51.4	40.4	36.8
Jul-2012	8.6	19.4	32.9	111.69	0.0	66.2	226.8	96.11	8.2	212	54.8	38.0	33.6
Aug-2012	4.2	16.9	31.4	42.85	0.0	67.8	190.1	96.14	7.8	234	48.8	32.1	27.6
Sep-2012	-0.6	12.0	26.2	50.12	0.0	70.6	133.0	96.03	9.5	242	74.2	45.8	41.5
Oct-2012	-15.3	-0.4	15.1	54.62	16.2	84.0	52.4	96.36	7.6	195	50.5	37.6	31.7
2012 WY Annual	-38.1	2.6	32.9	424.30	-	71.7	127.0	96.04	8.4	202	74.2	47.3	41.7

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.



### C.2.1.3 Steepbank Climate Station (C3)

The Steepbank Climate Station (C3) was upgraded to a full climate station in November 2010. During the 2012 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.2-5. Monthly observations for 2012 WY are summarized in Table C.2-6, and daily observations are provided in the RAMP database.

**Table C.2-5 Data collected at the RAMP Steepbank Climate Station (C3), 2012.**

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)	Average 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	Average Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Average 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.2-6 Summary of monthly climate data collected at the RAMP Steepbank Climate Station (C3) during the 2012 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)	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-2011	-30.5	-7.9	9.5	9.56	8.9	80.1	26.5	96.83	7.6	176	39.5	29.0	25.6
Dec-2011	-26.5	-8.0	7.5	15.94	21.9	82.7	14.3	96.98	8.1	182	63.1	40.9	34.3
Jan-2012	-35.7	-13.1	6.4	10.89	25.8	81.0	23.8	96.93	7.3	181	48.5	37.5	34.1
Feb-2012	-30.9	-10.8	5.3	1.85	26.2	78.2	61.2	97.61	7.8	139	44.2	31.5	28.5
Mar-2012	-23.2	-5.2	11.9	31.20	5.0	72.4	115.3	96.65	9.5	142	37.9	31.6	26.1
Apr-2012	-12.8	2.9	17.7	20.27	0.0	58.6	164.6	97.47	11.5	136	53.4	43.1	35.3
May-2012	-1.0	12.2	26.1	19.67	0.0	47.6	228.6	97.16	9.3	174	48.3	36.9	31.6
Jun-2012	3.4	16.5	28.5	74.44	0.0	62.7	219.7	96.80	9.2	147	54.3	43.5	35.3
Jul-2012	8.0	19.8	34.7	77.61	0.0	67.4	213.1	97.13	7.3	173	45.7	32.2	28.7
Aug-2012	2.7	17.6	33.0	35.10	0.0	67.0	185.6	97.24	4.9	190	41.4	31.3	28.0
Sep-2012	-0.1	12.3	26.3	112.10	0.0	72.0	125.8	97.23	7.0	187	44.7	34.1	29.6
Oct-2012	-13.3	0.2	15.5	57.62	12.3	82.4	45.9	97.53	8.4	176	49.5	35.6	29.6
2012 WY Annual	-35.7	3.0	34.7	466.25	-	71.0	118.7	97.13	8.2	167	63.1	43.5	35.3

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.

#### C.2.1.4 Pierre Climate Station (C4)

The Pierre Climate Station (C4) was installed on 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 2011 to October 2012. Table C.2-7 provides a list of the data collected at the station. Monthly observations for 2012 WY are summarized in Table C.2-8, and daily observations are provided in the RAMP database.

**Table C.2-7 Data collected at the RAMP Pierre Climate Station (C4), 2012.**

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	Average Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Average 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.2-8 Summary of monthly climate data collected at the RAMP Pierre Climate Station (C4) during the 2012 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)	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-2011	-30.5	-9.4	8.7	0.0	6.1	79.1	21.2	97.25	3.4	187	40.0	28.0	24.4
Dec-2011	-28.5	-9.8	9.4	16.1	18.3	81.0	10.2	97.36	4.5	197	50.5	29.3	20.0
Jan-2012	-39.7	-15.3	8.6	12.2	23.6	76.6	18.5	97.33	4.0	181	47.2	29.6	23.8
Feb-2012	-33.9	-11.6	7.6	5.0	25.2	74.4	59.1	98.02	4.1	170	33.9	22.1	16.3
Mar-2012	-27.6	-6.3	13.3	34.0	20.8	70.2	112.0	97.12	4.9	146	41.4	26.8	21.7
Apr-2012	-14.4	2.2	18.6	8.0	0.0	57.2	175.5	97.94	6.3	154	47.7	28.9	22.6
May-2012	-4.9	11.5	27.3	15.8	0.0	51.2	231.5	97.61	5.7	201	51.9	35.8	29.5
Jun-2012	0.1	16.1	29.6	30.9	0.0	65.2	223.3	97.30	5.3	169	42.9	28.0	21.4
Jul-2012	3.2	19.2	35.1	116.4	0.0	70.8	212.0	97.58	4.7	201	40.4	27.8	22.5
Aug-2012	0.8	16.5	31.9	76.1	0.0	72.7	176.5	97.61	3.2	210	42.5	29.2	23.3
Sep-2012	-2.6	11.1	26.7	102.4	0.0	74.7	119.2	97.59	4.7	222	51.5	34.2	28.6
Oct-2012	-16.5	-0.3	17.1	52.2	17.1	82.6	46.8	97.97	4.4	169	40.4	23.1	17.5
2012 WY Annual	-39.7	2.0	35.1	469.1	-	71.3	117.2	97.6	4.6	184.0	51.9	35.8	29.5

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.

### C.2.1.5 Surmont Climate Station (C5)

The Surmont Climate Station (C5) was installed on October 16, 2011. During the 2012 WY, air temperature, relative humidity, total precipitation, snow depth, wind speed and direction, and barometric pressure data were measured at this station as described in Table C.2-9. Monthly observations for the 2012 WY are summarized in Table C.2-10 and daily observations are provided in the RAMP database.

**Table C.2-9 Data collected at the RAMP Surmont Climate Station (C5), 2012.**

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 61302V barometric pressure sensor	Mean	kPa	Mean of readings every 5 sec.
Wind Speed and Direction -RM Young 05103-10 wind vane and propeller	Average Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	Average 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.2-10 Summary of monthly climate data collected at the RAMP Surmont Climate Station (C5) during the 2012 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)	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-2011	-26.5	-7.4	9.7	7.4	1.5	75.5	31.587	94.07	6.8	214	57.4	34.1	27.1
Dec-2011	-26.1	-6.3	8.2	35.8	19.7	77.9	16.063	94.25	8.2	242	57.5	41.5	34.4
Jan-2012	-37.0	-11.0	7.4	26.4	26.1	76.2	26.992	94.12	7.3	231	53.0	37.5	32.5
Feb-2012	-32.3	-8.8	9.7	11.5	26.4	71.5	63.062	94.80	5.7	219	40.5	30.9	27.5
Mar-2012	-21.9	-4.4	11.2	42.6	23.5	72.3	106.515	93.90	6.8	202	45.8	28.2	25.0
Apr-2012	-15.9	1.4	16.1	72.1	0.0	64.2	161.152	94.76	7.5	187	42.1	29.2	26.5
May-2012	-5.8	10.3	24.0	19.6	0.0	49.8	233.082	94.60	8.0	201	51.5	34.0	27.5
Jun-2012	0.2	14.9	27.7	47.5	0.0	66.0	211.856	94.27	6.6	198	40.8	27.6	22.8
Jul-2012	6.2	18.4	33.6	170.3	0.0	71.0	208.845	94.61	5.7	211	53.9	34.7	28.6
Aug-2012	3.3	16.0	31.0	44.2	0.0	70.7	188.687	94.64	6.2	226	41.1	26.1	21.8
Sep-2012	-1.1	11.6	25.7	86.9	0.0	70.2	131.295	94.59	7.3	227	63.4	33.8	28.2
Oct-2012	-12.1	-0.8	14.3	70.8	13.5	84.6	44.601	94.75	6.6	209	46.2	31.1	25.5
2012 WY Annual	-37.0	2.8	33.6	635.0	-	70.8	118.6	94.4	6.9	214	63.4	41.5	34.4

### C.2.1.6 Climate Variables at Other RAMP Stations

Table C.2-11 summarizes 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 weighing gauge) and L2 (using a Geonor weighing gauge), with rainfall also being measured from April to October of 2012 at hydrology stations S3, S19, S31, S40, and S43 using tipping bucket rain gauges.

Barometric pressure was monitored at Station S5A throughout the 2012 WY.

Table C.2-11 to Table C.2-13 provides 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.2-1.

**Table C.2-11 Climate data collected at other RAMP stations, 2012.**

Station	Variable	Sensor
L1 McClelland Lake	Total Precipitation	Ott Pluvio 1000 weighing gauge
	Water Temperature	Ott PLS built-in thermistor
	Air Temperature	HMP45C212 thermistor
	Relative Humidity	HMP45C212 humidity sensor
L2 Kearl 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 Kearl 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
S31 Hangingstone Creek at North Star Road	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.2-12 Summary of climate data collected at McClelland Lake (L1) and Kearl Lake (L2) during the 2012 WY.**

Station Month	L1 McClelland Lake				L2 Kearl Lake			
	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)	Precipitation Depth (mm)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)
Nov-2011	0.00	1.8	-8.8	81.7	8.08	7.5	-8.2	79.3
Dec-2011	20.00	0.5	-8.9	84.0	8.45	5.0	-8.1	81.8
Jan-2012	15.00	0.3	-15.0	80.6	11.80	3.9	-13.6	79.6
Feb-2012	5.00	0.0	-11.1	76.0	4.25	3.3	-10.2	73.5
Mar-2012	41.00	-0.1	-6.9	74.0	34.57	2.9	-5.9	71.1
Apr-2012	10.00	0.0	1.7	60.7	19.33	2.7	2.4	57.1
May-2012	12.30	8.1	11.4	53.5	41.63	4.8	12.2	48.3
Jun-2012	34.80	16.3	17.1	61.4	69.89	9.0	16.7	62.2
Jul-2012	56.40	19.6	20.0	67.8	85.03	12.0	20.2	67.3
Aug-2012	20.90	17.6	17.5	70.1	27.58	13.5	17.4	67.7
Sep-2012	89.20	13.1	11.9	74.0	126.76	12.9	12.4	72.0
Oct-2012	47.00	6.2	0.2	84.3	61.60	10.3	0.1	83.5
<b>Annual Sum</b>	351.60	-	-	-	498.98	-	-	-
<b>Annual Mean</b>	-	6.9	2.4	72.3	-	7.3	2.9	70.3

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.

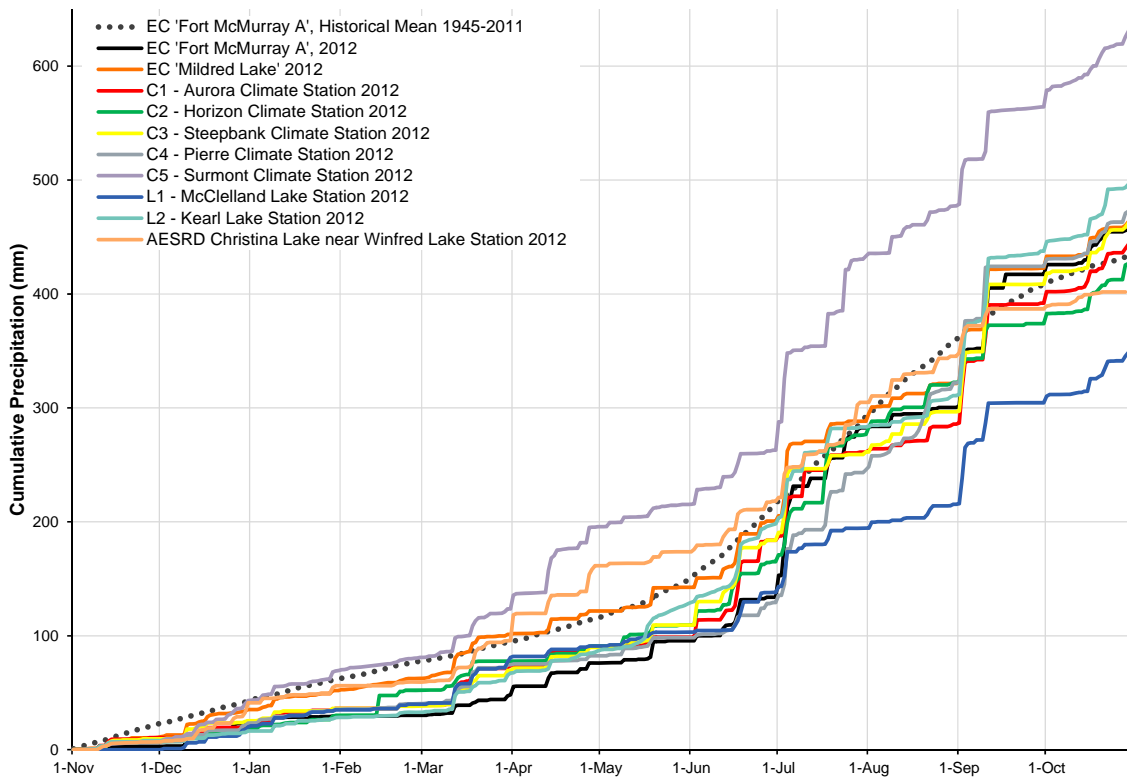


**Table C.2-13 Summary of total rainfall and atmospheric pressure data collected at other RAMP stations during the 2012 WY.**

Station	S3 Iyininim Creek above Kearl Lake	S19 Tar River Lowland Tributary near the mouth	S31 Hangingstone Creek at North Star Road	S40 MacKay River at Petro-Canada Bridge	S43 Firebag River above Suncor Firebag	S5A Muskeg River above Muskeg Creek
Variable	Total Rainfall (mm)					Station Pressure (kPa)
Period of Operation						
Nov-2011	-	-	-	-	-	97.37
Dec-2011	-	-	-	-	-	97.46
Jan-2012	-	-	-	-	-	97.47
Feb-2012	-	-	-	-	-	98.16
Mar-2012	-	-	-	-	-	97.22
Apr-2012	3.80 P	-	6.80 P	1.00 P	-	98.02
May-2012	29.80	-	1.70	2.60	21.59 P	97.69
Jun-2012	64.80	-	1.10	20.90	82.04	97.33
Jul-2012	101.70	-	11.90	39.00	141.22	97.61
Aug-2012	39.40	17.60 P	23.90	11.60	40.34	97.65
Sep-2012	145.10	100.10	45.40 P	30.60	1.20	97.64
Oct-2012	33.60 P	37.70 P	-	15.20	21.90 P	98.02
<b>Annual Sum</b>	418.20	155.40	90.80	120.90	308.30	-
<b>Annual Mean</b>	-	-	-	-	-	97.64

Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.

**Figure C.2-1 Cumulative total precipitation at climate stations in the Athabasca oil sands region in 2012 WY.**



### C.2.1.7 RAMP Database

RAMP climate data are available on-line through the RAMP database ([www.ramp-alberta.org](http://www.ramp-alberta.org)). The 2012 WY data are published to the RAMP website in May 2013 upon the completion of the QA/QC process for data management. The following notes apply to the monthly climate data (Table C.2-2, C.2-4, C.2-6, C.2-8, C.2-10, C.2-12, and C.2-13) 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, from which the wind is blowing, 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.2.1.8 2012 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 in the main report.

Snow course surveys were completed from February 9 to 17, March 8 to 16, and March 26 to April 4, 2012. The results organized by land cover type are shown in Table 4. Results organized by region are shown in Table . Snow survey data are also available through the RAMP database.

**Table C.2-14 Summary of the RAMP snow course surveys organized by land cover type, winter 2012.**

Terrain Type	Survey ID	February (Feb 9 to 17)		March (Mar 8 to 16)		April (Mar 26 to Apr 4)	
		Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)
Flat Low Lying	CANR-FL-A	44	37	37	59	52	99
	CNRL-FL-A	30	56	30	46	34	73
	MCLL-FL-A	31	35	30	30	44	99
	NEX-FL-A	37	70	41	56	46	144
	<i>Average</i>	36	50	35	<u>48</u>	44	104
Open Land/Lake Area	CANR-OP-A	11	34	14	28	19	67
	CNRL-OP-A	11	37	17	39	5	20
	MCLL-OP-A	17	37	17	50	19	71
	NEX-OP-A	17	38	18	29	15	76
	<i>Average</i>	14	37	17	<u>37</u>	15	59
Mixed Deciduous	CANR-MD-A	30	38	30	71	39	84
	CNRL-MD-A	24	29	25	46	22	46
	MCLL-MD-A	25	31	25	37	35	89
	NEX-MD-A	32	43	32	50	40	105
	<i>Average</i>	28	35	28	<u>51</u>	34	81
Jackpine	CANR-JP-A	28	33	27	29	36	71
	CNRL-JP-A	23	28	21	25	30	59
	MCLL-JP-A	18	32	14	27	24	70
	NEX-JP-A	22	49	21	20	26	74
	<i>Average</i>	23	36	21	<u>25</u>	29	69

Note: Underlined values denote the maximum observed values for a given terrain type in 2012. These values are plotted in Figure 4.1-4.

**Table C.2-15 Summary of the RAMP snow course surveys organized by region, winter 2012.**

Region	Survey ID	February (Feb 9 to 17)		March (Mar 8 to 16)		April (Mar 26 to Apr 4)	
		Snow Depth [cm]	SWE [mm]	Snow Depth [cm]	SWE [mm]	Snow Depth [cm]	SWE [mm]
Kearl Lake Area	CANR-FL-A	44	37	37	59	52	99
	CANR-OP-A	11	34	14	28	19	67
	CANR-MD-A	30	38	30	71	39	84
	CANR-JP-A	28	33	27	29	36	71
	Average	28	36	27	47	37	80
CNRL Lake Area	CNRL-FL-A	30	56	30	46	34	73
	CNRL-OP-A	11	37	17	39	5	20
	CNRL-MD-A	24	29	25	46	22	46
	CNRL-JP-A	23	28	21	25	30	59
	Average	22	38	23	39	23	50
McClelland Lake Area	MCLL-FL-A	31	35	30	30	44	99
	MCLL-OP-A	17	37	17	50	19	71
	MCLL-MD-A	25	31	25	37	35	89
	MCLL-JP-A	18	32	14	27	24	70
	Average	23	34	22	36	31	82
Sucker Lake Area	NEX-FL-A	37	70	41	56	46	144
	NEX-OP-A	17	38	18	29	15	76
	NEX-MD-A	28	52	53	96	37	95
	NEX-JP-A	22	49	21	20	26	74
	Average	26	52	33	50	31	97

### **C.3 HYDROMETRIC DATA COLLECTED IN THE 2012 WY**

Hydrometric data for the region were collected throughout the 2012 WY. RAMP hydrometric data are available on-line through the RAMP website ([www.ramp-alberta.org](http://www.ramp-alberta.org)). The 2012 WY data are published to the RAMP website in May 2013 upon the completion of the QA/QC process for data management.

#### **C.3.1 RAMP Hydrometric Data**

Hydrometric data, including water level and discharge, were collected for the region during the 2012 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 2012 WY.

Table C.3-1 below summarizes the equipment present at each RAMP hydrometric station during the 2012 WY, including types of data loggers, pressure transducers, and telemetry. During the 2012 WY, telemetry equipment was installed at all hydrometric stations at which telemetry equipment was not previously present, allowing for the collection of near-real-time data.

**Table C.3-1 Equipment at RAMP hydrometric stations.**

<b>RAMP Station</b>	<b>Data Logger Type</b>	<b>Pressure Transducer Type</b>	<b>Telemetry Type</b>
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
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

**Table C.3-1 (Cont'd.)**

<b>RAMP Station</b>	<b>Data Logger Type</b>	<b>Pressure Transducer Type</b>	<b>Telemetry Type</b>
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
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

### C.3.1.1 Water Level and Discharge

Table C.3-1 summarizes RAMP hydrometric monitoring in the 2012 WY. The quality assessment shown for each station record was based on an assessment matrix that considers the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the record completeness.

Data quality for the 2012 WY was generally good (34 of 44 locations) with wildlife, and equipment attrition affecting the 2012 WY hydrometric record at 11 stations as described below:

- A faulty voltage controller caused Station L1, McClelland Lake, to lose power several times between June 4 and June 15, 2012. A replacement voltage controller was installed June 15, 2012.
- Shortly after the installation of the pressure transducer at Station S3, Iyininim Creek, on April 25, 2012, the transducer was pulled out of the water and onto the bank, likely by floating ice during spring break-up. Data during this period were unusable, until reinstallation of the transducer on May 15, 2012.
- During the November 5, 2012 visit to Station S3, Iyininim Creek, the solar panel cables were found detached from the datalogger, likely caused by wildlife. No damage was observed and data quality was not affected.
- During the August 7, 2012 visit to Station S5A, Muskeg River above Muskeg Creek, the solar panel cables were found detached from the data logger, likely caused by wildlife. There was no observed damage, data quality was not affected, and normal operation of the station was restored.
- On April 28, 2012 the pressure transducer cable at Station S15A, Tar River near the mouth, was severed by moving ice. Data could not be collected until the May 14, 2012 station visit, when the pressure transducer was replaced.
- The pressure transducer at Station S16A, Calumet River upland tributary, was replaced on September 18, 2012, due to recent data quality issues.
- Damage by wildlife at Station S33, Muskeg River at the Aurora/Albian Boundary, caused a power failure between July 15 and August 7, 2012. Data quality was affected.
- The pressure transducer at Station S44, Pierre River near Fort McKay, was moved ashore, likely by moving ice in early May, after which the water level rose to a recordable level.
- Station S45, Ells River above Joslyn Creek Diversion, was damaged by wildlife on October 23, 2012. The station was reinstated on November 13, 2012.
- During the December 8, 2012 visit to Station S45, Ells River above Joslyn Creek Diversion, the solar panel was found torn off of the equipment mast, however only the mounts were damaged and the panel was reattached. This was likely caused by the same wildlife as in the previous damage to the station.
- Between September 27 and December 16, 2012, Station S51, High Hills River, was damaged several times by wildlife. All cables were found pulled from the datalogger enclosure, and the GOES telemetry antenna and cable were damaged.



- The pressure transducer cable was pulled from the datalogger and the solar panel cables were severed at Station S54, Dunkirk River near Fort McKay, from June 1 to 14, 2012. Damage was likely caused by wildlife.

Data quality for the following six stations was compromised due to backwater effects caused by beaver activity or flooding:

- S05, Muskeg River above Stanley Creek;
- S09, Kearl Lake Outlet;
- S10, Wapasu Creek at Canterra Road;
- S15A, Tar River near the mouth;
- S20, Muskeg River Upland;
- S33, Muskeg River at the Aurora North/Muskeg River Mine Boundary;
- S36, McClelland Lake Outlet above Firebag River; and
- S58, Sawbones Creek above Christina Lake.

**Table C.3-2 Summary of RAMP hydrometric monitoring during the 2012 WY.**

Watershed and Station	Catchment Area  (km <sup>2</sup> )	Monitored Period  2012 WY	Percent of Open-Water Period Record Available  2012 WY	Maximum Daily Discharge (Water Year: Nov 1 2011 - Oct 31 2012)		Minimum Daily Discharge (Open-Water Season: May 1 - Oct 31 2012)		Runoff Volume (Open-Water Season: May 1 - Oct 31 2012)	
				2012 WY	Historical mean	2012 WY	Historical mean	2012 WY	Historic mean
				(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(mm)	(mm)
<b>Athabasca River</b>									
S46 - Athabasca River near Embarras Airport	162,227	Nov 1 - Oct 31	100	3178	2700	502	570	11.6	11.5
S24 - Athabasca River below Eymundson Creek	146,000	Nov 1 - Oct 31	100	3680	2231	418	362	11.5	9.5
Athabasca River at Fort McMurray (07DA001)	133,000	Nov 1 - Oct 31	100	3680	2514	390	426	13.1	11.7
<b>Athabasca River East Tributaries</b>									
S6 - Mills Creek at Highway 63	9	Nov 1 - Oct 31	100	0.1	0.1	0.01	0.02	4.1	7.8
S12 - Fort Creek at Highway 63	32	Apr 22 - Oct 31	100	0.2	-	0.02	0.02	4.4	4.5
S25 - Susan Lake Outlet	14	May 19 - Oct 31	82	0.2	-	0.01	0.01	3.3	6.1
<b>Muskeg River Basin</b>									
S2 - Jackpine Creek at Canterra Road	358	Nov 1 - Oct 31	100	9.7	7.0	0.19	0.28	9.1	8.4
S3 - Iyininim Creek above Kearl Lake	32	Apr 25 - Oct 31	92	12.7	-	0.03	0.02	35.9	10.3
S5 - Muskeg River above Stanley Creek	395	Nov 1 - Oct 31	100	11.7	8.0	0.14	0.18	7.5	6.5
S5A - Muskeg River above Muskeg Creek	552	Nov 1 - Oct 31	100	10.2	8.1	0.29	0.35	6.2	5.8
S7 - Muskeg River near Fort McKay (07DA008)	1457	Nov 1 - Oct 31	100	29.4	21.8	0.45	1.07	7.0	7.0
S9 - Kearl Lake Outlet	73.6	May 5 - Oct 31	98	0.7	0.5	0.000	0.03	3.2	3.0
S10 - Wapasu Creek at Canterra Road	91	Nov 1 - Oct 31	100	8.6	2.4	0.02	0.06	11.2	7.7
S20 - Muskeg River Upland	157	Apr 23 - Oct 31	100	7.0	-	0.00	0.06	12.3	5.5
S22 - Muskeg Creek near the Mouth	369	Apr 23 - Oct 31	100	14.0	-	0.09	0.15	7.0	5.1
S33 - Muskeg River at Aurora/Albian Boundary	728	Nov 1 - Oct 31	88	17.7	13.4	0.48	0.44	6.8	6.4
S37 - East Jackpine Creek near the 1300m Contour	33	Apr 25 - Oct 31	100	1.9	-	0.02	0.01	18.5	10.9
<b>Steepbank River Basin</b>									
S38 - Steepbank River near Fort McMurray (07DA006)	1,320	Nov 1 - Oct 31	100	51.9	32.6	2.37	1.65	13.8	10.2

\* 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.3-2 (Cont'd.)**

Watershed and Station	Catchment Area	Monitored Period	Percent of Open-Water Period Record Available	Maximum Daily Discharge (Water Year: Nov 1 2011 - Oct 31 2012)		Minimum Daily Discharge (Open-Water Season: May 1 - Oct 31 2012)		Runoff Volume (Open-Water Season: May 1 - Oct 31 2012)	
				2012 WY	Historical mean	2012 WY	Historical mean	2012 WY	Historic mean
				(km <sup>2</sup> )	2012 WY	2012 WY	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)
<b>Firebag River Basin</b>									
S27 - Firebag River near the mouth (07DC001)	5,687.6	Nov 1 - Oct 31	100	150	117.0	19.30	15.46	12.8	10.4
S36 - McClelland Lake Outlet above Firebag River	330	Apr 25 - Oct 31	96	0.7	-	0.39	0.33	2.1	2.2
S43 - Firebag River above Suncor Firebag	2,437	Nov 1 - Oct 31	100	66.8	18.7	6.84	4.94	12.7	7.9
<b>Athabasca River West Tributaries</b>									
S44 - Pierre River near Fort McKay (07DA013)	123	May 5 - Oct 31	98	3.0	1.4	0.05	0.05	3.4	3.8
S48 - Big Creek	304	Apr 26 - Oct 31	100	0.9	-	0.15	-	2.2	-
S49 - Eymundson Creek near the mouth	243	Apr 26 - Oct 31	100	4.4	-	0.17	-	4.7	-
S50 - Red Clay Creek	187	Apr 26 - Oct 31	100	0.7	-	0.15	0.00	2.5	0.8
<b>Ells River Basin</b>									
S14A - Ells River at CNRL Bridge	2,450	Nov 1 - Oct 31	100	19.6	56.3	3.54	2.35	4.1	6.8
S45 - Ells River above Joslyn Creek Diversion	2,450	Nov 1 - Oct 23	96	20.1	24.2	4.07	2.70	4.1	4.7
<b>Mackay River Basin</b>									
S26 - MacKay River near Fort McKay (07DB001)	5,569.3	Nov 1 - Oct 31	100	33	108.7	4.17	3.65	3.8	6.6
S40 - MacKay River at Petro-Canada Bridge	5,290	Nov 1 - Oct 31	100	21	38.3	3.23	2.70	3.0	4.4
S53 - Dover River near the mouth	963	May 18 - Oct 31	91	5	14.1	0.23	0.15	2.3	1.6
S54 - Dunkirk River near Fort McKay	1570	May 17 - Oct 31	85	13	25.5	1.02	0.52	3.9	6.1
<b>Tar River Basin</b>									
S15A - Tar River near the mouth	333	May 14 - Oct 31	93	2.7	2.8	0.16	0.19	2.9	3.6
S19 - Tar River Lowland Tributary near the mouth	12	April 22 - Oct 30	100	0.099	-	0.000	0.002	2.6	2.0
S34 - Tar River above CNRL Lake	134	Nov 1 - Oct 31	100	3.9	4.8	0.05	0.10	5.9	8.4

\* 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.3-2 (Cont'd.)**

Watershed and Station	Catchment Area (km <sup>2</sup> )	Monitored Period 2012 WY	Percent of Open-Water Period Record Available 2012 WY	Maximum Daily Discharge (Water Year: Nov 1 2011 - Oct 31 2012)		Minimum Daily Discharge (Open-Water Season: May 1 - Oct 31 2012)		Runoff Volume (Open-Water Season: May 1 - Oct 31 2012)	
				2012 WY	Historical mean	2012 WY	Historical mean	2012 WY	Historic mean
				(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(mm)	(mm)
<b>Calumet River Basin</b>									
S16A / S16A / CR-1 - Calumet River	174	May 17 - Oct 31	91	1.3	2.2	0.02	0.02	1.4	1.7
<b>Poplar River Basin</b>									
S11 - Poplar Creek at Highway 63 (07DA007)	151	May 22 - Oct 31	82	3.8	9.8	0.08	0.06	8.1	14.1
S39 - Beaver River above Syncrude (07DA018)	165	Nov 1 - Oct 31	100	3.7	8.7	0.12	0.13	5.0	7.9
<b>Clearwater River Tributaries</b>									
S29 - Christina River near Chard (07CE002)	4,860	Nov 1 - Oct 31	100	60.8	93.9	12.90	6.47	8.7	7.6
S31 - Hangingstone Creek near the mouth	160	April 21 - Oct 31	100	4.3	-	0.24	0.18	10.6	8.7
S32 - Surmount Creek at Highway 881	158	April 21 - Oct 31	100	10.4	-	0.10	0.12	17.3	10.1
S42 - Clearwater River above Christina River (07CD005)	17,017	Nov 1 - Oct 31	100	166.0	190.3	63.10	59.36	9.0	8.5
S47 - Christina River near the mouth	13,455	Nov 1 - Oct 31	100	116.7	168.6	24.83	16.71	6.8	7.1
S51 - High Hills River near the mouth	1587	May 20 - Oct 31	75	64.7	-	3.07	-	6.9	-
S55 - Gregoire River above the Christina River	1014.7	May 20 - Oct 31	90	20.9	-	0.87	-	8.3	-
S56 - Jackfish River below Christina Lake	1290	May 16 - Oct 31	85	11.4	-	1.83	0.66	3.7	4.1
S57 - Sunday Creek above Christina Lake	374.1	May 16 - Oct 31	92	4.4	-	0.20	-	4.7	-
S58 - Sawbones Creek above Christina Lake	125.6								
				Maximum WY Water Level		Minimum WY Water Level			
<b>Water Level Stations</b>				2012 WY	Historic mean	2012 WY	Historic mean		
L1 - McClelland Lake (Firebag River Watershed)	191	Nov 1 - Oct 31	100	294.403	294.621	294.111	294.379		
L2 - Kearl Lake (Muskeg River Watershed)	73	Nov 1 - Oct 31	100	332.109	332.096	331.502	331.741		
L3 - Isadore's Lake	28	Nov 1 - Oct 31	100	233.956	234.022	233.676	233.684		
L4 - Namur Lake near the outlet (Ells River Watershed)	164	May 18 - Oct 31	91	-	-	-	-		

\* 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.3.1.2 Suspended Sediment

Suspended sediment samples were collected at 40 RAMP stream flow stations for a total of 185 measurements in the 2012 WY. The total suspended sediment (TSS) data are provided in Table C.3-3. Discharge (Q) shown in the table is the manual discharge measurement at the time the sample was collected where available.

**Table C.3-3 Suspended sediment data collected at RAMP hydrometric stations during the 2012 WY.**

Station		April 22 to 26	May 7 to 25	June 11 to 26	Aug 2 to 31	Sept 10 to 25	Oct 10 to Nov 5
S02	TSS (mg/L)	*	4.0	<3.0	4.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	1.260	0.880	0.381	1.500	2.140
S03	TSS (mg/L)	<3.0	*	*	6.0	496.0	6.0
	Q (m <sup>3</sup> /s)	0.103	*	*	0.041	3.700	0.307
S5	TSS (mg/L)	*	*	<3.0	<3.0	34.0	*
	Q (m <sup>3</sup> /s)	*	*	0.379	0.203	5.300	*
S5A	TSS (mg/L)	*	4.0	5.0	<3.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	*	1.330	0.664	0.510	6.970	2.950
S6	TSS (mg/L)	*	<3.0	<3.0	<3.0	6.0	<3.0
	Q (m <sup>3</sup> /s)	*	0.009	0.022	0.011	0.028	0.019
S7	TSS (mg/L)	*	<3.0	<3.0	3.0	4.0	<3.0
	Q (m <sup>3</sup> /s)	*	2.950	2.070	1.050	3.910	6.810
S9	TSS (mg/L)	*	5.0	29.0	20.0	3.0	<3.0
	Q (m <sup>3</sup> /s)	*	0.007	0.001	0.002	0.500	0.430
S10/ 10A	TSS (mg/L)	*	<3.0	4.0	4.0	6.0	4.0
	Q (m <sup>3</sup> /s)	*	0.328	0.104	0.110	4.090	1.050
S11	TSS (mg/L)	23.0	*	12.0	6.0	11.0	*
	Q (m <sup>3</sup> /s)	0.733	*	0.404	0.167	1.850	*
S12	TSS (mg/L)	8.0	17.0	<3.0	4.0	4.0	*
	Q (m <sup>3</sup> /s)	0.081	0.235	0.047	0.015	0.088	*
S14 A	TSS (mg/L)	*	11.0	3.0	<3.0	3.0	<3.0
	Q (m <sup>3</sup> /s)	*	6.150	6.000	9.010	3.660	5.350
S15 A	TSS (mg/L)	4.0	11.0	6.0	17.0	66.0	*
	Q (m <sup>3</sup> /s)	0.115	1.090	0.431	0.518	0.621	*
S16 A	TSS (mg/L)	<3.0	*	<3.0	<3.0	5.0	8.0
	Q (m <sup>3</sup> /s)	0.189	*	0.042	0.033	0.422	0.163
S19	TSS (mg/L)	11.0	10.0	<3.0	11.0	3.0	8.0
	Q (m <sup>3</sup> /s)	0.033	0.038	0.018	0.004	0.019	0.018
S20	TSS (mg/L)	5.0	*	6.0	<3.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	0.400	*	0.066	0.025	5.830	1.210
S22	TSS (mg/L)	11.0	*	6.0	<3.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	0.156	*	0.211	0.134	7.980	3.180
S24	TSS (mg/L)	*	73.0	361.0	277.0	97.0	7.0
	Q (m <sup>3</sup> /s)	*	836	1,710	2,080	833	481

\* Not measured.

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

Station		April 22 to 26	May 7 to 25	June 11 to 26	Aug 2 to 31	Sept 10 to 25	Oct 10 to Nov 5
S25	TSS (mg/L)	*	4.0	3.0	8.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	0.067	0.041	0.019	0.041	0.062
S31	TSS (mg/L)	17.0	*	<3.0	8.0	44.0	12.0
	Q (m <sup>3</sup> /s)	0.318	*	0.364	0.976	3.570	0.752
S32	TSS (mg/L)	5.0	*	23.0	20.0	393.0	*
	Q (m <sup>3</sup> /s)	0.342	*	0.691	0.858	5.520	*
S33	TSS (mg/L)	*	9.0	3.0	<3.0	3.0	<3.0
	Q (m <sup>3</sup> /s)	*	1.670	1.010	0.856	7.130	5.250
S34	TSS (mg/L)	*		*	<3.0	4.0	<3.0
	Q (m <sup>3</sup> /s)	*	18.0	*	0.199	0.184	0.289
S36	TSS (mg/L)	4.0	*	3.0	<3.0	6.0	3.0
	Q (m <sup>3</sup> /s)	0.473	*	0.409	0.411	0.526	0.502
S37	TSS (mg/L)	10.0	*	3.0	<3.0	3.0	<3.0
	Q (m <sup>3</sup> /s)	.301	*	0.277	0.030	1.690	0.357
S40	TSS (mg/L)	*	23.0	5.0	5.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	*	17.2	9.260	4.890	6.040	7.760
S43	TSS (mg/L)	*	8.0	<3.0	<3.0	15.0	11.0
	Q (m <sup>3</sup> /s)	*	18.300	8.730	7.570	54.300	25.000
S44	TSS (mg/L)	31.0	*	8.0	<3.0	4.0	*
	Q (m <sup>3</sup> /s)	0.302	*	0.144	0.089	0.421	*
S45	TSS (mg/L)	*	6.0	9.0	*	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	6.580	5.770	*	4.290	5.650
S46	TSS (mg/L)	*	*	344.0	240.0	47.0	12.0
	Q (m <sup>3</sup> /s)	*	*	1,910	1,790	822	571
S47	TSS (mg/L)	*	*	62.0	3.0	*	17.0
	Q (m <sup>3</sup> /s)	*	*	55.9	26.100	*	37.000
S48	TSS (mg/L)	12.0	*	7.0	9.0	3.0	*
	Q (m <sup>3</sup> /s)	0.185	*	0.163	0.383	0.631	*
S49	TSS (mg/L)	25.0	*	25.0	50.0	160.0	*
	Q (m <sup>3</sup> /s)	0.525	*	0.257	0.423	0.805	*
S50	TSS (mg/L)	5.0	*	3.0	7.0	8.0	*
	Q (m <sup>3</sup> /s)	0.327	*	0.188	0.142	0.536	*
S51	TSS (mg/L)	*	68.0	151.0	12.0	138.0	*
	Q (m <sup>3</sup> /s)	*	9.600	11.200	3.600	15.800	*
S52	TSS (mg/L)	*	*	*	*	*	<3.0
	Q (m <sup>3</sup> /s)	*	*	*	*	*	0.304
S53	TSS (mg/L)	*	*	15.0	<3.0	263.0	*
	Q (m <sup>3</sup> /s)	*	*	2.620	0.765	1.040	*
S54	TSS (mg/L)	*	*	5.0	3.0	9.0	<3.0
	Q (m <sup>3</sup> /s)	*	*	3.460	2.870	2.280	2.830
S55	TSS (mg/L)	*	161.0	34.0	*	28.0	12.0
	Q (m <sup>3</sup> /s)	*	6.670	5.250	*	7.410	4.480

\* Not measured.

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

Station		April 22 to 26	May 7 to 25	June 11 to 26	Aug 2 to 31	Sept 10 to 25	Oct 10 to Nov 5
S56	TSS (mg/L)	*	<3.0	3.0	3.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	8.570	4.280	2.490	2.360	2.160
S57	TSS (mg/L)	*	<3.0	5.0	<3.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	2.250	1.900	0.490	1.480	0.557
S58	TSS (mg/L)	*	4.0	4.0	<3.0	<3.0	<3.0
	Q (m <sup>3</sup> /s)	*	0.980	0.389	0.170	0.129	0.110

\* Not measured.

### C.3.2 Hydrometric Data from Focal Projects

Several oil sands operators provided stream flow and operational water withdrawal and release data to RAMP, as summarized in Table C.3-4.

### C.3.3 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 provides winter monitoring at seasonal WSC stations to extend the record to cover the full year. For stations where RAMP monitors 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. 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.

**Table C.3-4 Hydrometric information for 2012 WY received from oil sands operators and incorporated into the water balance analyses.**

Operator	Watershed	Activity	Annual Volume (dam <sup>3</sup> )	Location	Time-step
CNRL - Horizon	Athabasca	Withdrawals from Athabasca River	22,313.1	SW14-96 W4M	Daily
CNRL - Kirby	Christina	Water withdrawals	10.1	Various	Monthly
ConocoPhillips	Christina	Water withdrawals	51.4	Various	Daily
Husky Energy	Muskeg	Water releases	12.8	9 and 10-095-07 W4M	Daily
Imperial Oil Resources	Athabasca	Water withdrawals	11,151.6	469848 E, 6380064 N	Daily
		Water releases	682.6	470251 E, 6379927 N	Daily
MEG Energy	Christina	Water withdrawals	67.2	Various	Yearly
Nexen	Christina	Water withdrawals	77.4	Various	Daily
Shell – Jackpine Mine	Athabasca	Withdrawals from Athabasca River	8,681.2	SE 24-095-11-W4	Daily
Shell – Muskeg River Mine	Athabasca	Withdrawals from Athabasca River	6,079.5	SE 24-095-11-W4	Daily
StatOil Canada Ltd.	Christina	Water withdrawals	11.7	SW 10-79-10-W4	Monthly
Suncor Energy Ltd.	Athabasca	Withdrawals from the Athabasca River	27,018.2	473402 E, 6315276 N	Daily
		Releases to the Athabasca River	159.9		Daily
	Steepbank	Water withdrawals	20.9	Various	Daily
	Muskeg	Water withdrawals	69.1	Various	Daily
	Firebag	Water Releases	34.3	E11-95-6-W4	Monthly
	MackKay	Water withdrawals	11.4	SE-18-093-12-W4	Daily
Syncrude	Muskeg	Aurora Clean Water Diversion to Stanley Creek	5,503.7	21-096-09-W4M	Daily
	Athabasca	Treated Sewage Releases to Athabasca River	293.9	02-093-10-W4M	Daily
		Withdrawals from Athabasca River	39,104.6	35-096-09-W4M	Daily
	Poplar Creek	Diversion from Beaver Creek into Poplar Creek	511.5		Daily
	Ells	Water withdrawals from various sites	10.8	Various	Daily
Total E&P Canada Ltd.	MackKay	Water withdrawals	0.1	SW-3-95-12 W4M	Daily
	Tar	Water withdrawals	10.9	Various	Daily
	Athabasca	Water releases	22.1	NW-16-95-11 W4M	Daily

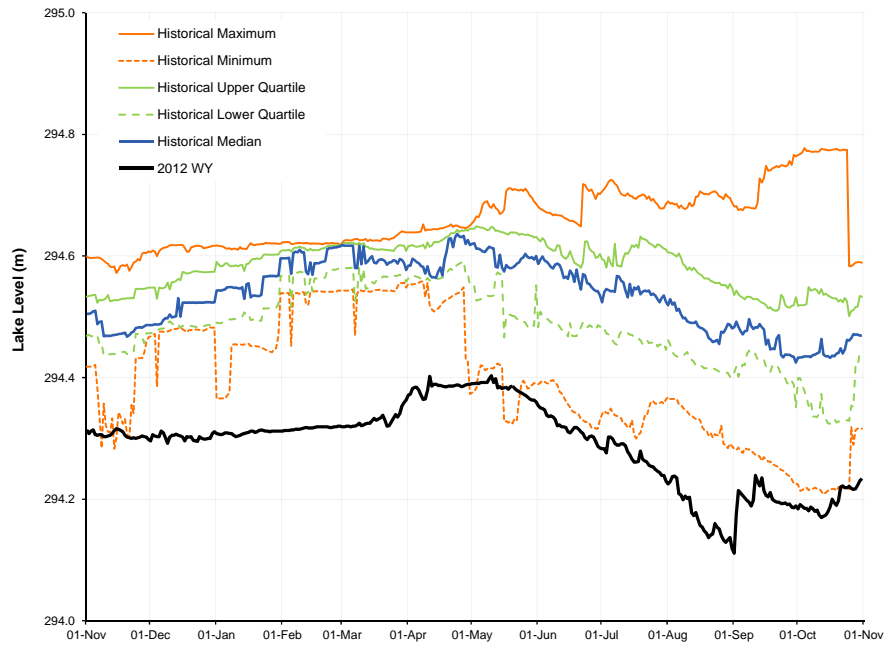
Note: The above data were used in the water balance calculations described in Section 5. Additional information was received from industry but not included within the water balance calculations, including (i) data classified as muskeg dewatering, groundwater extraction, or other processes not affecting natural surface watercourses and waterbodies; (ii) operator withdrawal and discharge data located downstream of the corresponding observed *test* monitoring location; 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).



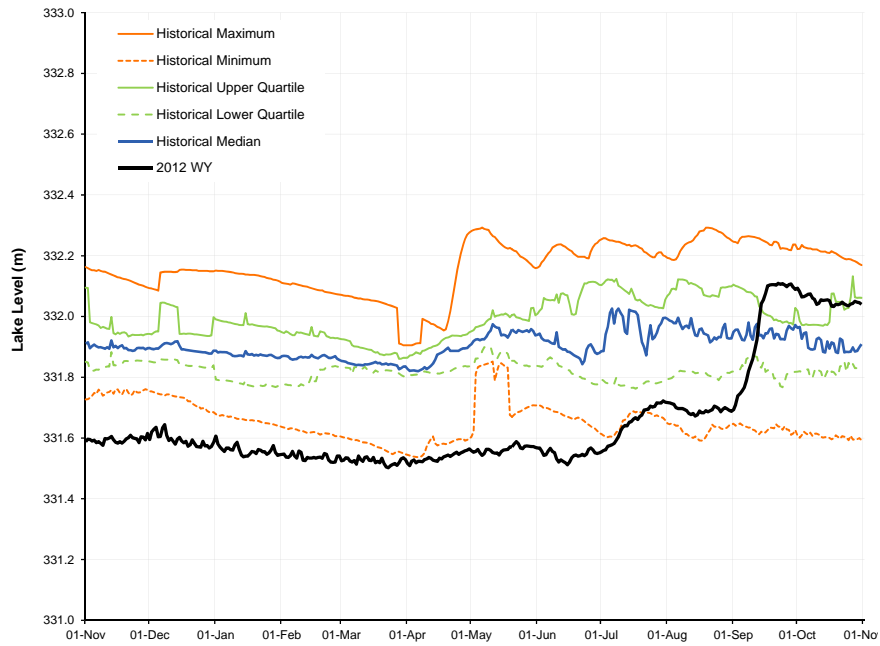
### C.3.4 2012 WY Hydrographs in Historical Context

Discharge and water level hydrographs for the 2012 WY, for each RAMP station, are presented in Figure C.3-1 to Figure C.3-49. Historical maximum, minimum, and median daily values are also provided to assist with interpretation. Stations L4, S43, S45, S48, S49, S50A, S51, S55, and S57 do not contain more than three open-water seasons of historical data, and historical data are; therefore, 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.

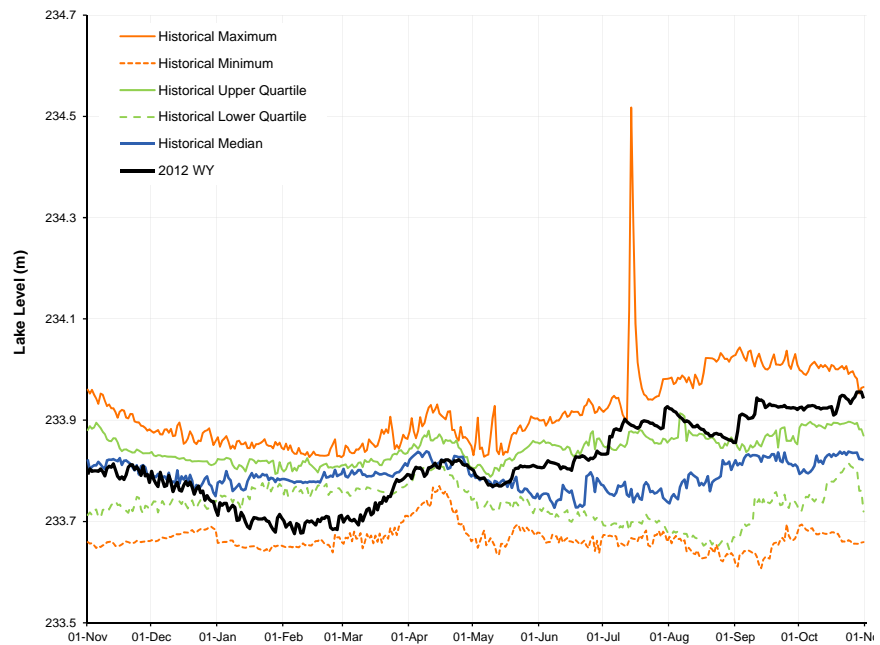
**Figure C.3-1 2012 WY water level hydrograph and historical context for Station L1, McClelland Lake.**



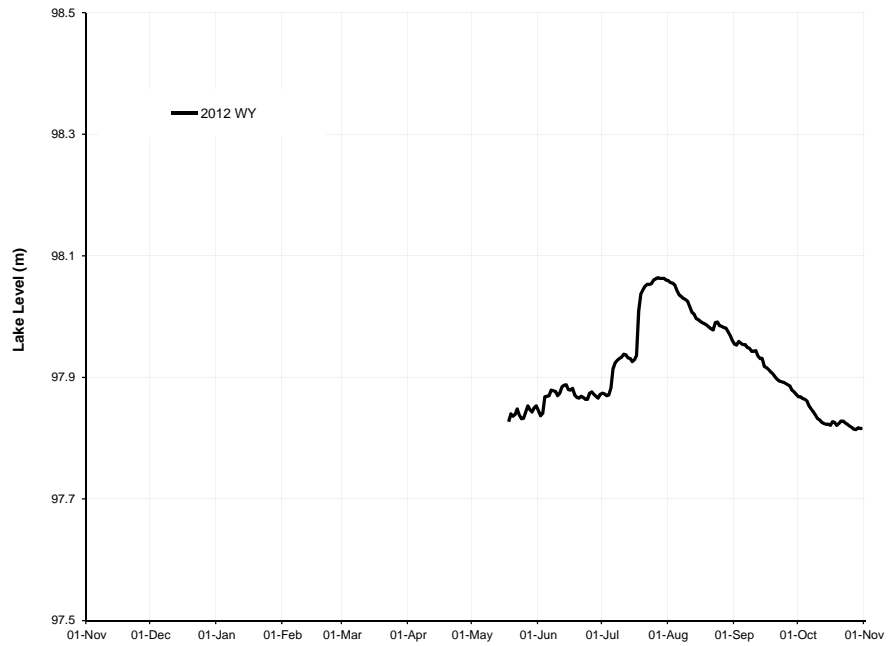
**Figure C.3-2 2012 WY water level hydrograph and historical context for Station L2, Kears Lake.**



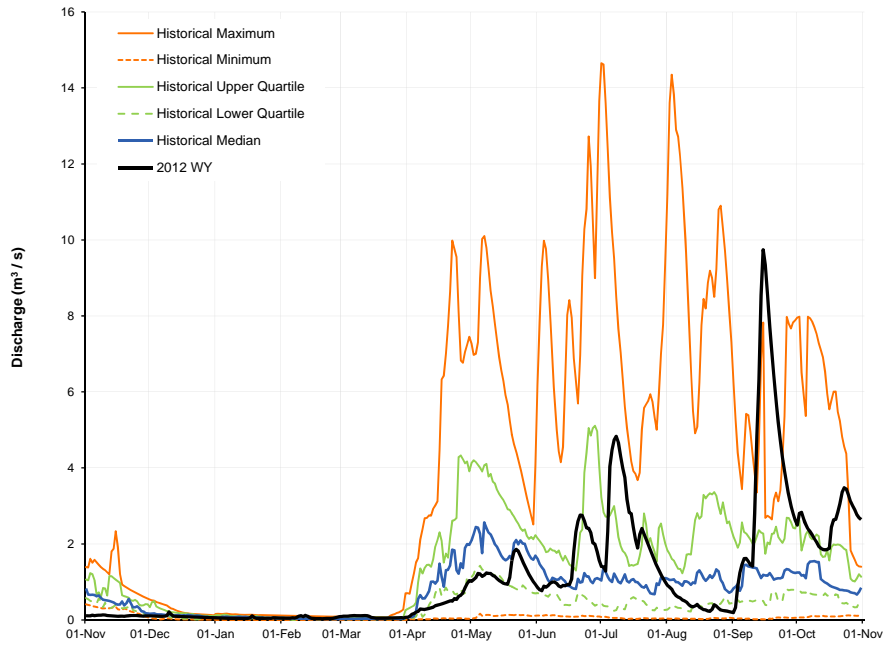
**Figure C.3-3 2012 WY water level hydrograph and historical context for Station L3, Isadore's lake.**



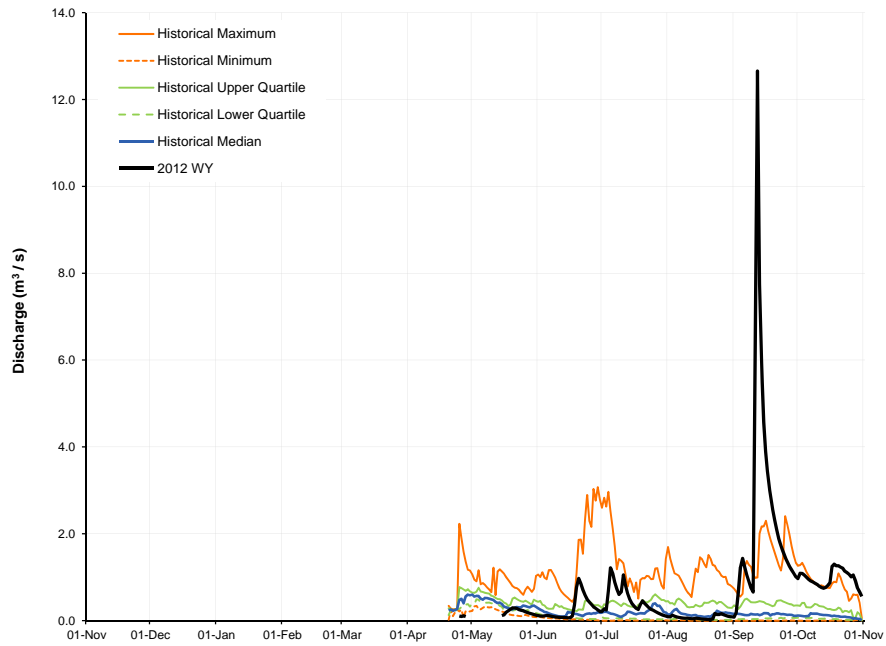
**Figure C.3-4 2012 WY water level hydrograph for Station L4, Namur Lake near the outlet.**



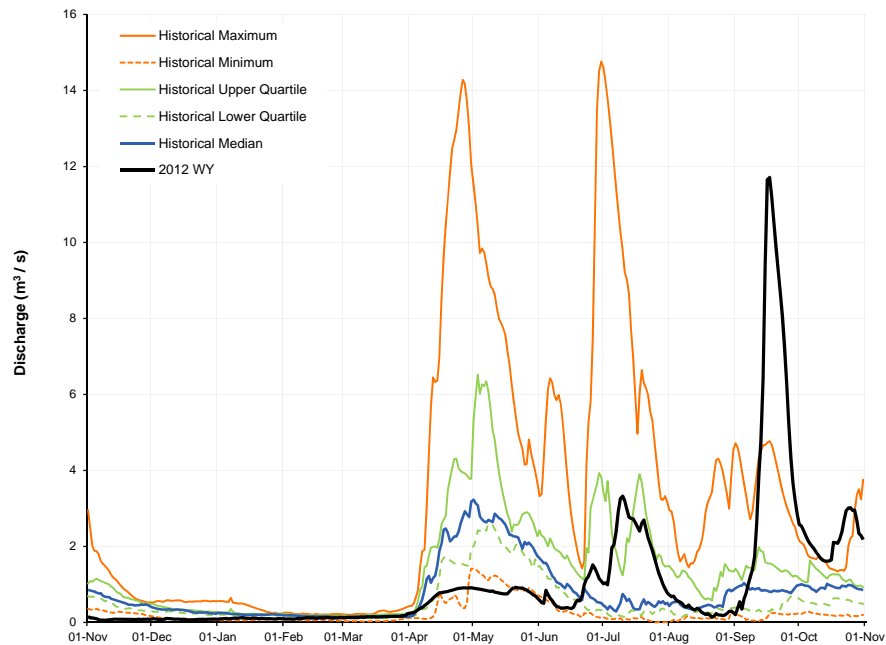
**Figure C.3-5 2012 WY discharge hydrograph and historical context for Station S2, Jackpine Creek at Canterra Road.**



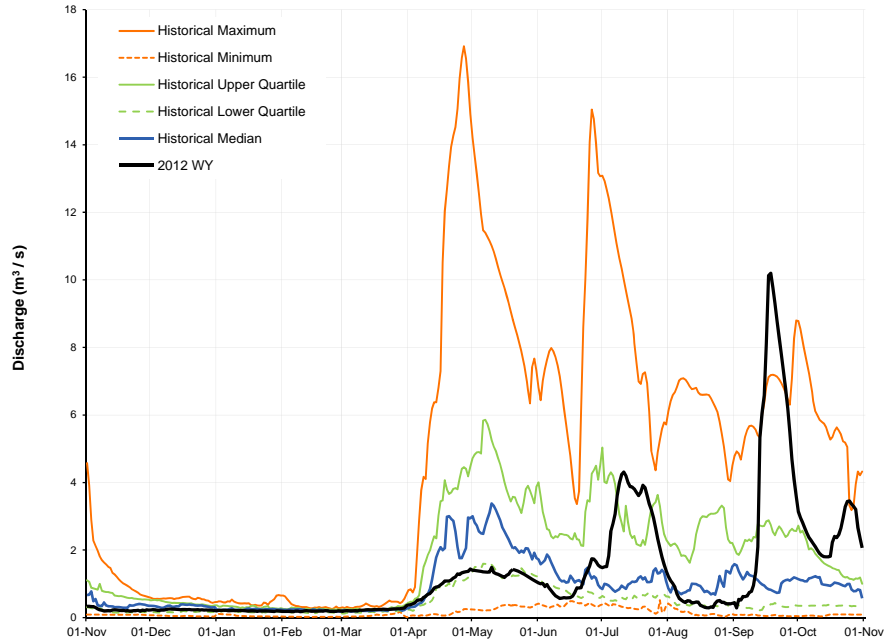
**Figure C.3-6 2012 WY discharge hydrograph and historical context for Station S3, Iyininim Creek above Kearl Lake.**



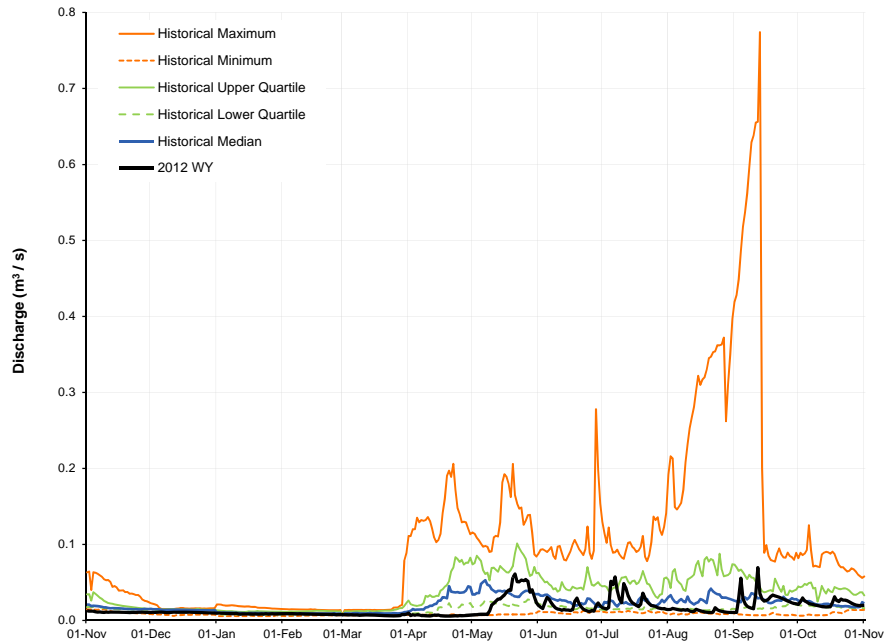
**Figure C.3-7 2012 WY discharge hydrograph and historical context for Station S5, Muskeg River above Stanley Creek.**



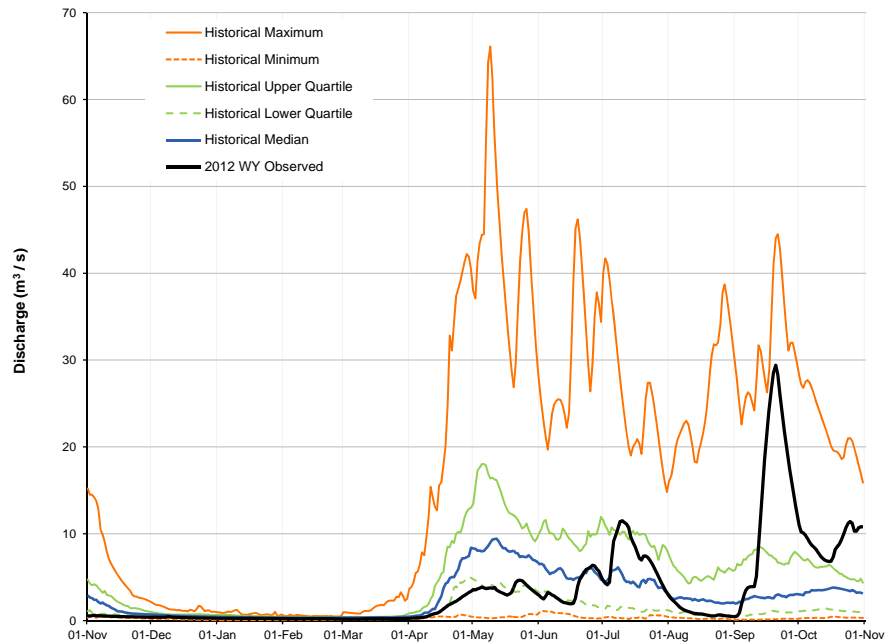
**Figure C.3-8 2012 WY discharge hydrograph and historical context for Station S5A, Muskeg River above Muskeg Creek.**



**Figure C.3-9 2012 WY discharge hydrograph and historical context for Station S6, Mills Creek at Highway 63.**

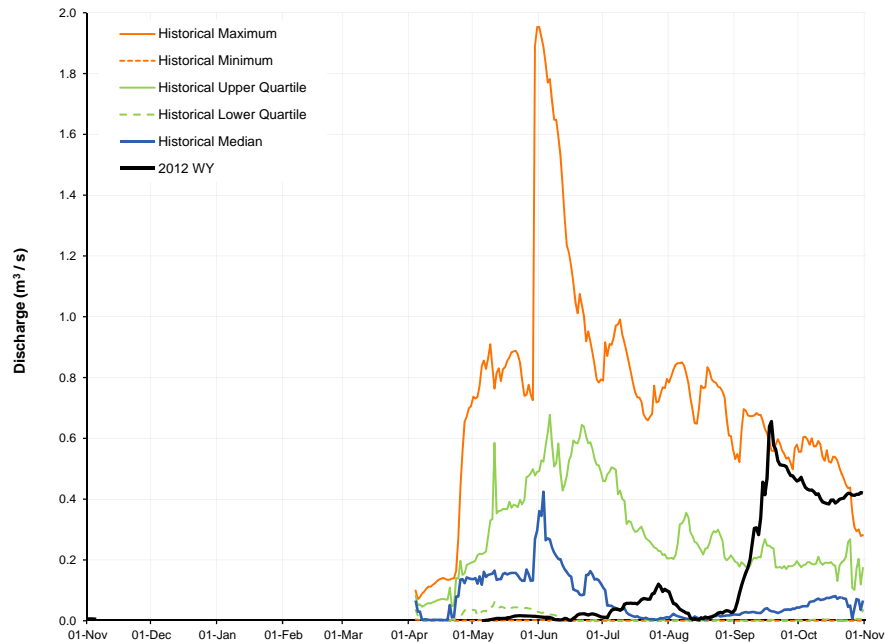


**Figure C.3-10 2012 WY discharge hydrograph and historical context for Station S7, Muskeg River near Fort McKay (07DA008).**



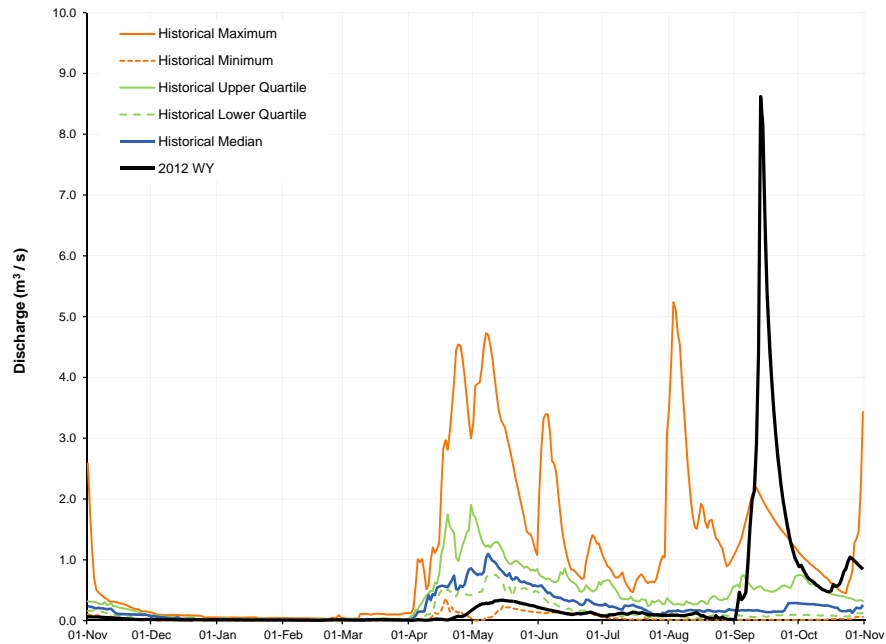
Note: Hydrograph is composed of WSC data from station 07DA008 from March 1 to October 31, 2012, and RAMP Station S7 data from November 1, 2011 to February 29, 2012.

**Figure C.3-11 2012 WY discharge hydrograph and historical context for Station S9, Kearl Lake Outlet.**



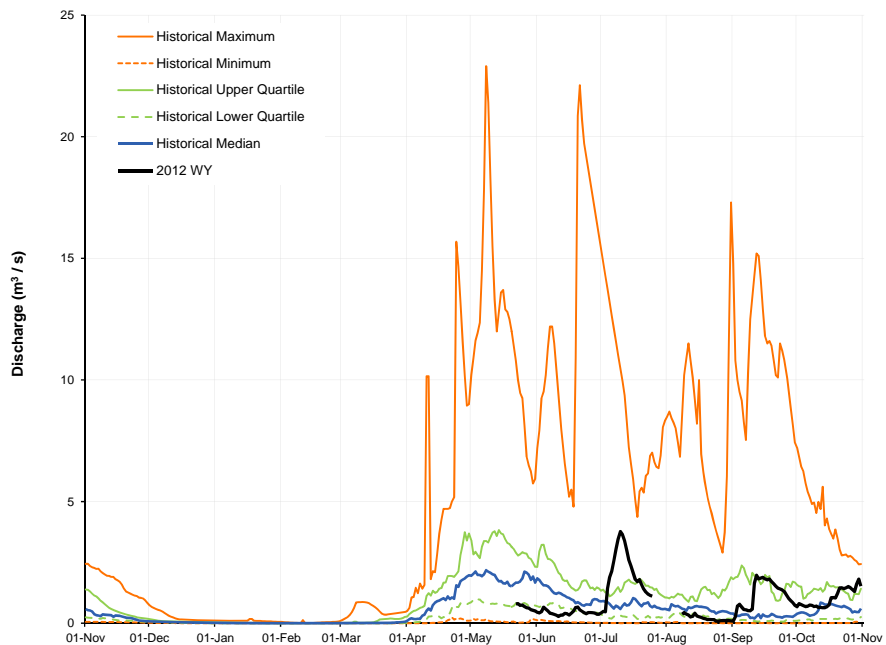
Note: Data at this station was impacted by beaver activity and data should be considered of poor quality.

**Figure C.3-12 2012 WY discharge hydrograph and historical context for Station S10/S10A, Wapasu Creek at Canterra Road/near the mouth.**

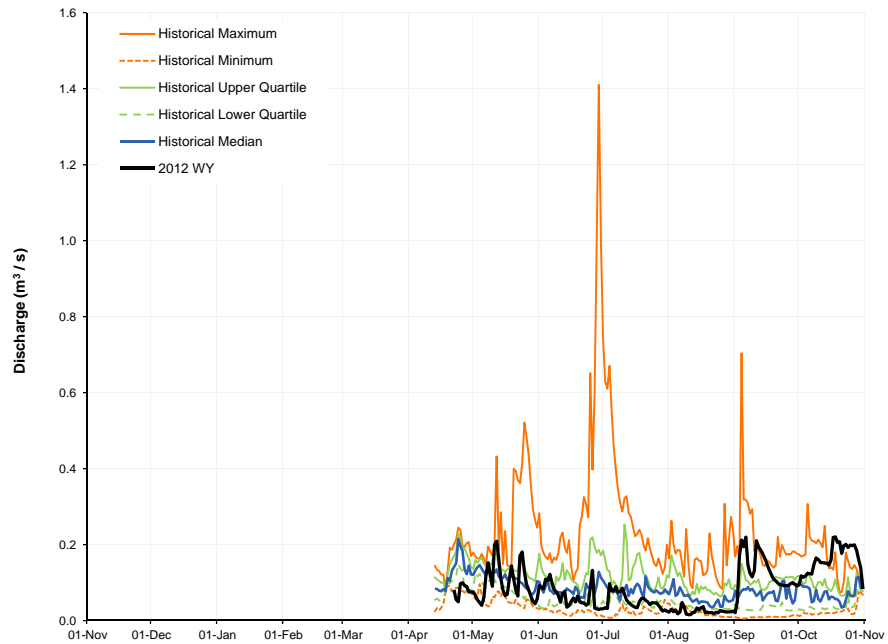


Note: Data at this station was impacted by beaver activity and is presented for reference purposes only.

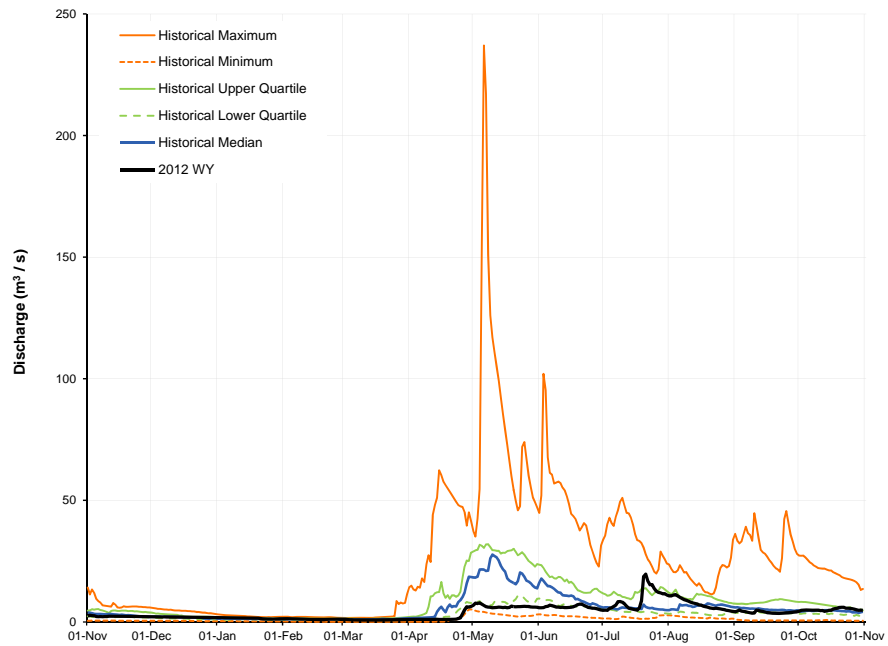
**Figure C.3-13 2012 WY discharge hydrograph and historical context for Station S11, Poplar Creek at Highway 63 (07DA007).**



**Figure C.3-14 2012 WY discharge hydrograph and historical context for Station S12, Fort Creek at Highway 63.**



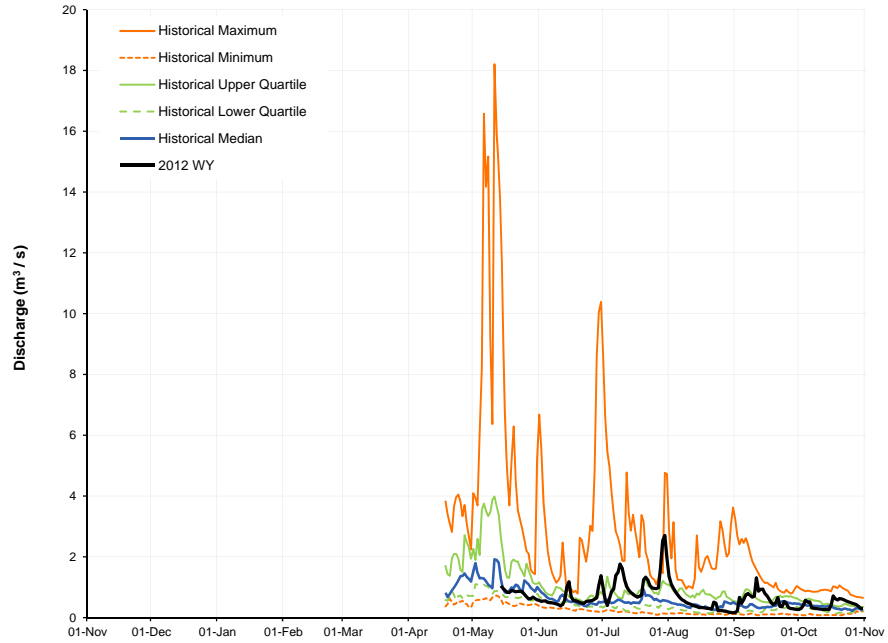
**Figure C.3-15 2012 WY discharge hydrograph and historical context for Station S14A, Ells River at the CNRL Bridge.**



Note: Historical statistics were based on data from WSC Station 07DA017 (1975 to 1986) and RAMP Station S14A (2004 to 2011).

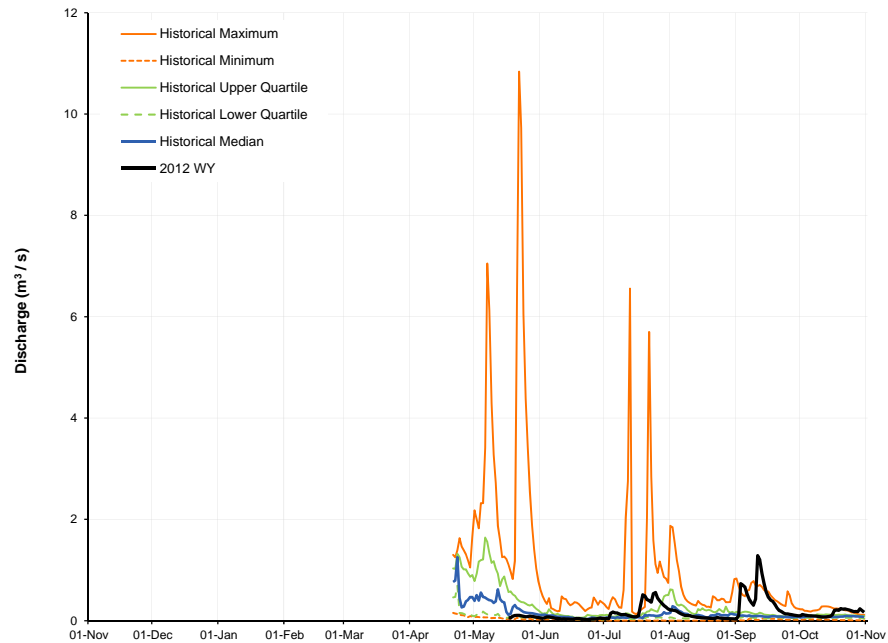


**Figure C.3-16 2012 WY discharge hydrograph and historical context for Station S15A, Tar River near the mouth.**



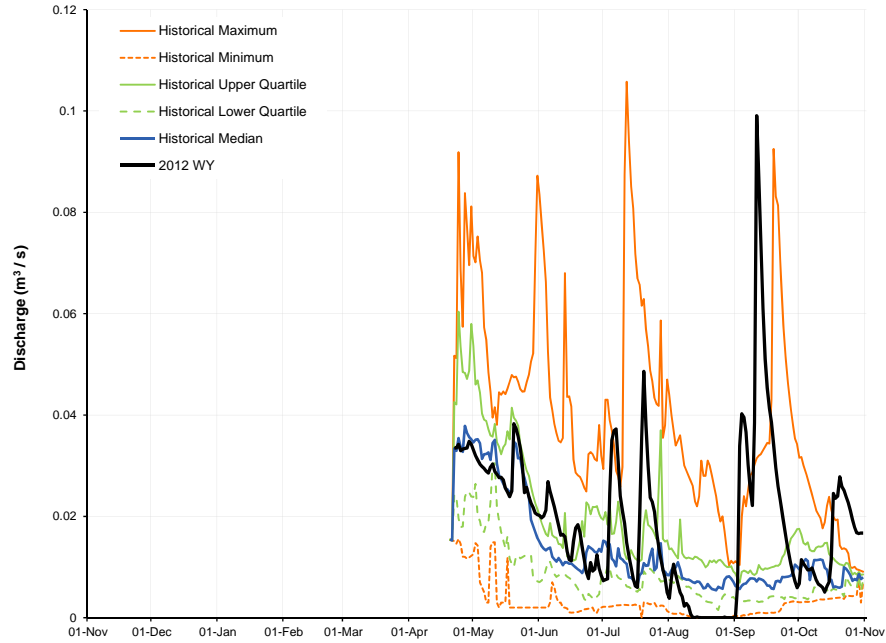
Note: Historical statistics were based on data from WSC Station 07DA015 (1975 to 1977), RAMP Station S15 (2001 to 2006), and RAMP Station S15A (2007 to 2011).

**Figure C.3-17 2012 WY discharge hydrograph and historical context for Station S16A, Calumet River near the mouth.**



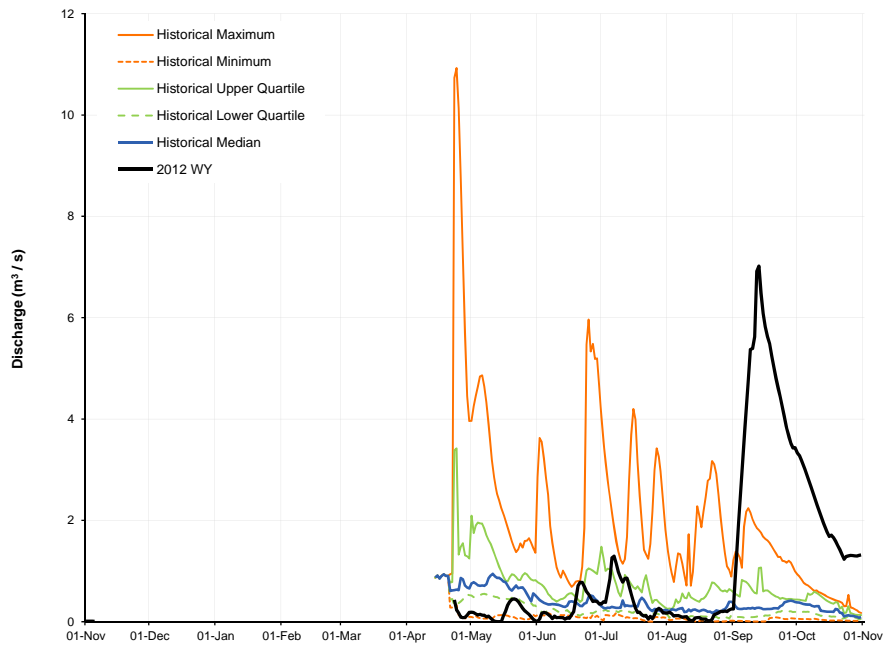
Note: Historical statistics were based on data from WSC Station 07DA014 (1975 to 1977), RAMP Station S16 (2001 to 2005), CNRL Station CR1 (2006 to 2009), and RAMP Station S16A (2010 to 2011).

**Figure C.3-18 2012 WY discharge hydrograph and historical context for Station S19, Tar River Lowland Tributary near the mouth.**



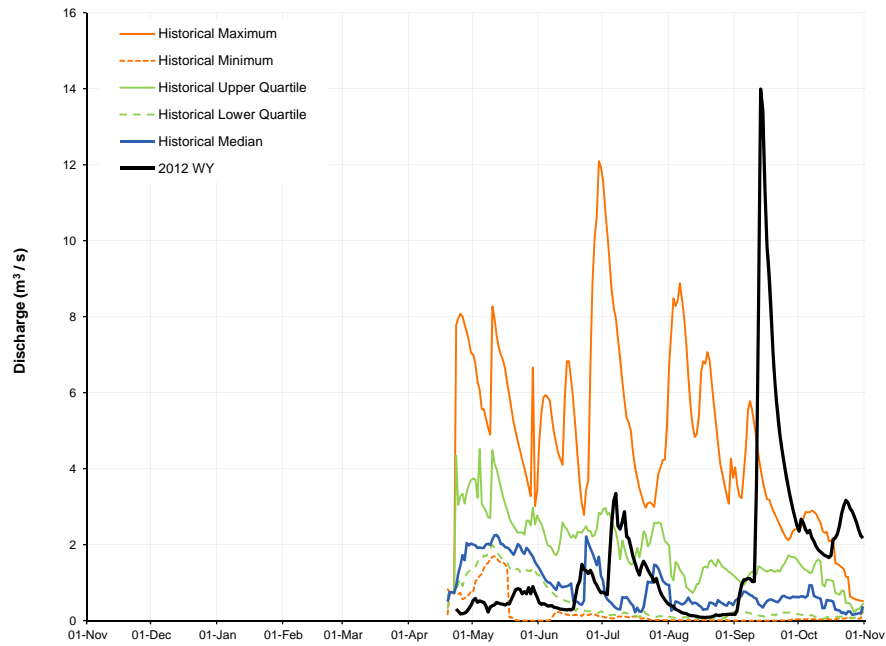
Note: Data at this station was impacted by beaver activity and data should be considered of poor quality.

**Figure C.3-19 2012 WY discharge hydrograph and historical context for Station S20, Muskeg River Upland.**

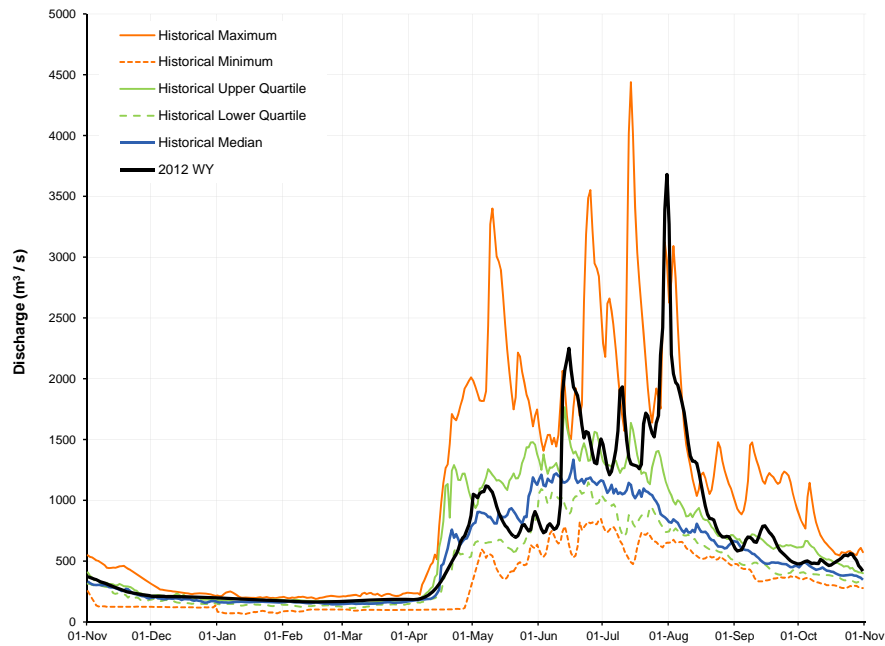


Note: Data at this station was impacted by beaver activity and data should be considered of poor quality.

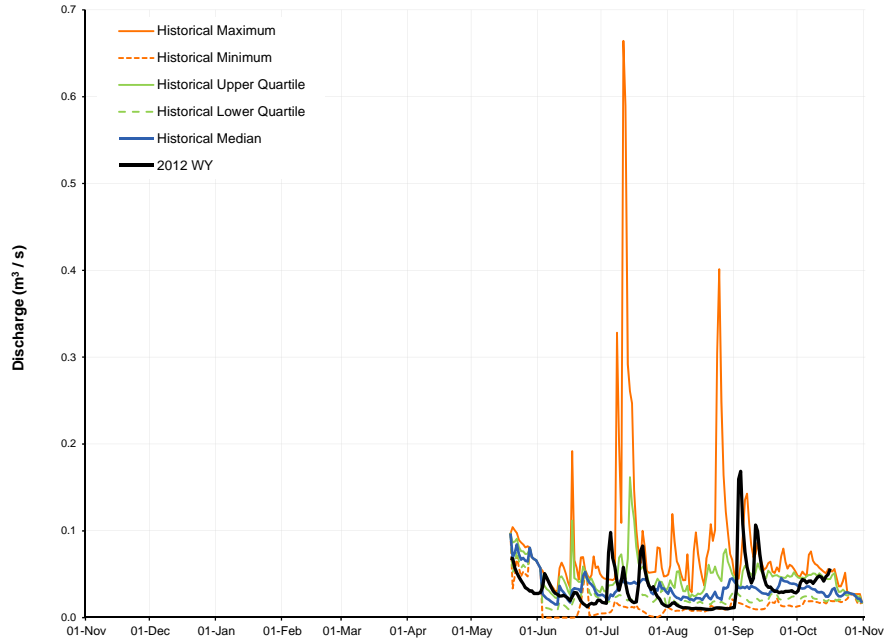
**Figure C.3-20 2012 WY discharge hydrograph and historical context for Station S22, Muskeg Creek near the mouth.**



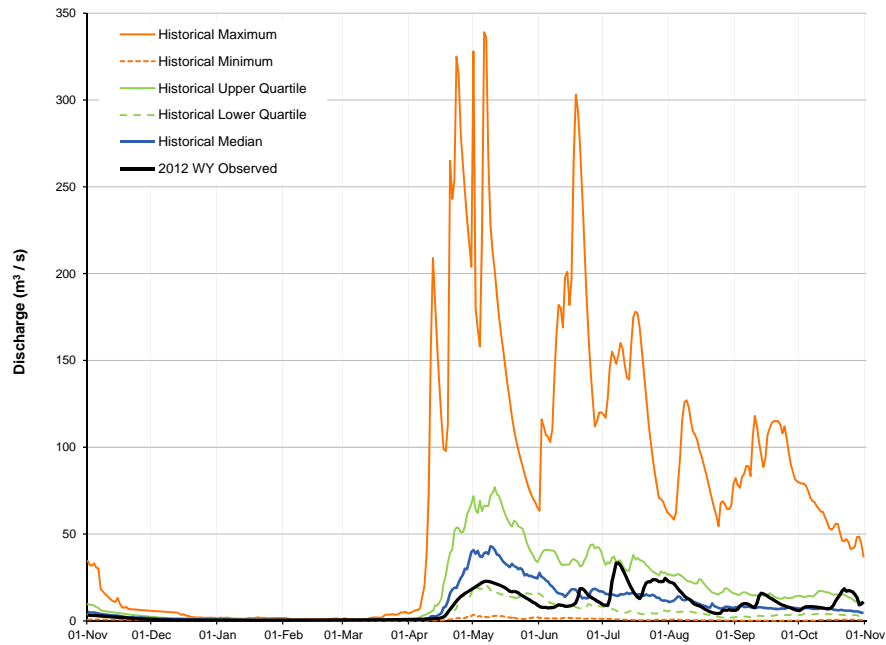
**Figure C.3-21 2012 WY discharge hydrograph and historical context for Station S24, Athabasca River below Eymundson Creek.**



**Figure C.3-22 2012 WY discharge hydrograph for Station S25, Susan Lake Outlet.**

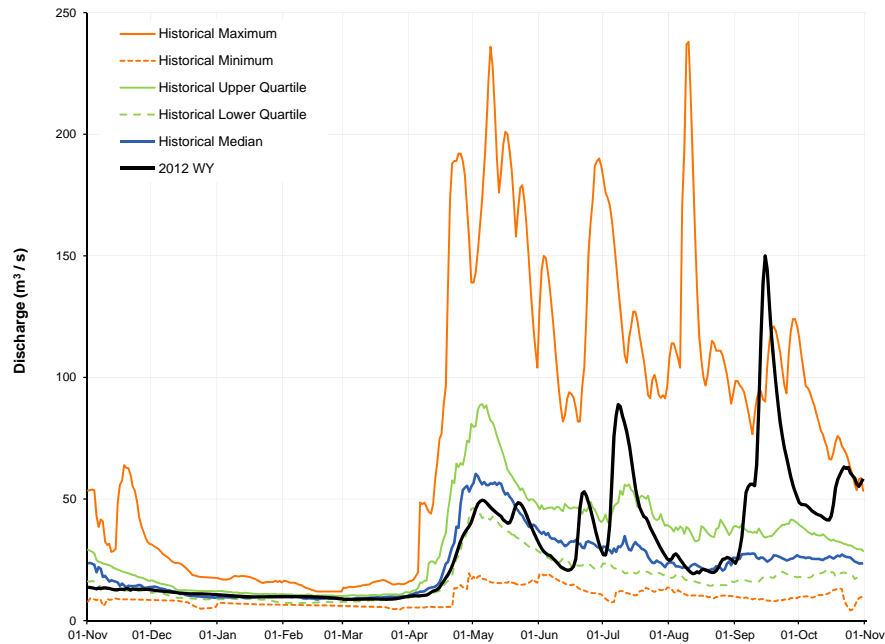


**Figure C.3-23 2012 WY discharge hydrograph and historical context for Station S26, MacKay River near Fort McKay (07DB001).**



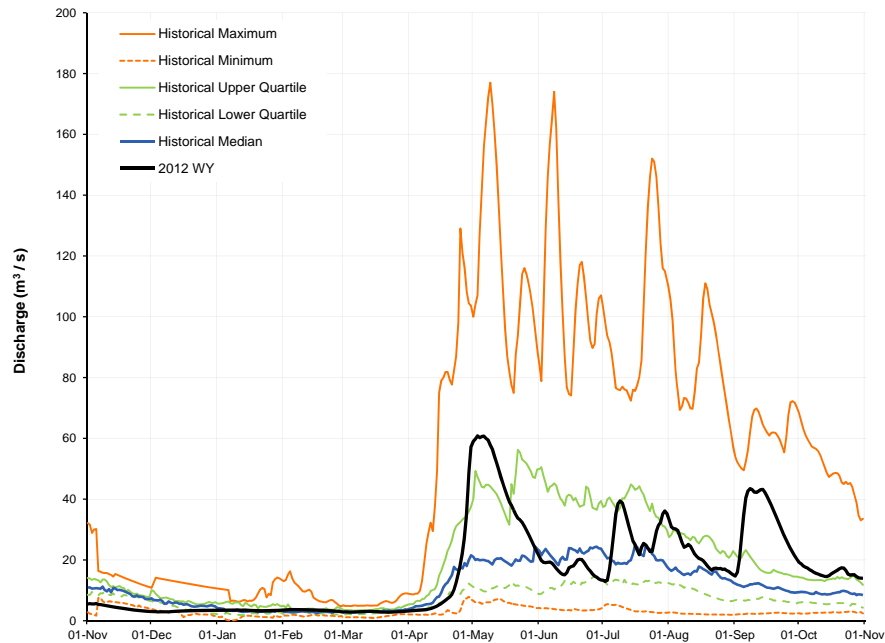
Note: Hydrograph was composed of WSC data from station 07DB001 from March 1 to October 31, 2012 WY, and RAMP Station S26 data from November 1, 2011 to February 29, 2012.

**Figure C.3-24 2012 WY discharge hydrograph and historical context for Station S27, Firebag River near the mouth (07DC001).**



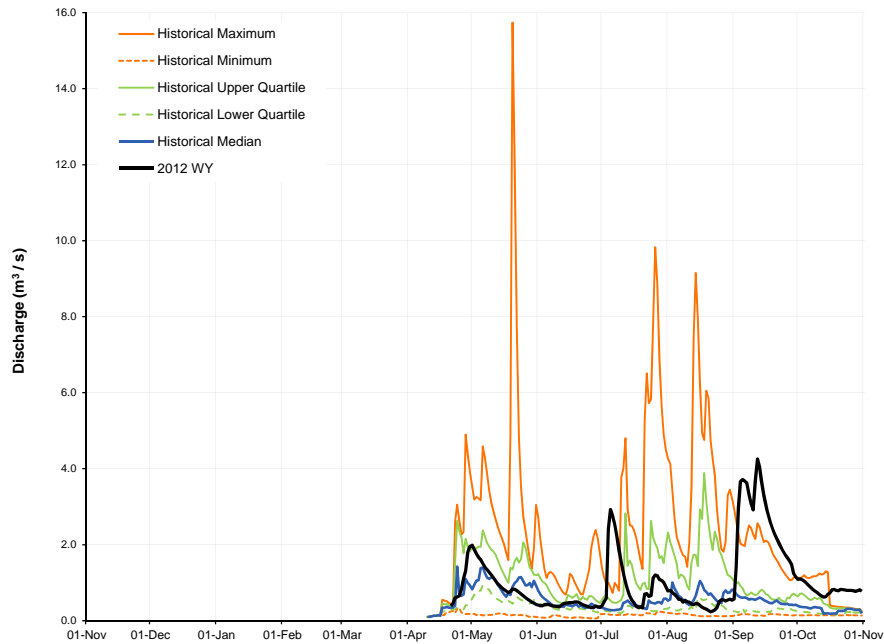
Note: Hydrograph was composed of WSC data from station 07DB001 from March 1 to October 31, 2012, and RAMP Station S27 data from November 1, 2011 to February 29, 2012.

**Figure C.3-25 2012 WY discharge hydrograph and historical context for Station S29, Christina River near Chard (07CE002).**

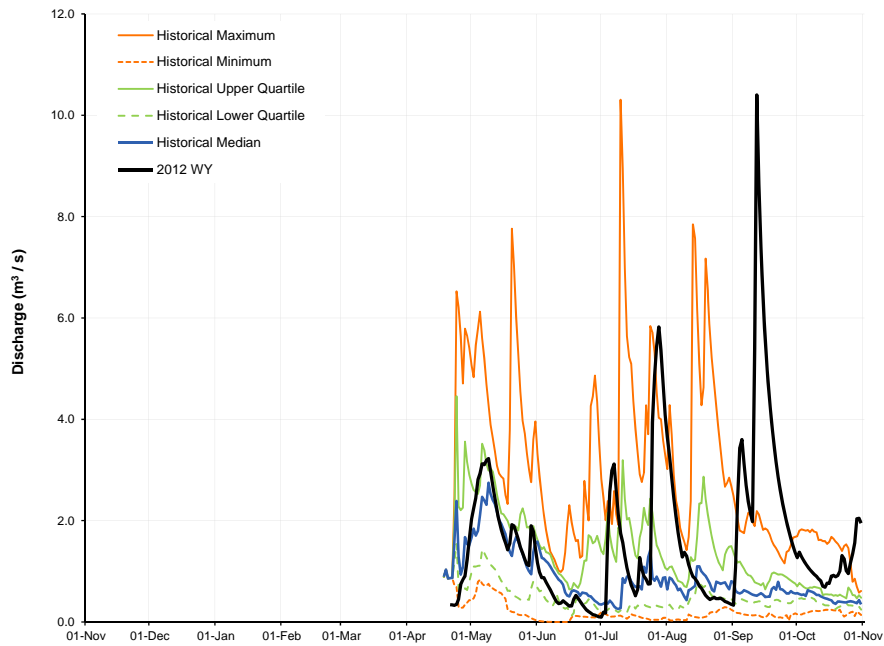


Note: Hydrograph was composed of WSC data from Station 07CE002 from March 1 to October 31, 2012, and RAMP Station S29 data from November 1, 2011 to February 29, 2012.

**Figure C.3-26 2012 WY discharge hydrograph and historical context for Station S31, Hangingstone Creek at North Star Road.**

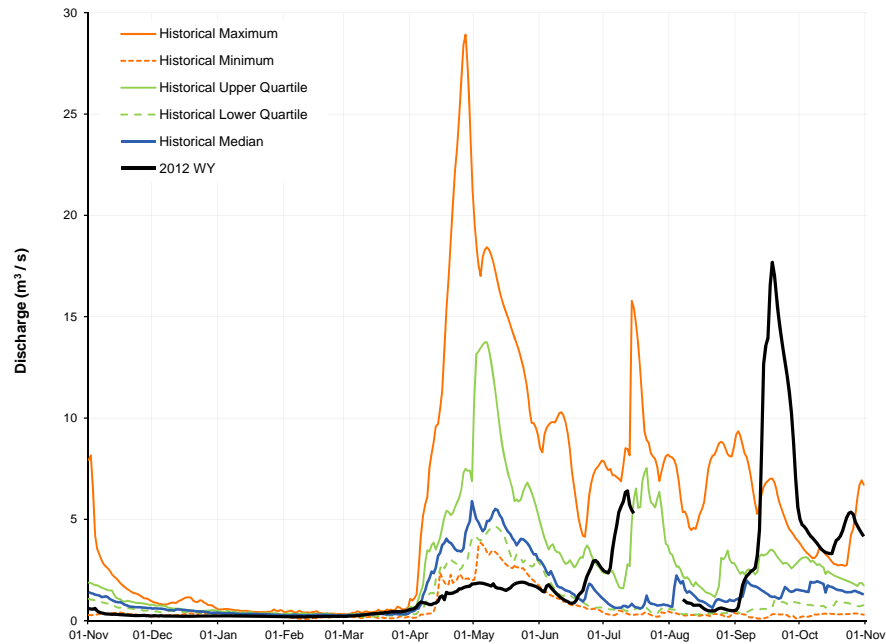


**Figure C.3-27 2012 WY discharge hydrograph and historical context for Station S32, Surmont Creek at Highway 881.**

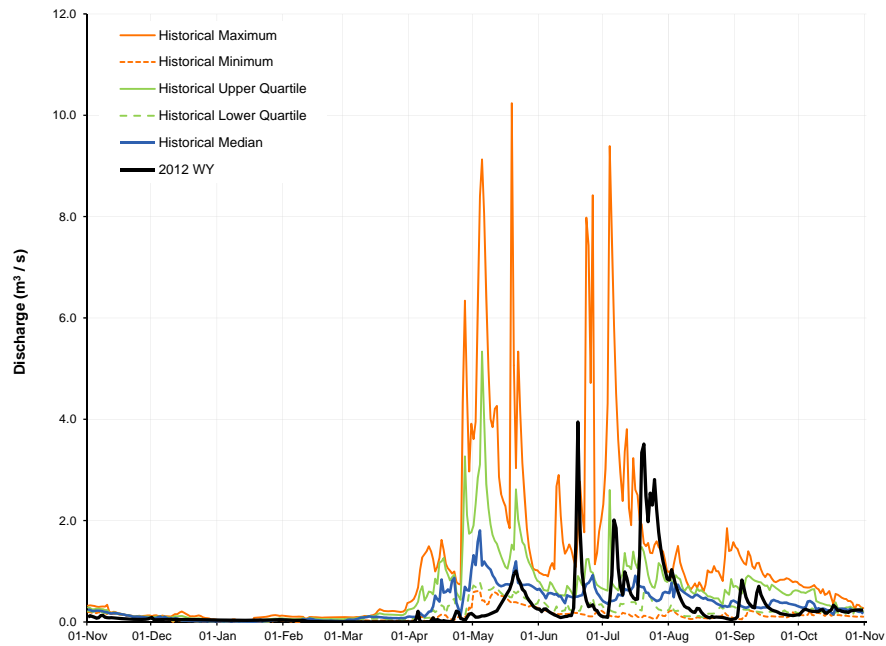


Note: Data at this station was impacted sporadically by backwater from Gregoire Lake and data should be considered with caution.

**Figure C.3-28 2012 WY discharge hydrograph and historical context for Station S33, Muskeg River at the Aurora/Albian Boundary.**

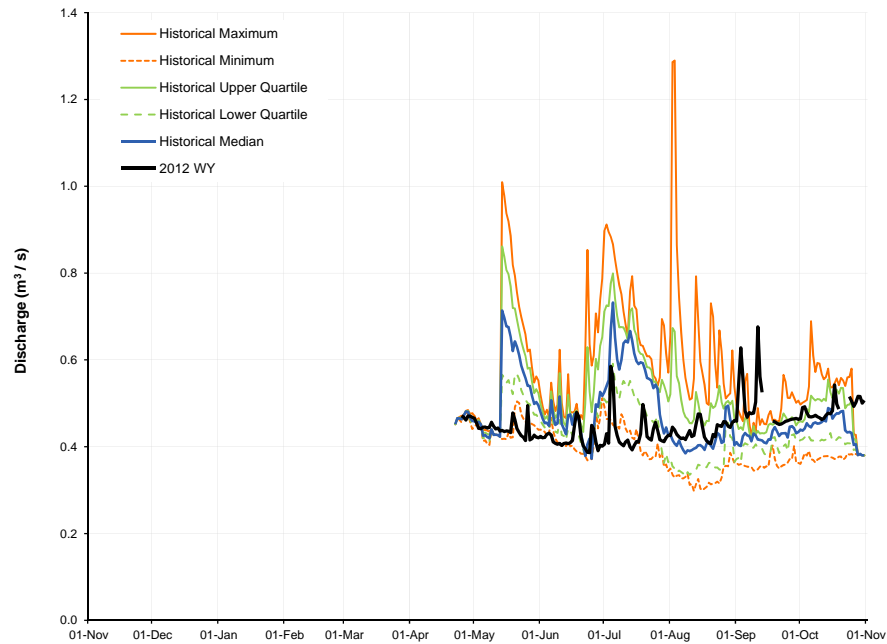


**Figure C.3-29 2012 WY discharge hydrograph and historical context for Station S34, Tar River above CNRL Lake.**



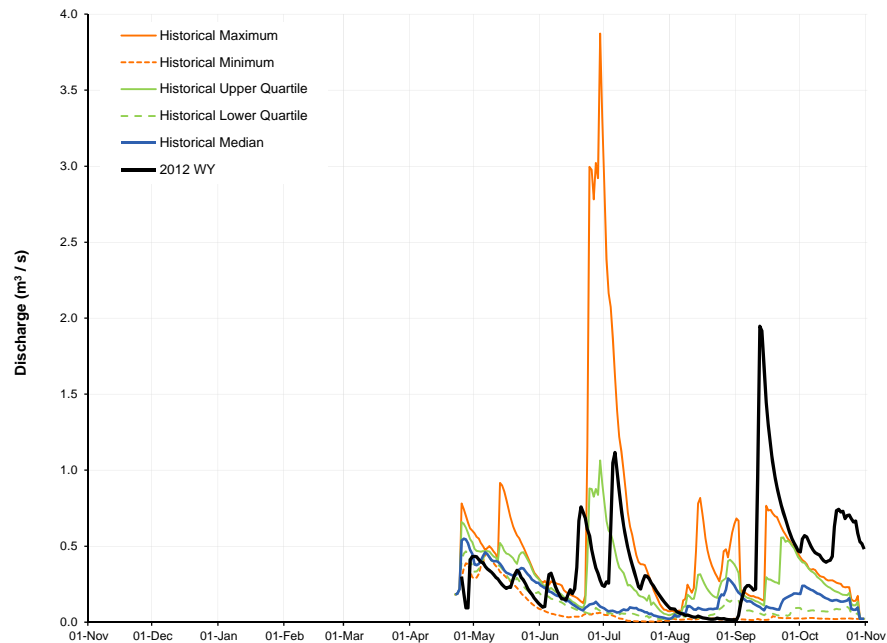
Note: Data at this station was impacted sporadically by backwater from CNRL Lake and data should be considered with caution.

**Figure C.3-30 2012 WY discharge hydrograph for Station S36, McClelland Lake Outlet above Firebag River.**



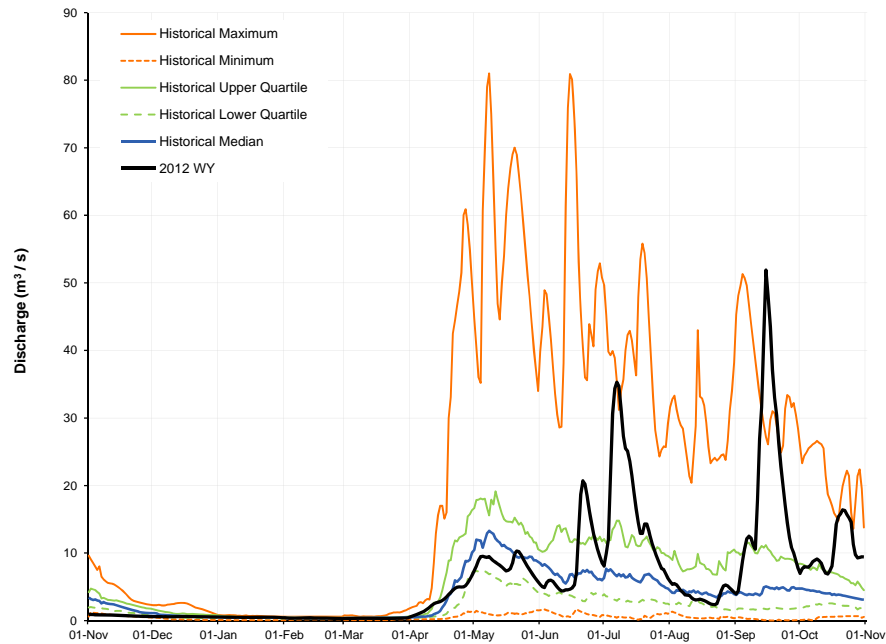
Note: Data at this station was impacted by beaver activity and data should be considered of poor quality.

**Figure C.3-31 2012 WY discharge hydrograph and historical context for Station S37, East Jackpine Creek near the 1,300 m contour.**



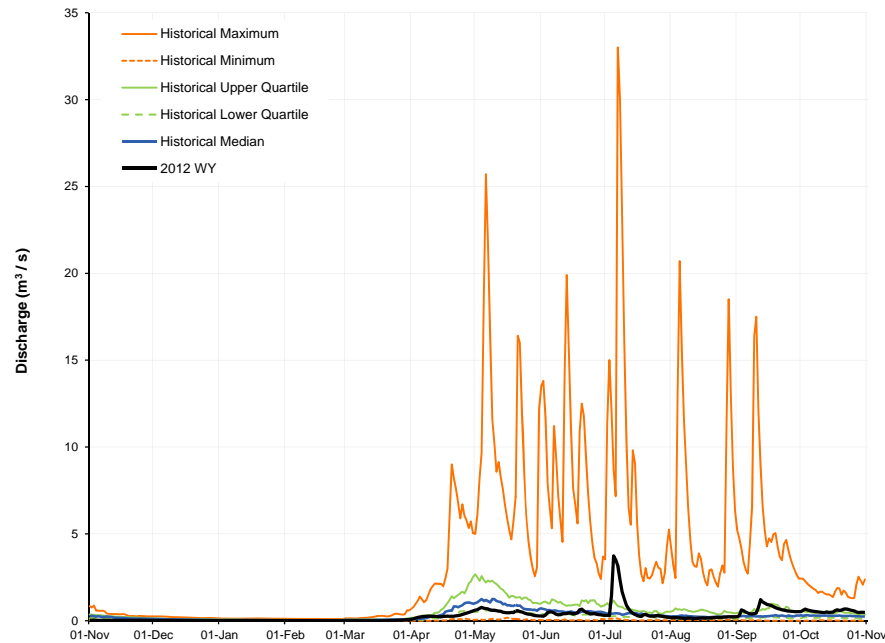


**Figure C.3-32 2012 WY discharge hydrograph and historical context for Station S38, Steepbank River near Fort McMurray (07DA006).**



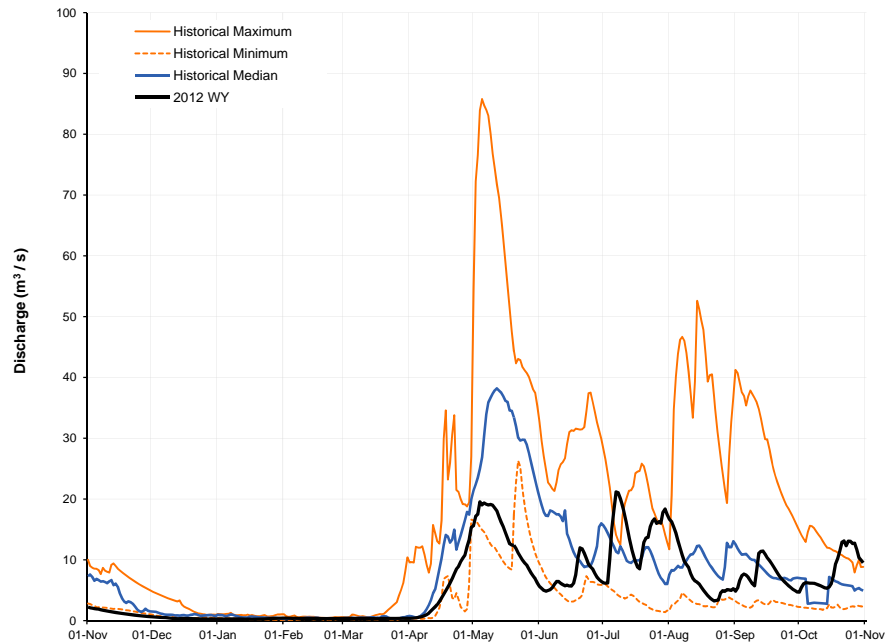
Note: Hydrograph was composed of WSC data from station 07DA006 from March 1 to October 31, 2012, and RAMP Station S38 data from November 1, 2011 to February 29, 2012.

**Figure C.3-33 2012 WY discharge hydrograph and historical context for Station S39, Beaver River above Syncrude (07DA018).**

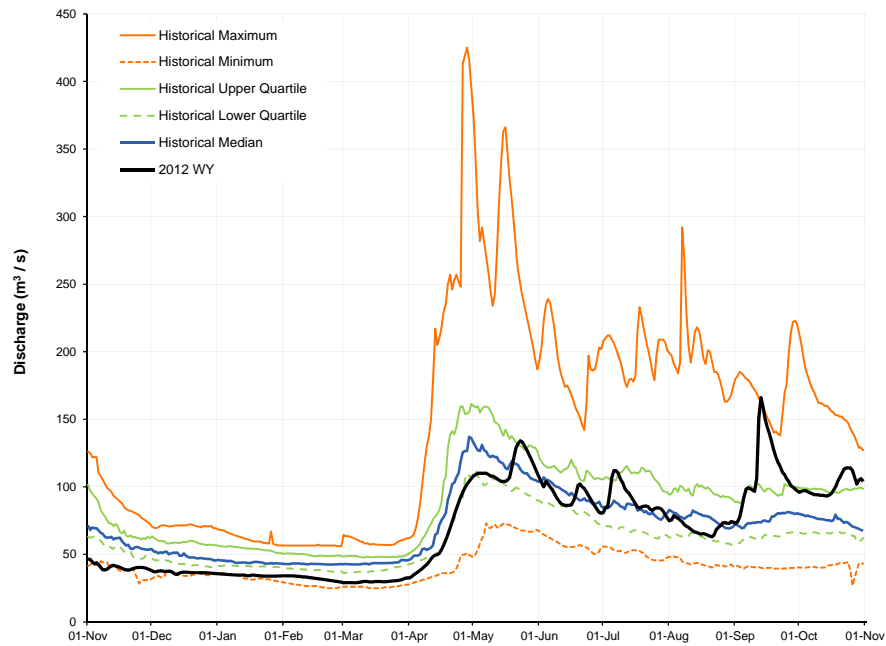


Note: Hydrograph was composed of WSC data from station 07DA018 from March 1 to October 31, 2012, and RAMP Station S39 data from November 1, 2011 to February 29, 2012.

**Figure C.3-34 2012 WY discharge hydrograph and historical context for Station S40, Mackay River at Petro-Canada Bridge.**

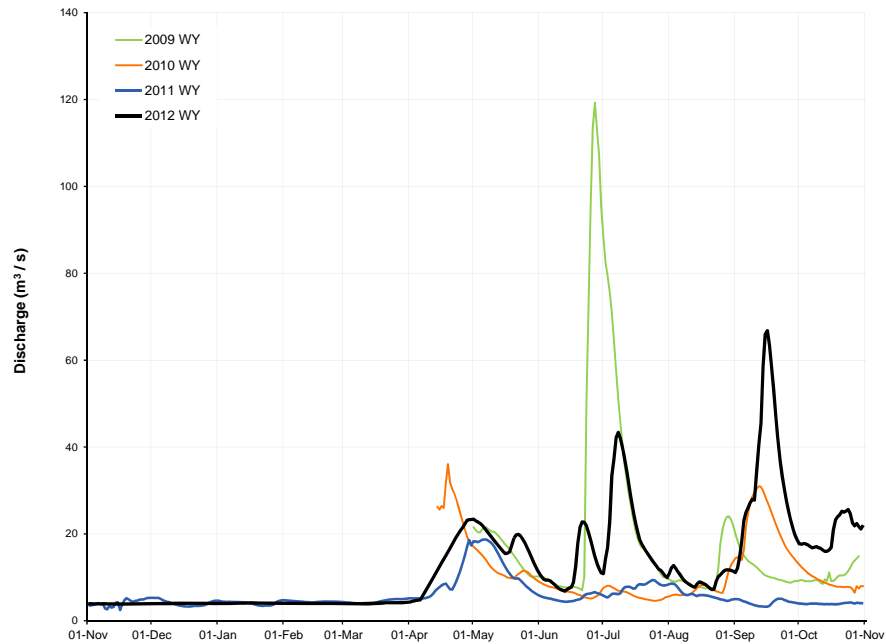


**Figure C.3-35 2012 WY discharge hydrograph and historical context for Station S42, Clearwater River above Christina River (07CD005).**

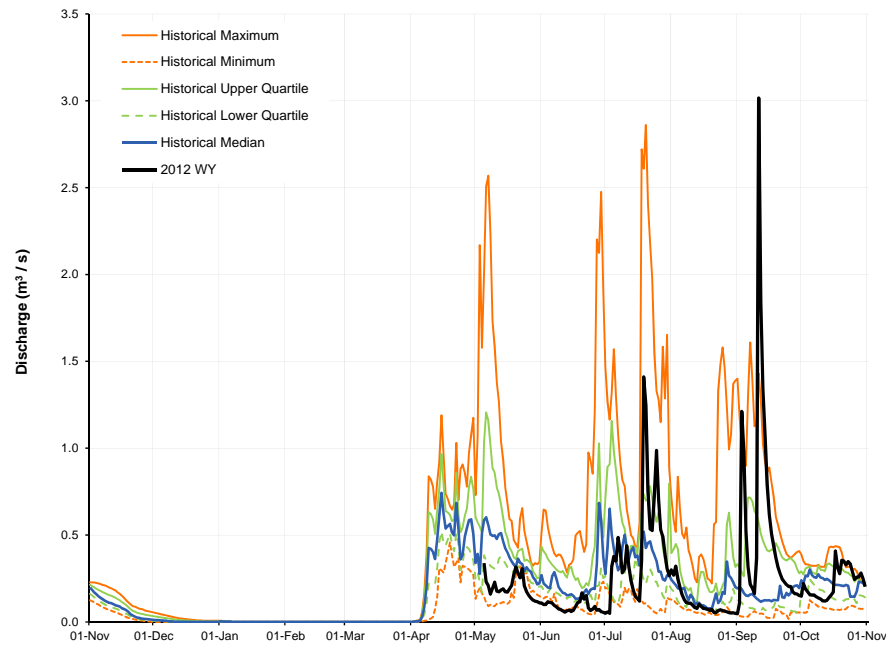


Note: Hydrograph was composed of WSC data from station 07CD005 from March 1 to October 31, 2012, and RAMP Station S42 data from November 1, 2011 to February 29, 2012.

**Figure C.3-36 2012 WY discharge hydrograph and historical context for Station S43, Firebag River above Suncor Firebag.**

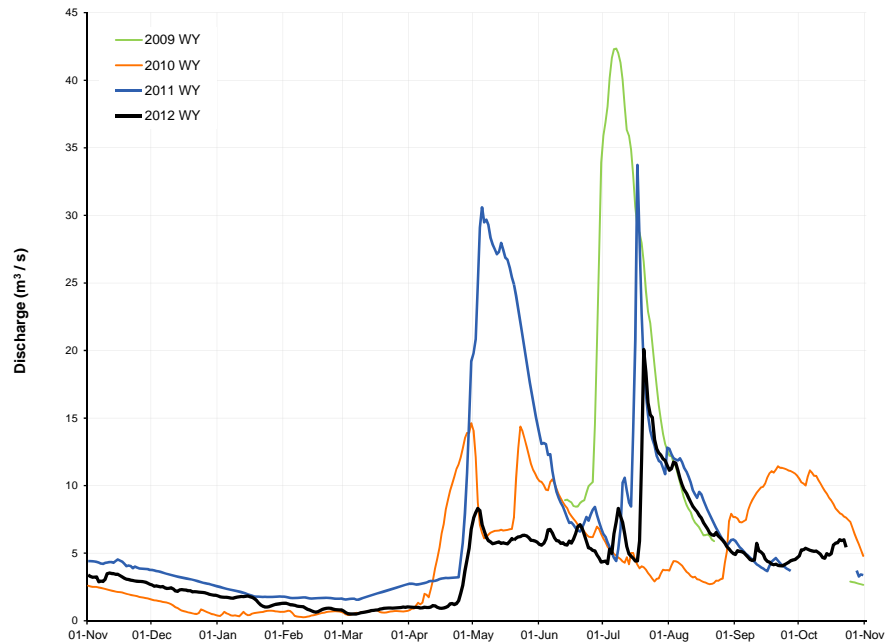


**Figure C.3-37 2012 WY discharge hydrograph and historical context for Station S44, Pierre River near Fort McKay (07DA013).**

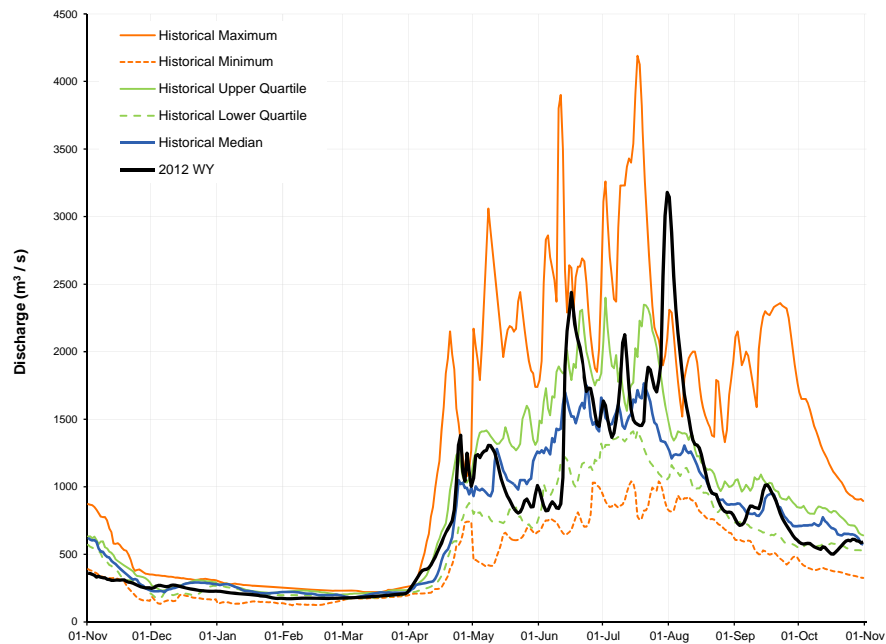


Note: Historical statistics were based on data from WSC Station 07DA013 (1975 to 1977) and RAMP Station S44 (2009 to 2011).

**Figure C.3-38 2012 WY discharge hydrograph for Station S45, Ells River above Joslyn Creek Diversion.**

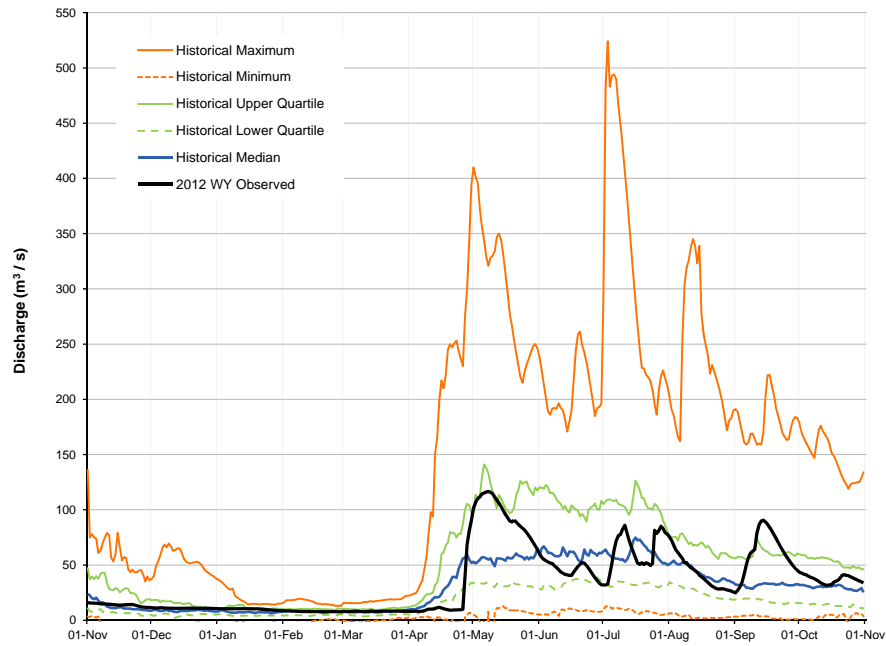


**Figure C.3-39 2012 WY discharge hydrograph and historical context for Station S46, Athabasca River near Embarras Airport.**



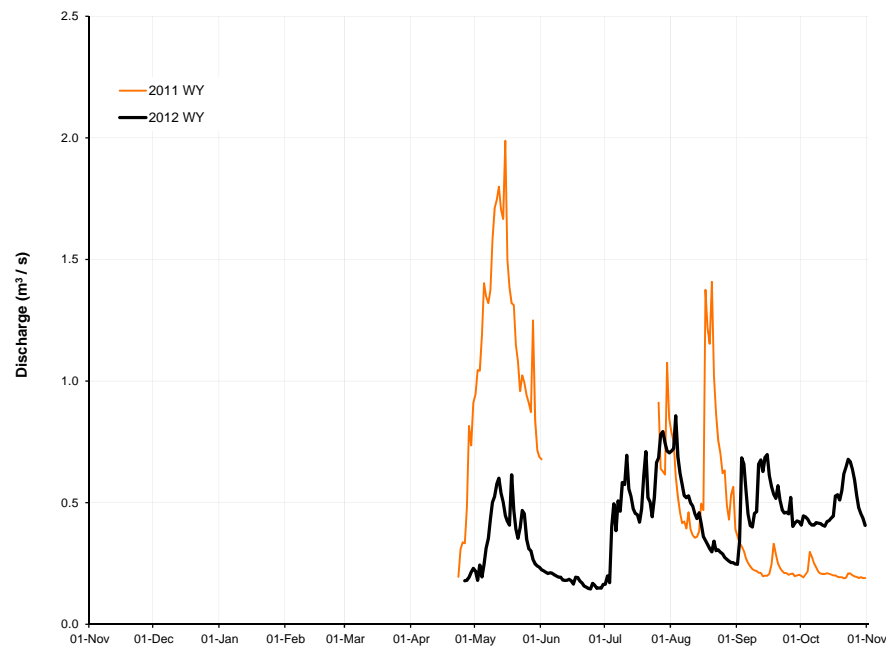
Note: Historical statistics were based on data from WSC Station 07DD001 (1971 to 1984).

**Figure C.3-40 2012 WY discharge hydrograph for Station S47, Christina River near the mouth.**

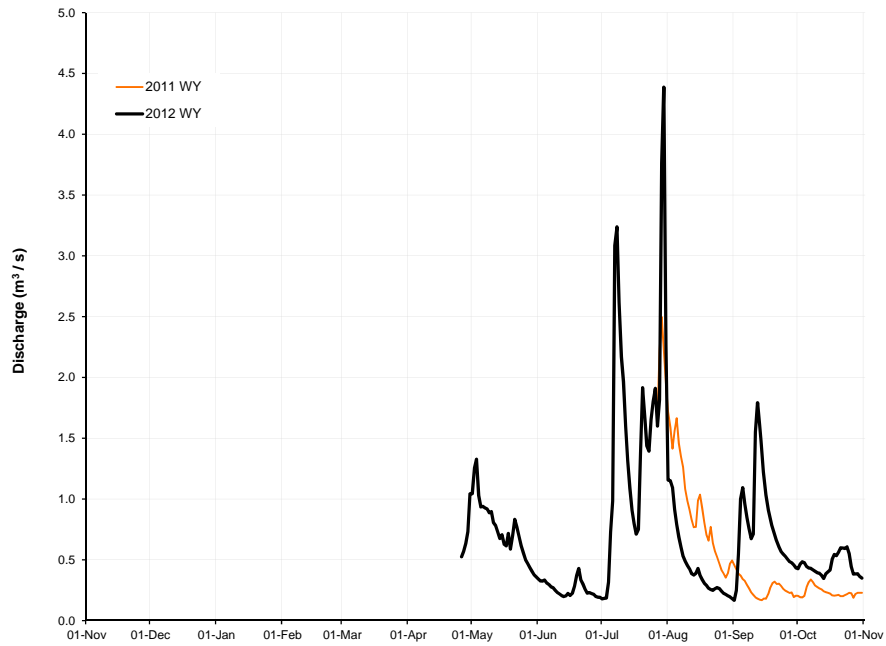


Note: Historical statistics from 1967 to 2011 were estimated by calculating the difference between the measured flow at Clearwater River above Christina River, WSC Station 07CD005 and Clearwater River above Draper, WSC Station 07CD001.

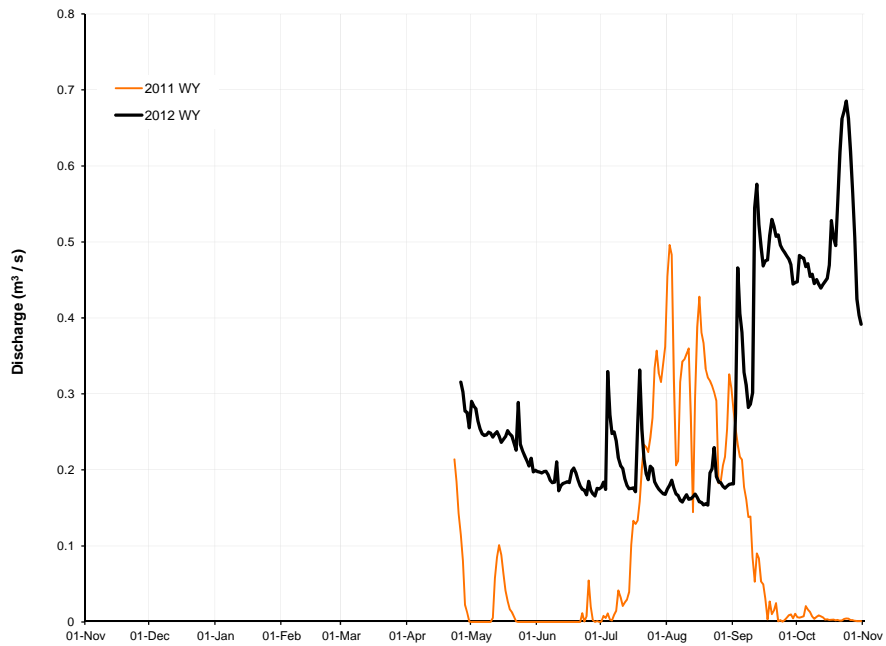
**Figure C.3-41 2012 WY discharge hydrograph for Station S48, Big Creek.**



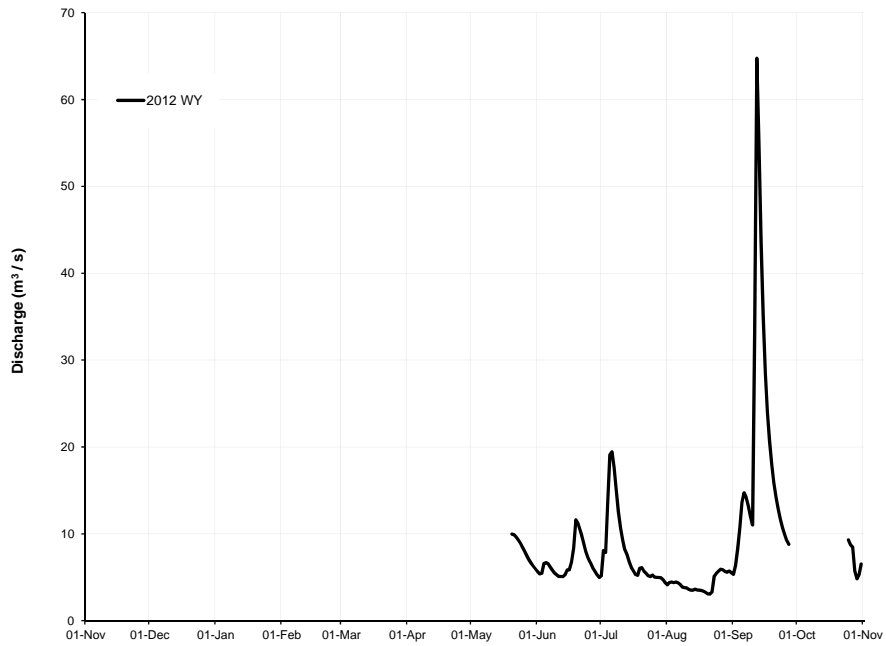
**Figure C.3-42 2012 WY discharge hydrograph for Station S49, Eymundson Creek near the mouth.**



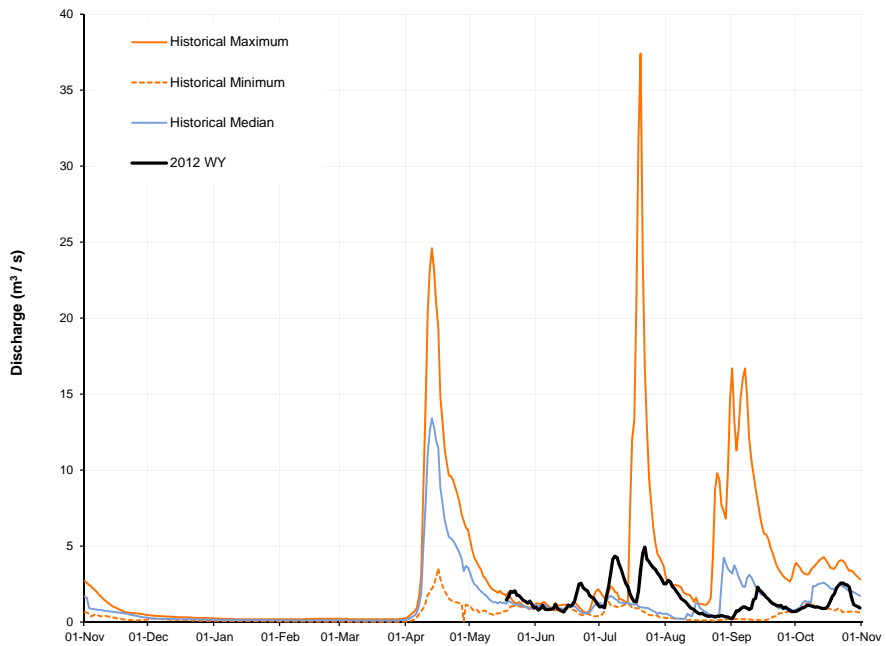
**Figure C.3-43 2012 WY discharge hydrograph for Station S50/S50A, Red Clay Creek.**



**Figure C.3-44 2012 WY discharge hydrograph for Station S51, High Hills River above Clearwater River.**

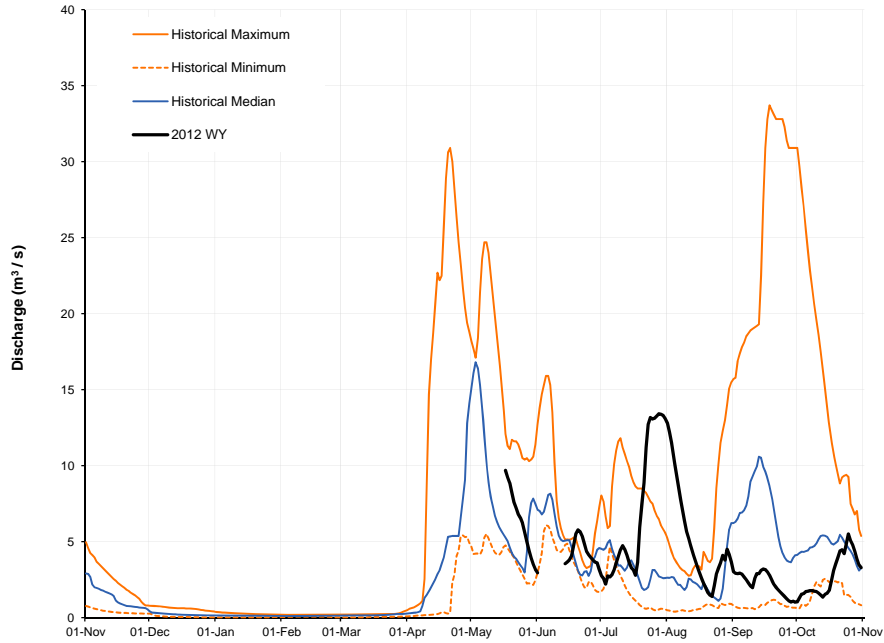


**Figure C.3-45 2012 WY discharge hydrograph for Station S53, Dover River near the mouth.**



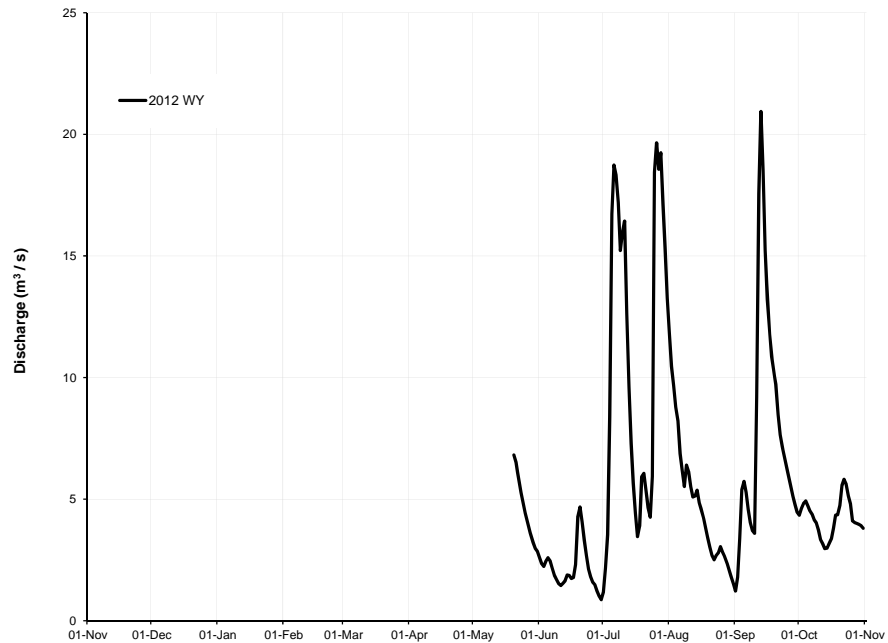
Note: Historical statistics were based on data from WSC Station 07DB002 (1975 to 1977).

**Figure C.3-46 2012 WY discharge hydrograph for Station S54, Dunkirk River near Fort McKay.**



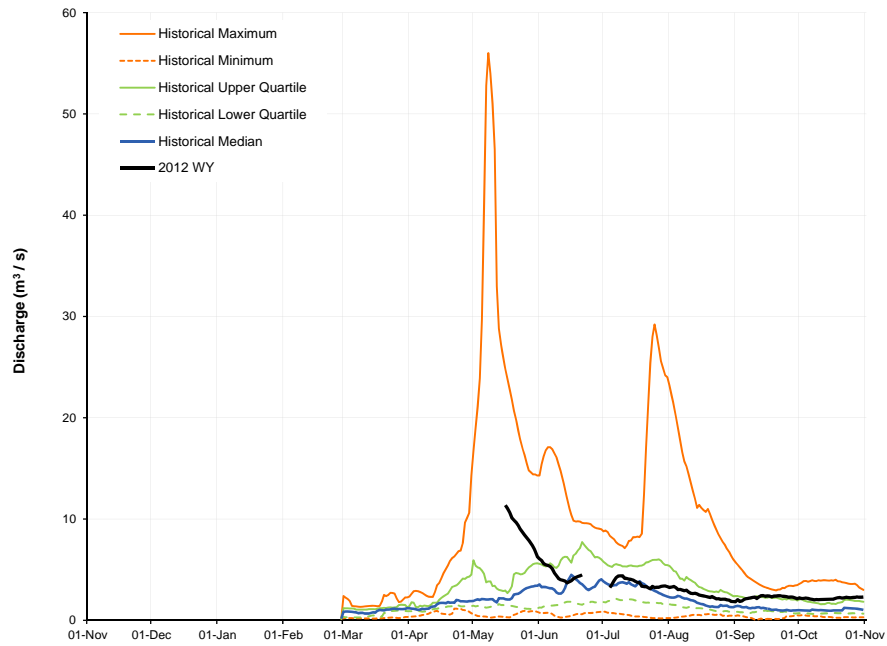
Note: Historical statistics were based on data from WSC Station 07DB003 (1975 to 1979).

**Figure C.3-47 2012 WY discharge hydrograph for Station S55, Gregoire River above Christina River.**



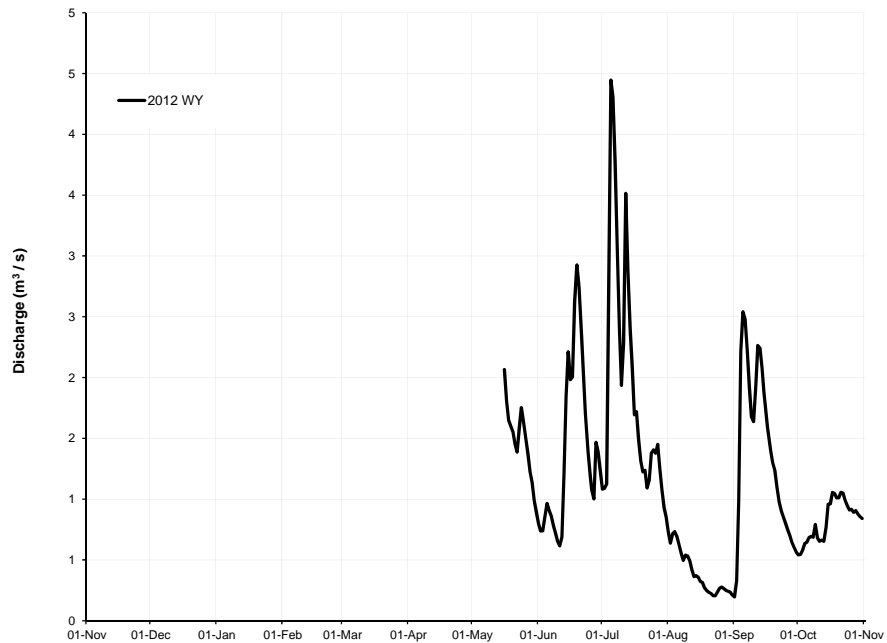


**Figure C.3-48 2012 WY discharge hydrograph for Station S56, Jackfish River below Christina Lake.**



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

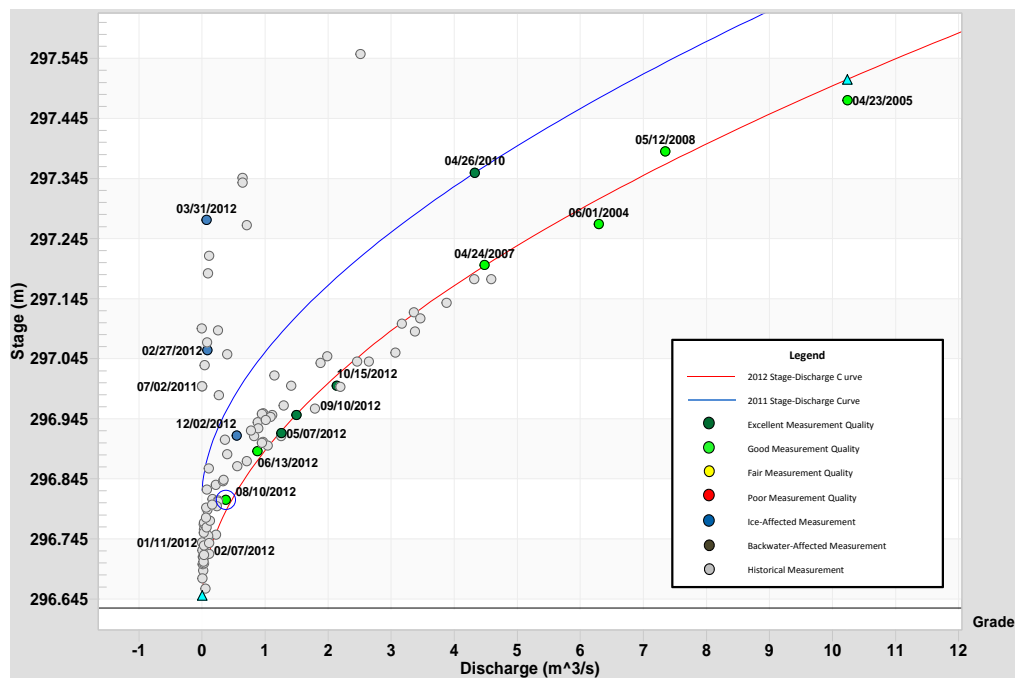
**Figure C.3-49 2012 WY discharge hydrograph for Station S57, Sunday Creek above Christina Lake.**



### C.3.5 Stage-Discharge Rating Curves

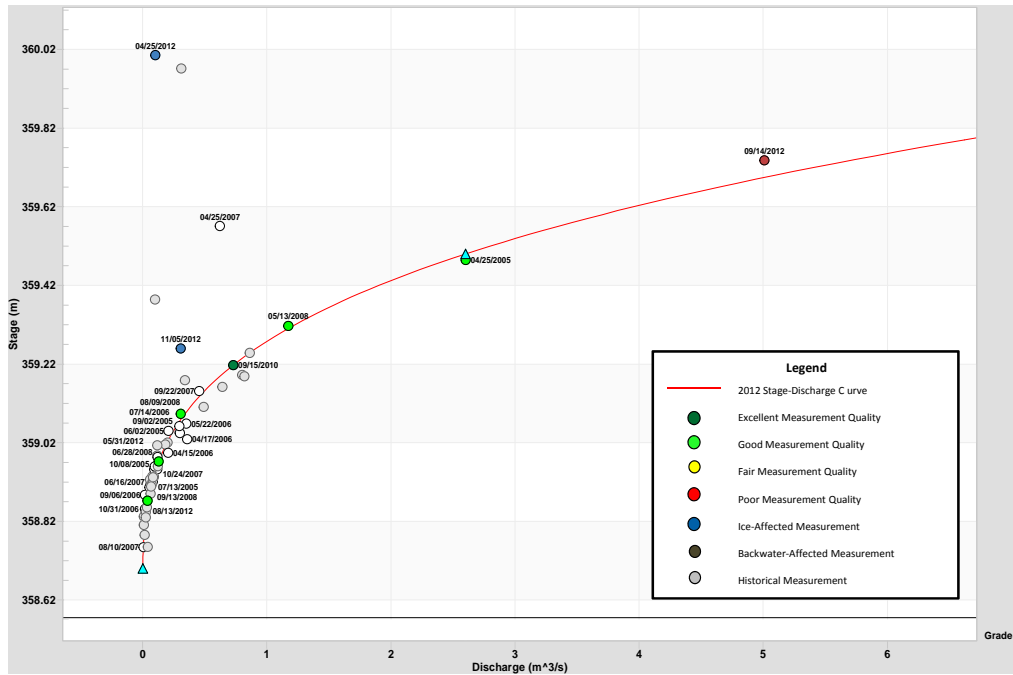
Water level and discharge measurements performed in the 2012 WY were used to derive and/or update stage-discharge rating curves for each hydrometric station. The derived rating curves are shown graphically for each station in Figure C.3-50 to Figure C.3-90. The legend in each graph describes the different elements of the image, including the current and previous stage-discharge curves, and the rating points and their associated measurement quality. The measurement quality for each rating point is a product of calculations from discharge data and observations from the field. Two stage-discharge curves are present in some of the graphs due to improvements to previous curves, to better represent the stage-discharge relationship for a given hydrometric station. In cases where only one curve is present, the stage-discharge curve has not changed from the previous sampling year. Stage-discharge curves are weighted more heavily towards rating points that show a trend, and are developed using a mixture of high and low discharge rating points. Previous rating points that were influential during the development of the stage-discharge curves are displayed along with the rating points from the 2012 WY. Stage values displayed in the graphs represent the water level elevation at a given station, and not the water depth. The water level elevation is calculated from a known geodetic or local assumed datum.

**Figure C.3-50 Stage-discharge rating curve for RAMP Station S2, Jackpine Creek at Canterra Road.**



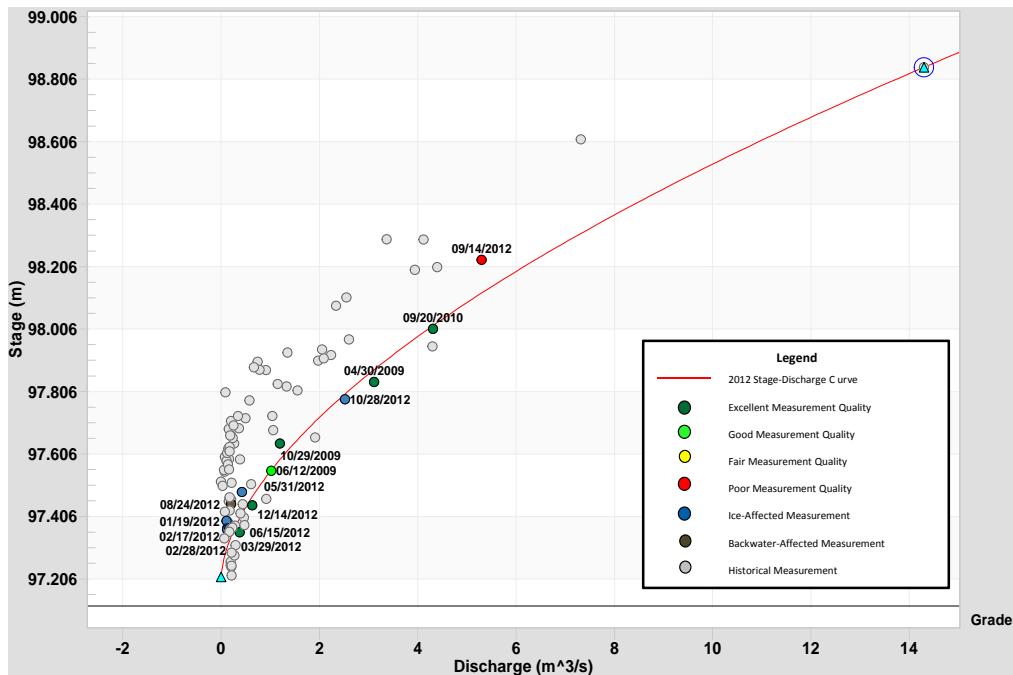
Period of Use: November 1, 2011 Open ended

**Figure C.3-51 Stage-discharge rating curve for RAMP Station S3, Iyininin Creek above Kearl Lake.**



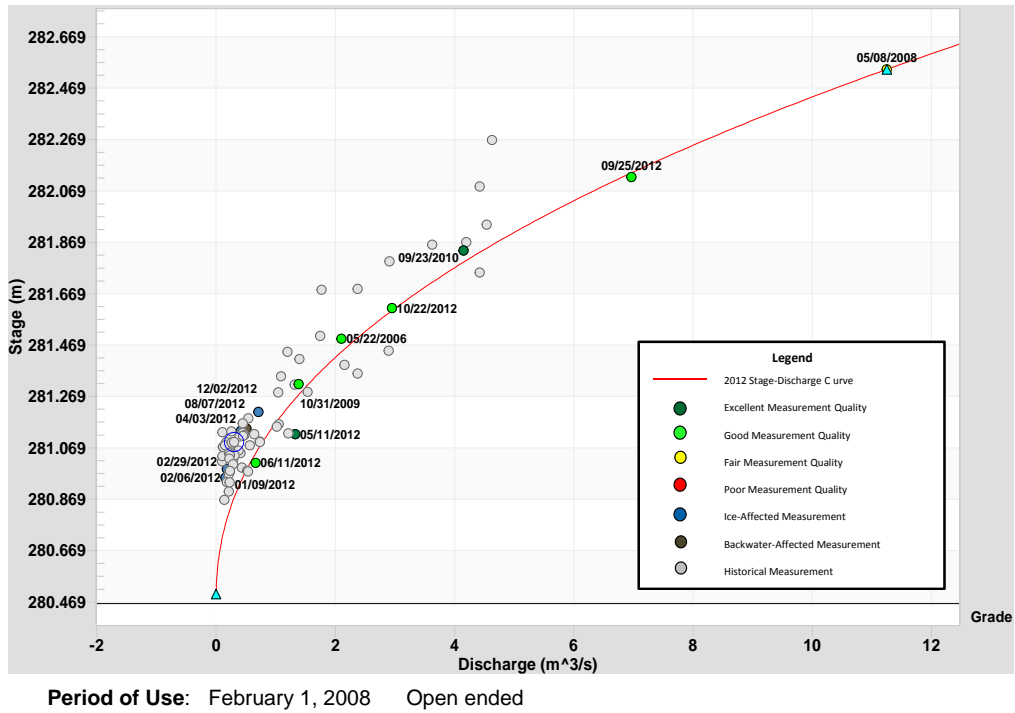
Period of Use: January 1, 2005 Open ended

**Figure C.3-52 Stage-discharge rating curve for RAMP Station S5, Muskeg River above Stanley Creek.**

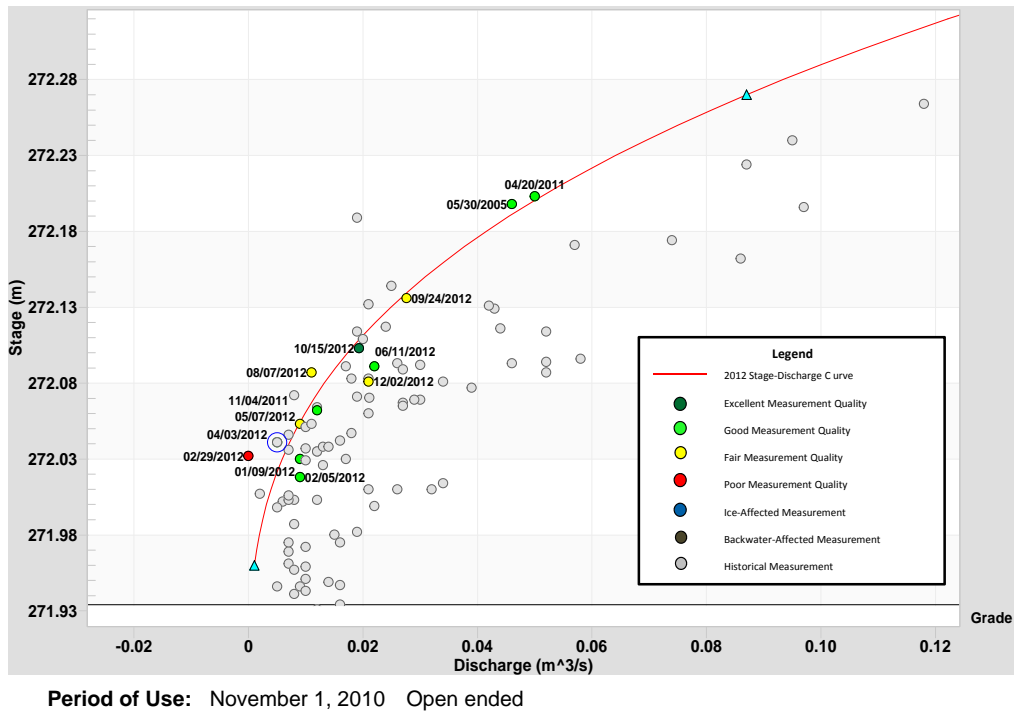


Period of Use: January 1, 2009 Open ended

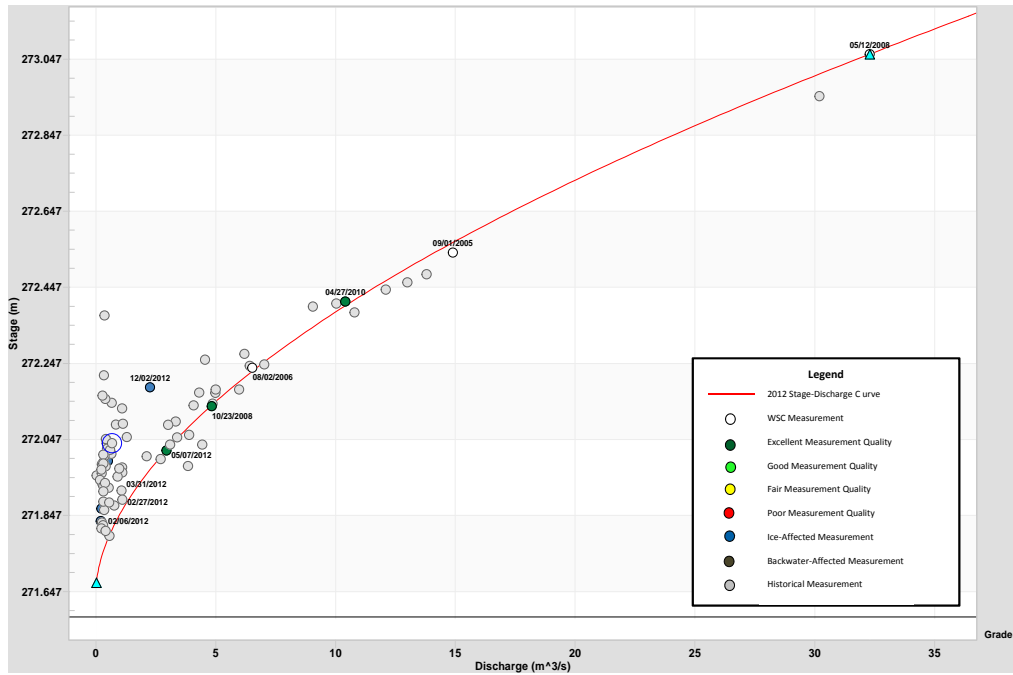
**Figure C.3-53 Stage-discharge rating curve for RAMP Station S5A, Muskeg River above Muskeg Creek.**



**Figure C.3-54 Stage-discharge rating curve for RAMP Station S6, Mills Creek at Highway 63.**

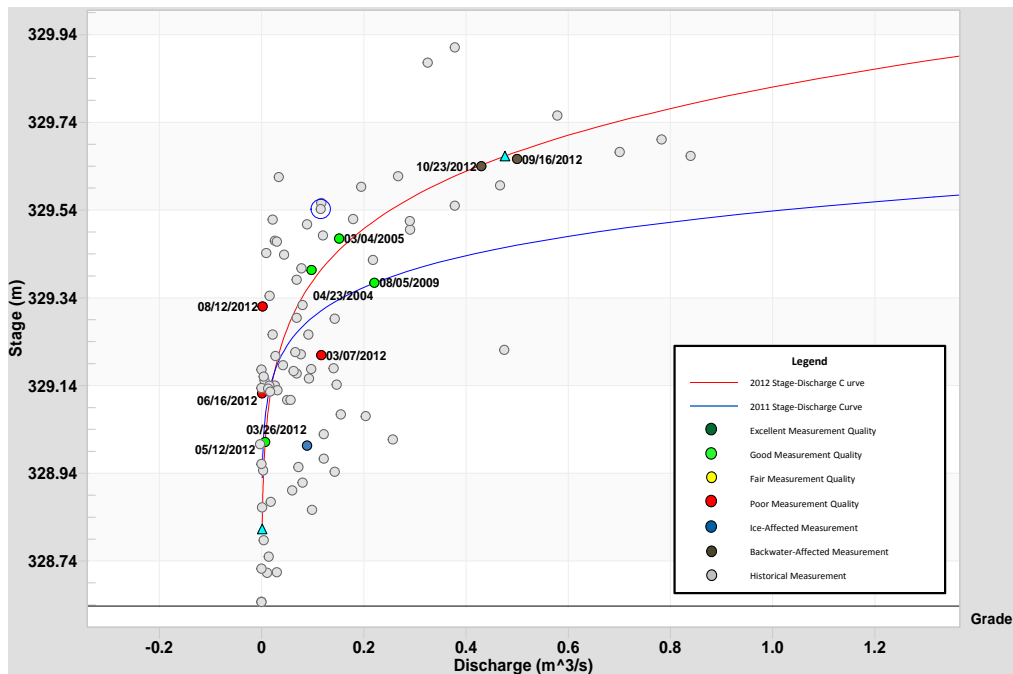


**Figure C.3-55 Stage-discharge rating curve for WSC Station 07DA008, RAMP Station S7, Muskeg River near Fort McKay.**



Period of Use: January 1, 2008    Open ended

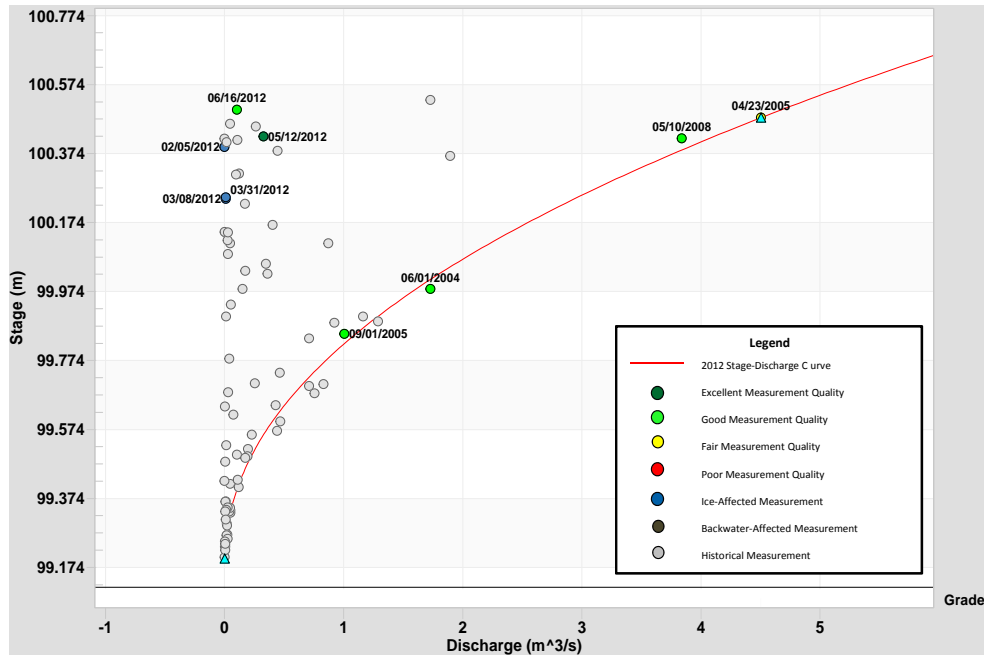
**Figure C.3-56 Stage-discharge rating curve for RAMP Station S9, Kearl Lake Outlet.**



Period of Use: November 1, 2012    Open ended

Note: The data quality at this station was compromised in the 2012 WY due to backwater effects caused by beaver activity.

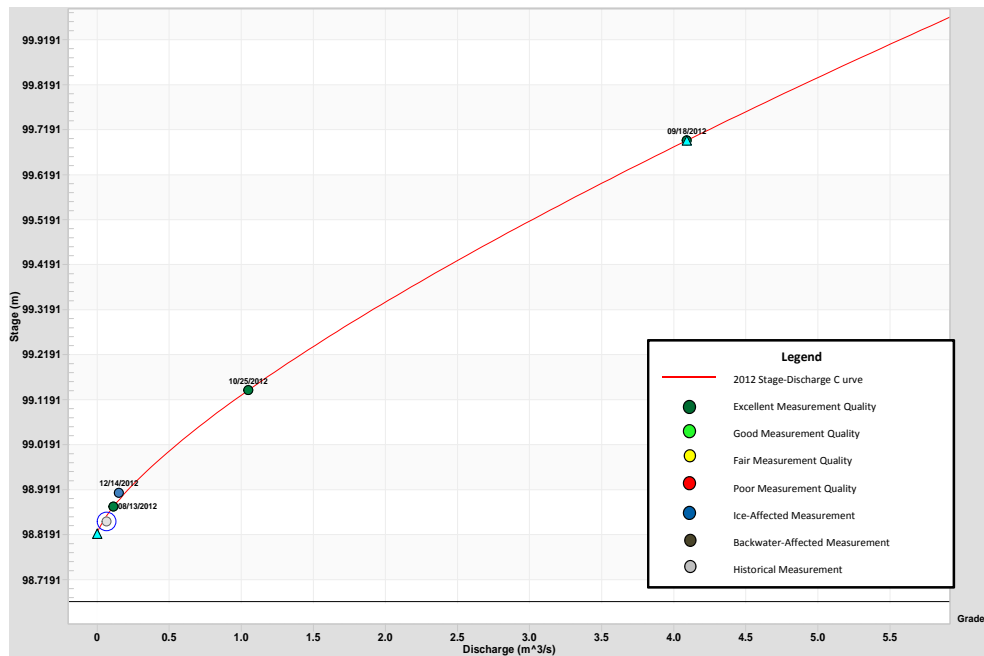
**Figure C.3-57 Stage-discharge rating curve for RAMP Station S10, Wapasu Creek at Canterra Road.**



**Period of Use:** April 26, 2007      Open ended

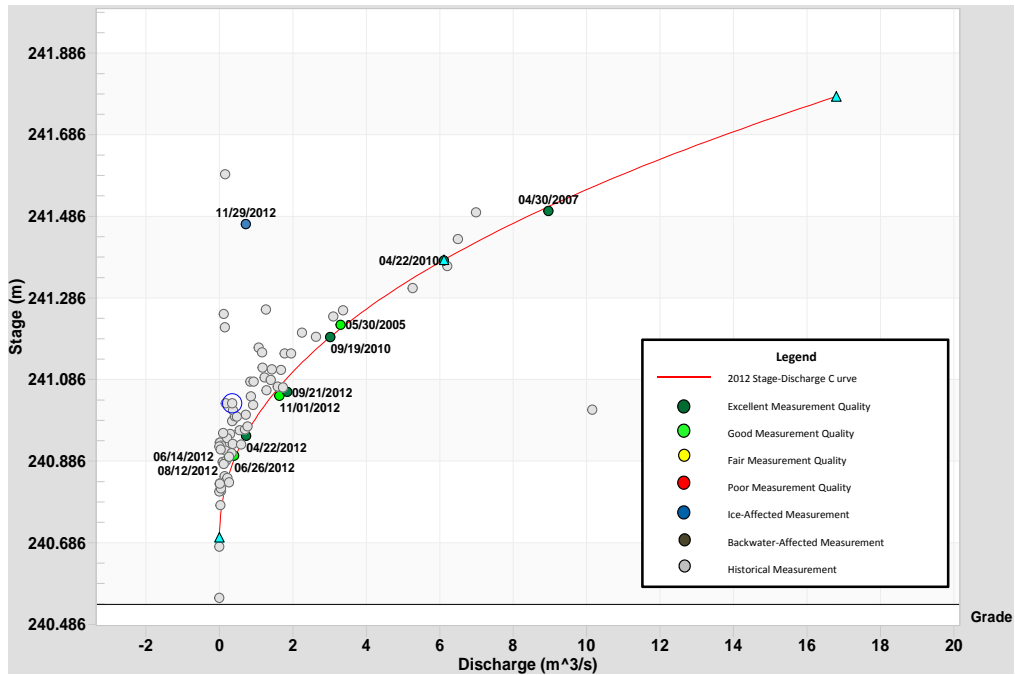
Note: The data quality at this station was compromised in the 2012 WY due to backwater effects caused by beaver activity. Stage-discharge measurements at this station were only collected until August, 2012, when the station was relocated upstream and renamed as Station S10A, see Figure C.3-58 below.

**Figure C.3-58 Stage-discharge rating curve for RAMP Station S10A, Wapasu Creek near the Mouth.**



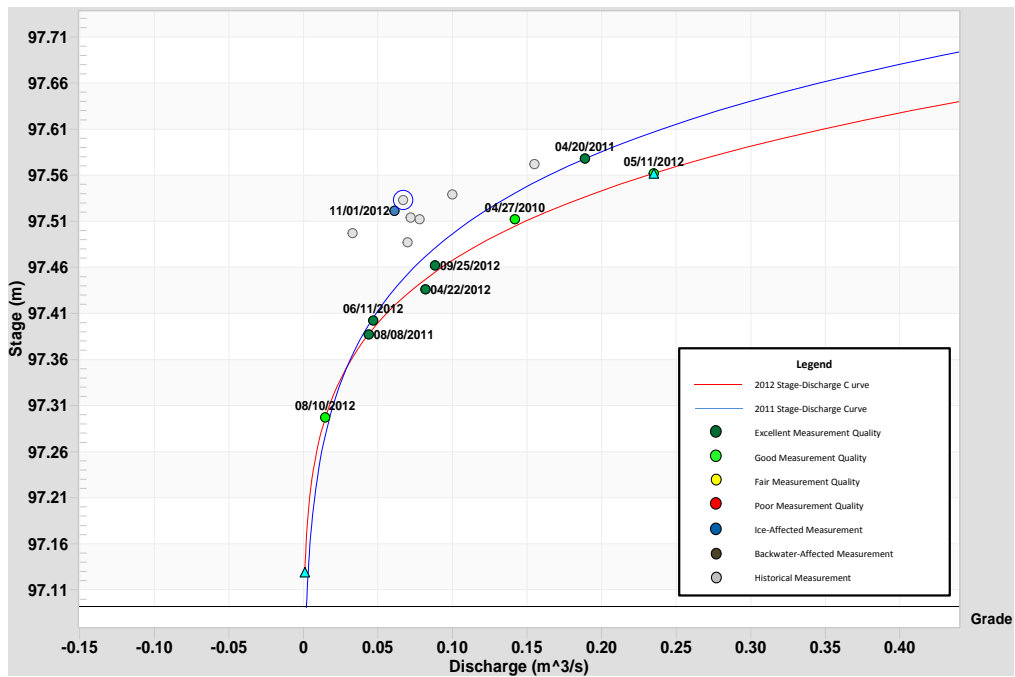
**Period of Use:** August 13, 2012      Open Ended

**Figure C.3-59 Stage-discharge rating curve for WSC Station 07DA007, RAMP Station S11, Poplar Creek at Highway 63.**



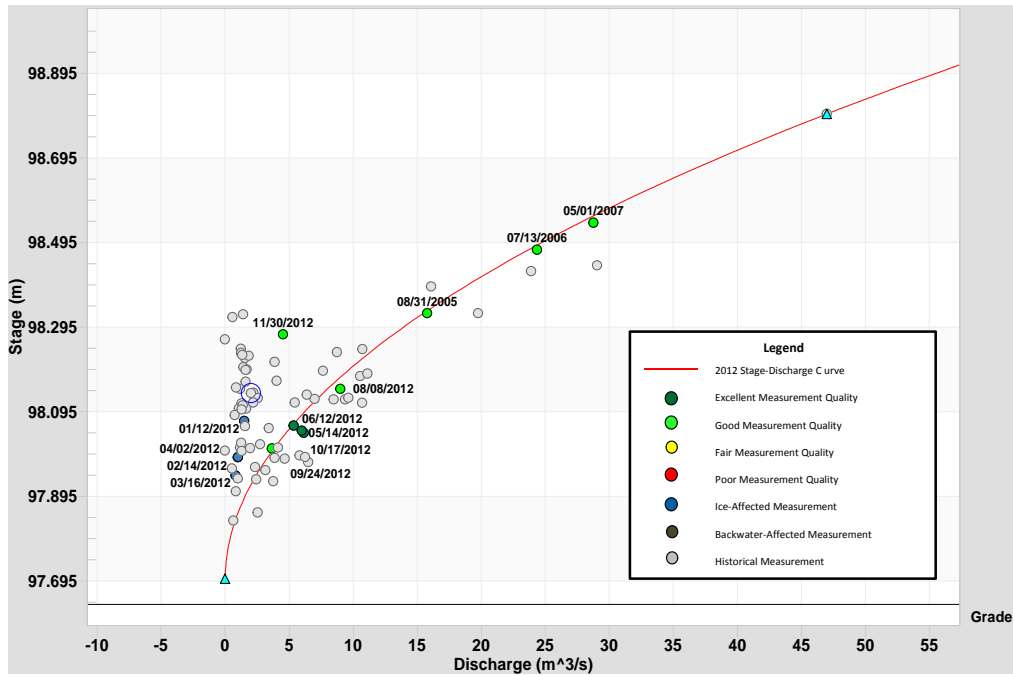
Period of Use: November 1, 2009 Open ended

**Figure C.3-60 Stage-discharge rating curve for RAMP Station S12, Fort Creek at Highway 63.**



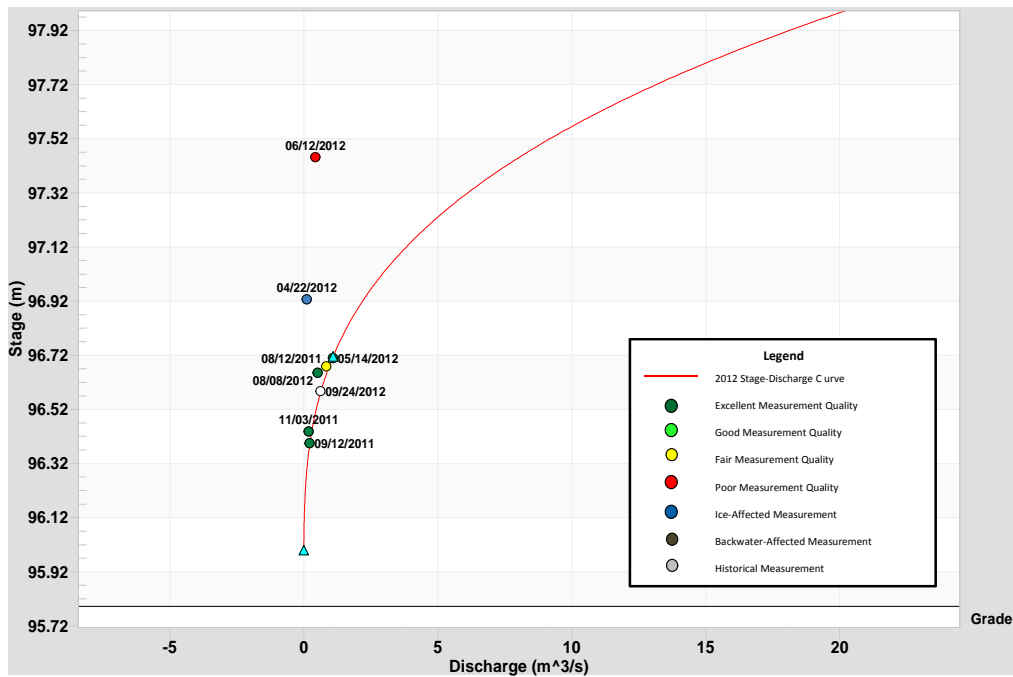
Period of Use: November 1, 2011 Open ended

**Figure C.3-61 Stage-discharge rating curve for RAMP Station S14A, Ells River at the CNRL Bridge.**



Period of Use: November 1, 2010 Open ended

**Figure C.3-62 Stage-discharge rating curve for RAMP Station S15A, Tar River near the mouth.**

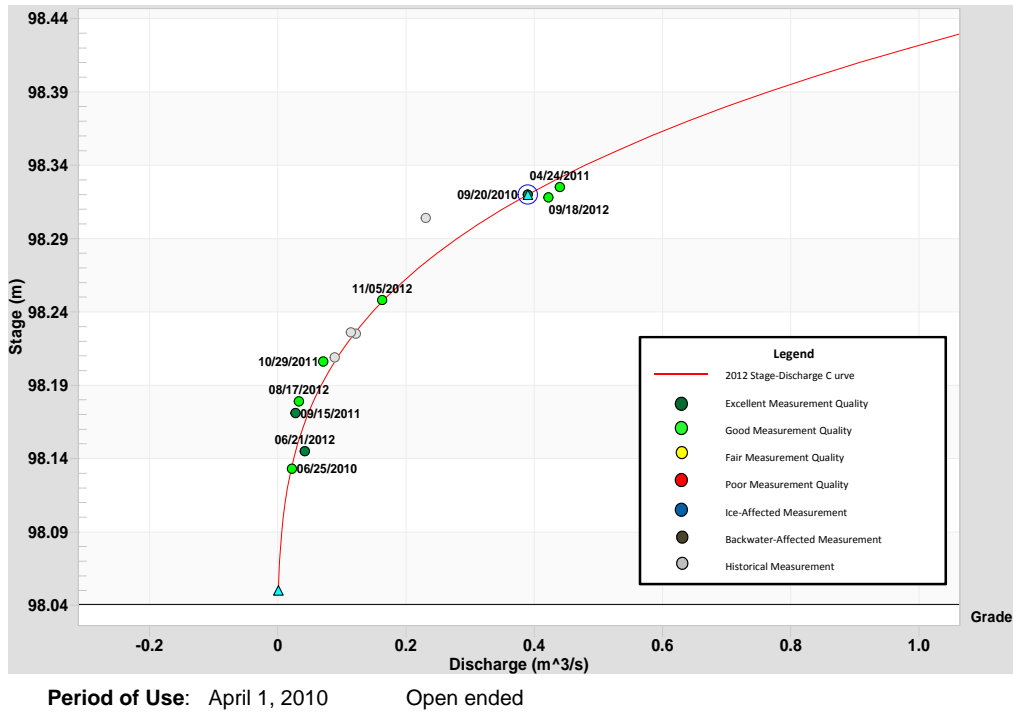


Period of Use: August 12, 2011 Open ended,

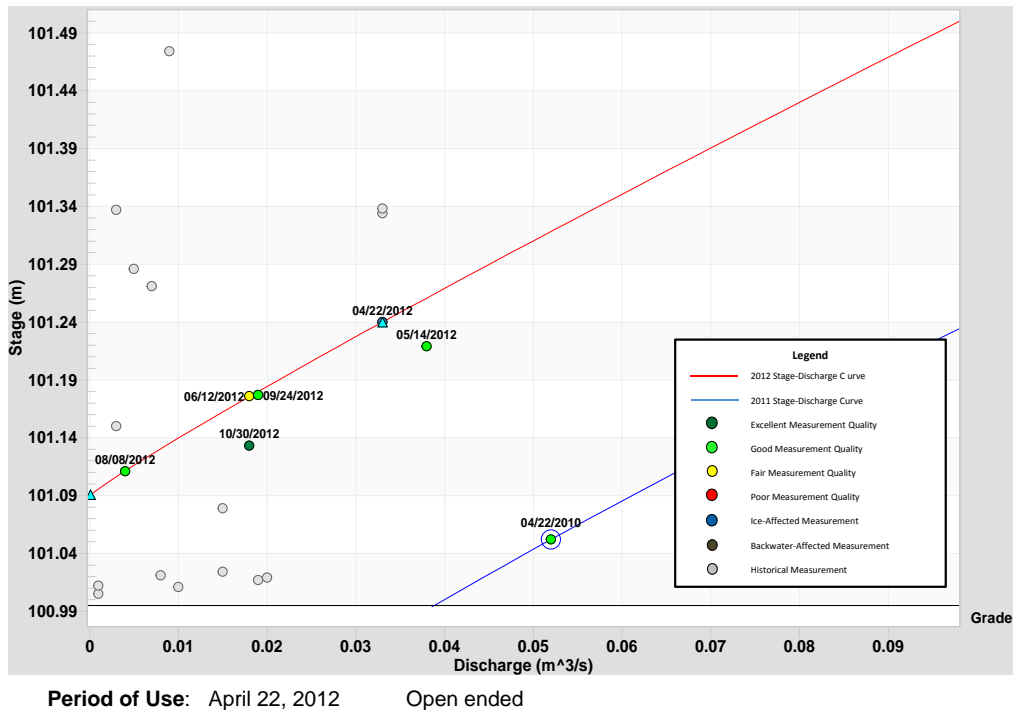
Note: Station was destroyed in wildfire and relocated on August 12, 2011.



**Figure C.3-63 Stage-discharge rating curve for RAMP Station S16A, Calumet River near the mouth.**

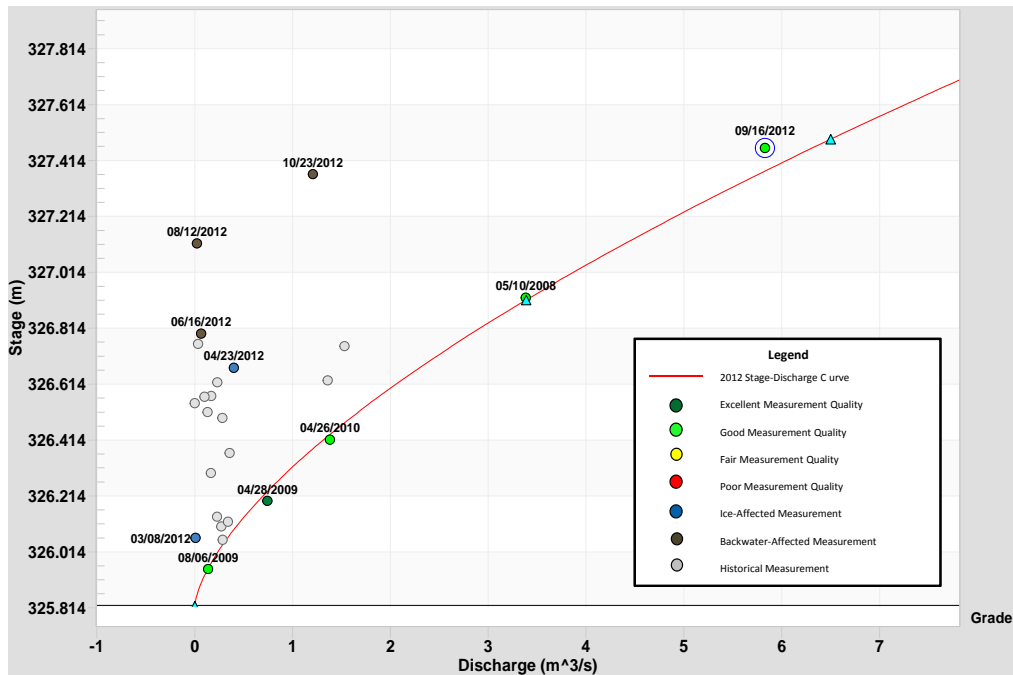


**Figure C.3-64 Stage-discharge rating curve for RAMP Station S19, Tar River Lowland Tributary near the mouth.**



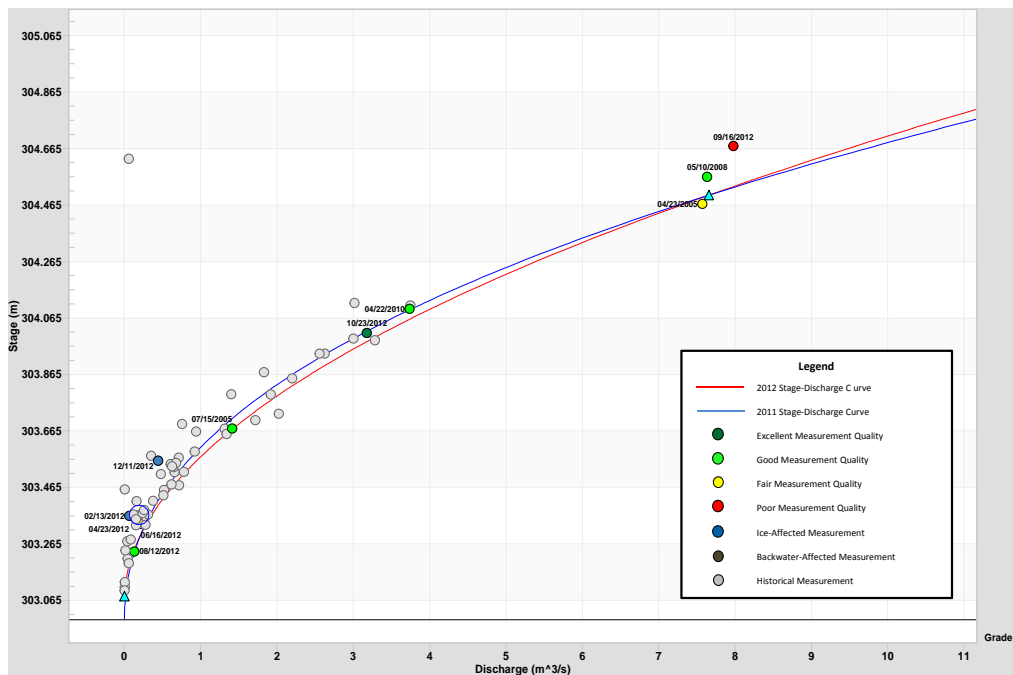
Note: The data quality at this station was compromised in previous years due to backwater effects caused by beaver activity. The station was relocated downstream in April 2012, and a new stage-discharge curve was developed.

**Figure C.3-65 Stage-discharge rating curve for RAMP Station S20, Muskeg River Upland.**



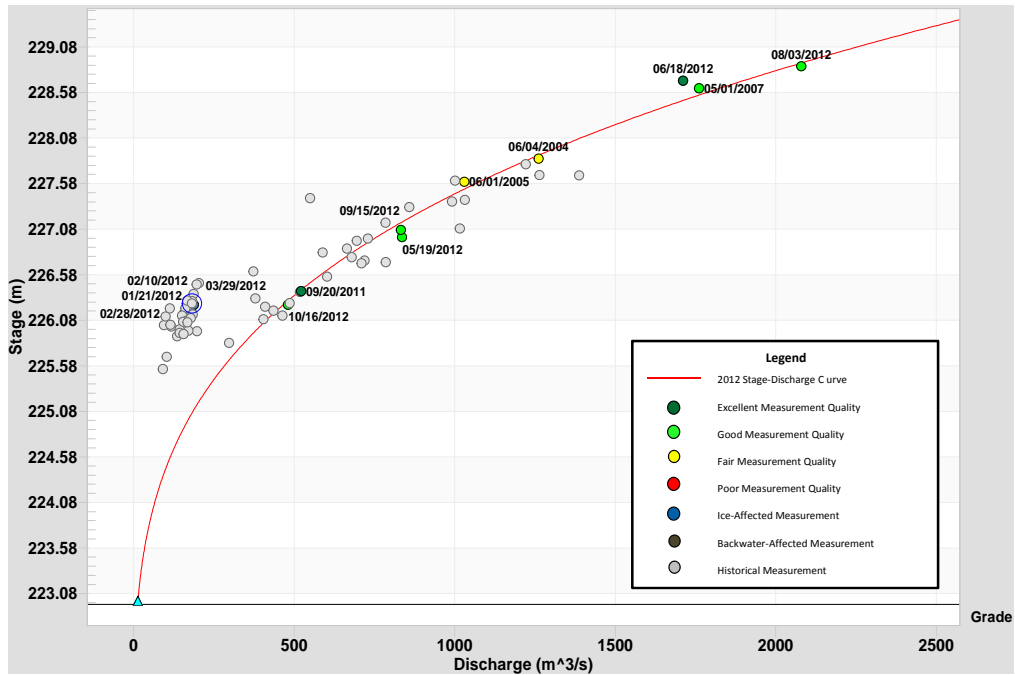
**Period of Use:** January 1, 2008 Open ended  
 Note: The data quality at this station was compromised in the 2012 WY due to backwater effects caused by beaver activity.

**Figure C.3-66 Stage-discharge rating curve for RAMP Station S22, Muskeg Creek near the mouth.**



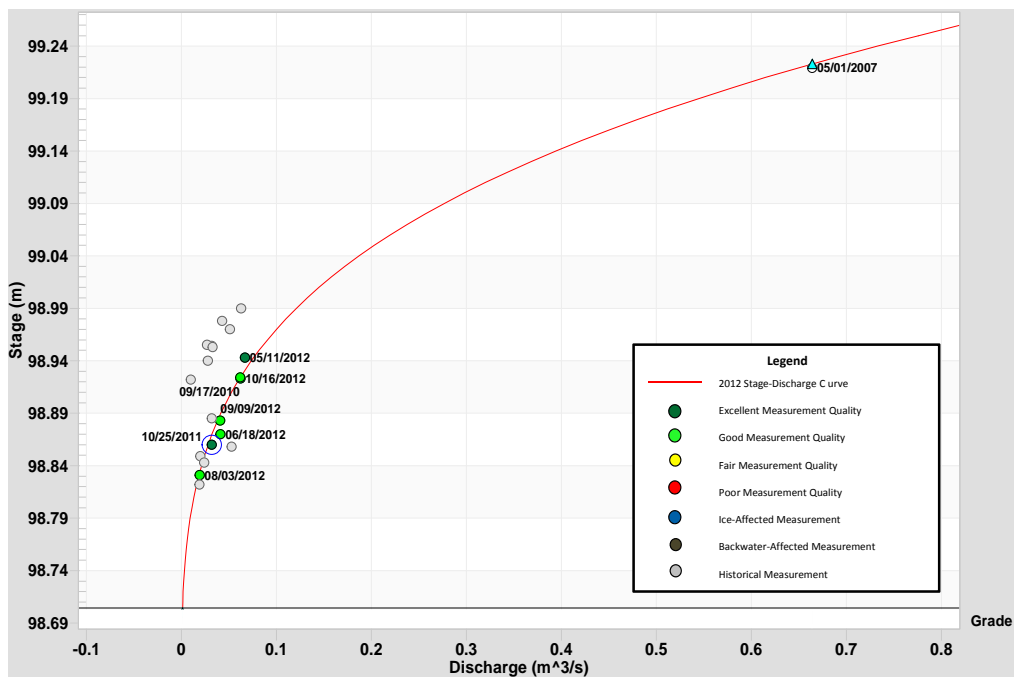
**Period of Use:** November 1, 2011 Open ended

**Figure C.3-67 Stage-discharge rating curve for RAMP Station S24, Athabasca River below Eymundson Creek.**



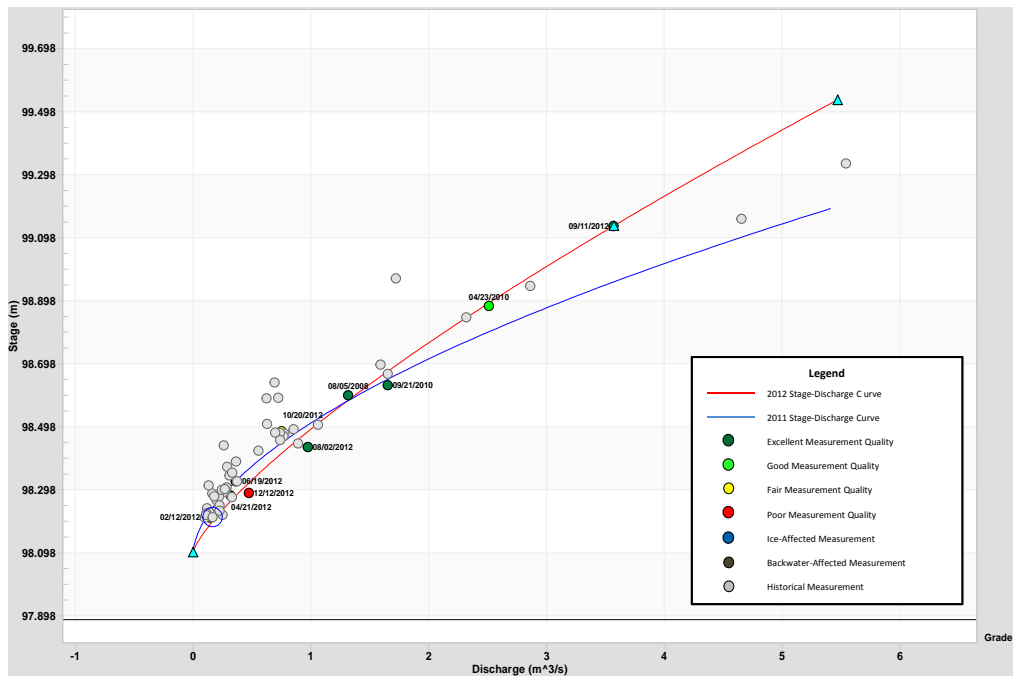
Period of Use: November 1, 2010 Open ended

**Figure C.3-68 Stage-discharge rating curve for RAMP Station S25, Susan Lake Outlet.**



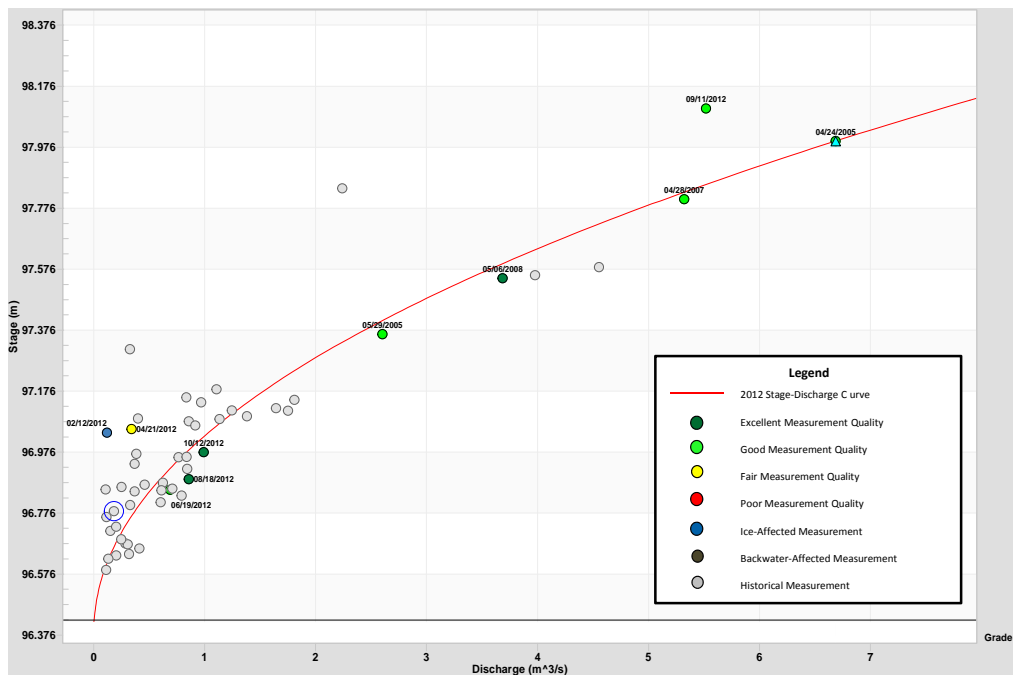
Period of Use: May 1, 2010 Open ended

**Figure C.3-69 Stage-discharge rating curve for RAMP Station S31, Hangingstone Creek at North Star Road.**



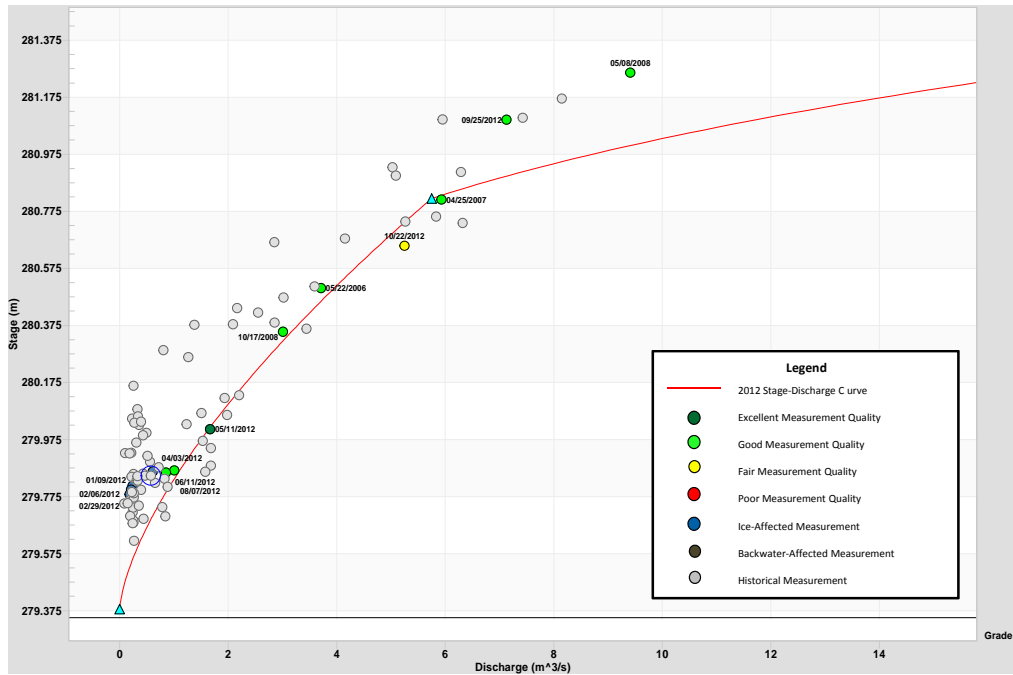
Period of Use: November 1, 2011 Open ended

**Figure C.3-70 Stage-discharge rating curve for RAMP Station S32, Surmont Creek at Highway 881.**



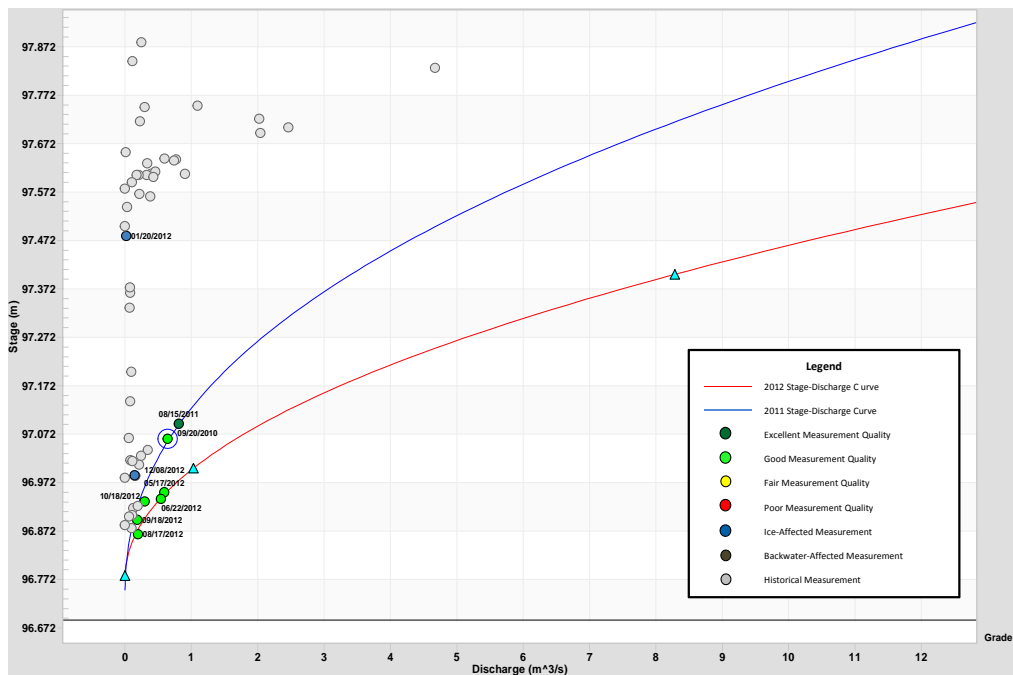
Period of Use: April 1, 2011 Open ended

**Figure C.3-71 Stage-discharge rating curve for RAMP Station S33, Muskeg River at the Aurora/Albian Boundary.**



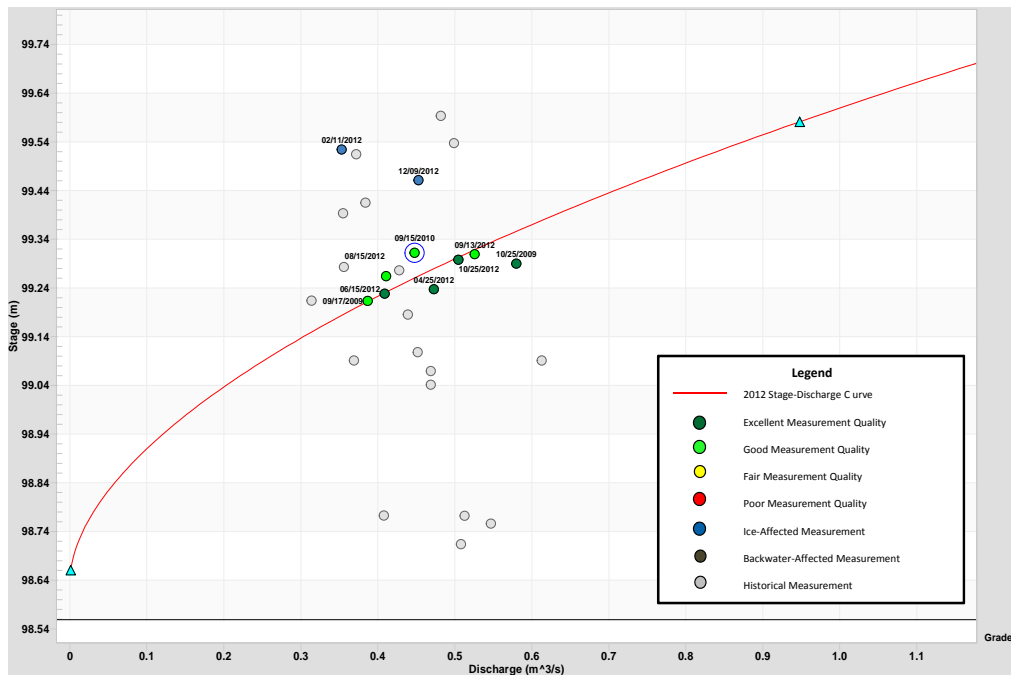
Period of Use: November 1, 2009 Open ended

**Figure C.3-72 Stage-discharge rating curve for RAMP Station S34, Tar River above CNRL Lake.**



Period of Use: November 1, 2011 Open ended

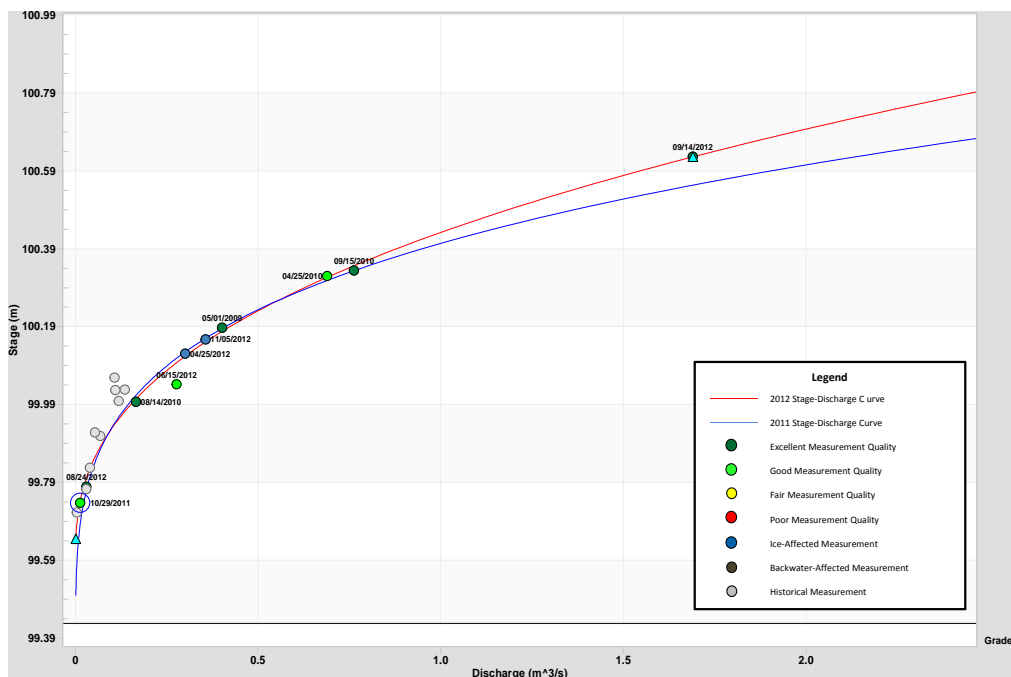
**Figure C.3-73 Stage-discharge rating curve for RAMP Station S36, McClelland Lake Outlet above Firebag River.**



**Period of Use:** May 1, 2009      Open ended

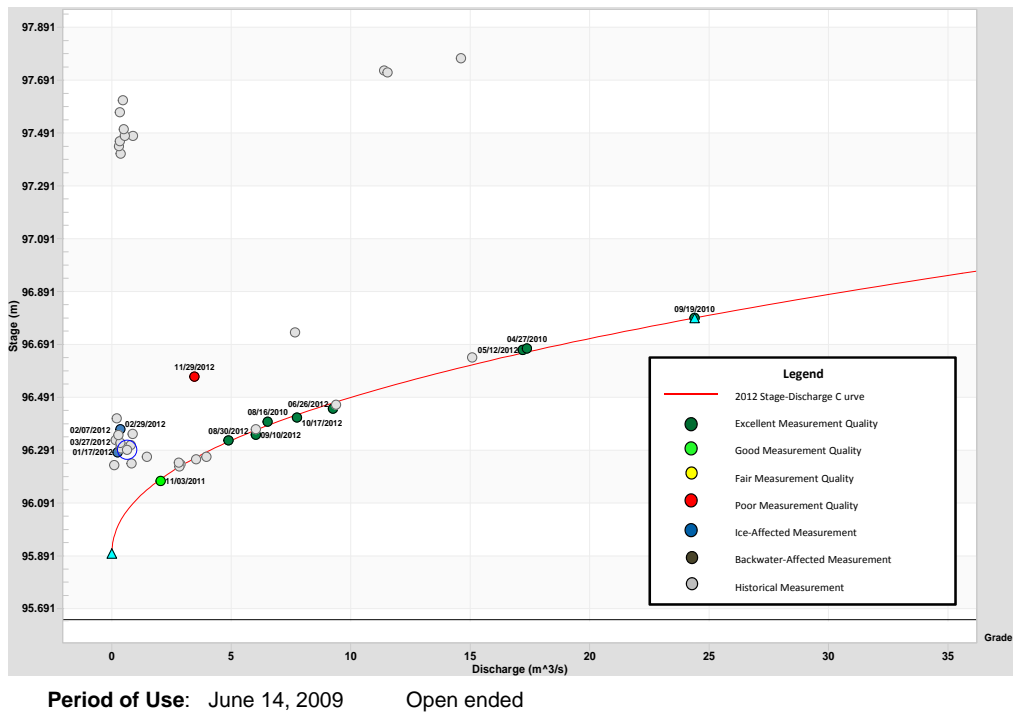
Note: The data quality at this station was compromised in the 2012 WY due to backwater effects caused by beaver activity.

**Figure C.3-74 Stage-discharge rating curve for RAMP Station S37, East Jackpine Creek near the 1,300 ft. contour.**

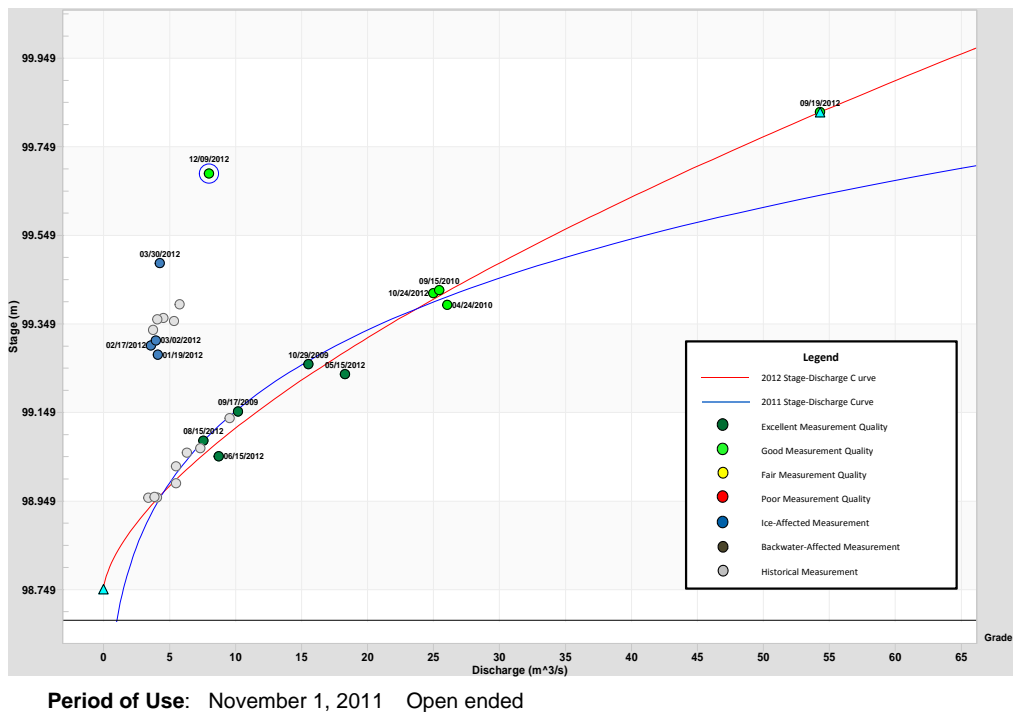


**Period of Use:** November 1, 2011      Open ended

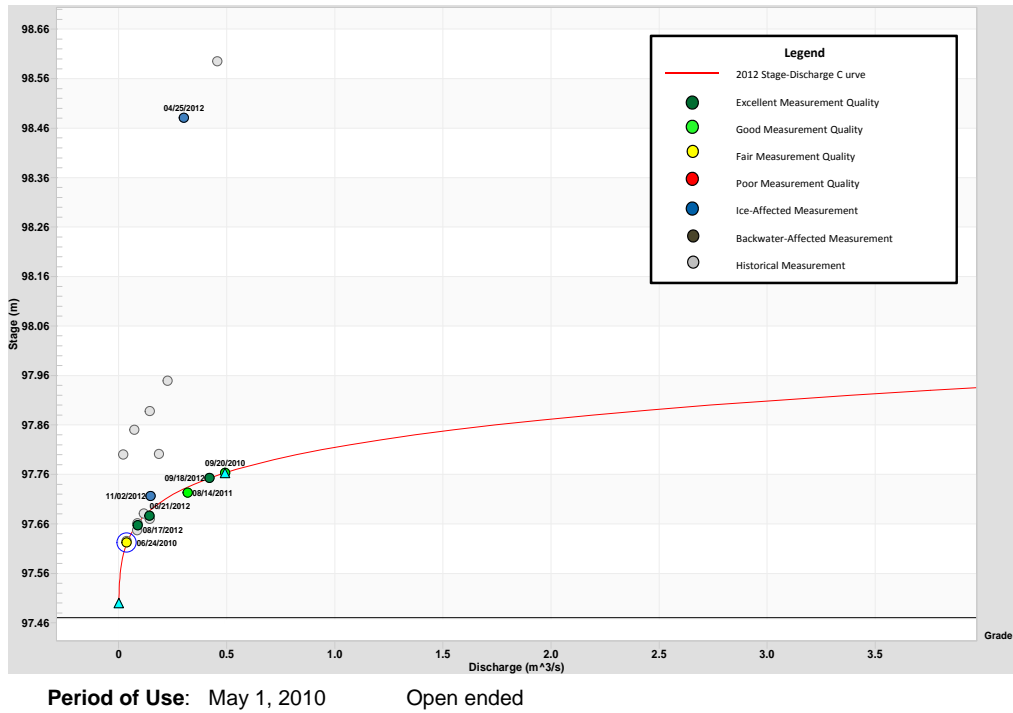
**Figure C.3-75 Stage-discharge rating curve for RAMP Station S40, MacKay River at the Petro-Canada Bridge.**



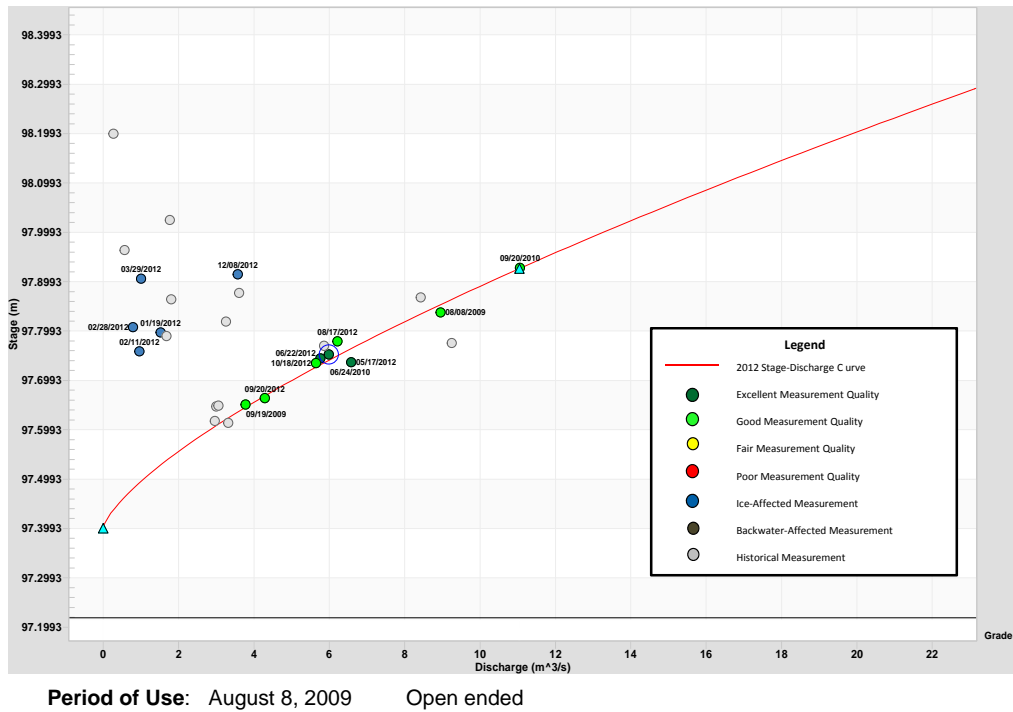
**Figure C.3-76 Stage-discharge rating curve for RAMP Station S43, Firebag River above Suncor Firebag.**



**Figure C.3-77 Stage-discharge rating curve for WSC Station 07DA013, RAMP Station S44, Pierre River near Fort McKay.**

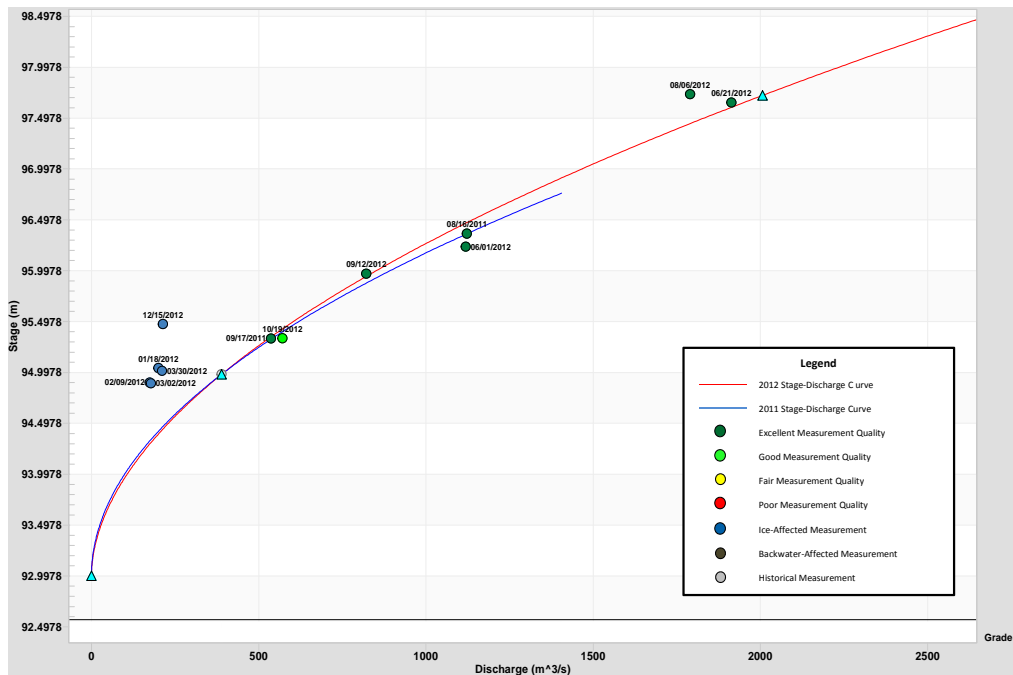


**Figure C.3-78 Stage-discharge rating curve for RAMP Station S45, Ells River above the Jocelyn Creek Diversion.**



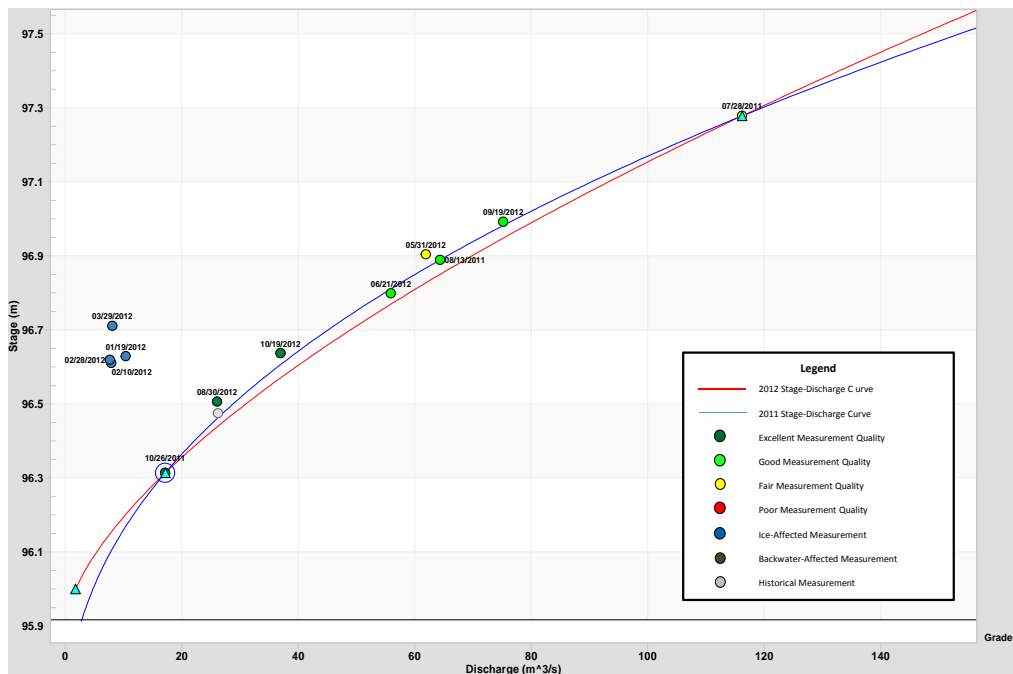


**Figure C.3-79 Stage-discharge rating curve for RAMP Station S46, Athabasca River near Embarras Airport.**



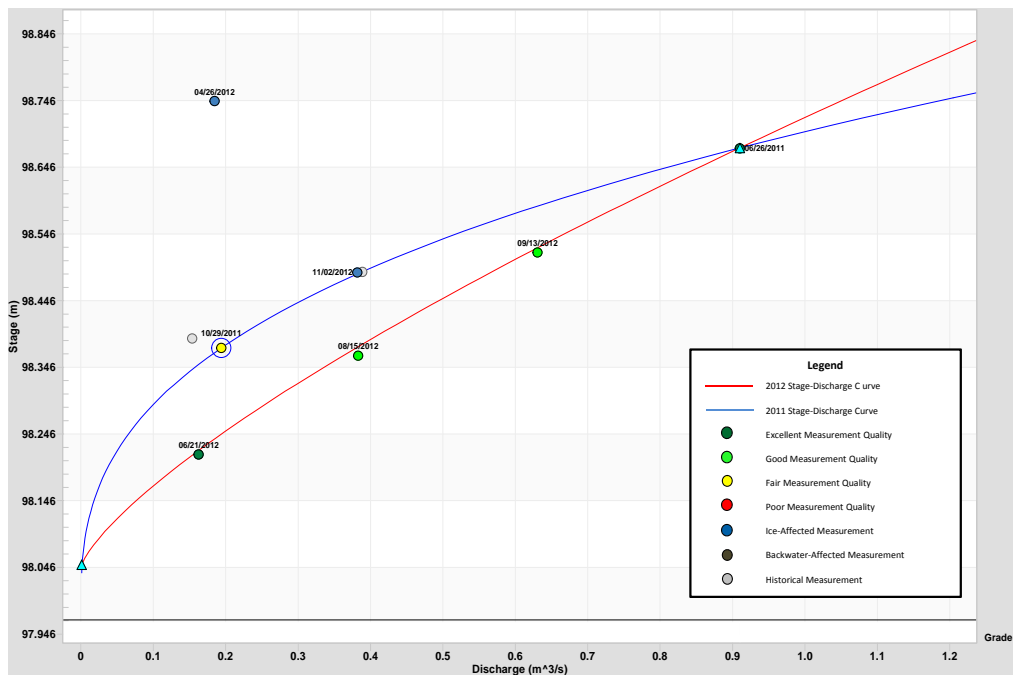
Period of Use: November 1, 2011 Open ended

**Figure C.3-80 Stage-discharge rating curve for RAMP Station S47, Christina River near the mouth.**



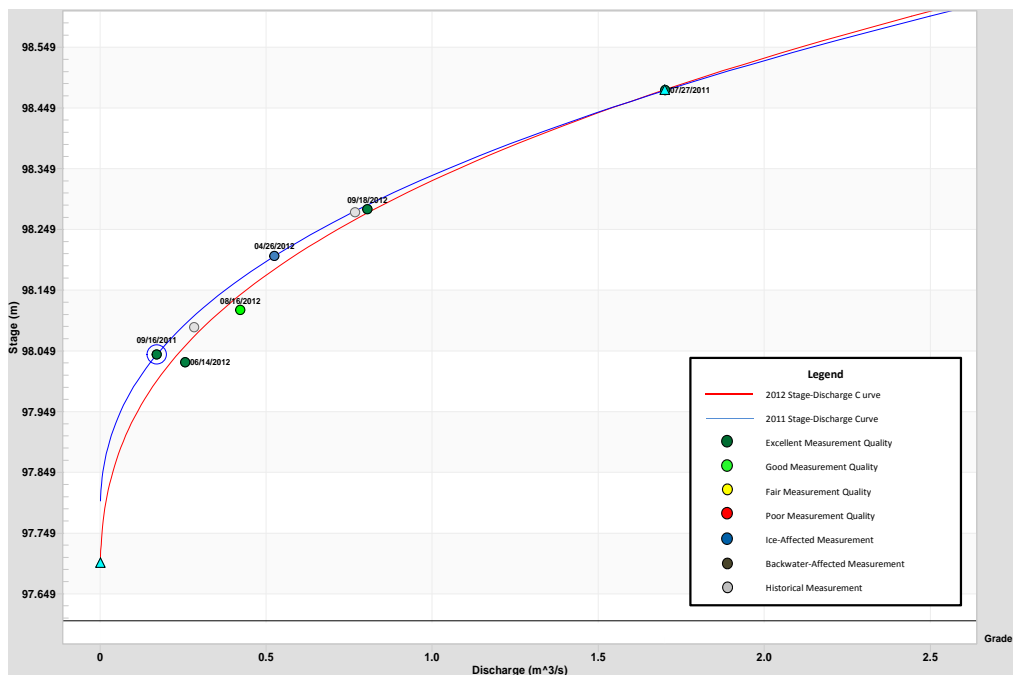
Period of Use: November 1, 2011 Open ended

**Figure C.3-81 Stage-discharge rating curve for RAMP Station S48, Big Creek.**



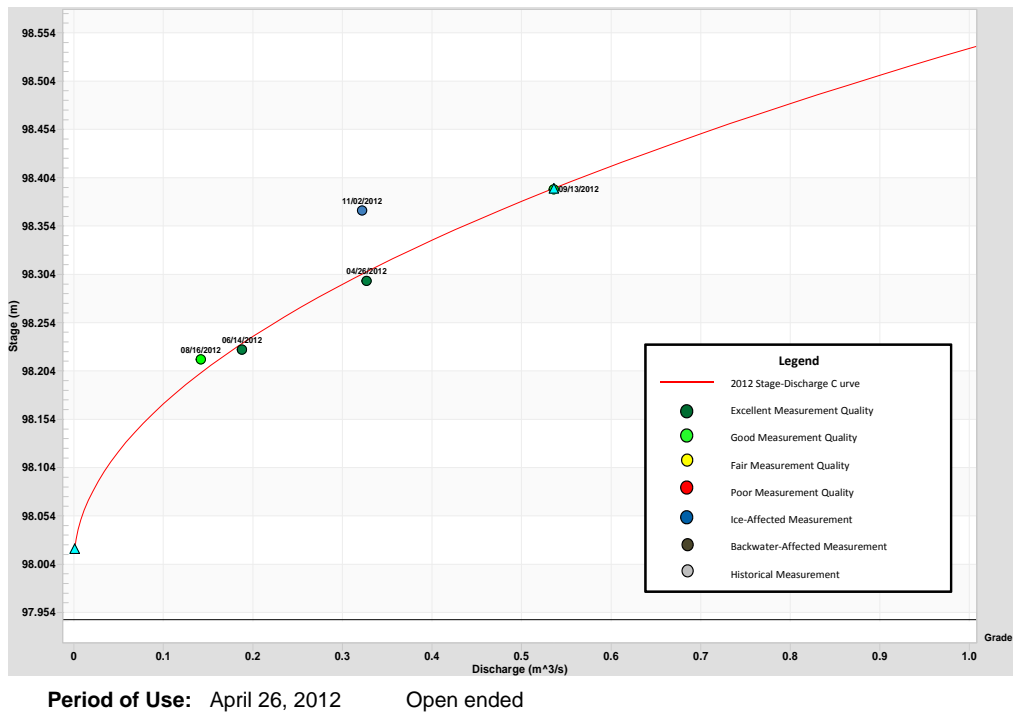
Period of Use: November 1, 2011 Open ended

**Figure C.3-82 Stage-discharge rating curve for RAMP Station S49, Eymundson Creek.**

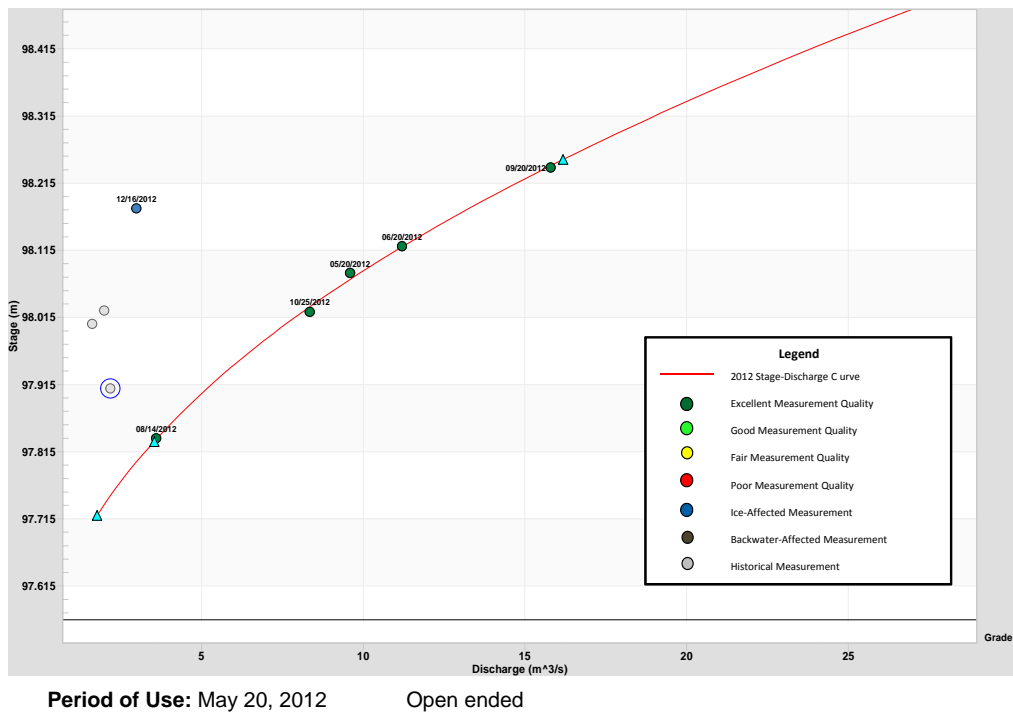


Period of Use: November 1, 2011 Open ended

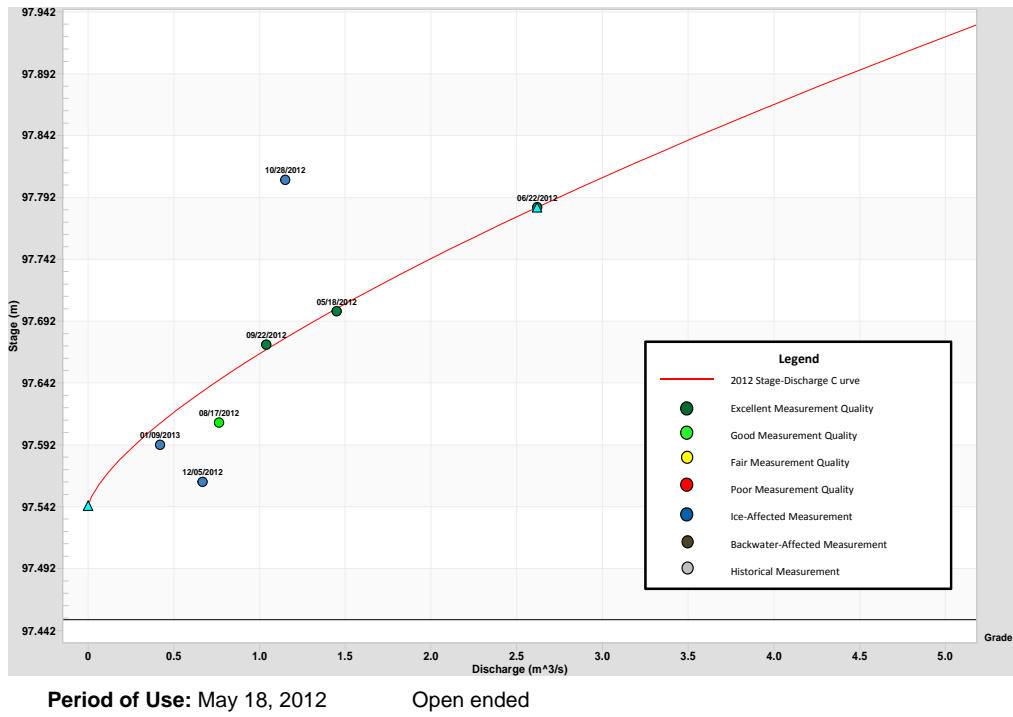
**Figure C.3-83 Stage-discharge rating curve for RAMP Station S50A, Red Clay Creek.**



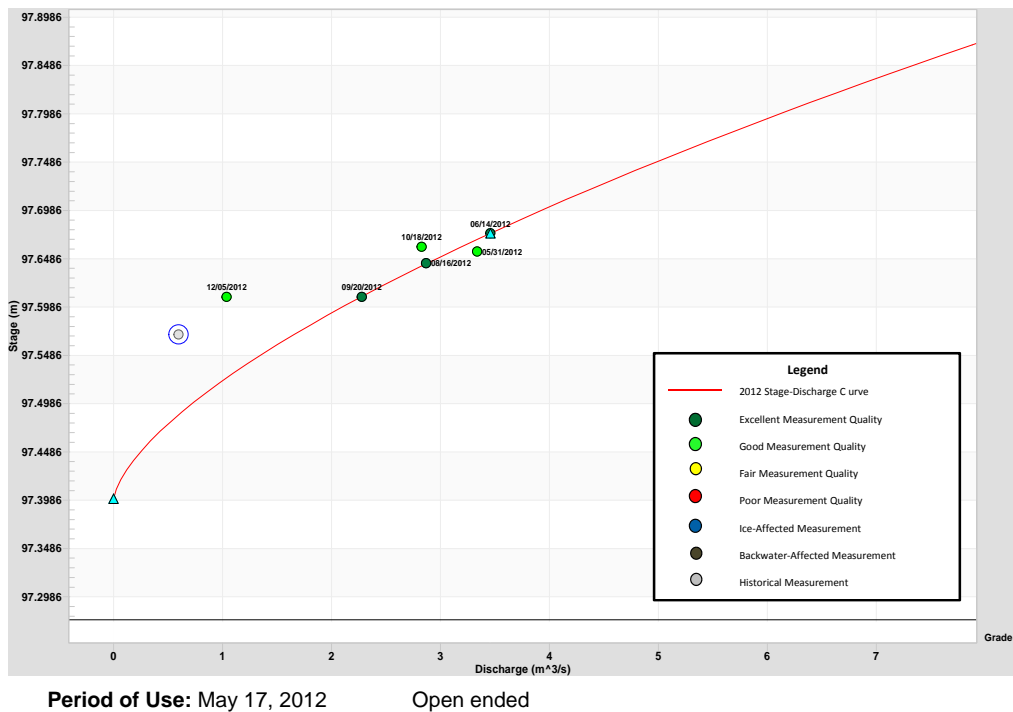
**Figure C.3-84 Stage-discharge rating curve for RAMP Station S51, High Hills River near the mouth.**



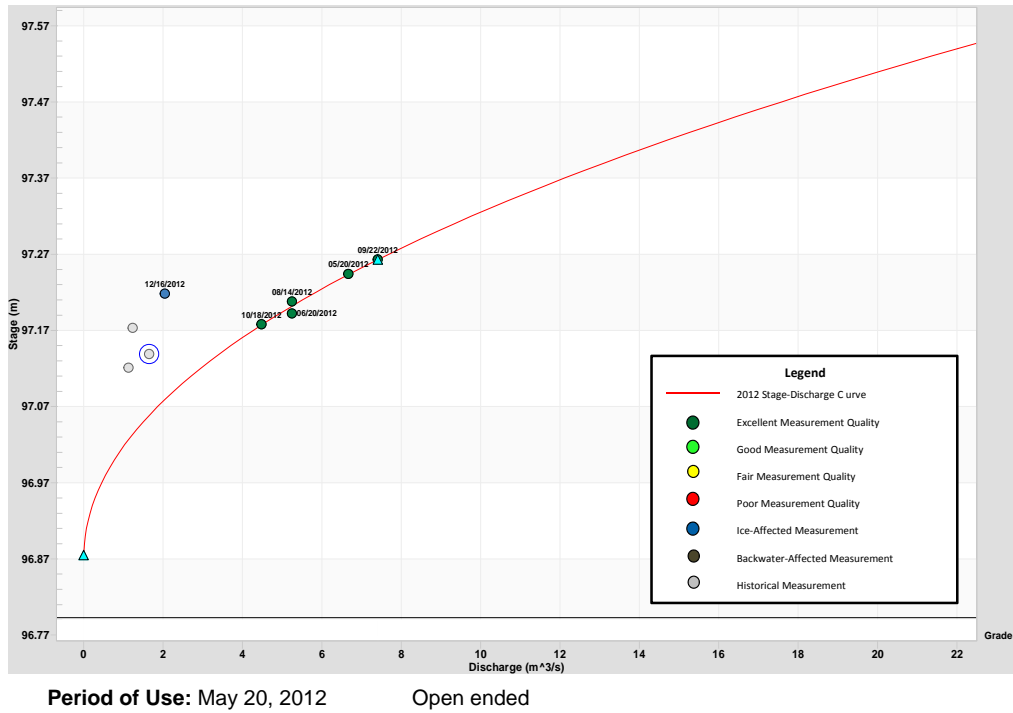
**Figure C.3-85 Stage-discharge rating curve for RAMP Station S53, Dover River near the mouth.**



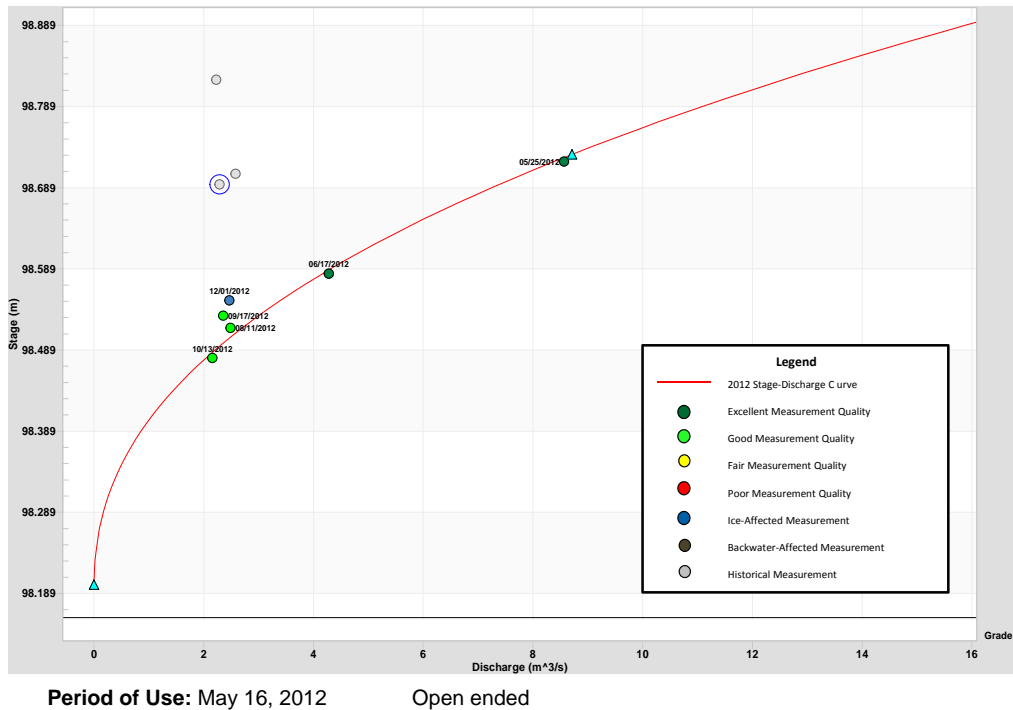
**Figure C.3-86 Stage-discharge rating curve for RAMP Station S54, Dunkirk River near Fort McKay.**



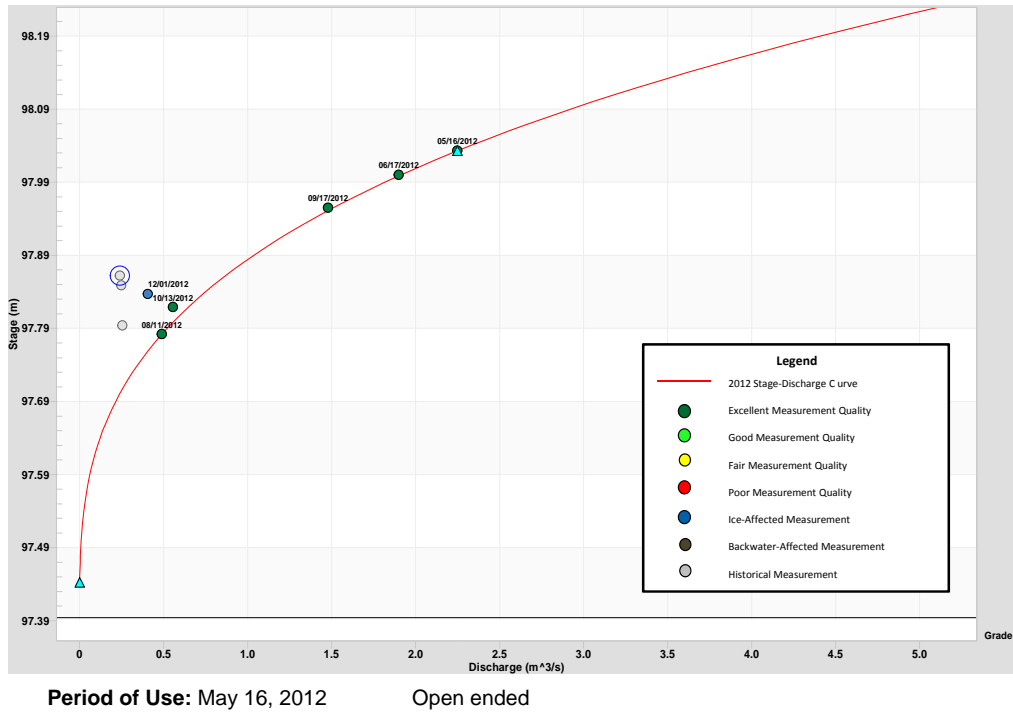
**Figure C.3-87 Stage-discharge rating curve for RAMP Station S55, Gregoire River near the mouth.**



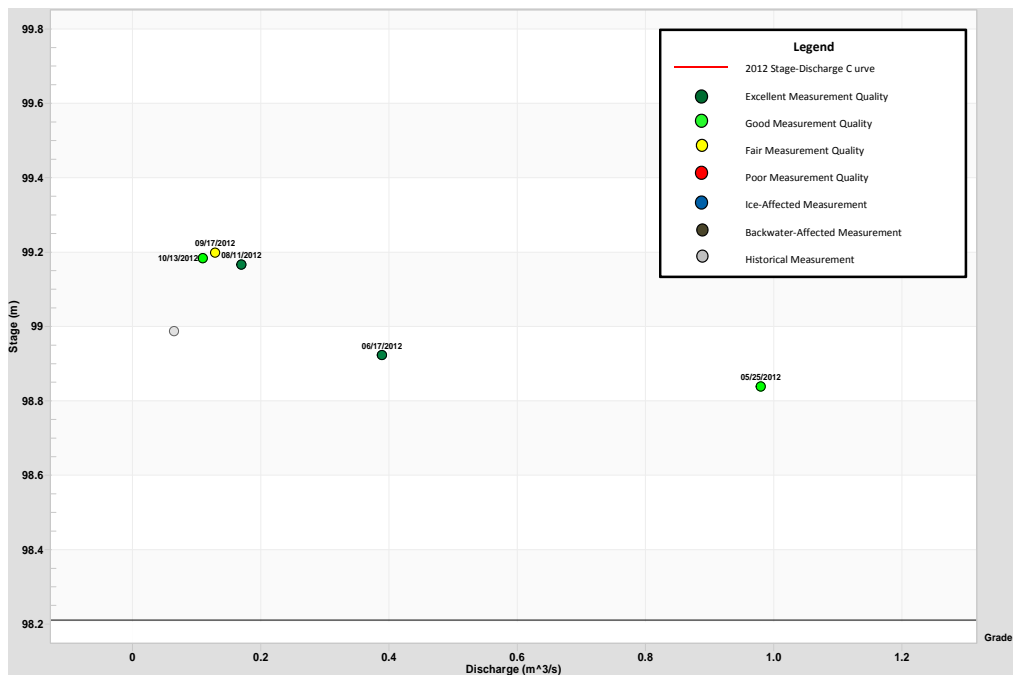
**Figure C.3-88 Stage-discharge rating curve for RAMP Station S56, Jackfish River below Christina Lake.**



**Figure C.3-89 Stage-discharge rating curve for RAMP Station S57, Sunday Creek above Christina Lake.**



**Figure C.3-90 Stage-discharge rating curve for RAMP Station S58, Sawbones Creek above Christina Lake.**



## C.4 NATURALIZED FLOW CALCULATION

### C.4.1 Introduction

A water balance approach was used to assess hydrologic impacts on the flow regime experienced at the mouth of major tributaries of 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 by subtracting flows that would not have occurred naturally, but have been added to the system through human intervention (flows added as a result of industrial activity such as industrial flow releases and land-use changes), a naturalized hydrograph for the 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.4.2 Rationale

#### C.4.2.1 Water Balance

In general, the water balance for a partially-developed catchment (that is, a catchment that has been affected by land clearing, hydrologic isolation, and water withdrawals and releases 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 withdrawals from the watercourse;

$Q_r$  are the focal project releases 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 land cleared within the watershed.

For catchments monitored as part of the RAMP program, the observed discharge was the discharge measured at streamflow stations near the catchment outlet. Most streamflow stations were operated by RAMP, but some were operated by government agencies, or by a combination of government agencies and RAMP.

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

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

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”.

#### C.4.2.2 Effect of Clearing

The effect of clearing was estimated by assuming a 20% increase in average 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 average 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 catchment area.

#### C.4.2.3 Closed-Circuited Areas

Closed-circuited (or hydrologically isolated) areas were delineated based on satellite imagery and reviewed by oil sands operators (Table C.4-1). It was assumed that zero runoff was released to the environment from closed-circuit areas.

The definition of “effective area” used in the water balance analyses was the area of the catchment remaining after removal of the closed-circuited areas. The effective area includes 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 purposes 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.4-1 Area of each watershed that was cleared or hydrologically closed-circuited, 2012.**

<b>Watershed</b>	<b>Total Area<sup>1</sup> (km<sup>2</sup>)</b>	<b>Closed-Circuit Area (km<sup>2</sup>)</b>	<b>Cleared Area (km<sup>2</sup>)</b>
Athabasca River <sup>2</sup>	155,455.4	376.1	88.4
Muskeg River	1,457.0	126.2	88.5
Steepbank River	1,320.0	4.9	45.3
Tar River	332.6	95.8	12.5
MacKay River	5,569.3	6.2	31.8
Calumet River	173.5	0.7	1.3
Firebag River	5,987.6	13.6	40.0
Ells River	2,450.0	3.4	22.7
Christina River <sup>2</sup>	13,038.0	7.9	66.7
Hangingstone River	962.0	0.5	0.1
Poplar Creek	151.0	3.1	1.8
Fort Creek	31.9	0.3	20.4

<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.4.3 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 releases. The resulting discharge represented the observed runoff ( $R$ ) from the contributing portion of the catchment. 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 catchment ( $Hyd_B$ ). The natural flow that would have occurred from industrially closed-circuited areas ( $R_n$ ), and the incremental flow from cleared areas ( $R_i$ ) were also calculated. This process is shown in equation form below:

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

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

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

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

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

where:

- A is the total catchment area (km<sup>2</sup>);
- A<sub>C</sub> is the cleared area in the catchment (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-circuit 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);
- R is the observed runoff from the effective area adjusted for reported industrial withdrawals and releases (m<sup>3</sup>/s); and

Other symbols are as defined previously. The water balance calculation is done at a daily time step.

### C.4.4 Previously Published Estimates

Naturalized flows provided in the RAMP reports in 2005 to 2007 (RAMP 2006, 2007, 2008) 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 from 2008 to 2012, which reflects more accurately a naturalized water balance, and these revisions were presented in 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.

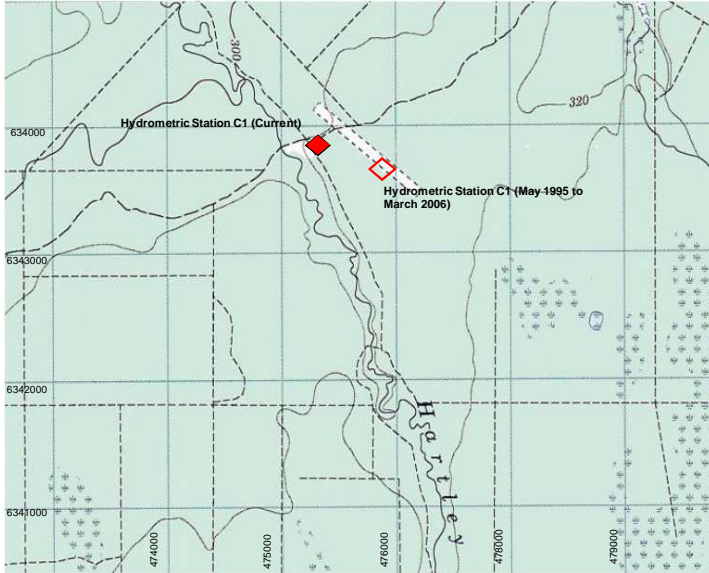
## **C.5 UPDATED STATION DESCRIPTION SHEETS**

Updated station description sheets are provided below for all stations that were active in the 2012 WY.

Revised 28 September, 2012

**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**

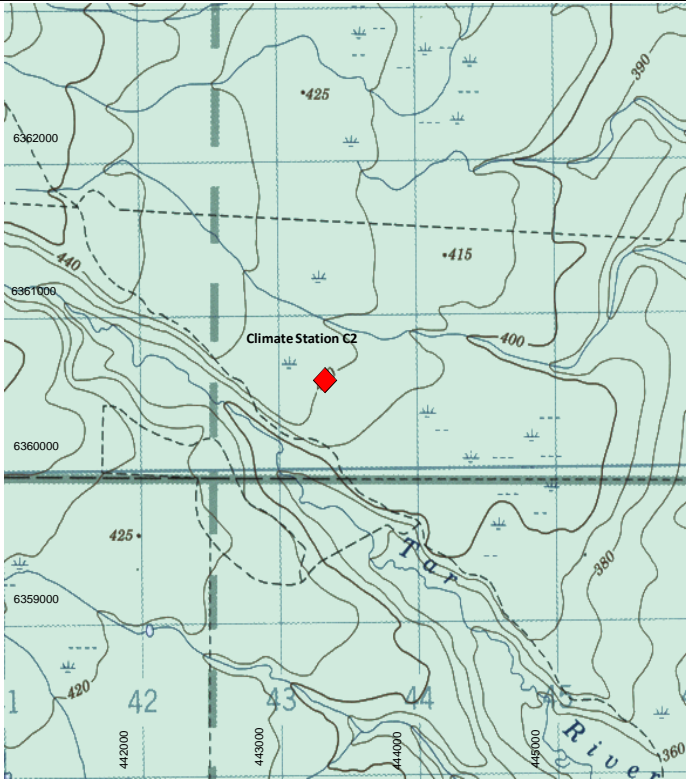
**Variables Measured:** Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation  
**Telemetry:** Cellular  
**Period of Record:** March 1996 to Present  
**Station Operation:** Year Round  
**Access:** Truck via Shell Jackpine Mine  
**UTM Coordinates:** 475230 E, 6344049 N (NAD83)  
**Lat/Long:** 57°14'20" N, 111°24'37" W (NAD83)  
**Station Elevation:** Geodetic elevation based on 2011 differential GPS program 308.5 ± 0.5m  
**NTS Map:** 73M/10



Revised 28 September, 2012

**Location and Purpose:**

Established in October 1998 to monitor climate conditions in the Tar River basin.



Map Grid Based on UTM NAD 27

**Station Details**

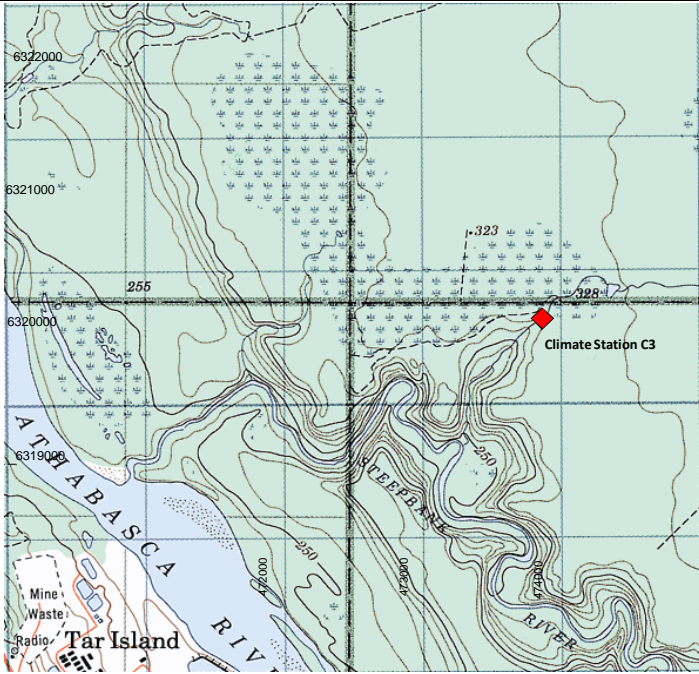
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 2008 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via CNRL 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>	Geodetic elevation based on 2011 differential GPS program 412 ± 0.5m
<b>NTS Map:</b>	74E/05



Revised 28 September, 2012

**Location and Purpose:**

Established in August 2009 to monitor precipitation in the Steepbank River area.



Map Grid Based on UTM NAD 27

**Station Details**

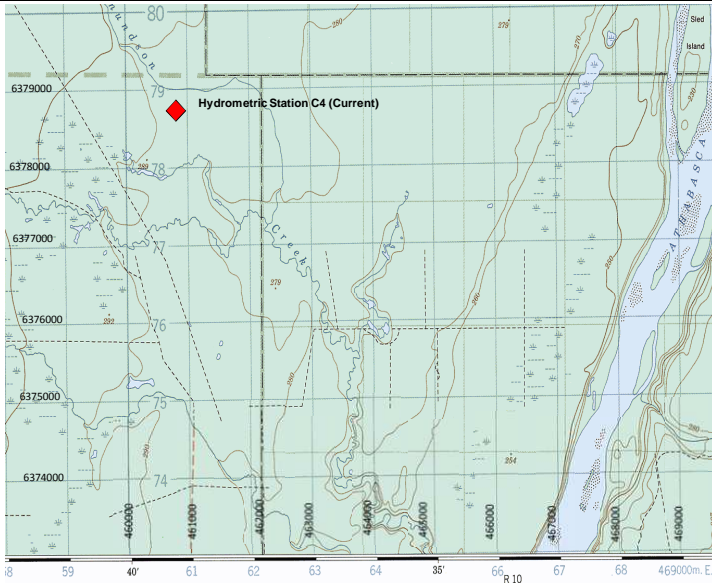
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	August 2009 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via Suncor
<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>	Estimated geodetic elevation 328 ± 5m
<b>NTS Map:</b>	74E/03



Revised 12 February, 2013

**Location and Purpose:**

Established in July 2011 to monitor climate conditions on the west side of the Athabasca River, north of all current development.



**Station Details**

**Variables Measured:** Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure

**Telemetry:** Cellular

**Period of Record:** July 2011 to Present

**Station Operation:** Year Round

**Access:** Helicopter

**UTM Coordinates:** 460853 E, 6378740 N (NAD83)

**Lat/Long:** 57°32'58" N, 111°39'14" W (NAD83)

**Station Elevation:** Geodetic elevation based on 2011 differential GPS program 291.5 ± 0.5m

**NTS Map:** 74E/12



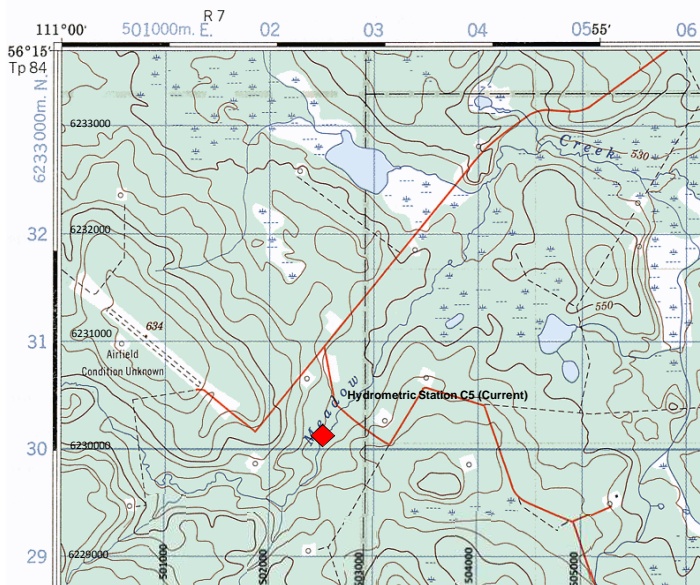
Revised 12 February, 2013

**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>	Estimated geodetic elevation 555 ± 5m
<b>NTS Map:</b>	74D/02



Map Grid Based on UTM NAD 27



Revised 24 January, 2013

**Location and Purpose:**

Established on the East side of McClelland Lake to monitor water levels.



Map Grid Based on UTM NAD 27

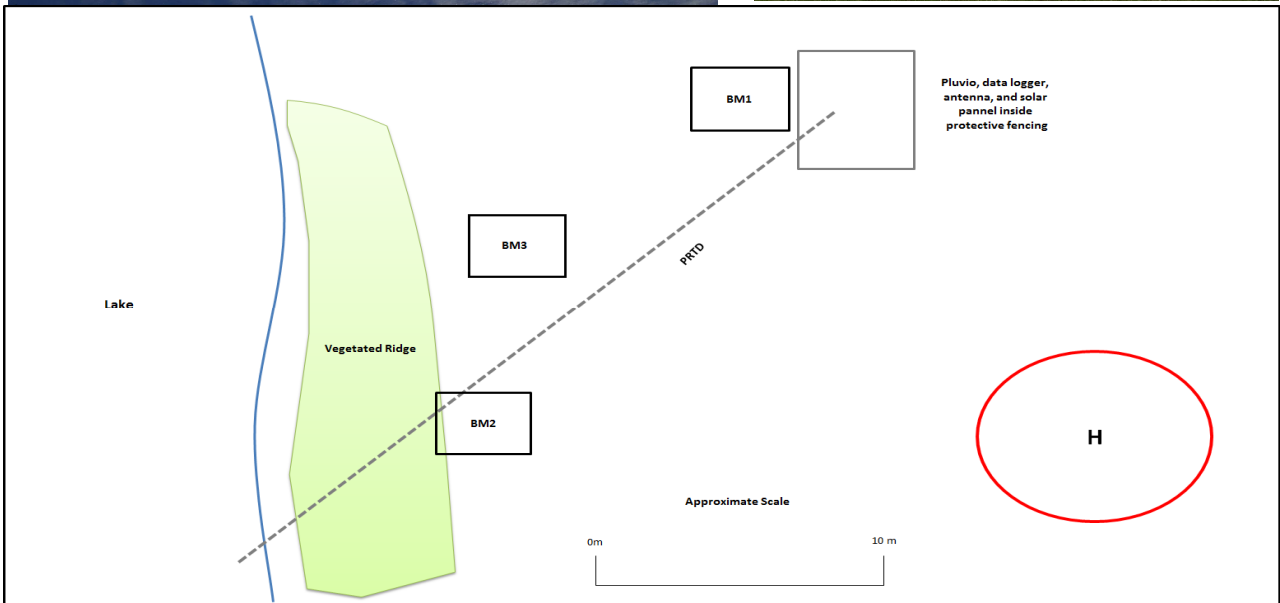


**Station Details**

**Variables Measured:** Water level, Water Temperature, Precipitation, Air Temperature, Relative Humidity  
**Telemetry:** Cellular  
**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 L1-1  
**Elevation:** 295.036m  
**Basis:** Level survey  
**Location:** 20m West of station  
**Description:** 3/4" Pipe  
**BM2:** RAMP L1-2  
**Elevation:** 294.664  
**Basis:** Level survey RAMP L1-1  
**Location:** 10m West of station  
**Description:** 3/4" Pipe  
**BM3:** RAMP L1-3  
**Elevation:** 294.865m  
**Basis:** Level survey RAMP L1-1  
**Location:** Next to Fence Enclosure  
**Description:** Iron Rod

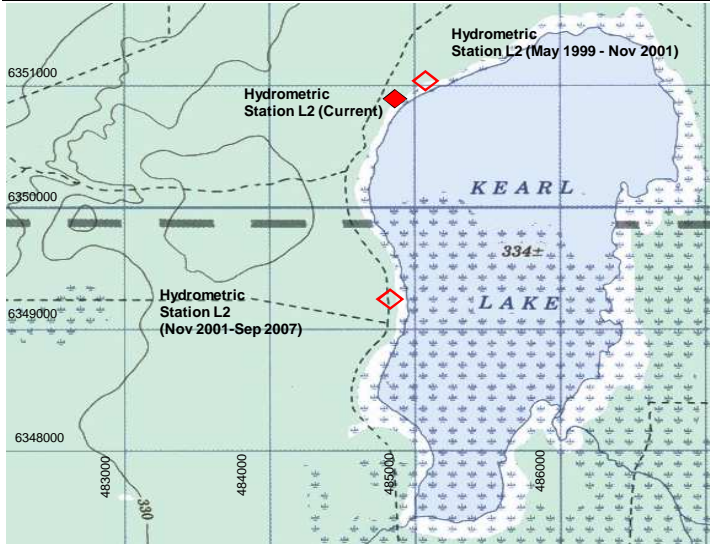




Revised 28 September, 2012

**Location and Purpose:**

Established to monitor water levels in Kearl Lake.



Map Grid Based on UTM NAD 27



**Station Details**

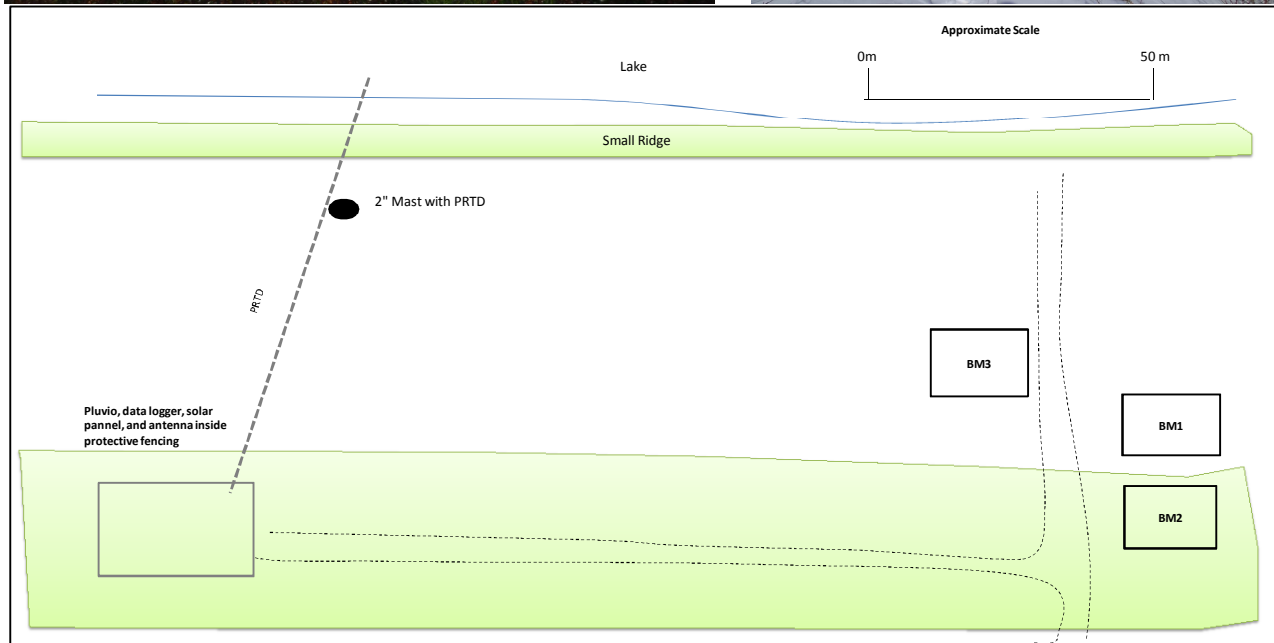
**Variables Measured:** Water Level, Water Temperature, Air Temperature, Precipitation, Relative Humidity  
**Telemetry:** Cellular  
**Period of Record:** May 1999 to Present  
**Station Operation:** Year Round  
**Access:** 2WD access via Canterra Road  
**Drainage Area:** 72.6km<sup>2</sup>  
**UTM 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 L2-1  
**Elevation:** 332.426 m  
**Basis:** Level Survey from previous Rebar BM  
**Location:** South of trail  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP L2-2  
**Elevation:** 332.258 m  
**Basis:** Level survey from previous Rebar BM  
**Location:** South of trail by previous Rebar BM  
**Description:** 3/4" Pipe with coupling

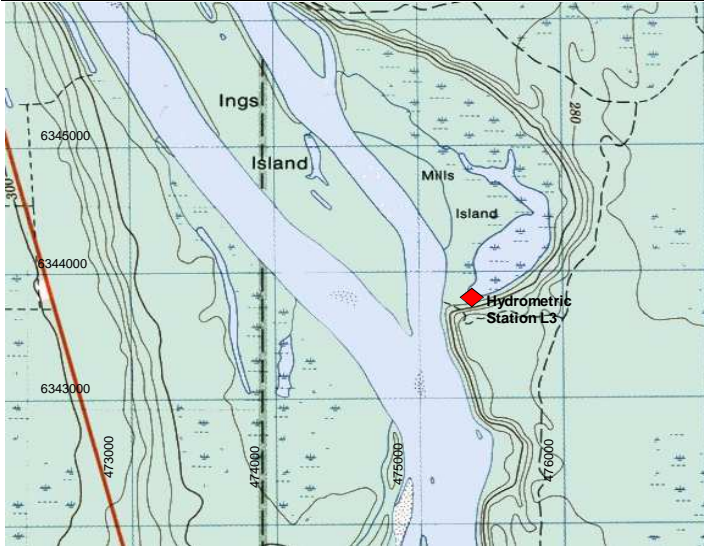
**BM:** RAMP L2-3  
**Elevation:** 332.830 m  
**Basis:** Level Survey from previous Rebar BM  
**Location:** North of trail  
**Description:** 3/4" Pipe with flagging



Revised 28 September, 2012

**Location and Purpose:**

Established to monitor water levels on Isadore's Lake.



Map Grid Based on UTM NAD 27

**Station Details**

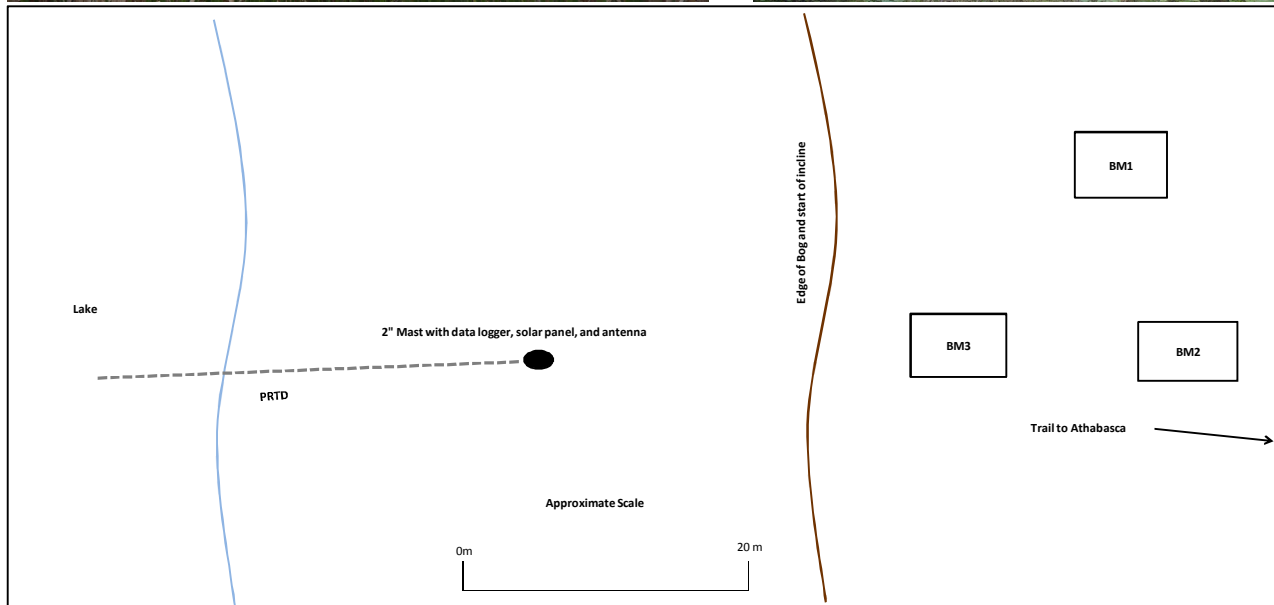
**Variables Measured:** Water level, Water Temperature  
**Telemetry:** Cellular  
**Period of Record:** February 2000 to Present  
**Station Operation:** Open water (April-October)  
 Summer: Jet Boat via Athabasca River, footpath; Winter: Helicopter  
**Access:**  
**Drainage Area:** 28km<sup>2</sup>  
**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 L3-1  
**Elevation:** 234.374 m  
**Basis:** Level Survey from decommissioned BM  
**Location:** 35m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP L3-2  
**Elevation:** 235.537 m  
**Basis:** Level Survey from decommissioned BM  
**Location:** 35m South of data logger  
**Description:** 3/4" Pipe with pink flagging

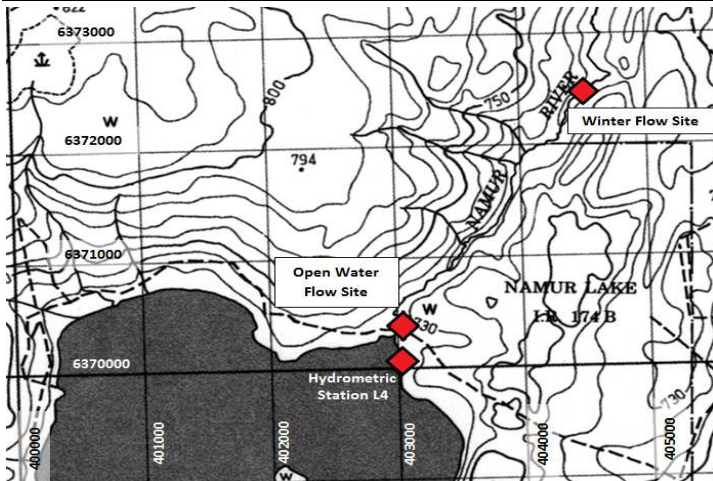
**BM:** RAMP L3-3  
**Elevation:** 234.619 m  
**Basis:** Level Survey from decommissioned BM  
**Location:** 30m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 28 January, 2013

**Location and Purpose:**

Established on the North-Eastern shore of Namur Lake to monitor water levels and discharge from the Lake.



Map Grid Based on UTM NAD 27



**Station Details**

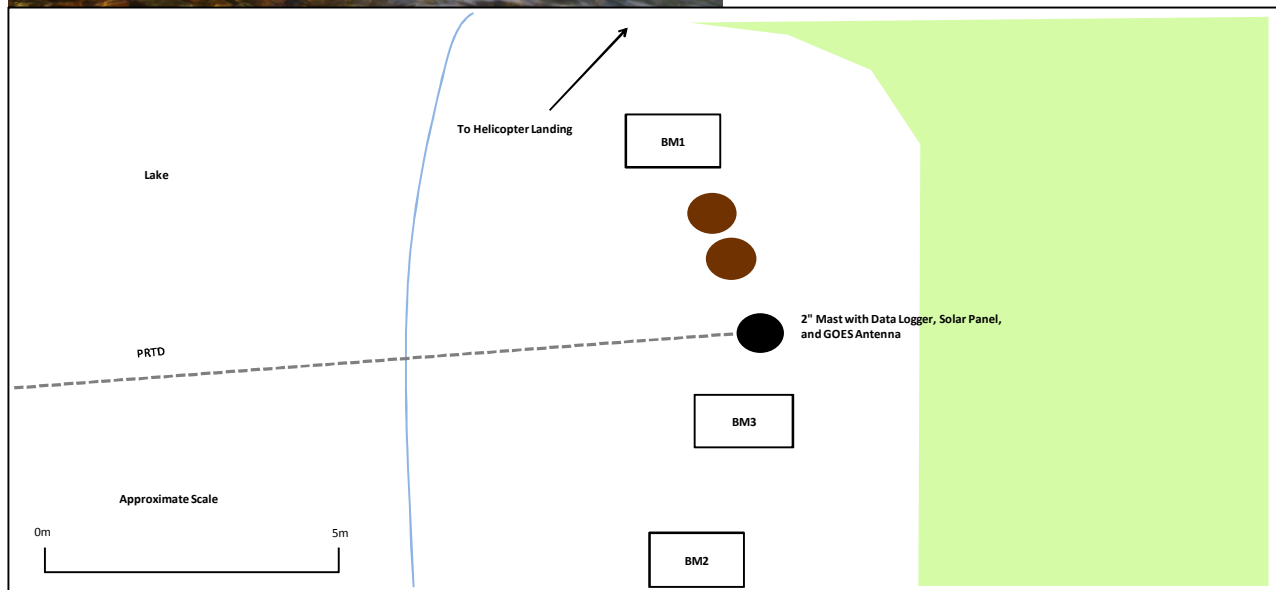
**Variables Measured:** Water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 164 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 402886 E, 6370260 N (NAD83)  
**Lat/Long:** 57°27'53"N, 112°37'8"W (NAD83)  
**NTS Map:** 84H/07

**Benchmark Information**

**BM:** RAMP L4-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 4m North West of station  
**Description:** 3/4" Pipe

**BM:** RAMP L4-2  
**Elevation:** 100.055 m  
**Basis:** Level Survey from RAMP L4-1  
**Location:** 5m South East of station  
**Description:** 3/4" Pipe

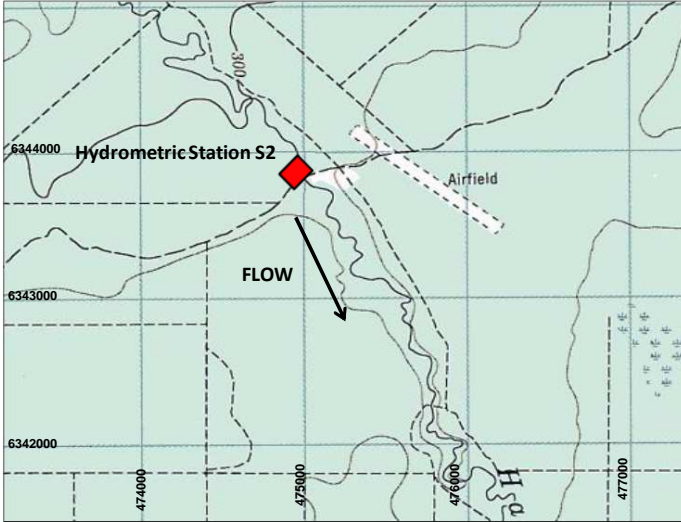
**BM:** RAMP L4-3  
**Elevation:** 100.127 m  
**Basis:** Level Survey from RAMP L4-1  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe



Revised 17 September, 2012

**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

**Station Details**

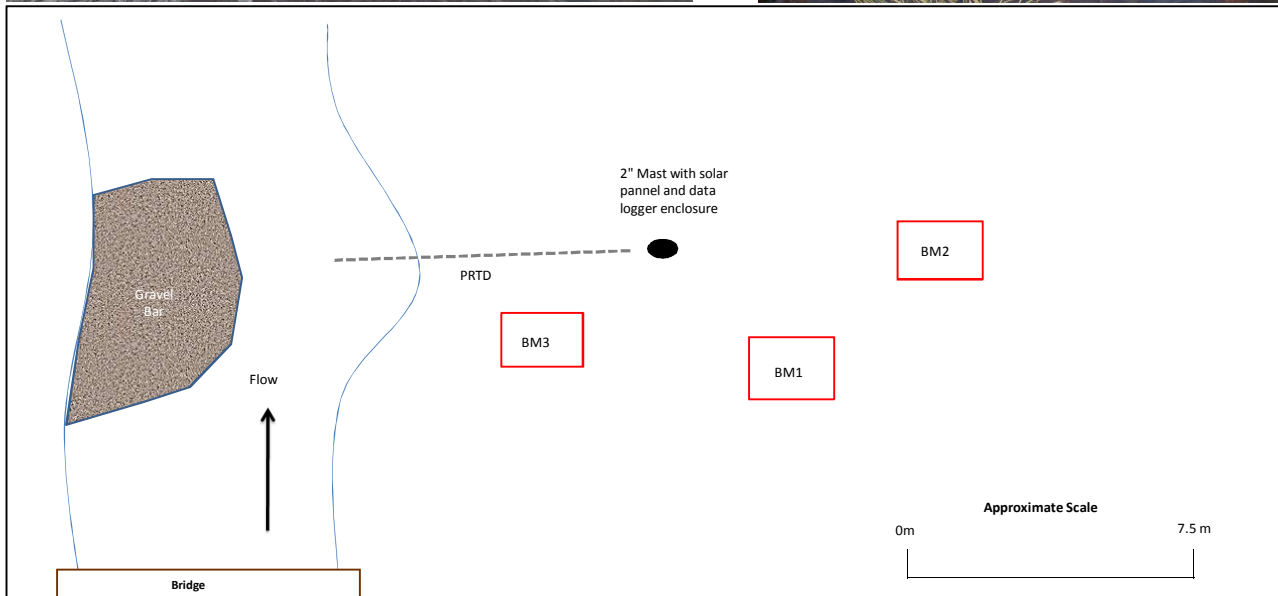
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 1995 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Canterra Road  
**Drainage Area:** 358 km<sup>2</sup>  
**UTM Coordinates:** 474961 E, 6344087 N (NAD83)  
**Lat/Long:** 57°14'21" N, 111°24'53" W (NAD83)  
**NTS Map:** 74E/3

**Benchmark Information**

**BM:** RAMP S2-1  
**Elevation:** 297.256 m  
**Basis:** Level Survey from RAMP S2-2  
**Location:** 3m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S2-2  
**Elevation:** 298.106 m  
**Basis:** Level Survey from previous Rebar BM  
**Location:** 3m East of data logger  
**Description:** T-post with flagging

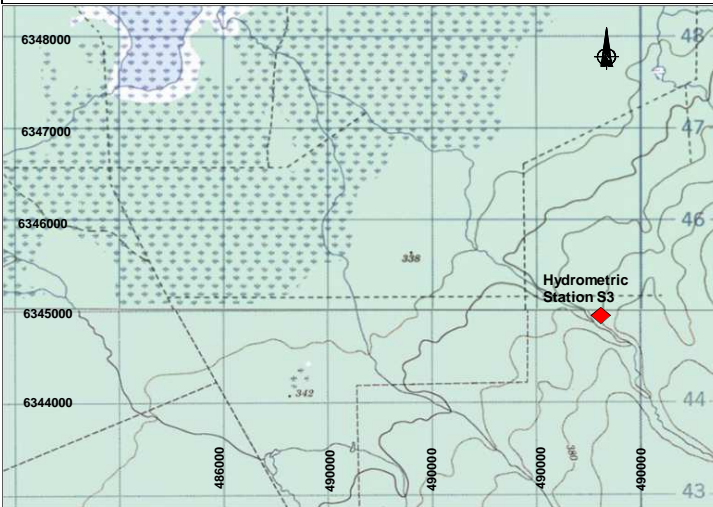
**BM:** RAMP S2-3  
**Elevation:** 297.336 m  
**Basis:** Level Survey from previous Rebar BM  
**Location:** 4m SW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 5 December, 2012

**Location and Purpose:**

Established to monitor discharge on Iyininin 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. A rain gauge was added to the station in 1998.



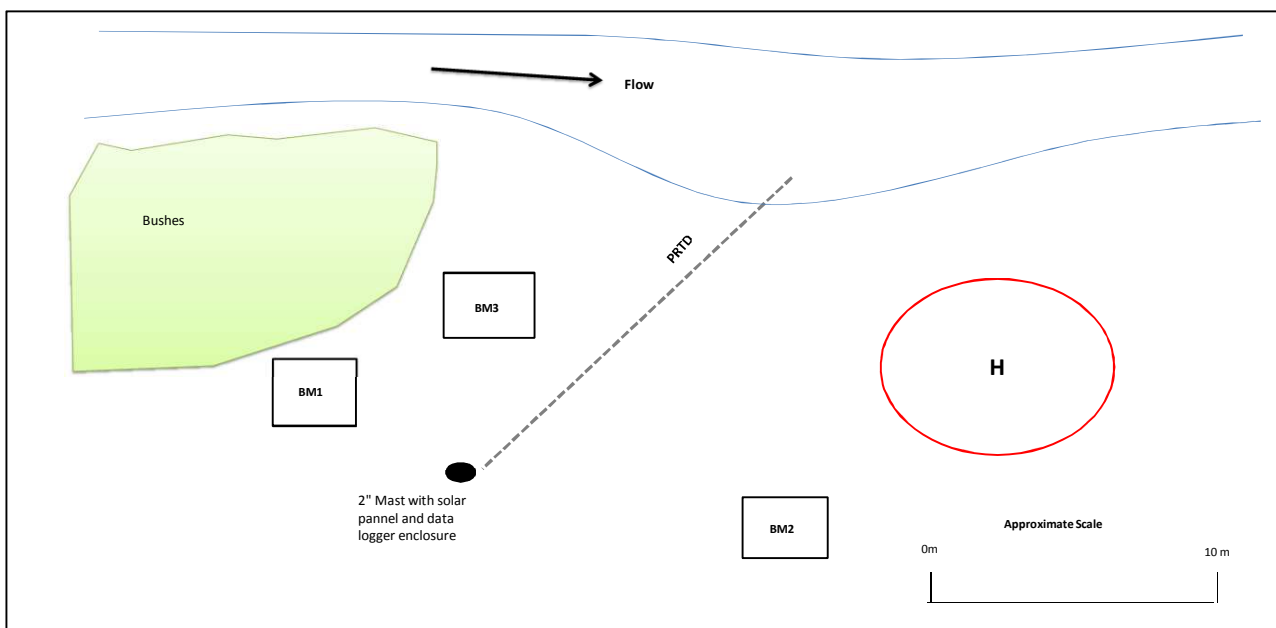
Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Discharge, water level, water temperature, rainfall
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 1995-Oct. 1999; May 2001-Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	32.2 km <sup>2</sup>
<b>UTM Coordinates:</b>	489491 E, 6345029 N (NAD83)
<b>Lat/Long:</b>	57°
<b>NTS Map:</b>	74E/06

**Benchmark Information**

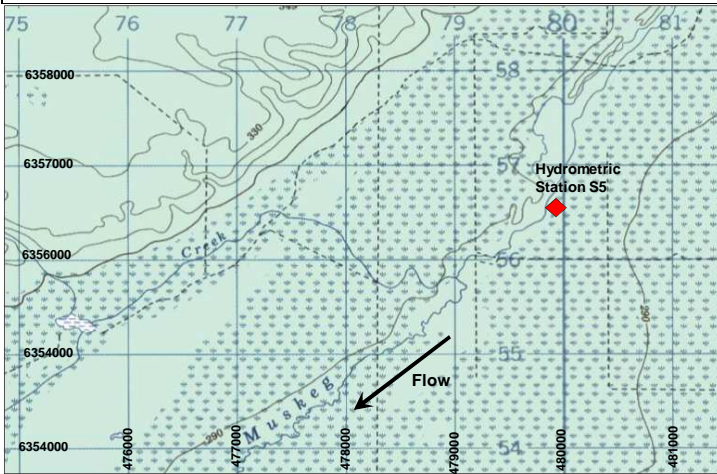
<b>BM:</b>	RAMP S3-1
<b>Elevation:</b>	361.565 m
<b>Basis:</b>	Level Survey from S3-2
<b>Location:</b>	5m West of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S3-2
<b>Elevation:</b>	361.382 m
<b>Basis:</b>	Level Survey from previous Rebar BM
<b>Location:</b>	4m NE of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S3-3
<b>Elevation:</b>	361.588 m
<b>Basis:</b>	Level Survey from RAMP S3-2
<b>Location:</b>	10m NW of data logger
<b>Description:</b>	3/4" Pipe with pink flagging



Revised 17 September, 2012

**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.



Map Grid Based on UTM NAD 27

**Station Details**

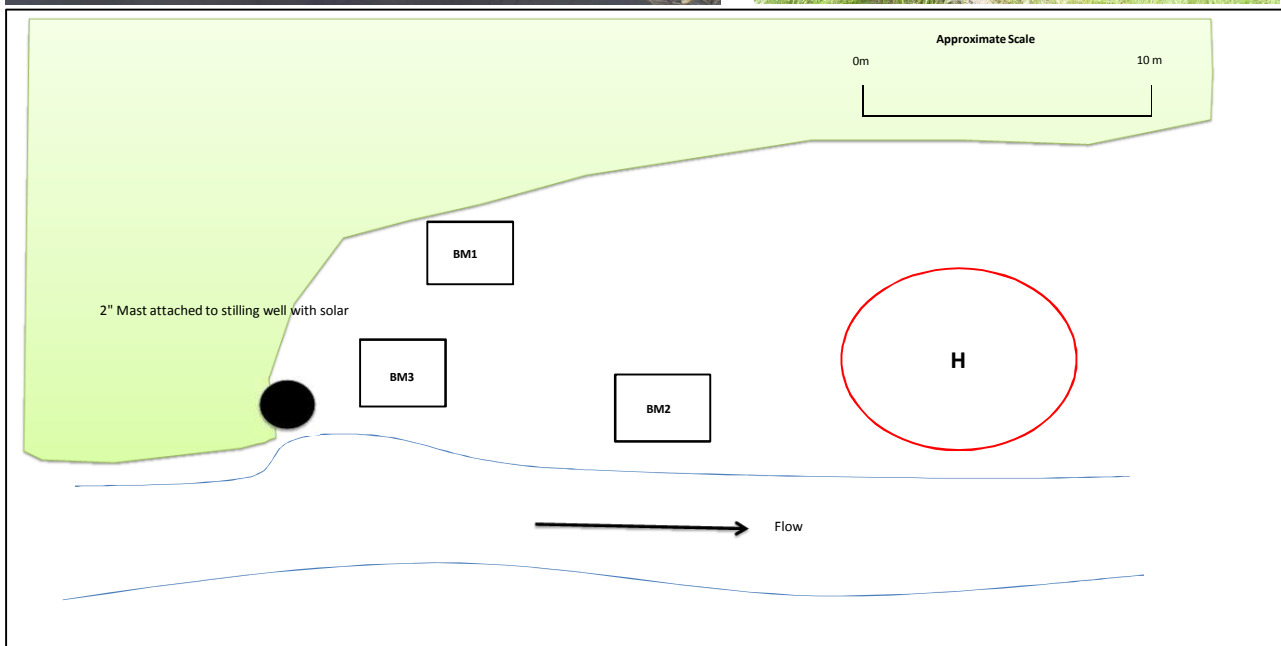
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Aug 1995-Dec 1996, Feb 2003-Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 395km<sup>2</sup>  
**UTM Coordinates:** 479760 E, 6356755 N (NAD83)  
**Lat/Long:** 57°21'11" N, 111°20'10" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S5-1  
**Elevation:** 98.369m  
**Basis:** Unknown  
**Location:** 6m South of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S5-2  
**Elevation:** 98.527 m  
**Basis:** Level Survey from RAMP S5-1  
**Location:** 12m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

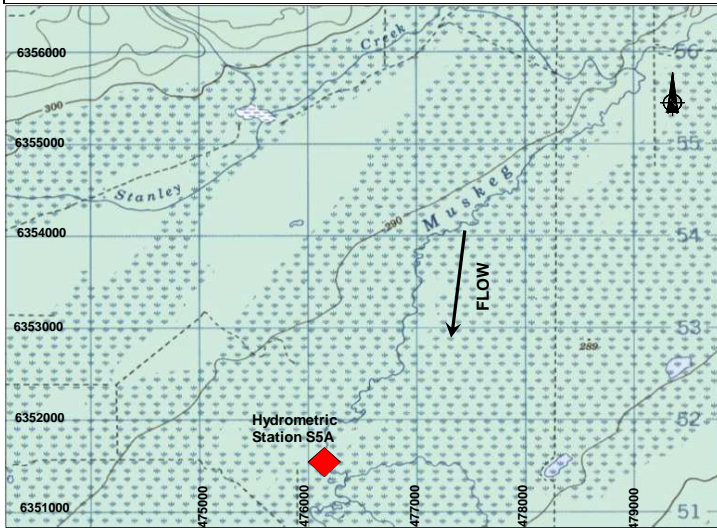
**BM:** RAMP S5-3  
**Elevation:** 98.404m  
**Basis:** Level Survey from RAMP S5-1  
**Location:** Close to data logger  
**Description:** T-Post



Revised 17 September, 2012

**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.



Map Grid Based on UTM NAD 27



**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:** 552km<sup>2</sup> (was 390km<sup>2</sup> until 1998)

**UTM Coordinates:** 476100 E, 6351600 N (NAD83)

**Lat/Long:** 57°18'30" N, 111°23'43" W (NAD83)

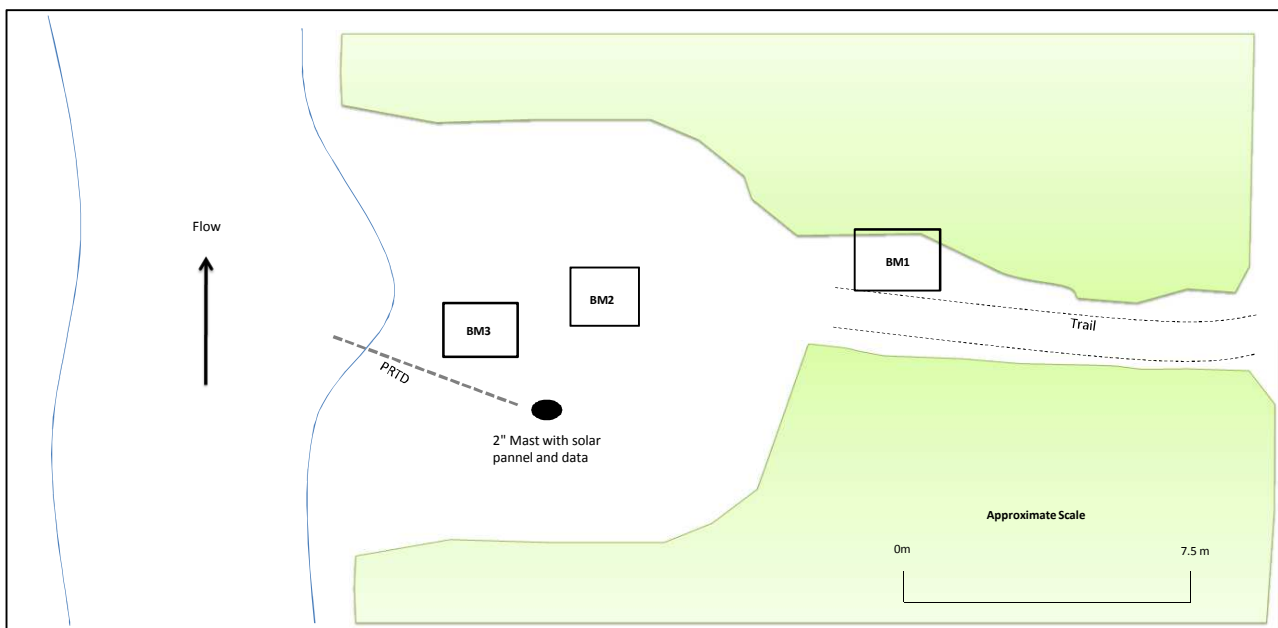
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S5A-1  
**Elevation:** 282.159m  
**Basis:** Level Survey from S5A-1  
**Location:** 10m West of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S5A-2  
**Elevation:** 282.697m  
**Basis:** Level Survey from S5A-1  
**Location:** 4m NW of data logger  
**Description:** T-post

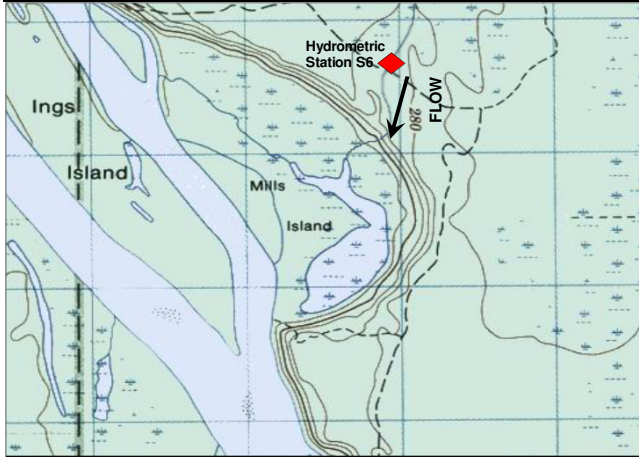
**BM:** RAMP S5A-3  
**Elevation:** 282.353m  
**Basis:** Level Survey from RAMP S5A-1  
**Location:** 3m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 18 September, 2012

**Location and Purpose:**

Established to monitor discharge on Mills Creek, downstream of the Mills Creek fen and upstream of 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.



Map Grid Based on UTM NAD 27



**Station Details**

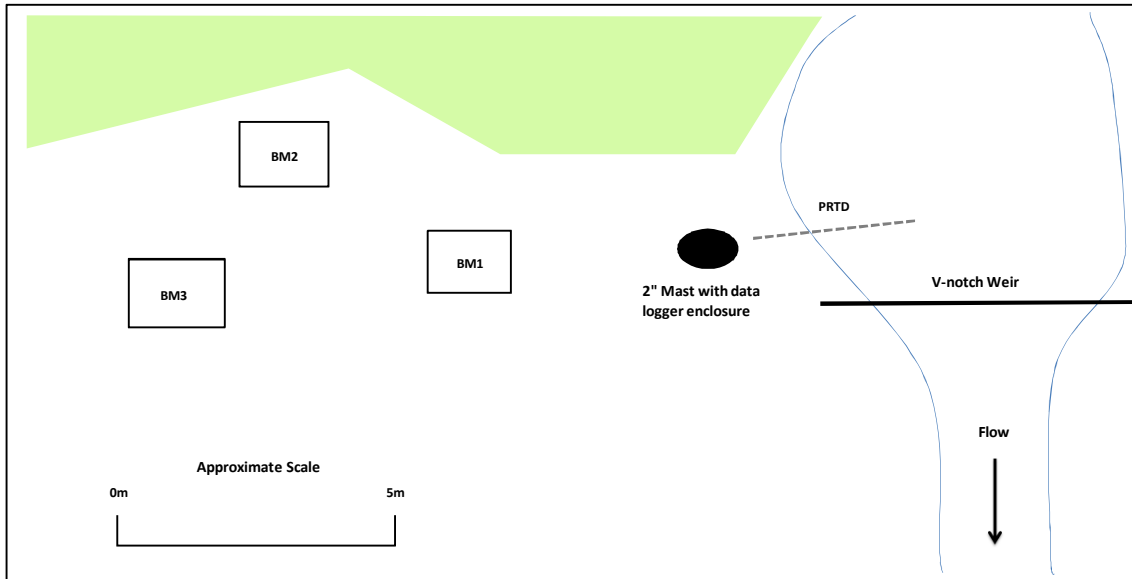
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 1997 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road access along Hwy 63 (paved)  
**Drainage Area:** 9km<sup>2</sup>  
**UTM Coordinates:** 463829 E, 6344743 N (NAD83)  
**Lat/Long:** 57°14'44" N, 111°35'57" W (NAD83)  
**NTS Map:** 74E/04

**Benchmark Information**

**BM:** RAMP S6-1  
**Elevation:** 273.600m  
**Basis:** Survey date unknown  
**Location:** 4m NW of data logger  
**Description:** Rebar in white PVC

**BM:** RAMP S6-2  
**Elevation:** 274.118m  
**Basis:** Level Survey from RAMP S6-1  
**Location:** 6m NW of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S6-3  
**Elevation:** 274.113m  
**Basis:** Level Survey from RAMP S6-1  
**Location:** 7m West of data logger  
**Description:** 3/4" Pipe with pink flagging

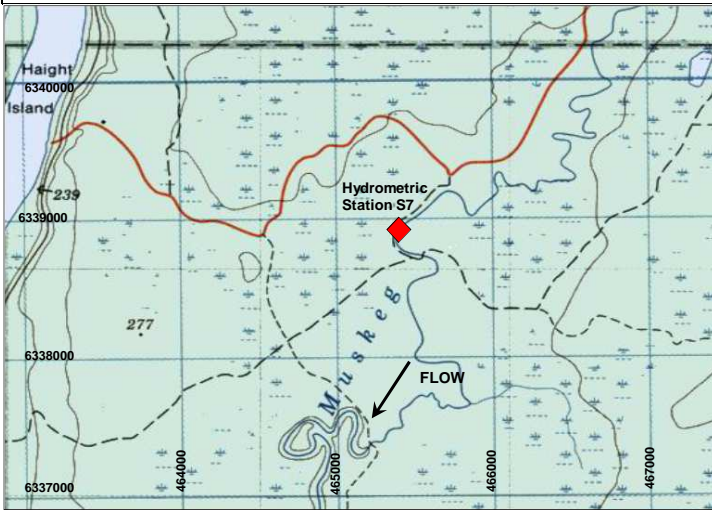




Revised 18 September, 2012

**Location and Purpose:**

Established to monitor winter discharge on the Muskeg River at Environment Canada hydrometric station 07DA008. The Environment Canada hydrometric station has operated since 1975 but discharges are only published for the March-October period.



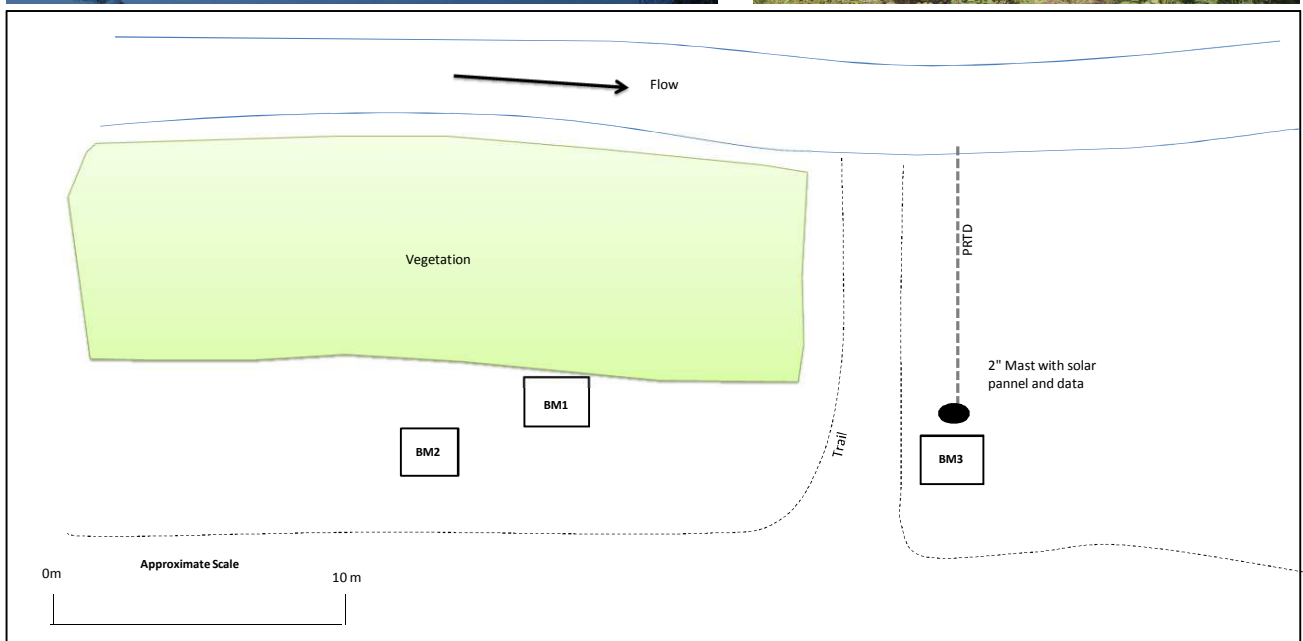
Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 1999 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD access via Canterra Road (gravel)
<b>Drainage Area:</b>	1457km <sup>2</sup>
<b>UTM Coordinates:</b>	465408 E, 6338944 N (NAD83)
<b>Lat/Long:</b>	57°11'32" N, 111°34'21" W (NAD83)
<b>NTS Map:</b>	74E/04

**Benchmark Information**

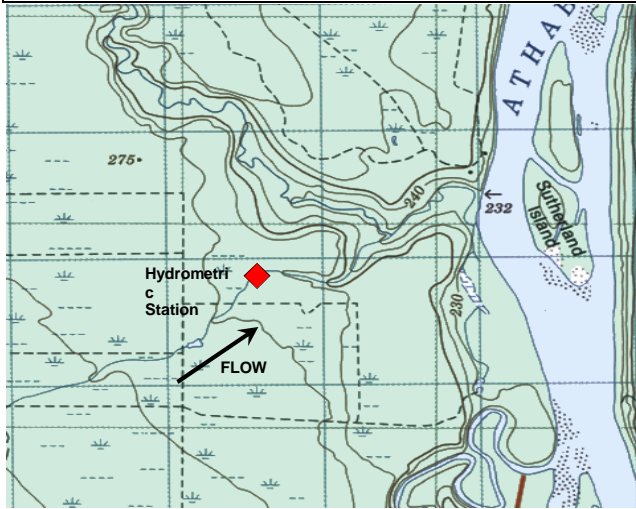
<b>BM:</b>	RAMP S7-1
<b>Elevation:</b>	275.498
<b>Basis:</b>	Level Survey from previous Rebar BM
<b>Location:</b>	8m West of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S7-2
<b>Elevation:</b>	274.826 m
<b>Basis:</b>	Level Survey from RAMP S7-1
<b>Location:</b>	10m West of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S7-3
<b>Elevation:</b>	275.212
<b>Basis:</b>	Level Survey from RAMP S7-1
<b>Location:</b>	2m South of data logger
<b>Description:</b>	3/4" Pipe with pink flagging



Revised 24 January, 2013

**Location and Purpose:**

Established to monitor discharge and rainfall on the Tar River Tributary, adjacent to the CNRL Horizon mine. The station was relocated (from 457315 E, 6352863 N) in April 2012 approximately 200 meters downstream to avoid beaver dam activity.



Map Grid Based on UTM NAD 27



**Station Details**

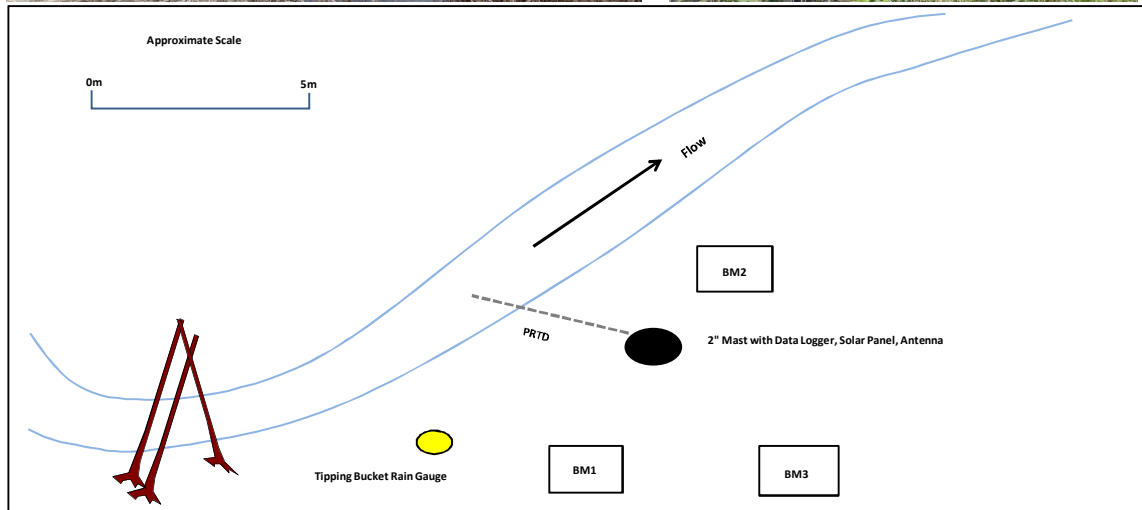
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** June 2002 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via CNRL Horizon Mine  
**Drainage Area:** 11.5km<sup>2</sup>  
**UTM Coordinates:** 457372 E, 6352880 N (NAD83)  
**Lat/Long:** 57°19'70"N, 111°42'28"W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S19A-1  
**Elevation:** 103.334 m  
**Basis:** Old station BM elevations  
**Location:** 5m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S19A-2  
**Elevation:** 103.599 m  
**Basis:** Level Survey from RAMP S19A-1  
**Location:** 3m South of station  
**Description:** 3/4" Pipe

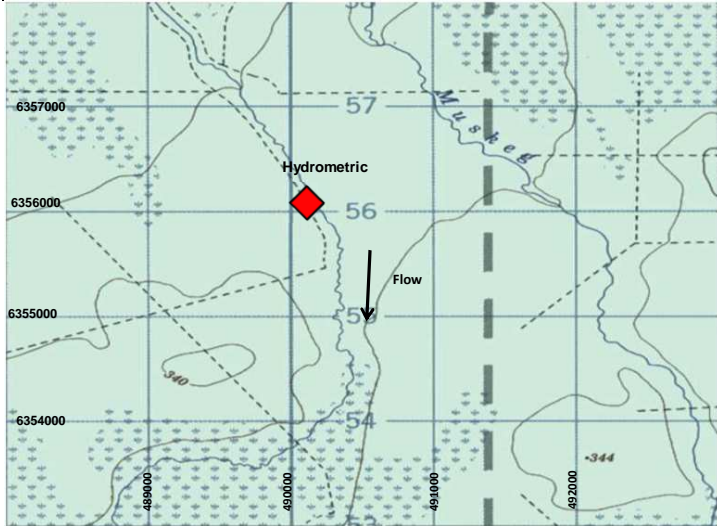
**BM:** RAMP S19A-3  
**Elevation:** 103.530 m  
**Basis:** Level Survey from RAMP S19A-1  
**Location:** 3m South East of station  
**Description:** 3/4" Pipe



Revised 6 November, 2012

**Location and Purpose:**

Established to monitor discharge on Wapasu Creek upstream of the Muskeg River. Extensive beaver activity since 2009 has flooded most of the area.



Map Grid Based on UTM NAD 27



**Station Details**

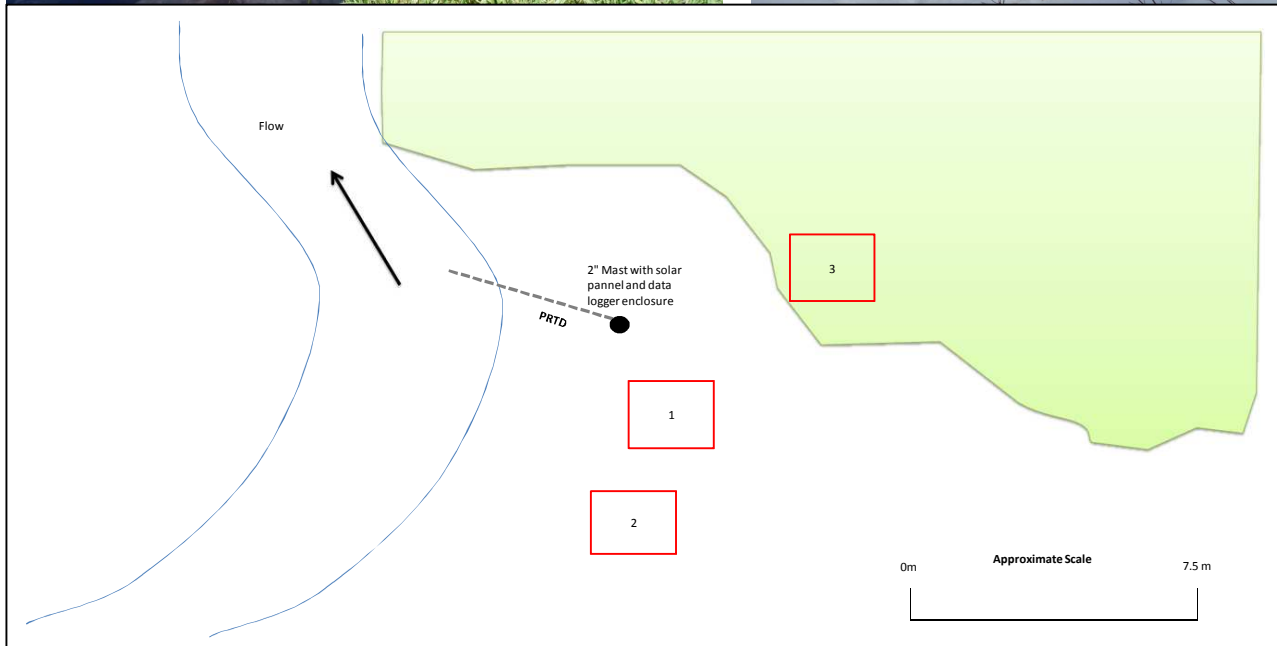
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Mar 1998-Oct 1999; May 2001-Present  
**Station Operation:** Year Round  
**Access:** 4WD via Canterra Road  
**Drainage Area:** 90.7 km<sup>2</sup>  
**UTM Coordinates:** 490350 E, 6355500 N  
**Lat/Long:** 57°20'35"N, 111°09'40"W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S10-1  
**Elevation:** 100.657m  
**Basis:** Assumed  
**Location:** 4m South of data logger  
**Description:** Rebar in PVC Pipe

**BM:** RAMP S10-2  
**Elevation:** 100.923m  
**Basis:** Assumed  
**Location:** 6m South of data logger  
**Description:** 3/4" Pipe

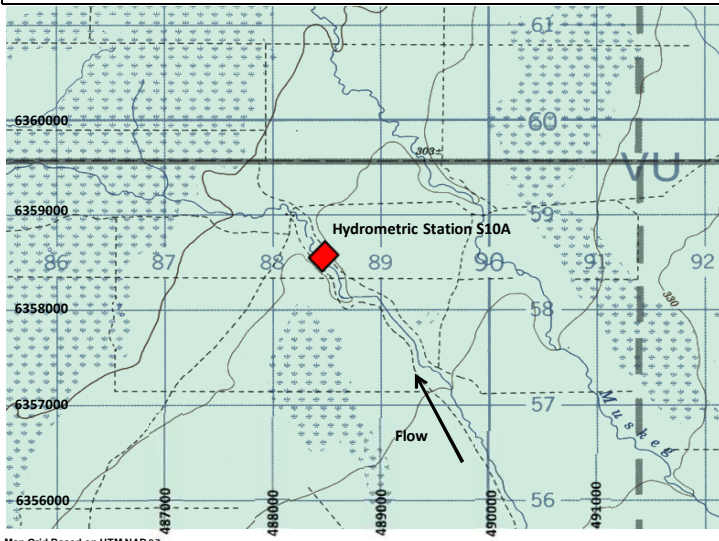
**BM:** RAMP S10-3  
**Elevation:** 100.729m  
**Basis:** Level Survey from RAMP S10-2  
**Location:** 8m NE of data logger  
**Description:** Nail in log



Revised 18 September, 2012

**Location and Purpose:**

Established to monitor discharge on Wapasu Creek upstream of the Muskeg River. 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, and now requires helicopter access.



Map Grid Based on UTM NAD 27



**Station Details**

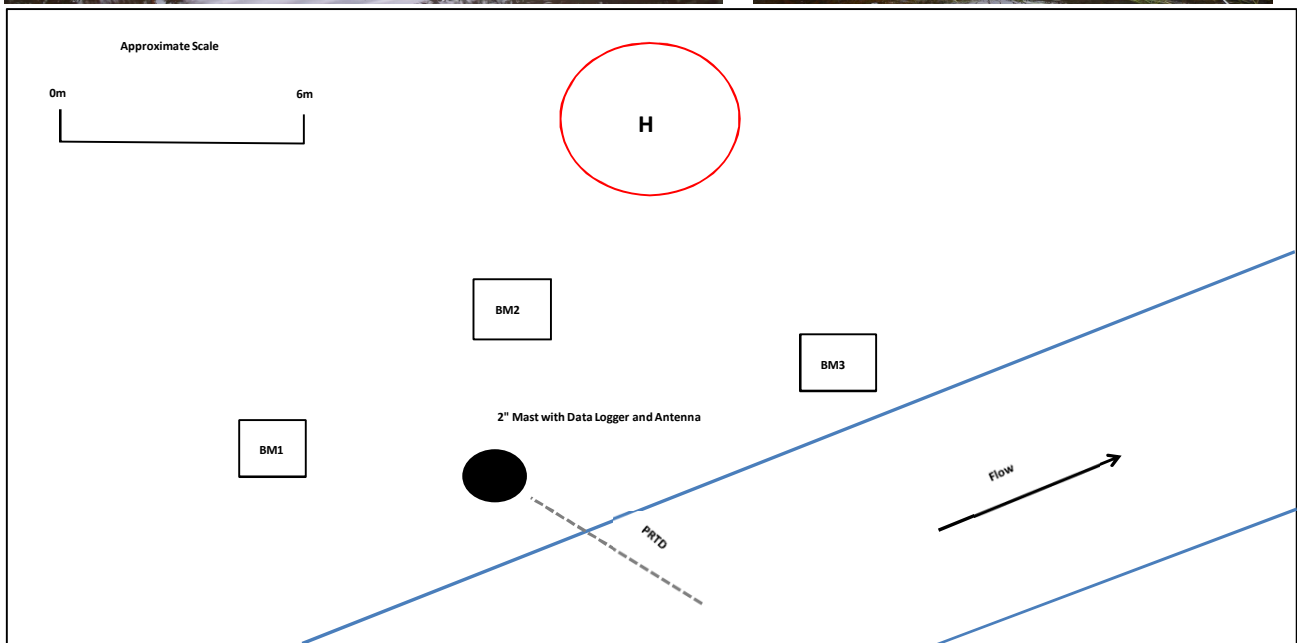
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Mar 1998-Oct 1999; May 2001-Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:**  
**UTM Coordinates:** 488573 mE, 6358554 mN (NAD83)  
**Lat/Long:** 57°22'11"N, 111°11'24"W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S10A-1  
**Elevation:** 100.236 m  
**Basis:** Level Survey from RAMP S10A-2  
**Location:** 5m NW of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S10A-2  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

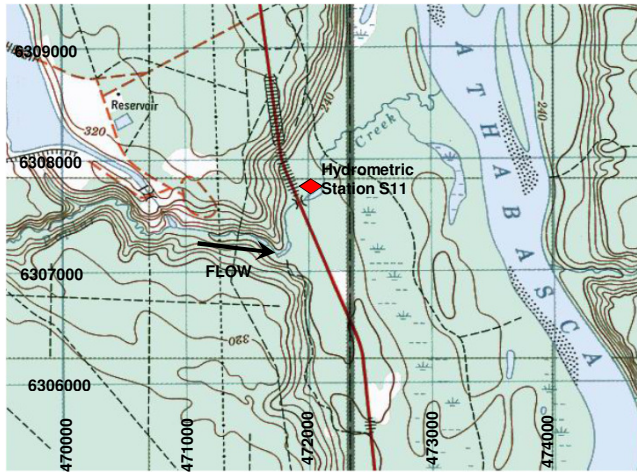
**BM:** RAMP S10A-3  
**Elevation:** 100.136 m  
**Basis:** Level Survey from RAMP S10A-2  
**Location:** 6 m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 18 September, 2012

**Location and Purpose:**

Established to monitor discharge on Poplar Creek upstream of the Athabasca River. The station is at the site of Environment Canada station (07DA007) that operated from 1973 to 1986.



Map Grid Based on UTM NAD 27



**Station Details**

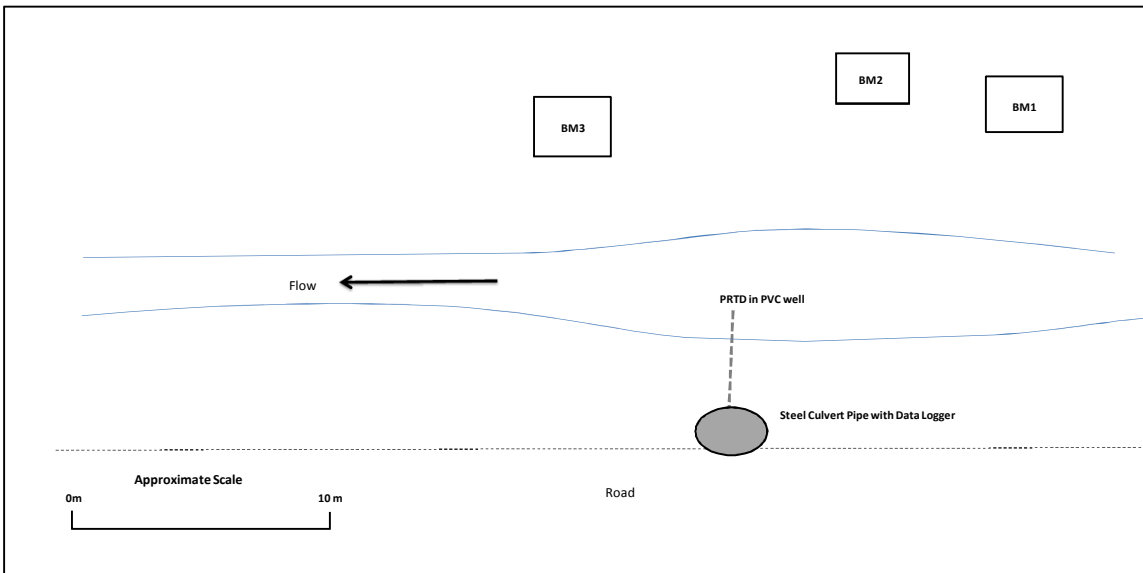
**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 1997 to Present  
**Station Operation:** Year Round (data logger installed in open water season only)  
**Access:** 2WD road access On Hwy 63 (paved)  
**Drainage Area:** 151km<sup>2</sup>  
**UTM Coordinates:** 472000 E, 6307650 N (NAD83)  
**Lat/Long:** 56°54'46" N, 111°27'44" W (NAD83)  
**NTS Map:** 74D/14

**Benchmark Information**

**BM:** RAMP S11-1  
**Elevation:** 242.095m  
**Basis:** Level survey from decommissioned BM  
**Location:** On Right Bank, 15m Upstream from logger  
**Description:** ASCM marker, square pin next to orange stake

**BM:** RAMP S11-2  
**Elevation:** 242.261m  
**Basis:** Level Survey from RAMP S11-1  
**Location:** Near S11-1  
**Description:** 3/4" Pipe with pink flagging

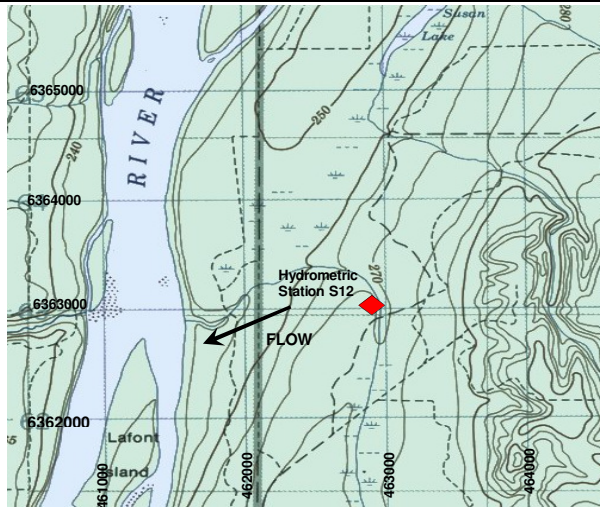
**BM:** RAMP S11-3  
**Elevation:** 242.226m  
**Basis:** Level Survey from RAMP S11-1  
**Location:** 20m East of RAMP S11-1  
**Description:** 3/4" Pipe with pink flagging



Revised 18 September, 2012

**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.



Map Grid Based on UTM NAD 27



**Station Details**

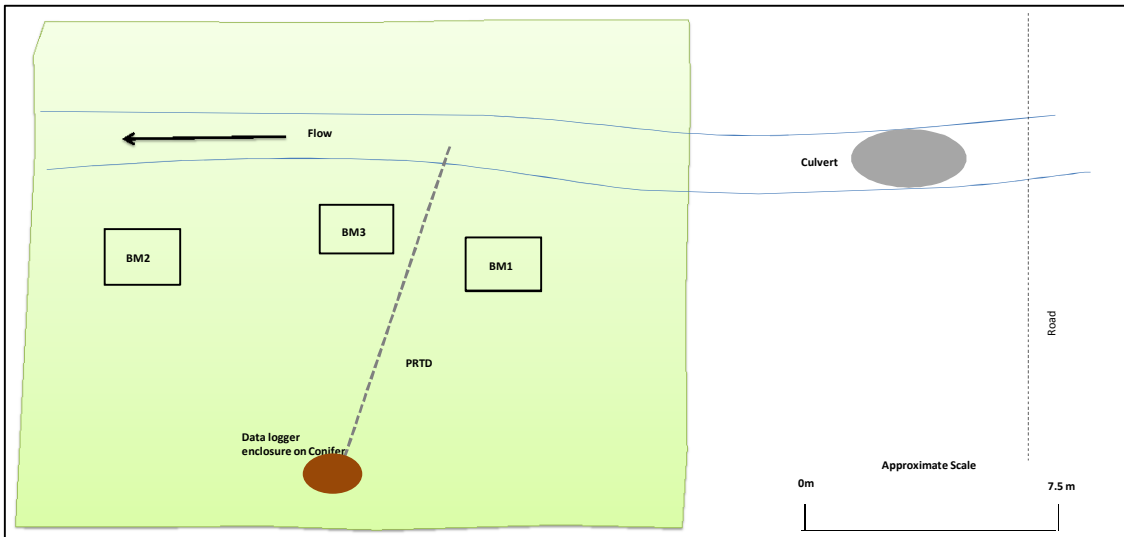
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2000-Oct. 2002; Apr 2006-Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access via Hwy 63 extension  
**Drainage Area:** 32km<sup>2</sup>  
**UTM Coordinates:** 462600 E, 6363400 N (NAD83)  
**Lat/Long:** 57°24'48" N, 111°37'18" W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S12-1  
**Elevation:** 98.699m  
**Basis:** Assumed  
**Location:** 5m Upstream of logger on Left Bank  
**Description:** T-Post

**BM:** RAMP S12-2  
**Elevation:** 99.093m  
**Basis:** Level Survey from RAMP S12-1  
**Location:** 10m NW of data logger  
**Description:** 3/4" Pipe with flagging

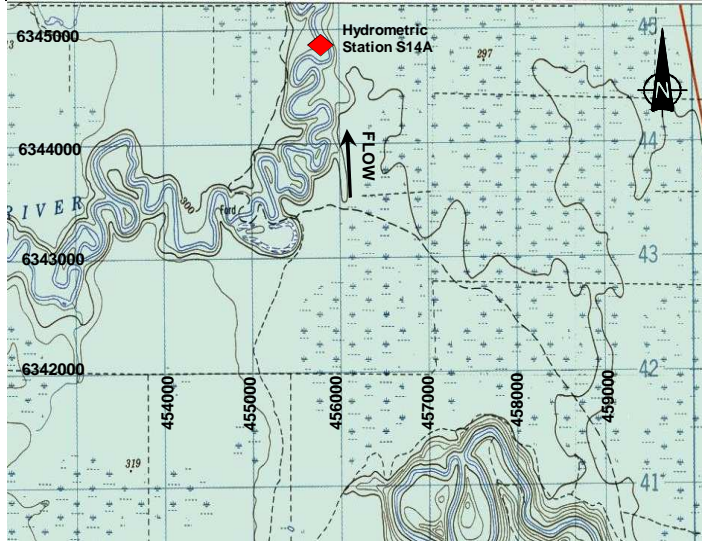
**BM:** RAMP S12-3  
**Elevation:** 99.058 m  
**Basis:** Level Survey from RAMP S12-1  
**Location:** 8m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 24 January, 2013

**Location and Purpose:**

Established in 2004 to monitor discharge on the Ells River. This station replaced S14.



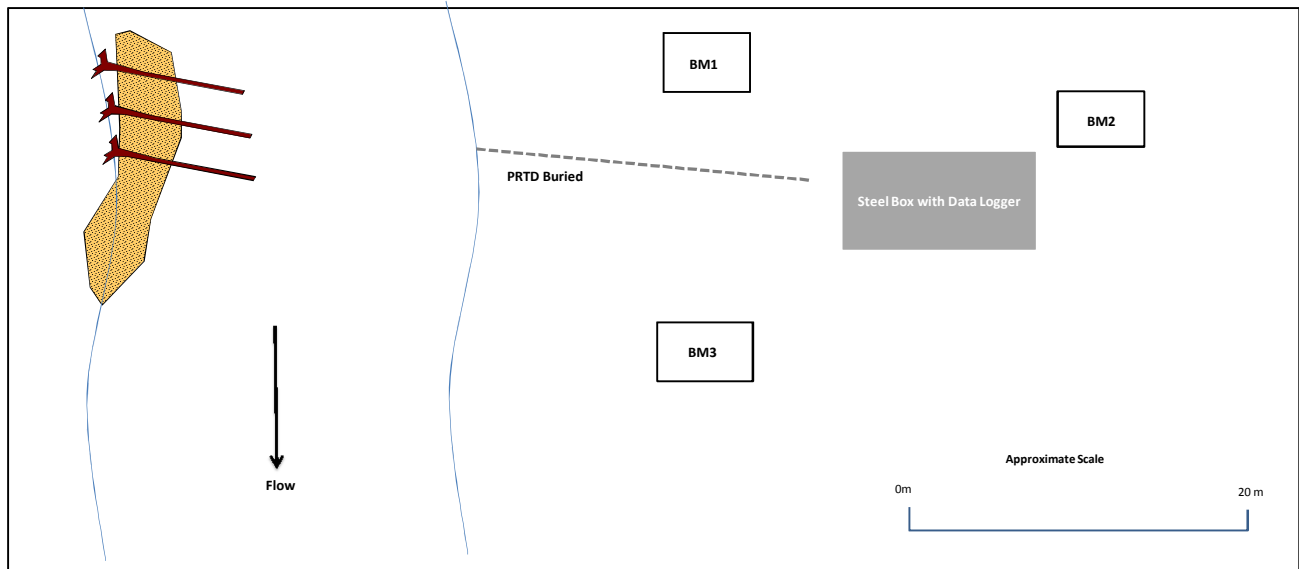
Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 2004 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD road access
<b>Drainage Area:</b>	2450km <sup>2</sup>
<b>UTM Coordinates:</b>	455748 E, 6344947 N (NAD83)
<b>Lat/Long:</b>	57°14'44" N, 111°43'56" W (NAD83)
<b>NTS Map:</b>	74E/04

**Benchmark Information**

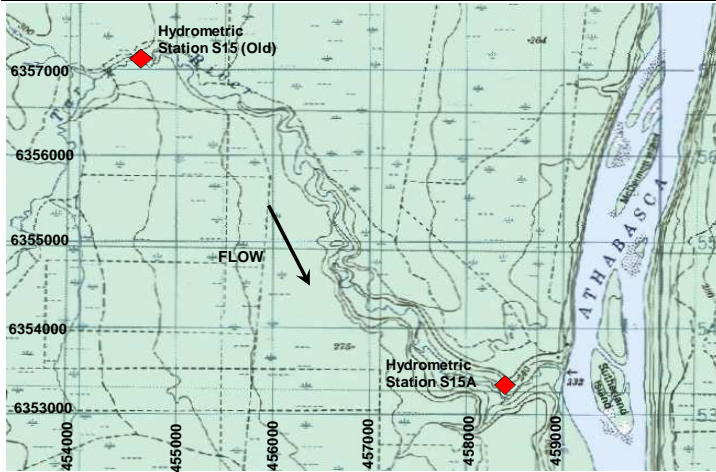
<b>BM:</b>	RAMP S14A-1
<b>Elevation:</b>	100.077
<b>Basis:</b>	Level survey based on old BM3
<b>Location:</b>	3m South West of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S14A-2
<b>Elevation:</b>	100.495
<b>Basis:</b>	Level survey based on RAMP S14A-1
<b>Location:</b>	5m South East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S14A-3
<b>Elevation:</b>	100.752m
<b>Basis:</b>	Level survey based on RAMP S14A-1
<b>Location:</b>	5m North East of station
<b>Description:</b>	3/4" Pipe



Revised 24 January, 2013

**Location and Purpose:**

Established on May 1, 2007 to replace station S15. The purpose of the station is to monitor discharge on the Tar River below development.



Map Grid Based on UTM NAD 27

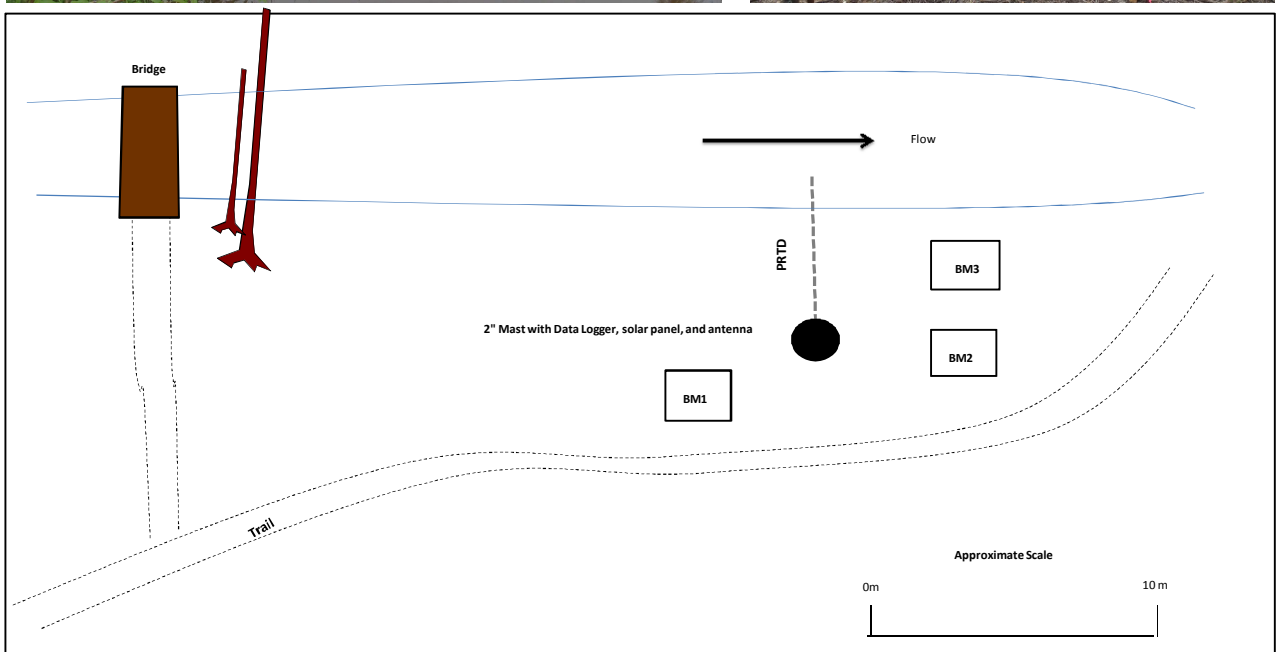


**Station Details**

<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 2007 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD road via CNRL Horizon
<b>Drainage Area:</b>	333km <sup>2</sup>
<b>UTM Coordinates:</b>	458395 E, 6353391 N (NAD83)
<b>Lat/Long:</b>	57°19'17.57" N, 111°41'27.08" W (NAD83)
<b>NTS Map:</b>	74E/05

**Benchmark Information**

<b>BM:</b>	RAMP S15A-1
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed
<b>Location:</b>	3m South of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S15A-2
<b>Elevation:</b>	99.815 m
<b>Basis:</b>	Level Survey from RAMP S15A-1
<b>Location:</b>	2m East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S15A-3
<b>Elevation:</b>	99.929 m
<b>Basis:</b>	Level Survey from RAMP S15A-1
<b>Location:</b>	3m North East of station
<b>Description:</b>	3/4" Pipe

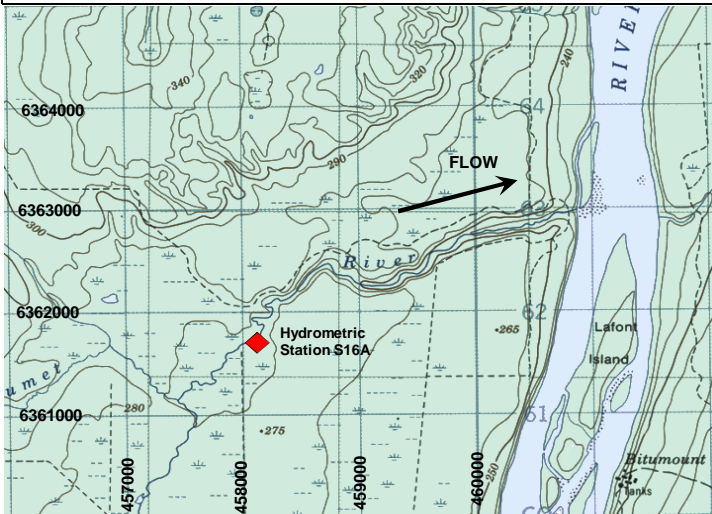




Revised 24 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Calumet River near the Mouth. Located approximately 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.



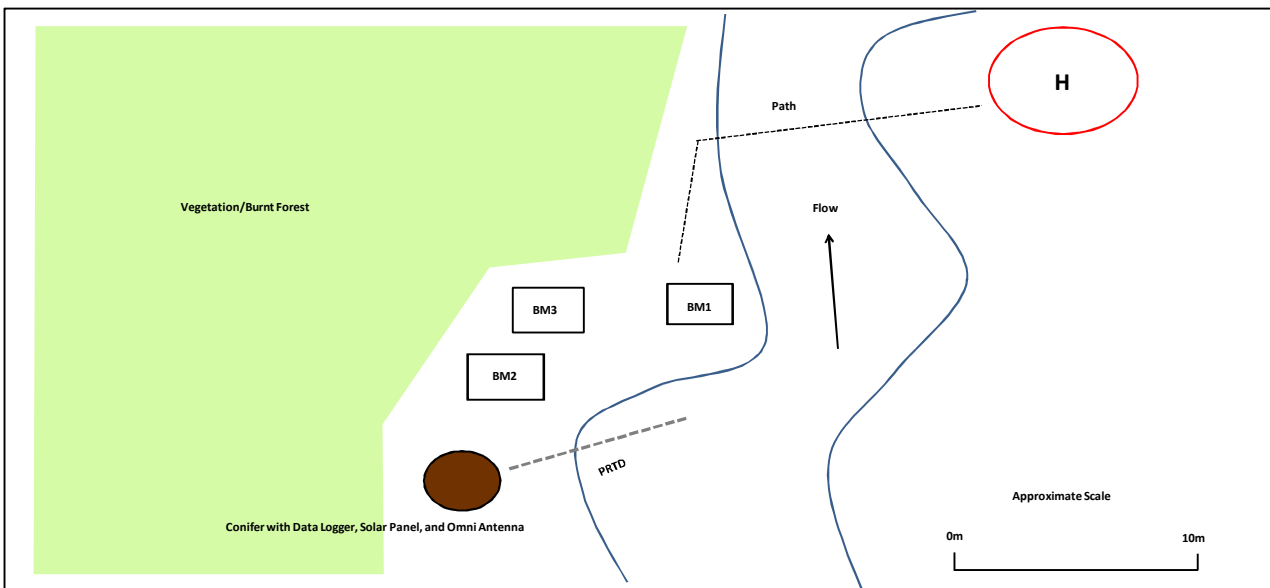
Map Grid Based on UTM NAD 27

**Station Details**

<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 2001 to Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	174km <sup>2</sup>
<b>UTM Coordinates:</b>	458147 E, 6361695 N (NAD83)
<b>Lat/Long:</b>	57°23'46" N, 111°41'47" W(NAD83)
<b>NTS Map:</b>	74E/05

**Benchmark Information**

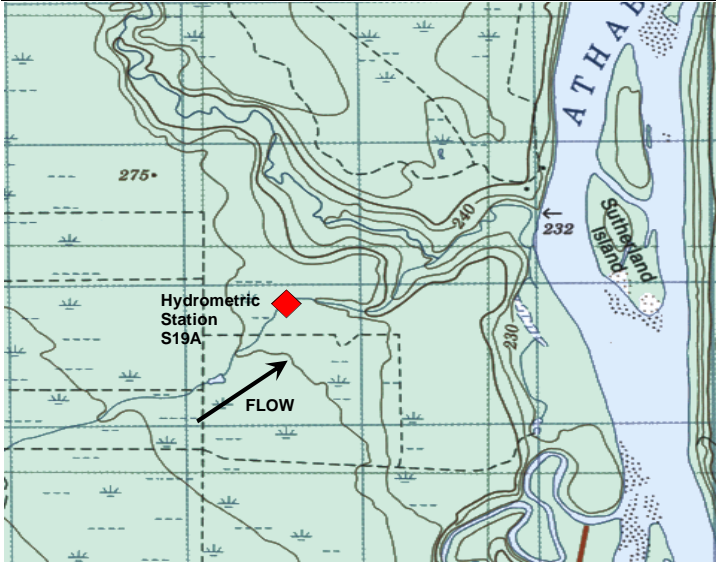
<b>BM:</b>	RAMP S16A-1
<b>Elevation:</b>	99.525m
<b>Basis:</b>	Assumed
<b>Location:</b>	12m North East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S16A-2
<b>Elevation:</b>	99.937m
<b>Basis:</b>	Level Survey from RAMP S16A-1
<b>Location:</b>	10m North of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S16A-3
<b>Elevation:</b>	100.356m
<b>Basis:</b>	Level Survey from RAMP S16A-1
<b>Location:</b>	8m North of station
<b>Description:</b>	3/4" Pipe



Revised 24 January, 2013

**Location and Purpose:**

Established to monitor discharge and rainfall on the Tar River Tributary, adjacent to the CNRL Horizon mine. The station was relocated (from 457315 E, 6352863 N) in April 2012 approximately 200 meters downstream to avoid beaver dam activity.



Map Grid Based on UTM NAD 27



**Station Details**

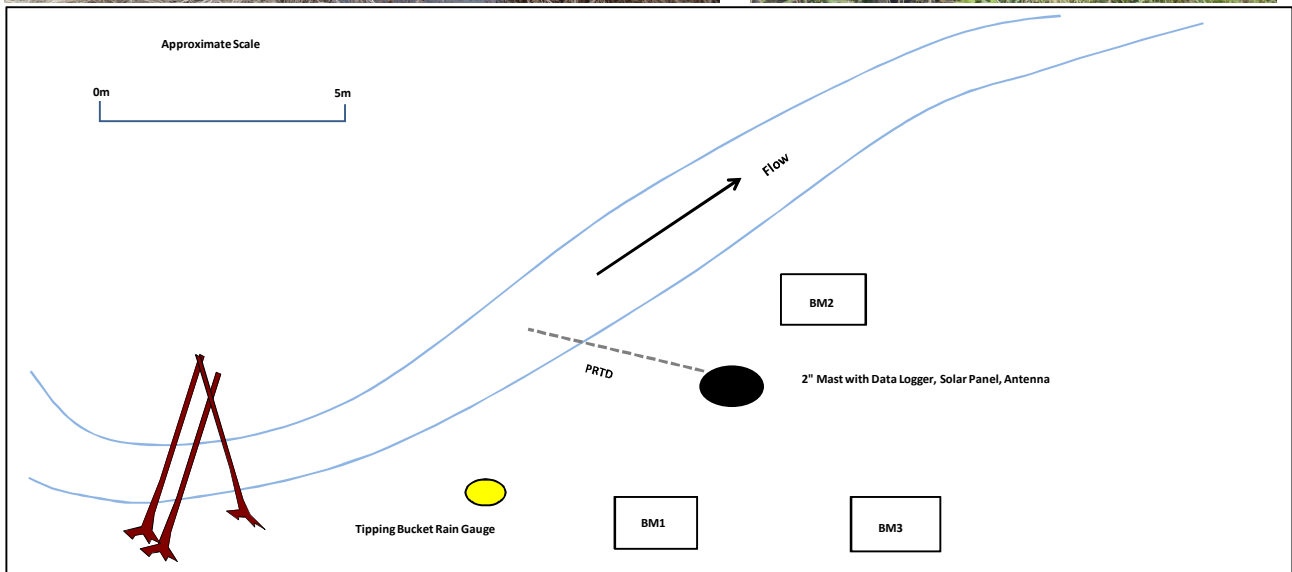
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** June 2002 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via CNRL Horizon Mine  
**Drainage Area:** 11.5km<sup>2</sup>  
**UTM Coordinates:** 457372 E, 6352880 N (NAD83)  
**Lat/Long:** 57°19'70"N, 111°42'28"W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S19A-1  
**Elevation:** 103.334 m  
**Basis:** Old station BM elevations  
**Location:** 5m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S19A-2  
**Elevation:** 103.599 m  
**Basis:** Level Survey from RAMP S19A-1  
**Location:** 3m South of station  
**Description:** 3/4" Pipe

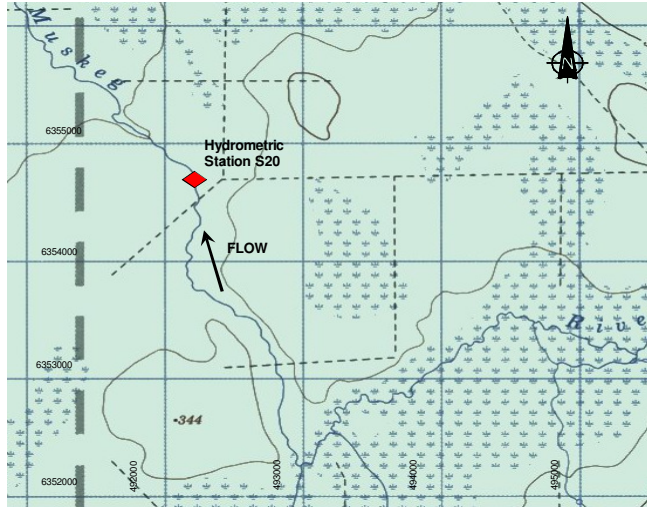
**BM:** RAMP S19A-3  
**Elevation:** 103.530 m  
**Basis:** Level Survey from RAMP S19A-1  
**Location:** 3m South East of station  
**Description:** 3/4" Pipe



Revised 19 September, 2012

**Location and Purpose:**

Established to monitor discharge on the upper reach of the Muskeg River.



Map Grid Based on UTM NAD 27

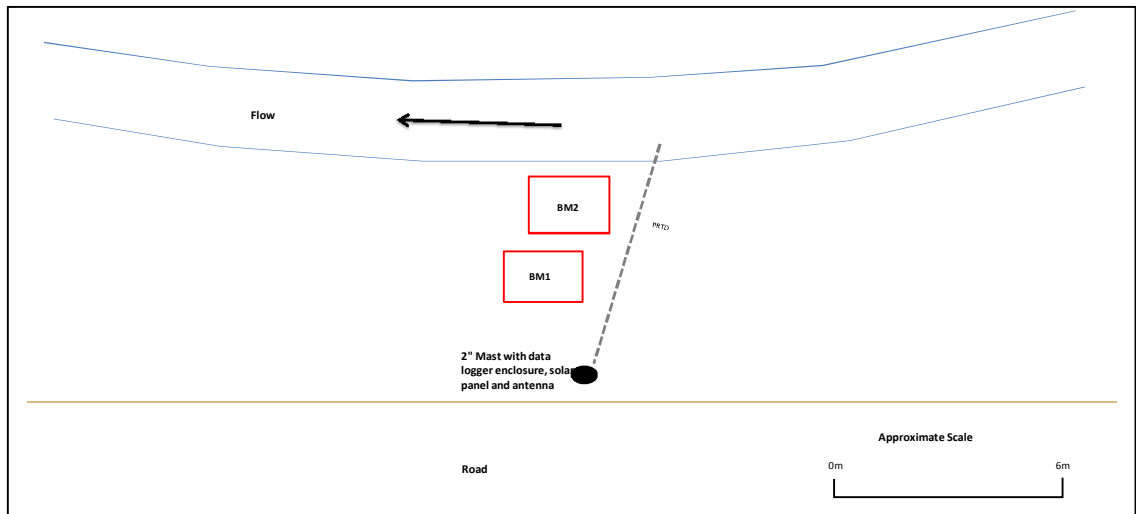
**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD access on Canterra Rd. via Kearl Project  
**Drainage Area:** 157km<sup>2</sup>  
**UTM Coordinates:** 49178 E, 6354787 N (NAD83)  
**Lat/Long:** 57°20'09" N, 111°07'48" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S20-1  
**Elevation:** 328.976 m  
**Basis:** Unknown  
**Location:** 3m East of data logger  
**Description:** T-Post

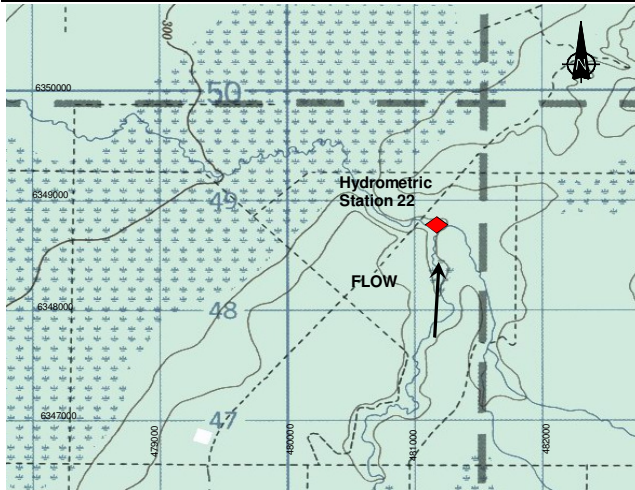
**BM:** RAMP S20-2  
**Elevation:** 328.468 m  
**Basis:** Level Survey from RAMP S20-1  
**Location:** 6m East of data logger  
**Description:** 3/4" Pipe with flagging



Revised 20 September, 2012

**Location and Purpose:**

Established to monitor discharge on Muskeg Creek upstream of the Muskeg River.



Map Grid Based on UTM NAD 27



**Station Details**

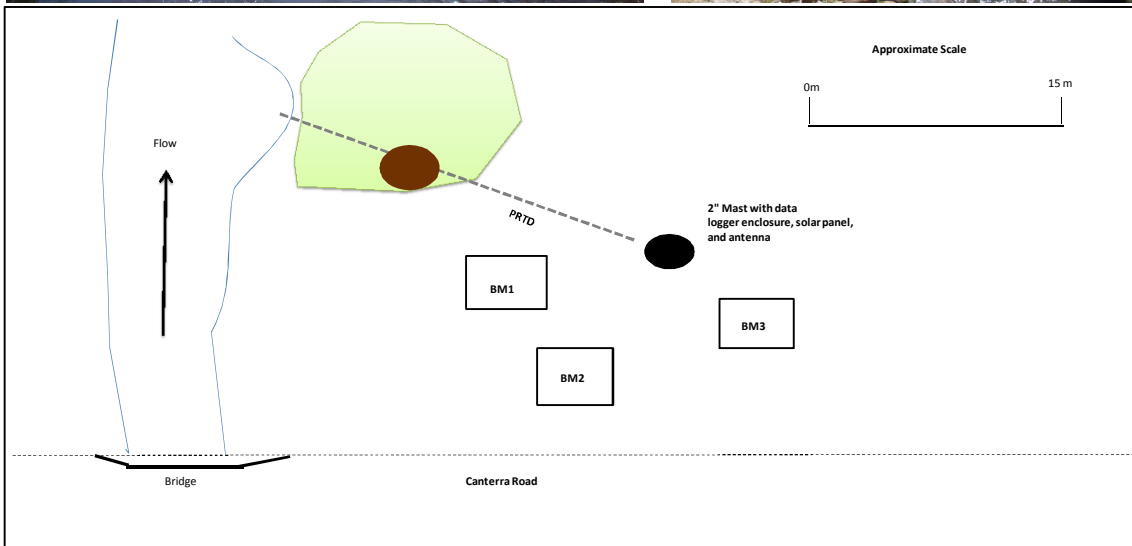
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access on Canterra Road  
**Drainage Area:** 369km<sup>2</sup>  
**UTM Coordinates:** 481036 E, 6348856 N (NAD83)  
**Lat/Long:** 57°17'3.5" N, 111°18'56.5" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S22-1  
**Elevation:** 305.596 m  
**Basis:** Level Survey from previous Nail BM  
**Location:** 3m West of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S22-2  
**Elevation:** 305.689 m  
**Basis:** Level Survey from RAMP S22-1  
**Location:** 5m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

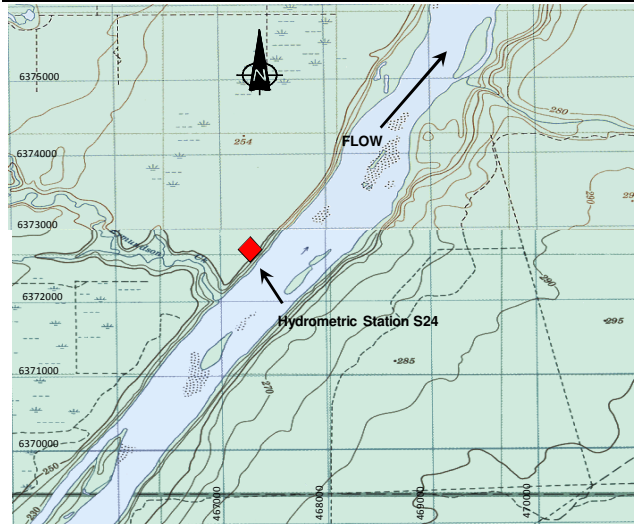
**BM:** RAMP S22-3  
**Elevation:** 306.078 m  
**Basis:** Level Survey from RAMP S22-1  
**Location:** 1m SE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 12 February, 2013

**Location and Purpose:**

Established to monitor discharge on the Athabasca River downstream of Eymundson Creek.



Map Grid Based on UTM NAD 27

**Station Details**

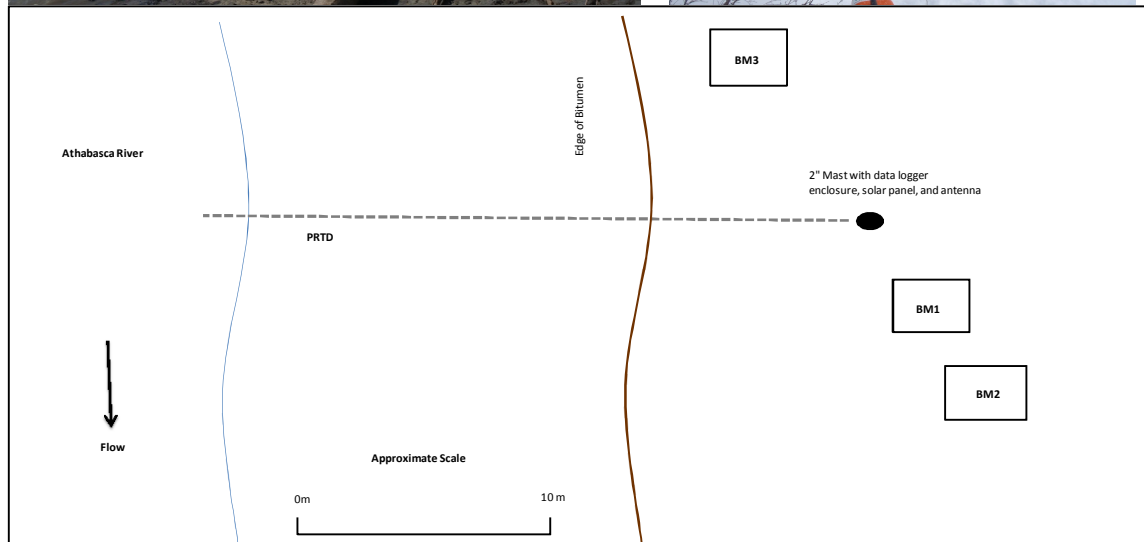
**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 2001 to Present  
**Station Operation:** Year Round  
**Access:** Boat (summer) or helicopter (winter)  
**Drainage Area:** 14600km<sup>2</sup>  
**Station Coordinates:** 466313 E, 6372760 N (NAD83)  
**Flow Coordinates:** 467570 E, 6375010 N (NAD 83)  
**Station Lat/Long:** 57°29'46" N, 111°33'43" W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S24-1  
**Elevation:** 231.347  
**Basis:** Geodetic  
**Location:** 2m North of data logger  
**Description:** T-Post

**BM:** RAMP S24-2  
**Elevation:** 230.823m  
**Basis:** Level Survey from RAMP S24-1  
**Location:** 5 m North of data logger  
**Description:** 3/4" Pipe with pink flagging

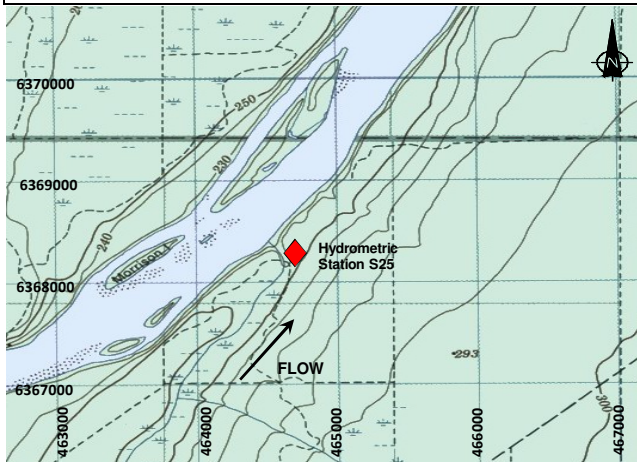
**BM:** RAMP S24-3  
**Elevation:** 230.366m  
**Basis:** Level Survey from RAMP S24-1  
**Location:** 8m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 20 September, 2012

**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.



Map Grid Based on UTM NAD 27

**Station Details**

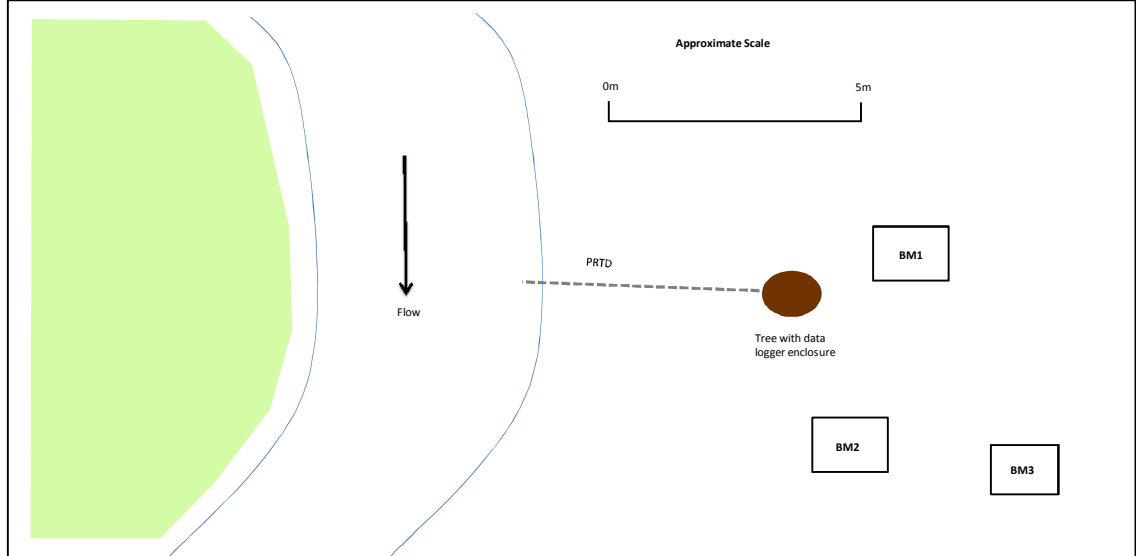
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** Aug-Oct. 2002; May 2006-Present  
**Station Operation:** Open water (April-October)  
**Access:** Boat via the Athabasca River  
**Drainage Area:** 13.6km<sup>2</sup> (including Susan Lake)  
**UTM Coordinates:** 464491 E, 6368503 N (NAD83)  
**Lat/Long:** 57°27'28" N, 111°35'30" W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S25-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2m North of data logger  
**Description:** T-Post in PVC

**BM:** RAMP S25-2  
**Elevation:** 100.121 m  
**Basis:** Level Survey from RAMP S25-1  
**Location:** 2m East of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S25-3  
**Elevation:** 100.261 m  
**Basis:** Level Survey from RAMP S25-1  
**Location:** 4m East of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 January, 2013

**Location and Purpose:**

Established to monitor discharge on Hangingsstone Creek.



Map Grid Based on UTM NAD 27



**Station Details**

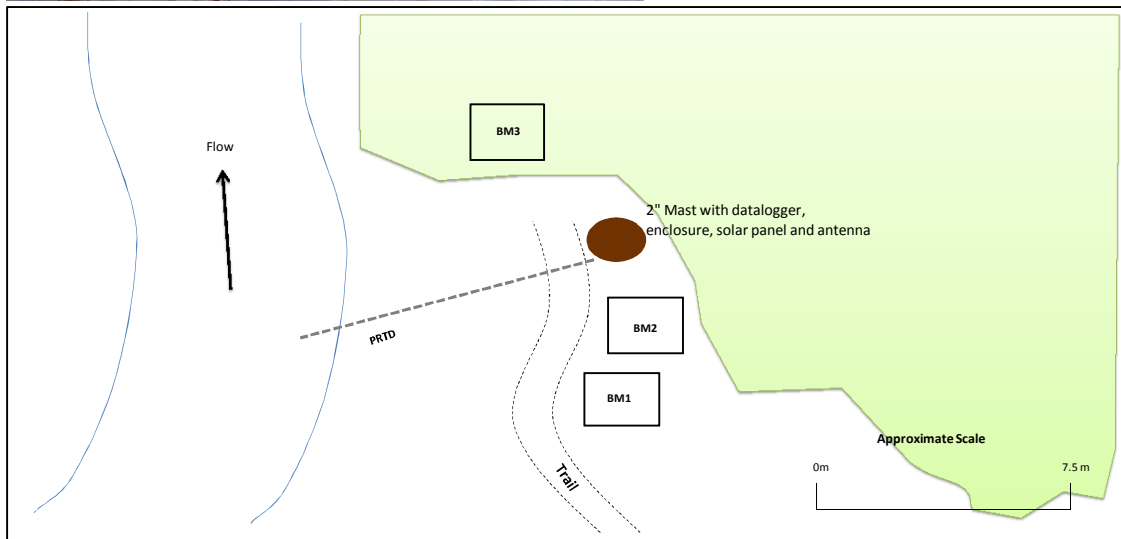
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Period of Record:** April 2004 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via North Star Road  
**Drainage Area:** 160km<sup>2</sup>  
**UTM Coordinates:** 476969 E, 6236095 N (NAD83)  
**Lat/Long:** 56°16'9"N, 111°22'19"W (NAD83)  
**NTS Map:** 74D/06

**Benchmark Information**

**BM:** RAMP S31-1  
**Elevation:** 100.128 m  
**Basis:** Assumed  
**Location:** 8m South of data logger  
**Description:** T-Post

**BM:** RAMP S31-2  
**Elevation:** 99.982m  
**Basis:** Level Survey from RAMP S31-1  
**Location:** 3m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S31-3  
**Elevation:** 99.726 m  
**Basis:** Level Survey from RAMP S31-1  
**Location:** 5m NW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 21 September, 2012

**Location and Purpose:**

Established to monitor discharge on Surmont Creek.



Map Grid Based on UTM NAD 27

**Station Details**

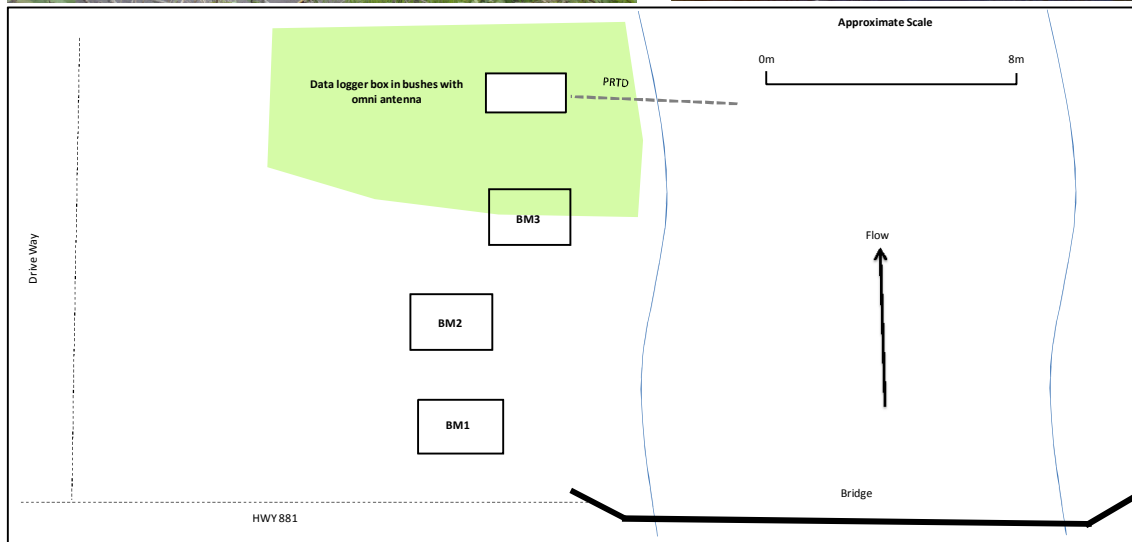
**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** April 2004 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 158km<sup>2</sup>  
**UTM Coordinates:** 490252 E, 6254511 N (NAD83)  
**Lat/Long:** 56°26'N, 111°9'29"W (NAD83)  
**NTS Map:** 74D/06

**Benchmark Information**

**BM:** RAMP S32-1  
**Elevation:** 99.118m  
**Basis:** Level Survey from RAMP S32-3  
**Location:** 10m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S32-2  
**Elevation:** 99.412 m  
**Basis:** Level Survey from RAMP S32-1  
**Location:** 15m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S32-3  
**Elevation:** 98.981 m  
**Basis:** Assumed  
**Location:** 3m South of data logger  
**Description:** Rebar

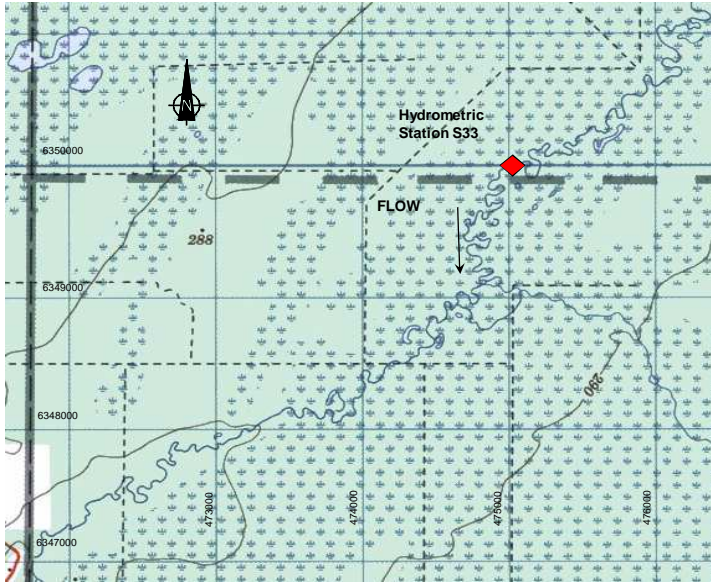




Revised 29 August, 2012

**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.



Map Grid Based on UTM NAD 27



**Station Details**

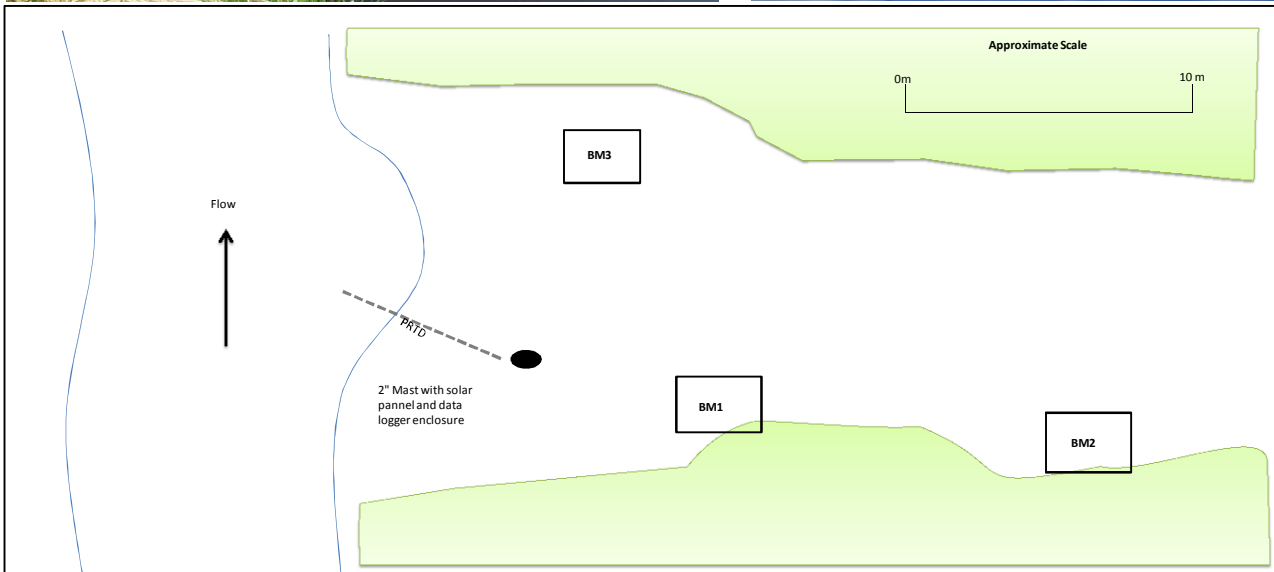
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** April 2003 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via the Aurora North mine  
**Drainage Area:** 728km<sup>2</sup>  
**UTM Coordinates:** 474876 E, 6350204 N (NAD83)  
**Lat/Long:** 57°17'39" N, 111°25'1" W (NAD83)  
**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP S33-1  
**Elevation:** 281.509m  
**Basis:** Geodetic  
**Location:** 3m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S33-2  
**Elevation:** 281.503m  
**Basis:** Level Survey from RAMP S33-1  
**Location:** 8m South of data logger  
**Description:** 3/4" Pipe with pink flagging

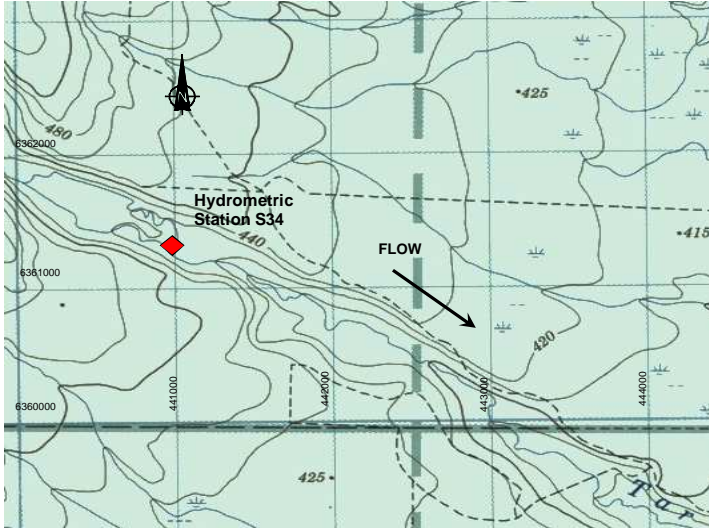
**BM:** RAMP S33-3  
**Elevation:** 281.349m  
**Basis:** Level Survey from RAMP S33-1  
**Location:** 8m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 28 January, 2013

**Location and Purpose:**

Established in April 2005 to monitor discharge on the Tar River above the CNRL Compensation Lake.



**Station Details**

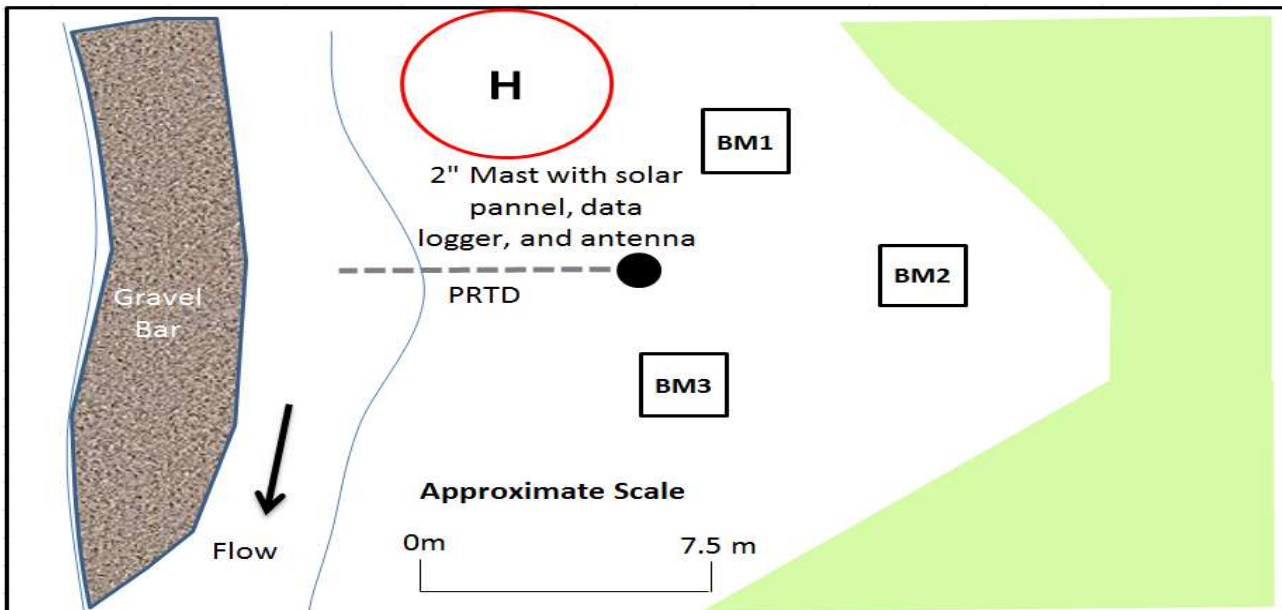
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** April 2005 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 134km<sup>2</sup>  
**UTM Coordinates:** 440712 E, 6361615 N (NAD83)  
**Lat/Long:** 57°23'38.84" N, 111°59'10.17" W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S34-1  
**Elevation:** 98.328  
**Basis:** Level Survey from previous BM2  
**Location:** 2m South of station  
**Description:** 3/4" Pipe

**BM:** RAMP S34-2  
**Elevation:** 98.508  
**Basis:** Level Survey from RAMP S34-1  
**Location:** 2m East of station  
**Description:** 3/4" Pipe

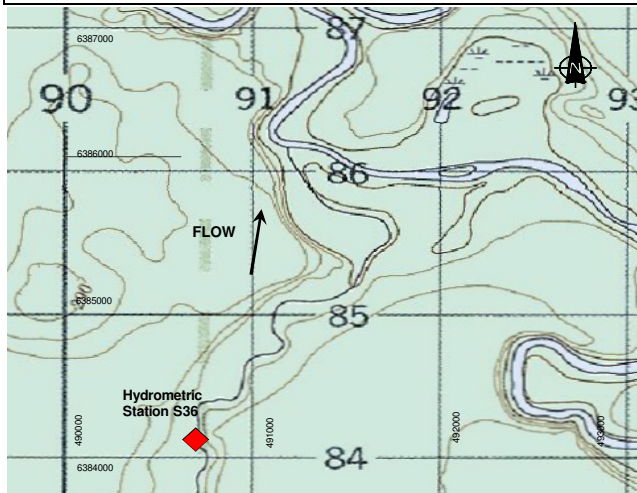
**BM:** RAMP S34-3  
**Elevation:** 98.078  
**Basis:** Level Survey from RAMP S34-1  
**Location:** 8m South of station  
**Description:** 3/4" Pipe



Revised 24 January, 2013

**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



**Station Details**

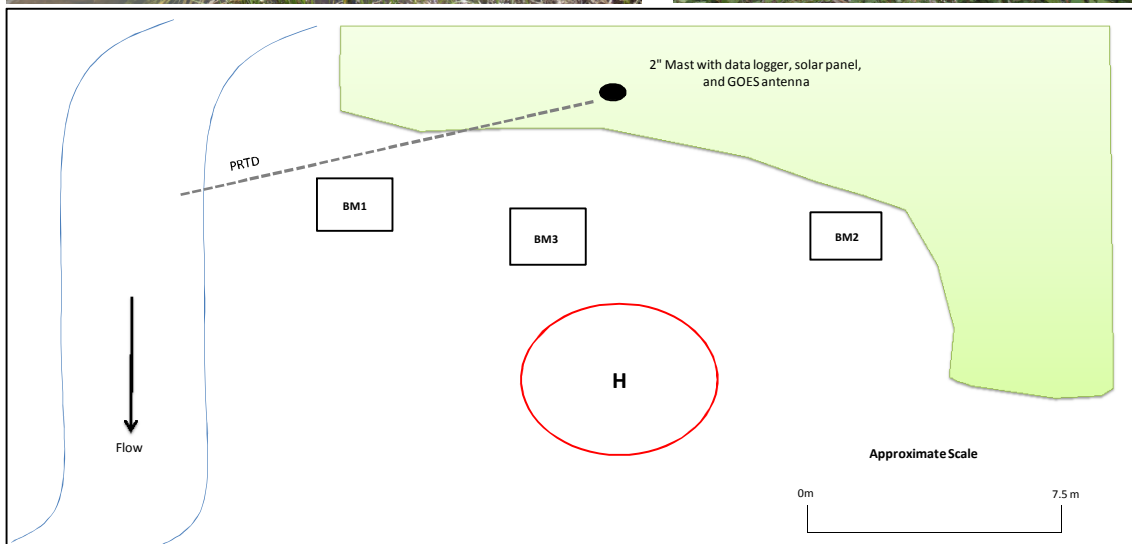
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES 07DC902  
**Period of Record:** May 2008 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 368 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 490626 E, 6384064 N (NAD83)  
**Lat/Long:** 57°35'56"N, 111°9'25"W (NAD83)  
**NTS Map:** 74E/11

**Benchmark Information**

**BM:** RAMP S36-1  
**Elevation:** 99.923m  
**Basis:** Assumed  
**Location:** 8m North East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S36-2  
**Elevation:** 100.313m  
**Basis:** Level Survey from RAMP S36-1  
**Location:** 6m North of station  
**Description:** 3/4" Pipe

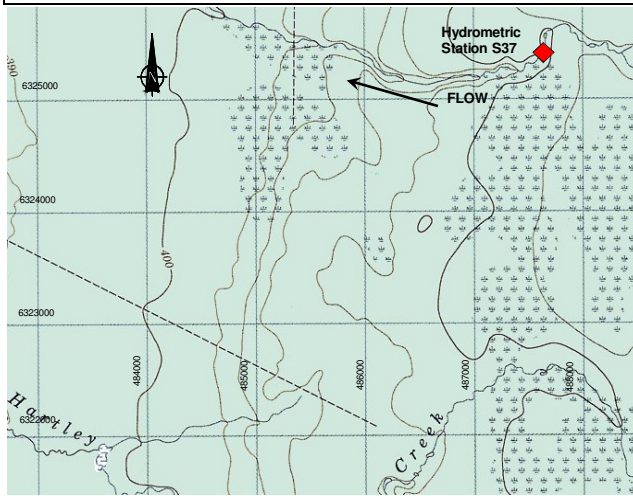
**BM:** RAMP S36-3  
**Elevation:** 100.206m  
**Basis:** Level Survey from RAMP S36-1  
**Location:** 8m West of station  
**Description:** 3/4" Pipe



Revised 24 September, 2012

**Location and Purpose:**

Established to monitor discharge on an upland reference location in the Muskeg River catchment.



Map Grid Based on UTM NAD 27

**Station Details**

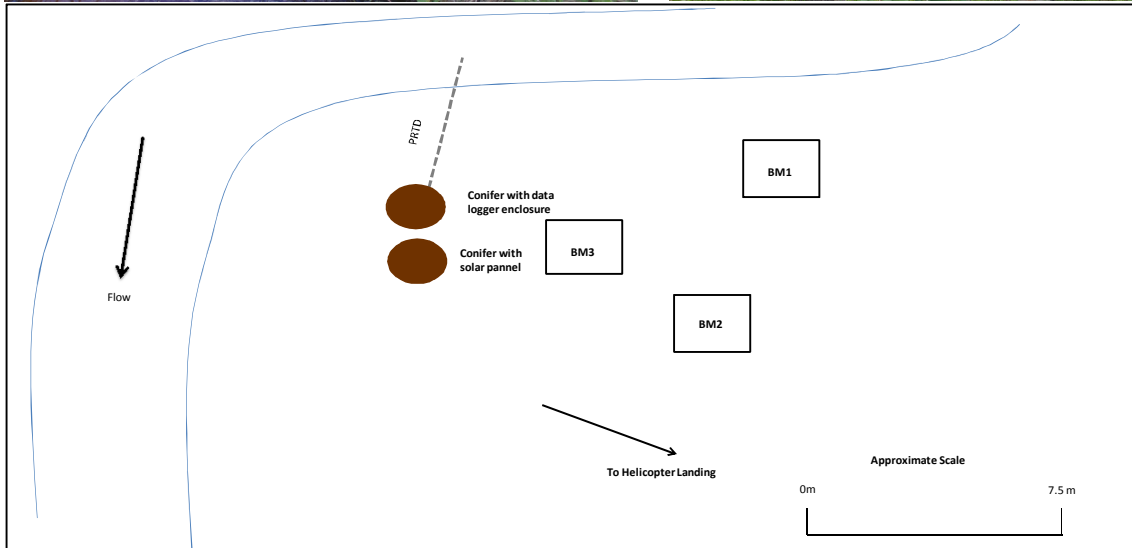
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** September 2007 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 33km<sup>2</sup>  
**UTM Coordinates:** 487840 E, 6325424 N (NAD83)  
**Lat/Long:** 57°4'19.4" N, 111°12'2.0" W (NAD83)  
**NTS Map:** 74E/03

**Benchmark Information**

**BM:** RAMP S37-1  
**Elevation:** 100.838m  
**Basis:** Assumed  
**Location:** 3m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S37-2  
**Elevation:** 101.078 m  
**Basis:** Level Survey from RAMP S37-1  
**Location:** 4m SW of data logger  
**Description:** 3/4" Pipe with flagging

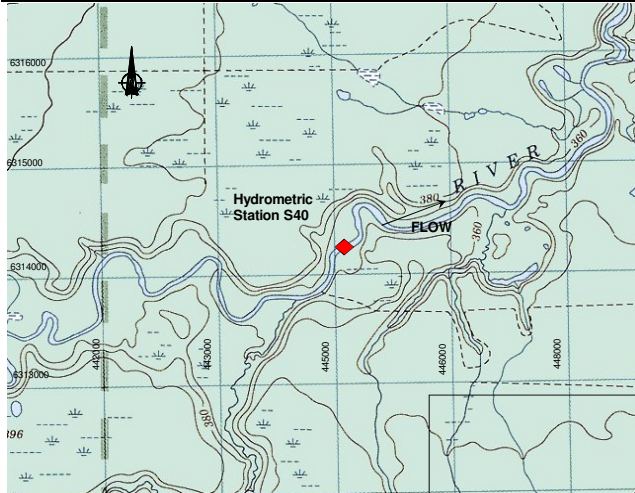
**BM:** RAMP S37-3  
**Elevation:** 101.178 m  
**Basis:** Level Survey from RAMP S37-1  
**Location:** 1.5m from data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 24 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Mackay River at the Petro-Canada Bridge.



Map Grid Based on UTM NAD 27



**Station Details**

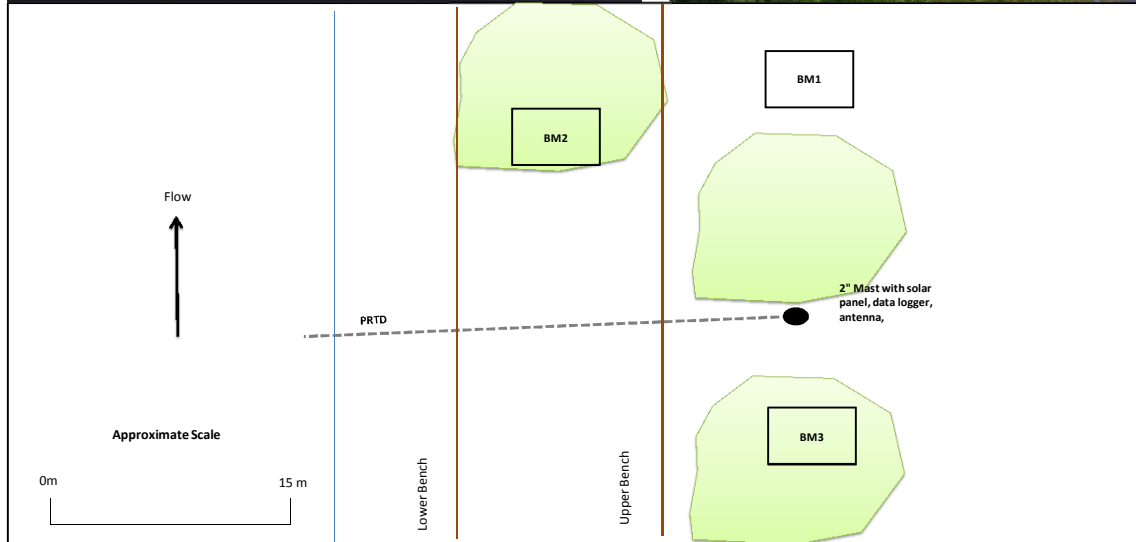
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** January 2008 to Present  
**Station Operation:** Year Round  
**Access:** Truck  
**Drainage Area:** 5290km<sup>2</sup>  
**UTM Coordinates:** 445023 E, 6314256 N (NAD83)  
**Lat/Long:** 56°58'7"N, 111°54'15"W (NAD83)  
**NTS Map:** 74D/13

**Benchmark Information**

**BM:** RAMP S40-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 4m North East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S40-2  
**Elevation:** 97.982m  
**Basis:** Level Survey from RAMP S40-1  
**Location:** 3m South of station  
**Description:** T-Post on lower bench

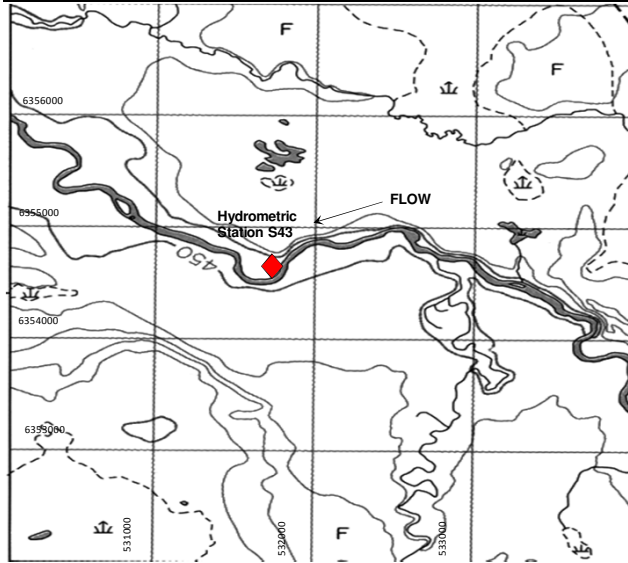
**BM:** RAMP S40-3  
**Elevation:** 99.932m  
**Basis:** Level Survey from RAMP S40-1  
**Location:** 4m South of station  
**Description:** 3/4" Pipe



Revised 24 January, 2013

**Location and Purpose:**

Established in May 2009 to monitor discharge on the Firebag River upstream of oilsands operations .



Map Grid Based on UTM NAD 27

**Station Details**

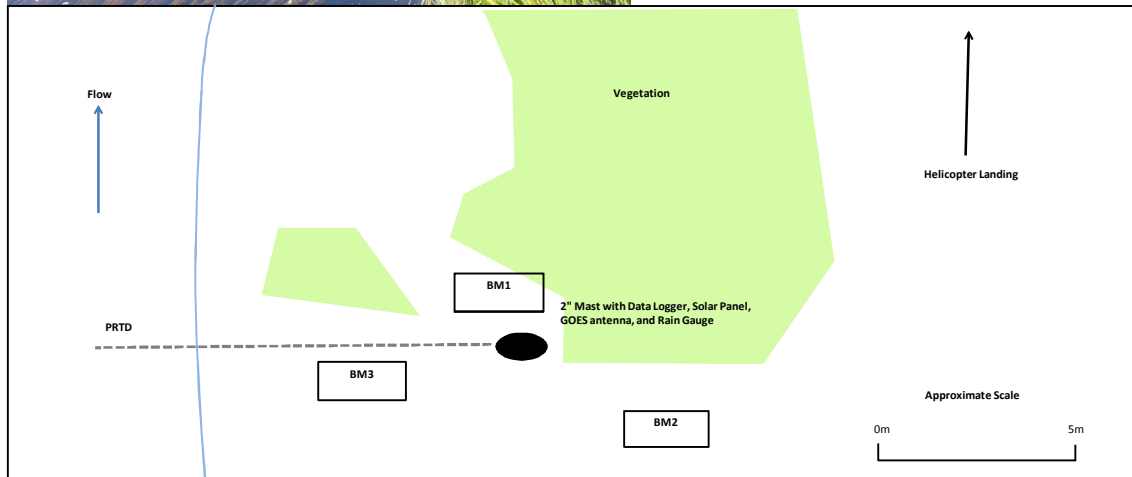
**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** GOES 07DC903  
**Period of Record:** May 2009 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 2,382 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 531528 E, 6354782 N (NAD83)  
**Lat/Long:** 57°20'05" N, 110°28'35" W (NAD83)  
**NTS Map:** 74E/08

**Benchmark Information**

**BM:** RAMP S43-1  
**Elevation:** 100.270m  
**Basis:** Assumed  
**Location:** 1m South of station  
**Description:** 3/4" Pipe

**BM:** RAMP S43-2  
**Elevation:** 100.338 m  
**Basis:** Level Survey from RAMP S43-1  
**Location:** 1m East of station  
**Description:** 3/4" Pipe

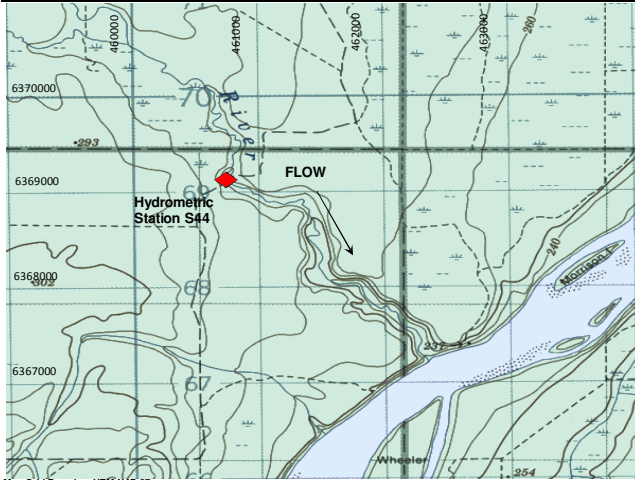
**BM:** RAMP S43-3  
**Elevation:** 100.113m  
**Basis:** Level Survey from RAMP S43-1  
**Location:** 5m North of station  
**Description:** 3/4" Pipe



Revised 12 December, 2012

**Location and Purpose:**

Established to monitor discharge on Pierre River. Installed at Environment Canada hydrometric station 07DA013 that operated from 1975 to 1977.



Map Grid Based on UTM NAD 27



**Station Details**

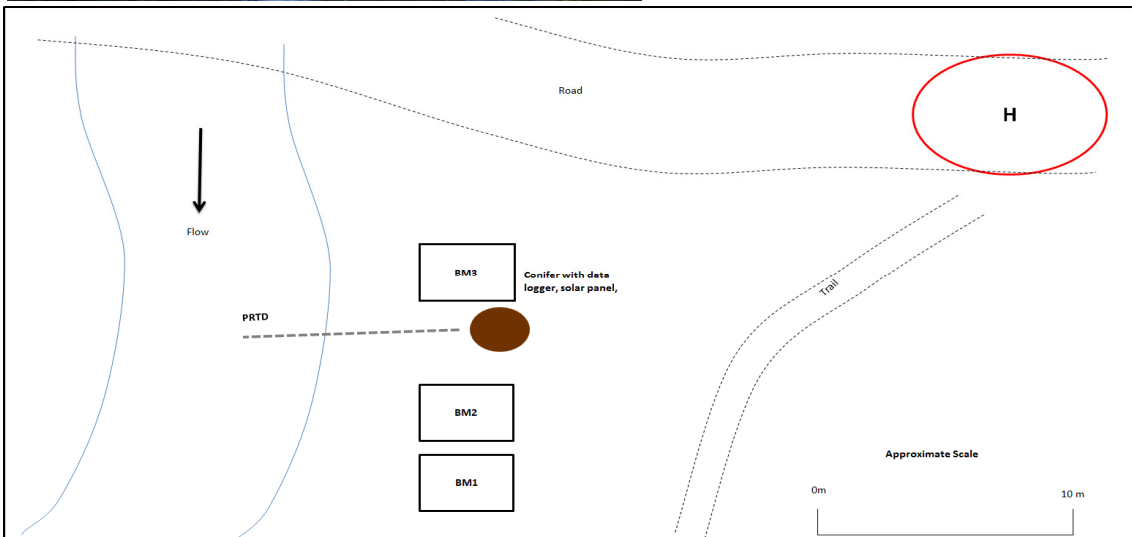
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** 1975-77; May 2009-Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 123km<sup>2</sup>  
**UTM Coordinates:** 460775 E, 6369400 N (NAD83)  
**Lat/Long:** 57°27'52.5" N, 111°39'14.9" W (NAD83)  
**NTS Map:** 74E/05

**Benchmark Information**

**BM:** RAMP S44-1  
**Elevation:** 99.878m  
**Basis:** Assumed  
**Location:** 8m East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S44-2  
**Elevation:** 100.086m  
**Basis:** Level Survey from RAMP S44-1  
**Location:** 6m East of station  
**Description:** 3/4" Pipe

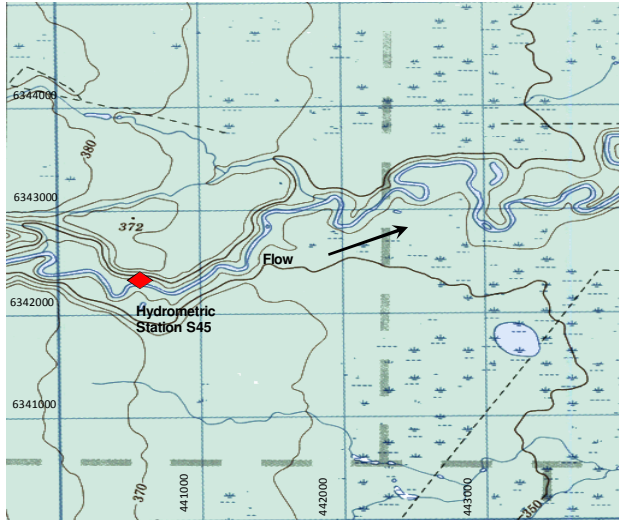
**BM:** RAMP S44-3  
**Elevation:** 99.784m  
**Basis:** Level Survey from RAMP S44-1  
**Location:** 2m West of station  
**Description:** 3/4" Pipe



Revised 12 December, 2012

**Location and Purpose:**

Established to monitor discharge on the Ells River upstream of the proposed Joslyn Creek Diversion and the Fort MacKay water intake.



Map Grid Based on UTM NAD 27

**Station Details**

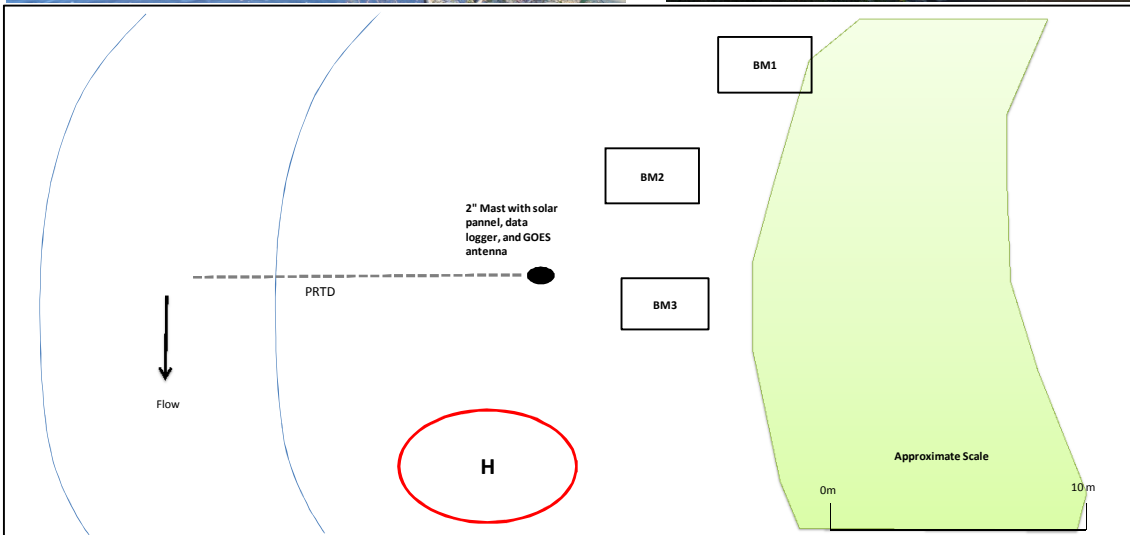
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** June 2009 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 2450km<sup>2</sup>  
**UTM Coordinates:** 440605 E, 6342459 N (NAD83)  
**Lat/Long:** 57°13'17" N, 111°59'01" W (NAD83)  
**NTS Map:** 74E/04

**Benchmark Information**

**BM:** RAMP S45-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 12m West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S45-2  
**Elevation:** 99.784m  
**Basis:** Level Survey from RAMP S45-1  
**Location:** 6m West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S45-3  
**Elevation:** 99.880m  
**Basis:** Level Survey from RAMP S45-1  
**Location:** 3m North of station  
**Description:** 3/4" Pipe

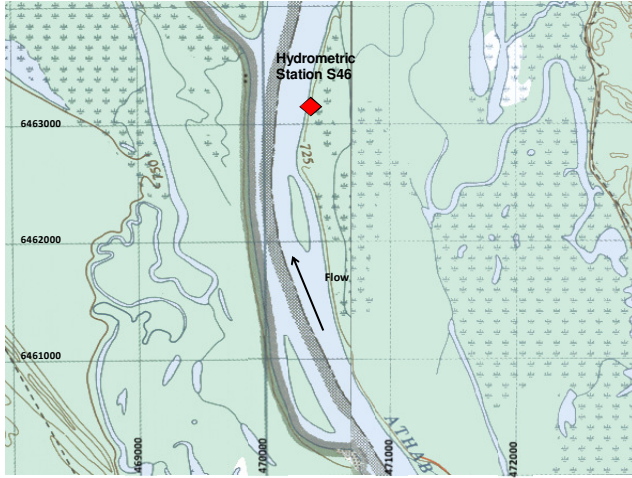




Revised 12 February, 2013

**Location and Purpose:**

Station was established in August 2011 to monitor water level and discharge downstream of Oil Sands development.



Map Grid Based on UTM NAD 27

**Station Details**

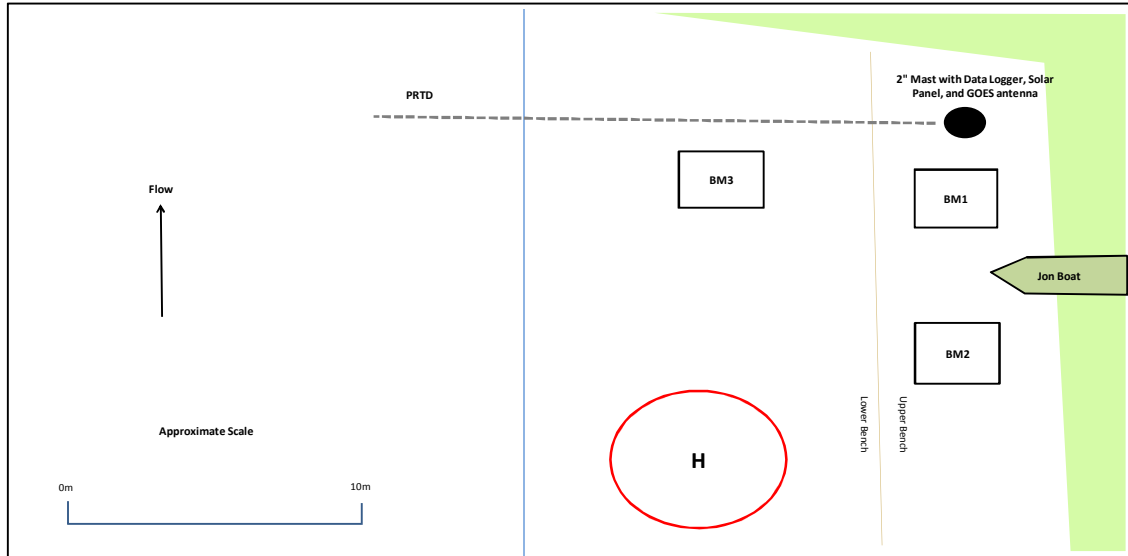
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES 07DD911  
**Period of Record:** August 2011 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 162000km<sup>2</sup>  
**UTM Coordinates:** 470241 E, 6463206 N (NAD83)  
**Lat/Long:** 58°18'32" N, 111°30'28" W (NAD83)  
**NTS Map:** 74L/05/06

**Benchmark Information**

**BM:** RAMP S46-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S46-2  
**Elevation:** 99.771m  
**Basis:** Level Survey from RAMP S46-1  
**Location:** 6m West of data logger (Lower Bench)  
**Description:** 3/4" Pipe with pink flagging

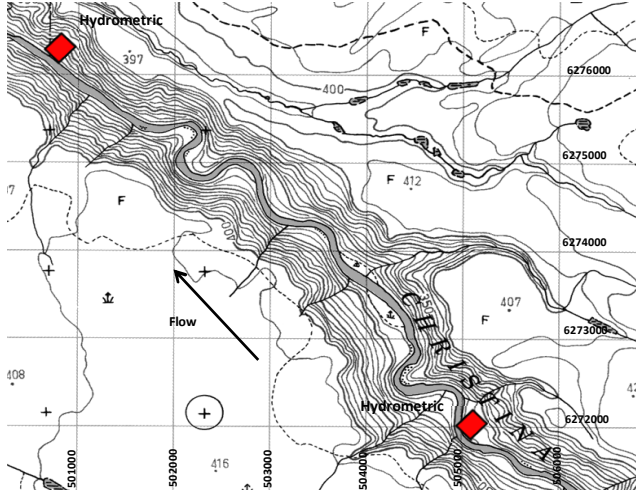
**BM:** RAMP S46-3  
**Elevation:** 98.508m  
**Basis:** Level Survey from RAMP S46-1  
**Location:** 6m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Christina River near the mouth and downstream of all development in the Christina watershed. In August 2012, the station was relocated approximately 5km upstream to provide a deeper reach for avoiding winter ice cover. The new station S47A (505048 E, 6272065 N) was monitored concurrently with this station to provide data overlap until this station was decommissioned on October 25, 2012.



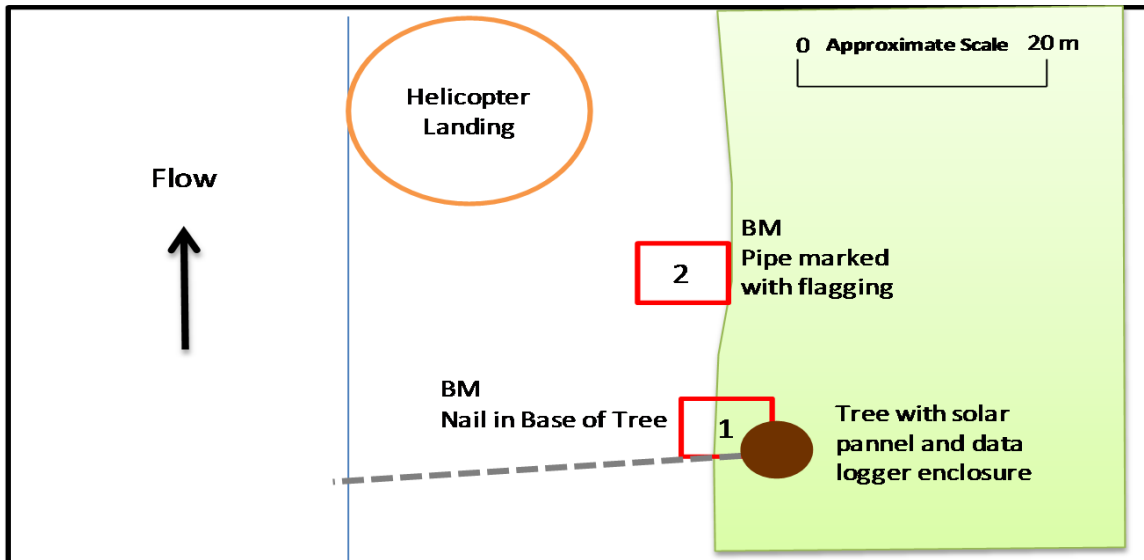
**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 2011 to October 2012  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 13455km<sup>2</sup>  
**UTM Coordinates:** 500672 E, 6276404 N (NAD83)  
**Lat/Long:** 56°37'54"N, 110°59'20"W (NAD83)  
**NTS Map:** 74D/10

**Benchmark Information**

**BM:** RAMP S47-1  
**Elevation:** 100.159m  
**Basis:** Level survey from S47-2  
**Location:** In tree with data logger  
**Description:** Nail in base of tree

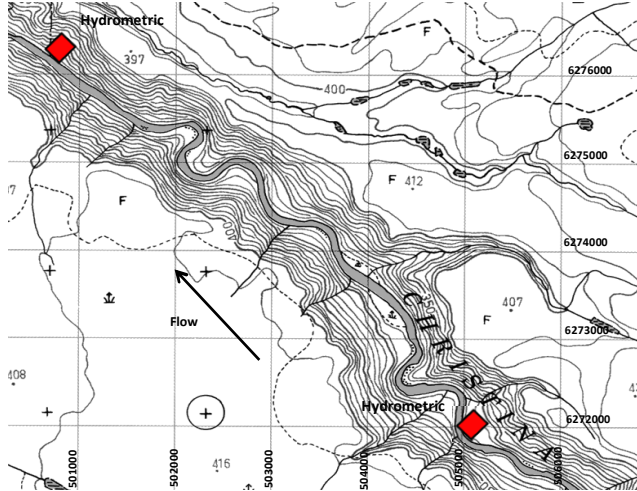
**BM:** RAMP S47-2  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 3m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Christina River near the mouth and downstream of all development in the Christina watershed. In August 2012, the station was relocated approximately 5km upstream to provide a deeper reach and better monitoring. The previous location S47 (500672 E, 6276404 N) and S47A were monitored concurrently from August 2012 to October 2012 to provide data overlap.



Map Grid Based on UTM NAD 27



**Station Details**

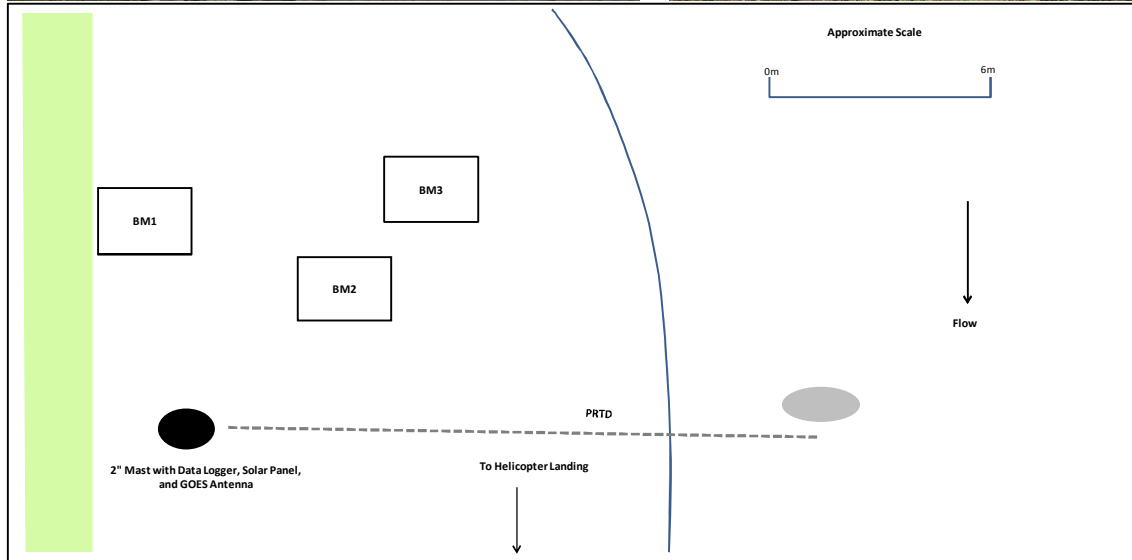
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES 07CE907  
**Period of Record:** May 2011 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 13,309 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 505048 E, 6272065 N (NAD83)  
**Lat/Long:** 56°35'34"N, 110°55'4"W (NAD83)  
**NTS Map:** 74D/10

**Benchmark Information**

**BM:** RAMP S47A-1  
**Elevation:** 100.095m  
**Basis:** Assumed  
**Location:** 6m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S47A-2  
**Elevation:** 99.884m  
**Basis:** Level Survey from RAMP S47A-1  
**Location:** 5m South of data logger  
**Description:** 3/4" Pipe with pink flagging

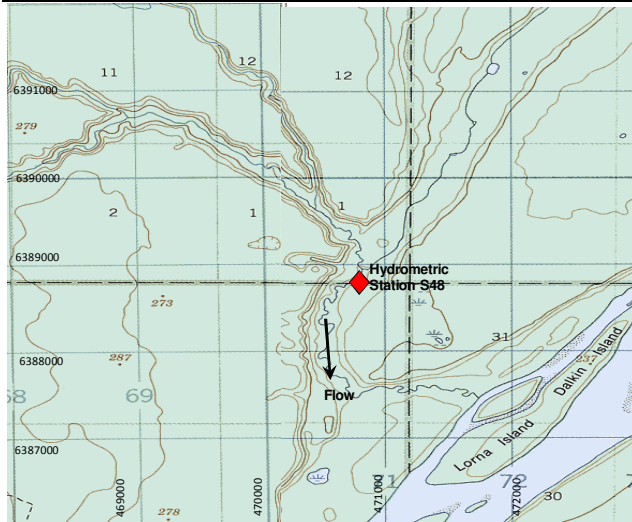
**BM:** RAMP S47A-3  
**Elevation:** 99.579m  
**Basis:** Level Survey from RAMP S47A-1  
**Location:** 7m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 12 December, 2012

**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 Mine.



Map Grid Based on UTM NAD 27

**Station Details**

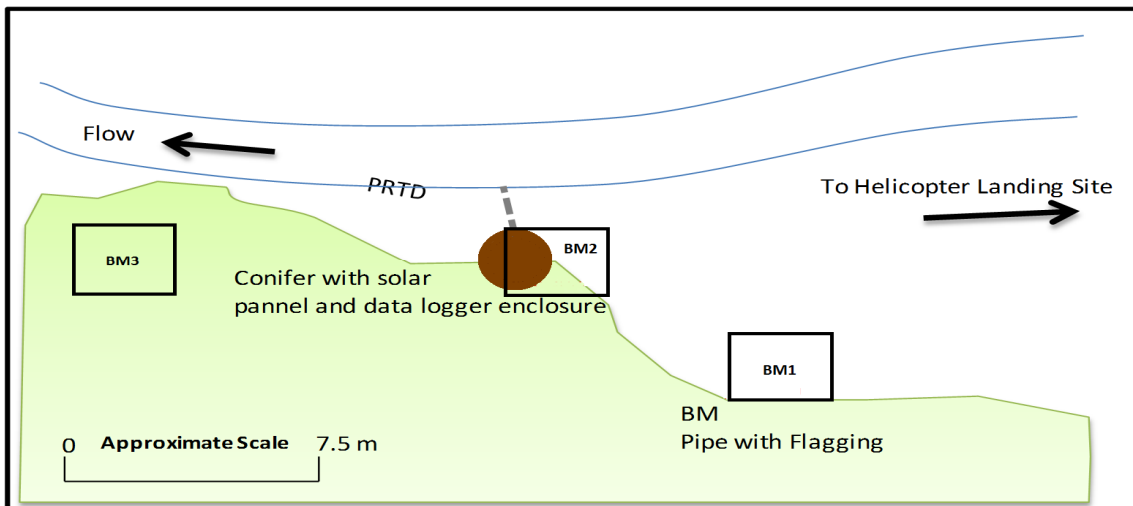
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 304km<sup>2</sup>  
**UTM Coordinates:** 470894 E, 6389207 N (NAD83)  
**Lat/Long:** 57°38'39" N, 111°29'15" W (NAD83)  
**NTS Map:** 74E/11

**Benchmark Information**

**BM:** RAMP S48-1  
**Elevation:** 100.000  
**Basis:** Assumed  
**Location:** 2m from station  
**Description:** 3/4" Pipe

**BM:** RAMP S48-2  
**Elevation:** 99.717  
**Basis:** Level Survey from RAMP S48-1  
**Location:** In base of logger tree  
**Description:** Nail

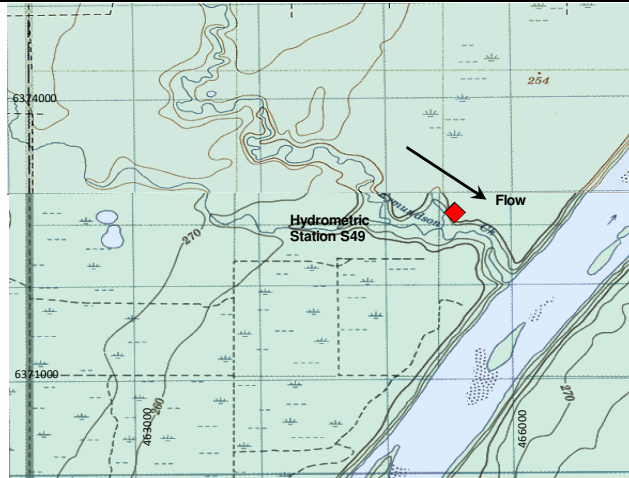
**BM:** RAMP S48-3  
**Elevation:** 99.798m  
**Basis:** Level Survey from RAMP S48-1  
**Location:** 5m South East of station  
**Description:** 3/4" Pipe with pink flagging



Revised 12 December, 2012

**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.



Map Grid Based on UTM NAD 27



**Station Details**

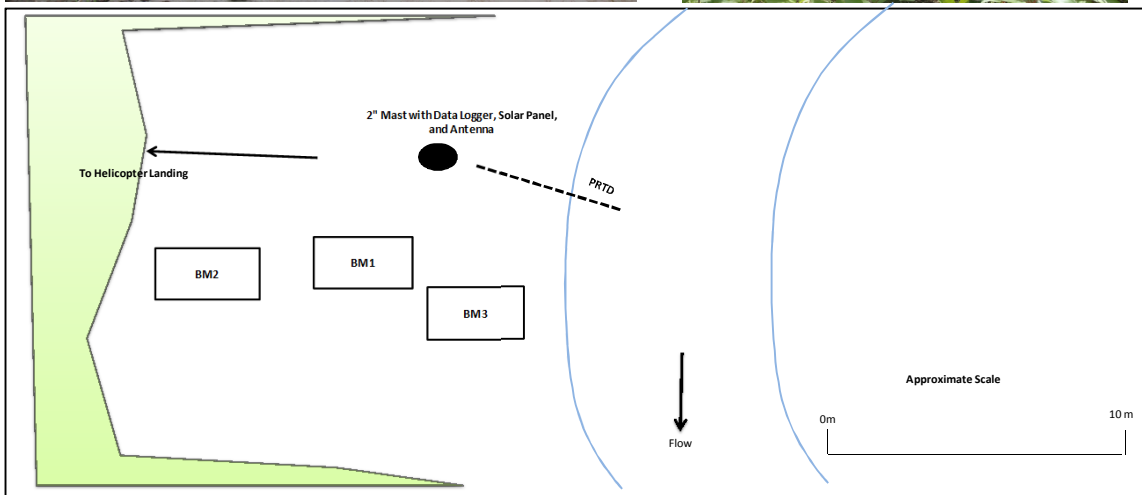
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 243km<sup>2</sup>  
**UTM Coordinates:** 465524 E, 6372768 N (NAD83)  
**Lat/Long:** 57°29'46"N, 111°34'30"W (NAD83)  
**NTS Map:** 74E/12

**Benchmark Information**

**BM:** RAMP S49-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 6m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S49-2  
**Elevation:** 99.918  
**Basis:** Level Survey from RAMP S49-1  
**Location:** 5m North East of station  
**Description:** 3/4" Pipe

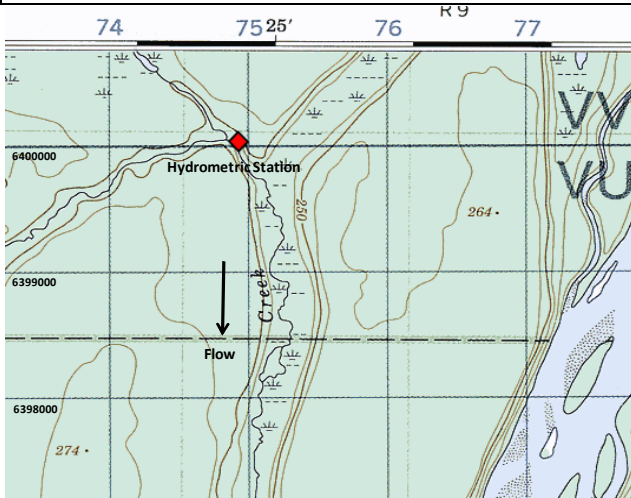
**BM:** RAMP S49-3  
**Elevation:** 100.304  
**Basis:** Level Survey from RAMP S49-1  
**Location:** 7m North of station  
**Description:** 3/4" Pipe



Revised 24 January, 2013

**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.



Map Grid Based on UTM NAD 27



**Station Details**

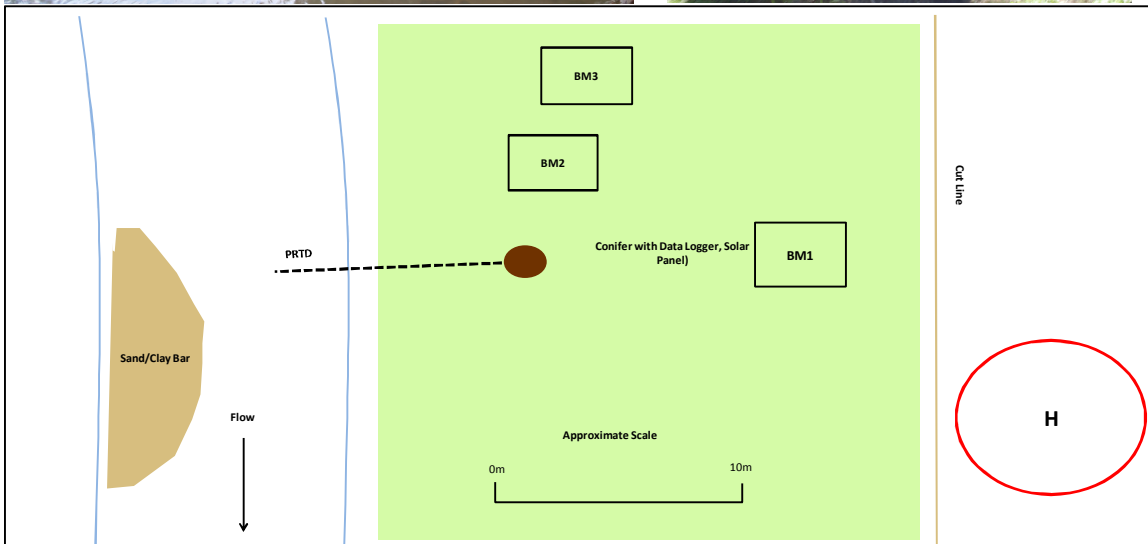
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2011 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 187km<sup>2</sup>  
**UTM Coordinates:** 474881 E, 6400224 N (NAD83)  
**Lat/Long:** 57°44'36"N, 111°25'16"W (NAD83)  
**NTS Map:** 74E/11

**Benchmark Information**

**BM:** RAMP S50A-1  
**Elevation:** 100.995m  
**Basis:** Level Survey from RAMP S50A-2  
**Location:** 5m East of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S50A-2  
**Elevation:** 100.160m  
**Basis:** Level Survey from RAMP S50A-Old BM1  
**Location:** 4m North of station  
**Description:** 3/4" Pipe

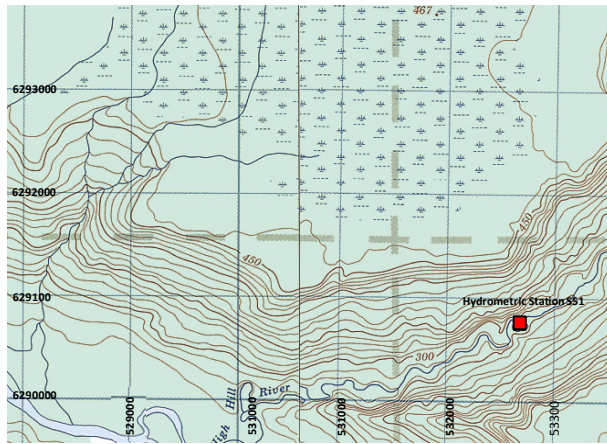
**BM:** RAMP S50A-3  
**Elevation:** 99.968  
**Basis:** Level Survey from RAMP S50A-2  
**Location:** 6m North of station  
**Description:** 3/4" Pipe



Revised 28 January, 2013

**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.



Map Grid Based on UTM NAD 27



**Station Details**

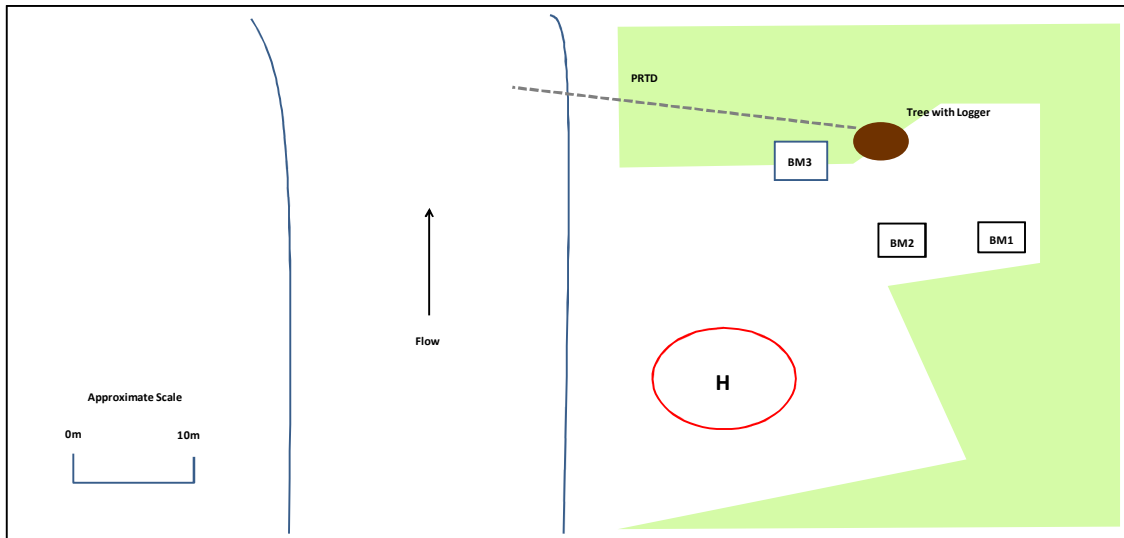
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES 07CD901  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,587 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 533925 mE, 6291921 mN (NAD83)  
**Lat/Long:** 56°45'42"N, 110°28'2"W (NAD83)  
**NTS Map:** 74D/16

**Benchmark Information**

**BM:** RAMP S51-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3 m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S51-2  
**Elevation:** 100.058 m  
**Basis:** Level Survey from RAMP S51-1  
**Location:** 3 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

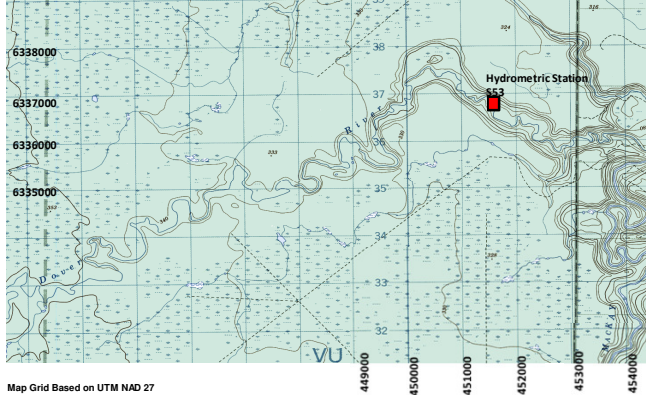
**BM:** RAMP S51-3  
**Elevation:** 100.474 m  
**Basis:** Level Survey from RAMP S51-1  
**Location:** 2 m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 24 January, 2013

**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**

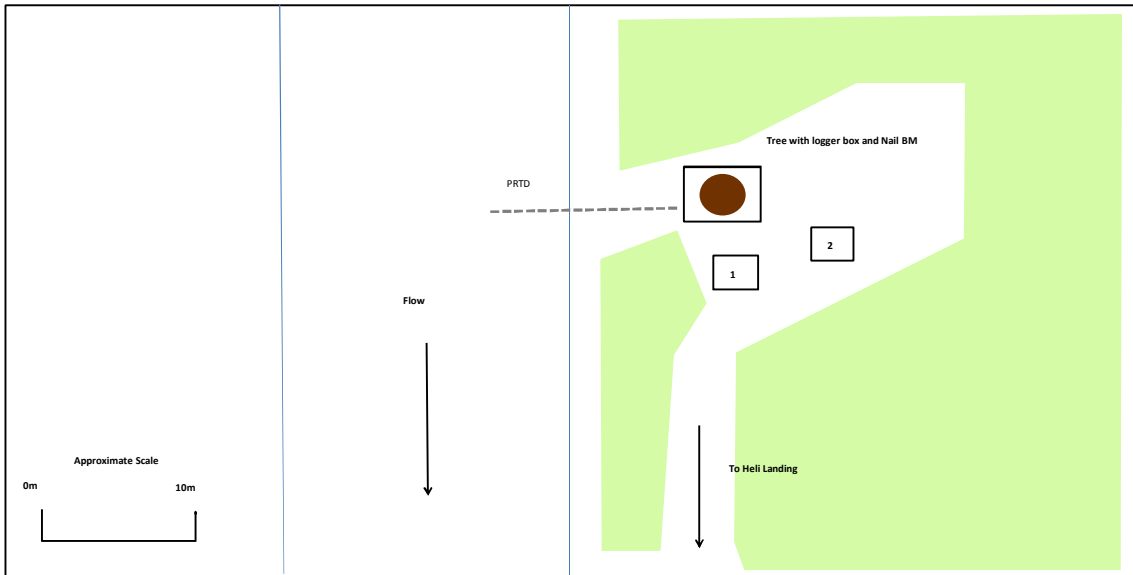
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:**  
**UTM Coordinates:** 451453 mE, 6337015 mN (NAD83)  
**Lat/Long:** 57°10'25"N, 111°48'10"W (NAD83)  
**NTS Map:** 74E/04

**Benchmark Information**

**BM:** RAMP S53-1  
**Elevation:** 100.361m  
**Basis:** Assumed  
**Location:** 5m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S53-2  
**Elevation:** 100.165m  
**Basis:** Level Survey from RAMP S53-1  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S53-3  
**Elevation:** 100.388m  
**Basis:** Level Survey from RAMP S53-1  
**Location:** 5m East of station  
**Description:** 3/4" Pipe

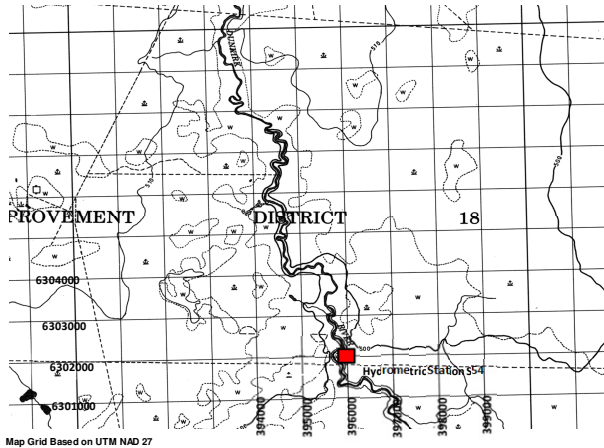




Revised 24 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Dunkirk River upstream of the confluence with the MacKay River. The Water Survey of Canada operated a nearby hydrometric station 07DB003 (at 56°51'20" N, 112°42'40" W) between 1975 and 1979.



**Station Details**

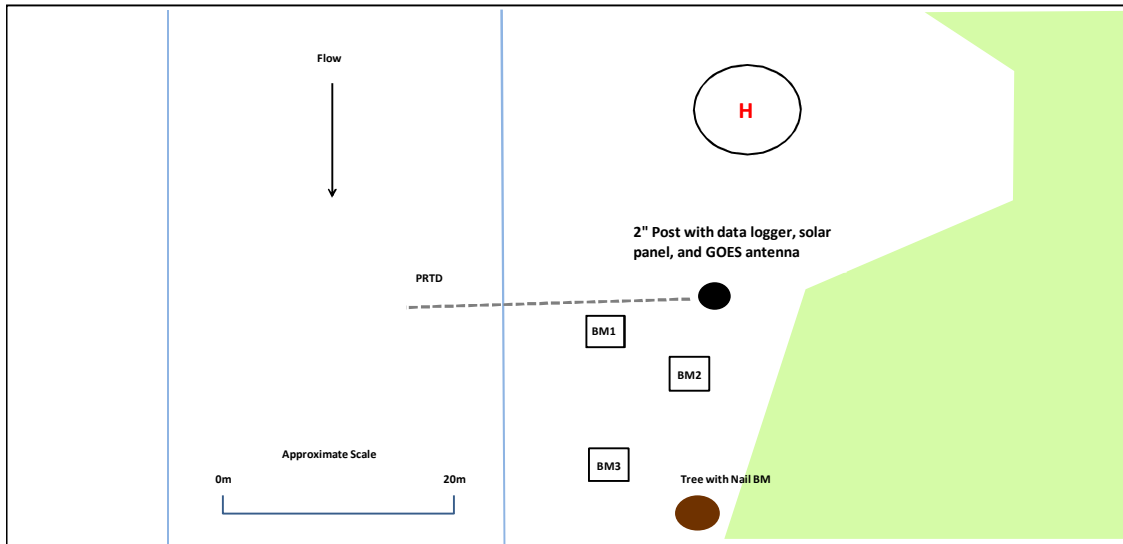
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES 07DB003  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,570 km<sup>2</sup> (WSC)  
**UTM Coordinates:** 395815 mE, 6302066 mN (NAD83)  
**Lat/Long:** 56°51'2"N, 112°42'29"W (NAD83)  
**NTS Map:** 84A/15

**Benchmark Information**

**BM:** RAMP S54-1  
**Elevation:** 99.674 m  
**Basis:** Level Survey from RAMP S54-Old BM3  
**Location:** 3m South West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S54-2  
**Elevation:** 99.699 m  
**Basis:** Level Survey from RAMP S54-1  
**Location:** 2m South East of station  
**Description:** 3/4" Pipe

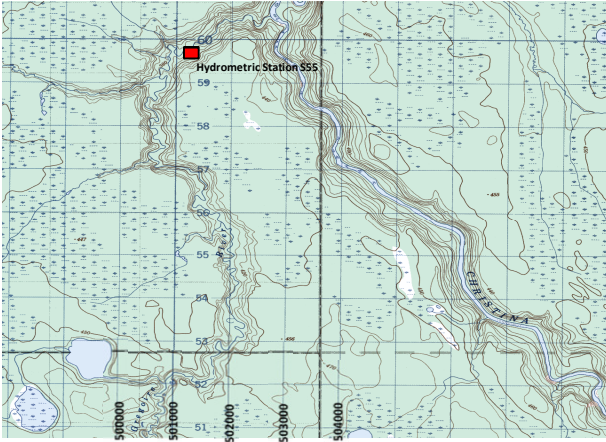
**BM:** RAMP S54-3  
**Elevation:** 99.908 m  
**Basis:** Level Survey from RAMP S54-1  
**Location:** 6m East of station  
**Description:** 3/4" Pipe



Revised 25 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Gregoire River near the mouth.



Map Grid Based on UTM NAD 27



**Station Details**

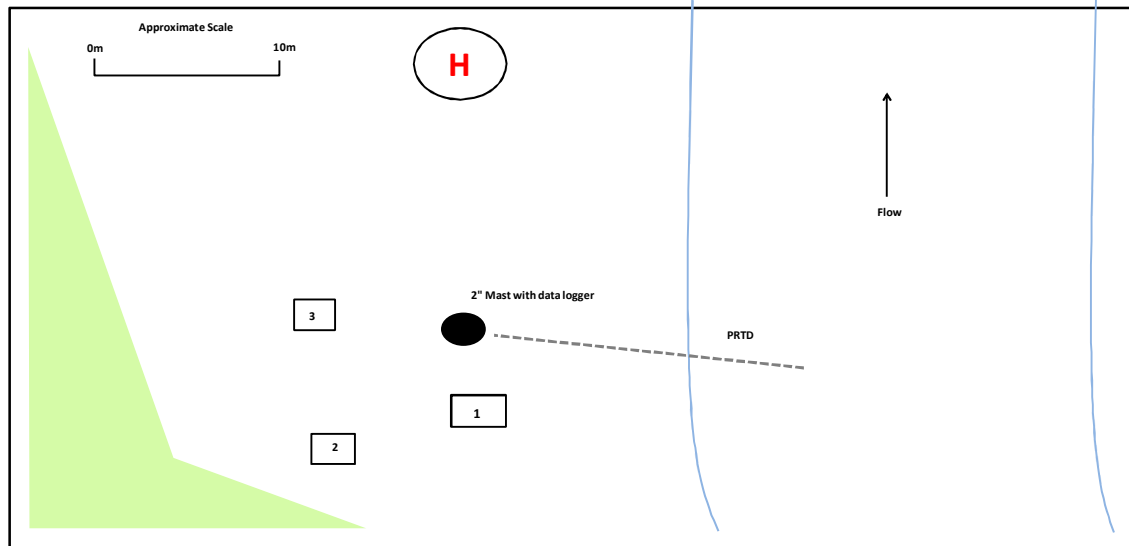
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:**  
**UTM Coordinates:** 510184 mE, 6259986 mN (NAD83)  
**Lat/Long:** 56°29'3"N, 110°50'4"W (NAD83)  
**NTS Map:** 74D/07

**Benchmark Information**

**BM:** RAMP S55-1  
**Elevation:** 100.181 m  
**Basis:** Assumed  
**Location:** 2 m South of data logger  
**Description:** 2" Pipe

**BM:** RAMP S55-2  
**Elevation:** 99.806 m  
**Basis:** Level Survey from RAMP S55-1  
**Location:** 5 m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

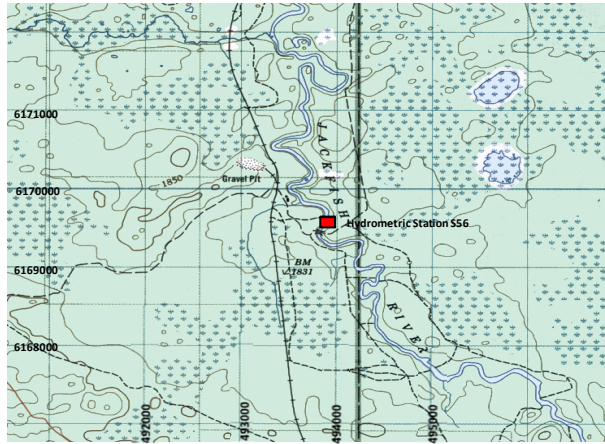
**BM:** RAMP S55-3  
**Elevation:** 99.786 m  
**Basis:** Level Survey from RAMP S55-1  
**Location:** 4m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 January, 2013

**Location and Purpose:**

Established to monitor discharge on the Jackfish River upstream of the Christina River. The Water Survey of Canada operated hydrometric station 07CE005 at this location between 1982 and 1995.



Map Grid Based on UTM NAD 83



**Station Details**

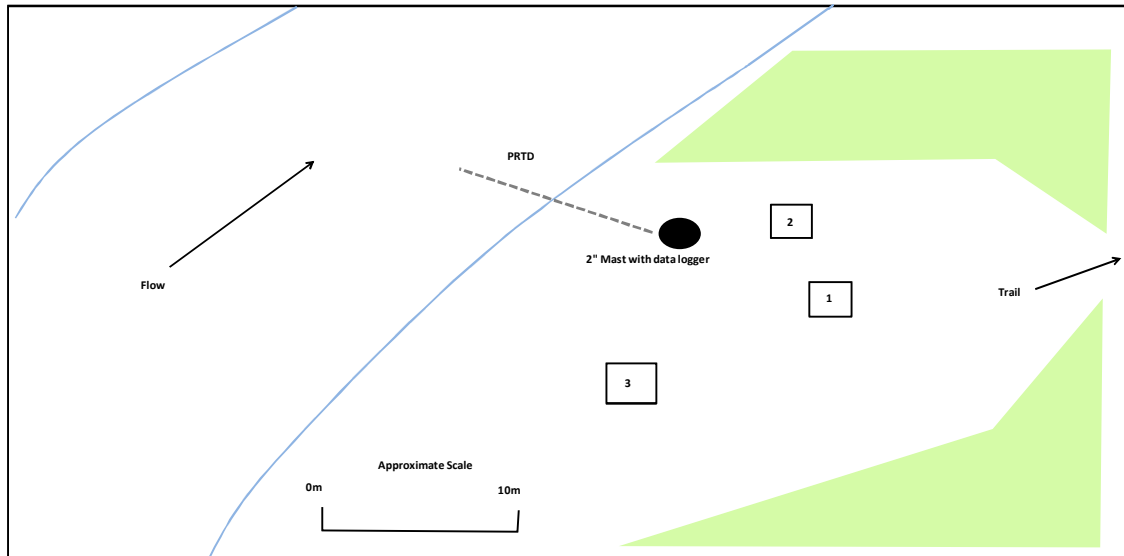
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** 2WD road via Hwy 881  
**Drainage Area:**  
**UTM Coordinates:** 493741 mE, 6169693 mN (NAD83)  
**Lat/Long:** 55°40'22"N, 111°5'58"W (NAD83)  
**NTS Map:** 73M/11

**Benchmark Information**

**BM:** RAMP S56-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 4 m East of data logger  
**Description:** T-post

**BM:** RAMP S56-2  
**Elevation:** 99.967 m  
**Basis:** Level Survey from RAMP S56-1  
**Location:** 2 m East of data logger  
**Description:** 3/4" Pipe with pink flagging

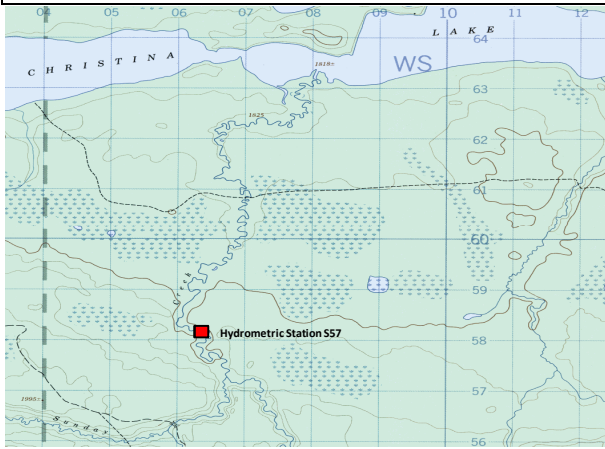
**BM:** RAMP S56-3  
**Elevation:** 100.051 m  
**Basis:** Level Survey from RAMP S56-1  
**Location:** 4 m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 August, 2012

**Location and Purpose:**

Established to monitor discharge on Sunday Creek upstream of Christina Lake.



Map Grid Based on UTM NAD 27

**Station Details**

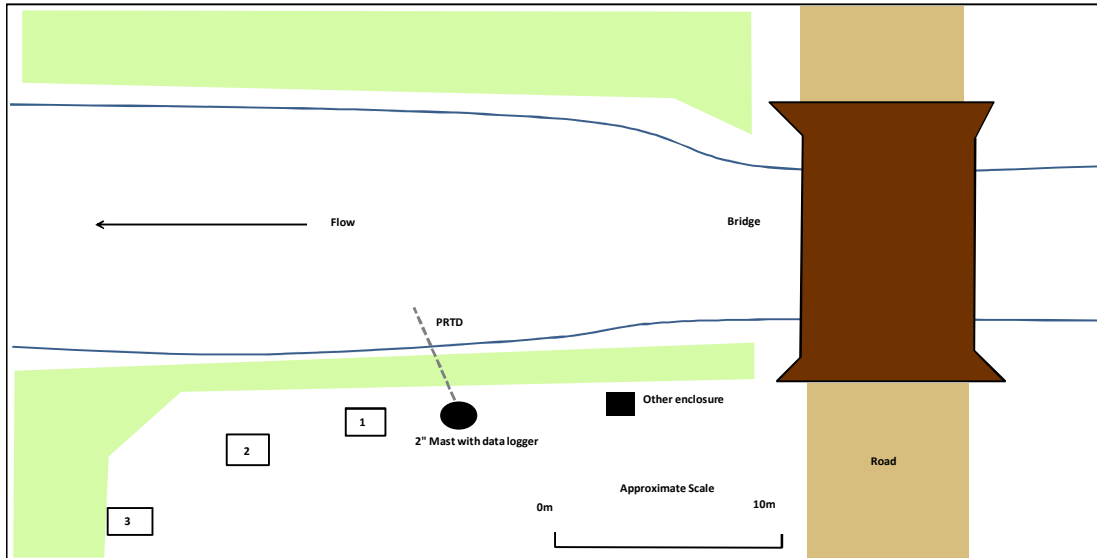
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** 2WD road via Cenovus Christina Lake Mine  
**Drainage Area:**  
**UTM Coordinates:** 506210 mE, 6158391 mN (NAD83)  
**Lat/Long:** 55°34'17"N, 110°54'46"W (NAD83)  
**NTS Map:** 73M/10

**Benchmark Information**

**BM:** RAMP S57-1  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S57-2  
**Elevation:** 99.961 m  
**Basis:** Level Survey from RAMP S57-1  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

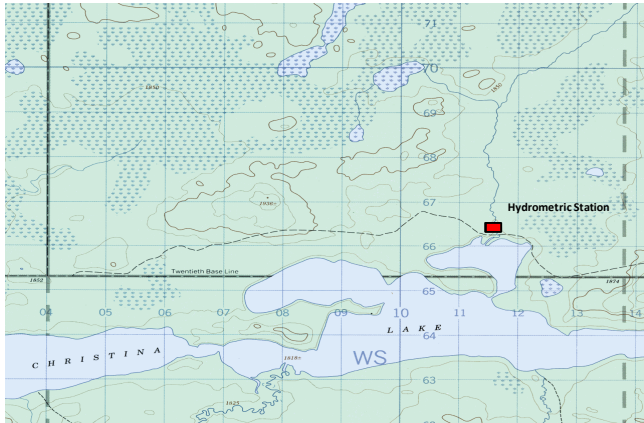
**BM:** RAMP S57-3  
**Elevation:** 100.060 m  
**Basis:** Level Survey from RAMP S57-1  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 29 August, 2012

**Location and Purpose:**

Established to monitor discharge on Sawbones Creek upstream of the confluence with Christina Lake.



Map Grid Based on UTM NAD 27

**Station Details**

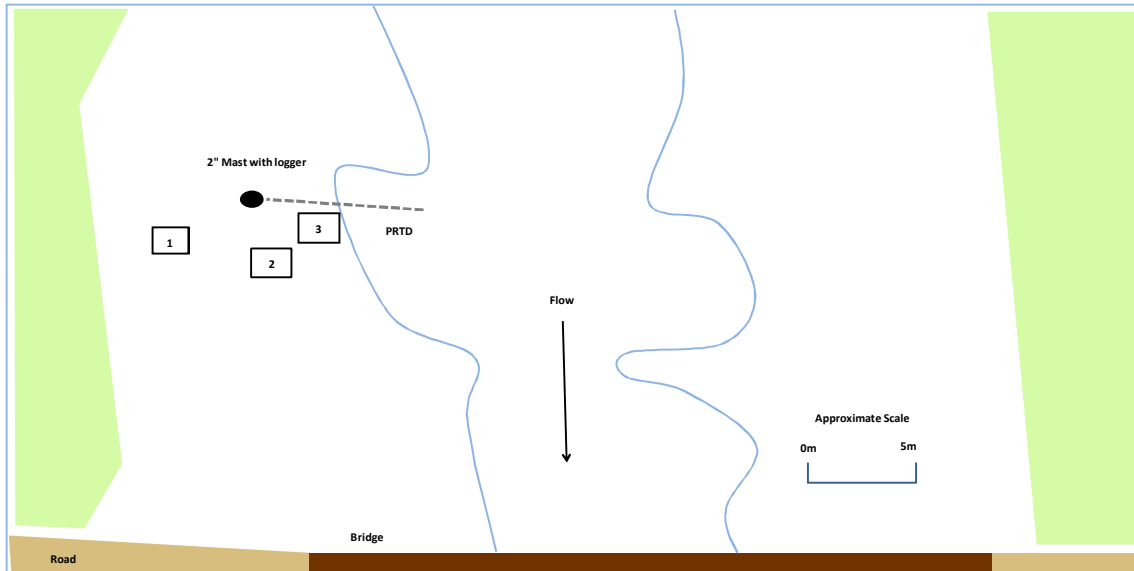
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via the MEG Energy Mine  
**Drainage Area:**  
**UTM Coordinates:** 511412 mE, 6167165 mN (NAD83)  
**Lat/Long:** 55°39'76"N, 110°49'16"W (NAD83)  
**NTS Map:** 73M/10

**Benchmark Information**

**BM:** RAMP S58-1  
**Elevation:** 99.865m  
**Basis:** Level Survey from RAMP S58-3  
**Location:** 6 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S58-2  
**Elevation:** 99.872 m  
**Basis:** Level Survey from RAMP S58-3  
**Location:** 5 m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S58-3  
**Elevation:** 100.000m  
**Basis:** Assumed  
**Location:** 5 m East of data logger  
**Description:** 3/4" Pipe with pink flagging



## C.6 INVENTORY OF CLIMATE AND HYDROLOGIC DATA IN THE RAMP DATABASE

An inventory of climate and hydrologic data collected by RAMP, and provided 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 2012 WY RAMP Technical Report and Appendices including:

- Water Survey of Canada (WSC)  
(<http://www.wsc.ec.gc.ca/>)
  - Provisional WSC hydrologic data have been used when final data are not yet available. In the RAMP database, data for a joint WSC/RAMP Station were provided starting with the year in which RAMP monitoring began. To provide regional context RAMP stations were identified where historical WSC data were 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 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	2012-10-31
	Water Level	1997-04-17	2012-10-31
	Water Temperature	2007-10-20	2012-10-31
S03 - Iyininim Creek above Kearl Lake	Total Rainfall	1999-04-30	2012-11-05
	Discharge	1989-01-18	2012-11-05
	Water Level	1989-04-20	2012-11-05
	Water Temperature	2011-08-15	2012-11-05
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	2012-10-31
	Water Level	2003-02-12	2012-10-31
	Water Temperature	2010-06-26	2012-10-31
S05A - Muskeg River above Muskeg Creek	Station Pressure	2002-03-16	2012-10-31
	Discharge	1995-08-11	2012-10-31
	Water Level	1997-04-17	2012-10-31
	Water Temperature	2004-09-01	2011-10-31
S06 - Mills Creek at Highway 63	Discharge	1997-04-16	2012-10-31
	Water Level	1997-04-16	2012-10-31
	Water Temperature	2010-09-19	2012-10-31
S07 - Muskeg River near Fort McKay (07DA008)	Discharge <sup>1</sup>	1998-03-01	2012-10-31
	Water Level	2000-01-01	2012-10-31
	Water Temperature	2010-06-22	2012-10-31
S08 - Stanley Creek near the mouth	Water Level	1999-09-14	2003-10-14
S09 - Kearl Lake Outlet	Discharge	1989-01-18	2012-10-31
	Water Level	1989-01-18	2012-10-31
	Station Pressure	1999-04-07	2001-04-20
	Water Temperature	2011-04-26	2012-10-31
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	2012-10-31
	Water Level	2012-08-13	2012-10-31
	Water Temperature	2012-08-13	2012-10-31
S11 - Poplar Creek at Highway 63 (07DA007)	Discharge <sup>2</sup>	1996-04-20	2012-10-31
	Water Level	1995-05-05	2012-10-31
	Water Temperature	2008-05-14	2012-10-31
S12 - Fort Creek at Highway 63	Discharge	2000-04-02	2012-11-01
	Water Level	2000-04-02	2012-11-01
	Water Temperature	2011-08-08	2012-11-01

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S13 - Shell Pond 3 Outlet	Discharge	2000-03-02	2002-12-07
	Water Level	2000-03-02	2002-12-07
S14 - Ells River above Joslyn Creek	Discharge <sup>3</sup>	2001-03-15	2007-10-24
	Water Level	2001-05-13	2007-10-24
S14A - Ells River at CNRL Bridge	Discharge <sup>3</sup>	2004-10-30	2012-10-31
	Water Level	2004-10-30	2012-10-31
	Water Temperature	2005-07-14	2012-10-31
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	2012-10-30
	Water Level	2007-05-01	2012-10-30
	Water Temperature	2007-09-21	2012-10-30
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
S16A - Calumet River near the mouth	Discharge <sup>5</sup>	2010-04-12	2012-10-31
	Water Level	2010-05-12	2012-10-31
	Water Temperature	2011-07-27	2012-10-31
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	2012-10-30
	Discharge	2001-05-09	2012-10-30
	Water Level	2001-05-09	2012-10-30
S20 - Muskeg River Upland	Water Temperature	2012-04-23	2012-10-30
	Discharge	2001-05-08	2012-10-31
	Water Level	2001-05-08	2012-10-31
S21 - Shelley Creek near the mouth	Water Temperature	2012-04-24	2012-10-31
	Water Level	2001-05-14	2003-10-14
	Discharge	1989-01-17	2012-10-31
S22 - Muskeg Creek near the mouth	Water Level	1989-01-17	2012-10-31
	Water Temperature	2012-04-24	2012-10-31
	Discharge	2001-01-01	2002-12-31
S23 - Aurora Boundary Weir	Water Level	2001-01-01	2002-12-31



**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S24 - Athabasca River below Eymundson Creek	Discharge	2001-06-20	2012-10-31
	Water Level	2001-06-20	2012-10-31
	Water Temperature	2010-08-11	2012-10-31
S25 - Susan Lake Outlet	Discharge	2002-06-11	2012-10-25
	Water Level	2002-06-11	2012-10-25
	Water Temperature	2012-05-19	2012-10-25
S26 - MacKay River near Fort McKay (07DB001)	Discharge <sup>6</sup>	2001-03-01	2012-10-31
S27 - Firebag River near the mouth (07DC001)	Discharge <sup>7</sup>	2002-01-01	2012-10-31
	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	2012-10-31
	Water Level	2002-04-10	2012-10-31
	Total Rainfall	2010-04-23	2012-10-31
S32 - Surmount Creek at Highway 881	Discharge	2002-05-18	2012-10-31
	Water Level	2002-01-14	2012-10-31
	Water Temperature	2008-06-24	2012-10-31
S33 - Muskeg River at Aurora/Albian Boundary	Discharge	2003-01-29	2012-10-31
	Water Level	2003-04-30	2012-10-31
	Water Temperature	2009-11-01	2012-10-31
S34 - Tar River above CNRL Lake	Discharge	2005-04-26	2012-10-31
	Water Level	2005-04-26	2012-10-31
	Water Temperature	2008-04-08	2012-10-31
S35 - McClelland Lake Outlet	Water Level	2008-06-29	2008-10-08
S36 - McClelland Lake Outlet above Firebag River	Discharge	2008-05-14	2012-10-31
	Water Level	2008-05-14	2012-10-31
	Water Temperature	2011-07-27	2012-10-31
S37 - East Jackpine Creek near the 1,300 m Contour	Discharge	2007-09-22	2012-11-05
	Water Level	2007-09-22	2012-11-05
	Water Temperature	2012-04-25	2012-11-05
S38 - Steepbank River near Fort McMurray (07DA006)	Discharge <sup>9</sup>	2009-01-01	2012-10-31
S39 - Beaver River above Syncrude (07DA018)	Discharge <sup>10</sup>	2009-01-01	2012-10-31
S40 - MacKay River at Petro-Canada Bridge	Discharge	2008-01-01	2012-10-31
	Water Level	2008-01-01	2012-10-31
	Total Rainfall	2010-04-23	2012-10-31
	Water Temperature	2008-09-19	2012-10-31
S42 - Clearwater River above Christina River (07CD005)	Discharge <sup>11</sup>	2009-01-01	2012-10-31
S43 - Firebag River above Suncor Firebag	Discharge	2009-05-01	2012-10-31
	Water Level	2009-05-01	2012-10-31
	Total Rainfall	2010-04-12	2012-10-31
	Water Temperature	2009-09-18	2012-10-31

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S44 - Pierre River near Fort McKay (07DA013)	Discharge <sup>12</sup>	2009-05-01	2012-11-02
	Water Level	2009-05-01	2012-11-02
	Water Temperature	2011-07-27	2012-11-02
S45 - Ells River above Joslyn Creek Diversion	Discharge	2009-06-13	2012-10-31
	Water Level	2009-06-13	2012-10-31
	Water Temperature	2009-06-13	2012-10-31
S46 – Athabasca River near Embarras Airport	Discharge <sup>13</sup>	2011-08-16	2012-10-31
	Water Level	2011-08-16	2012-10-31
	Water Temperature	2011-08-16	2012-10-31
S47 - Christina River near the mouth	Discharge	2011-07-28	2011-10-25
	Water Level	2011-07-28	2011-10-25
	Water Temperature	2011-07-28	2011-10-25
S48 - Big Creek near the mouth	Discharge	2011-04-23	2012-11-02
	Water Level	2011-04-23	2012-11-02
	Water Temperature	2011-04-23	2012-11-02
S49 - Eymundson Creek near the mouth	Discharge	2011-07-27	2012-11-02
	Water Level	2011-07-27	2012-11-02
	Water Temperature	2011-07-27	2012-11-02
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	2012-11-02
	Water Level	2012-04-26	2012-11-02
	Water Temperature	2012-04-26	2012-11-02
S51 – High Hills River near the mouth	Discharge	2012-05-20	2012-10-31
	Water Level	2012-05-20	2012-10-31
	Water Temperature	2012-05-20	2012-10-31
S53 – Dover River near the mouth	Discharge <sup>14</sup>	2012-05-18	2012-10-31
	Water Level	2012-05-18	2012-10-31
	Water Temperature	2012-05-18	2012-10-31
S54 – Dunkirk River near Fort McKay	Discharge <sup>15</sup>	2012-05-17	2012-10-31
	Water Level	2012-05-17	2012-10-31
	Water Temperature	2012-05-17	2012-10-31
S55 – Gregoire River near the mouth	Discharge	2012-05-20	2012-10-31
	Water Level	2012-05-20	2012-10-31
	Water Temperature	2012-05-20	2012-10-31
S56 – Jackfish River below Christina Lake	Discharge <sup>16</sup>	2012-05-16	2012-10-31
	Water Level	2012-05-16	2012-10-31
	Water Temperature	2012-05-16	2012-10-31
S57 – Sunday Creek above Christina Lake	Discharge	2012-05-16	2012-10-31
	Water Level	2012-05-16	2012-10-31
	Water Temperature	2012-05-16	2012-10-31

**Table C.6-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S58 – Sawbones Creek above Christina Lake	Discharge	-	-
	Water Level	2012-05-25	2012-10-31
	Water Temperature	2012-05-25	2012-10-31
CR1 - Calumet River	Discharge <sup>5</sup>	2005-05-04	2009-10-18
L1 - McClelland Lake	Daily Maximum Temperature	2007-03-29	2012-10-31
	Daily Minimum Temperature	2007-03-29	2012-10-31
	Daily Mean Temperature	2007-02-09	2012-10-31
	Total Rainfall	2002-08-09	2012-10-31
	Total Precipitation	2006-04-15	2012-10-31
	Relative Humidity	2006-09-06	2012-10-31
	Discharge	1997-06-22	2006-09-02
	Water Level	1997-06-22	2012-10-31
L2 - Kearl Lake	Water Temperature	2008-03-14	2012-10-31
	Daily Maximum Temperature	2008-01-01	2012-10-31
	Daily Minimum Temperature	2008-01-01	2012-10-31
	Daily Mean Temperature	2007-09-25	2012-10-31
	Total Precipitation	2008-01-01	2012-10-31
	Relative Humidity	2007-09-25	2012-10-31
	Discharge	2007-04-26	2007-10-17
	Water Level	1989-01-19	2012-10-31
L3 – Isadore’s Lake	Water Temperature	2007-09-25	2012-10-31
	Water Level	2000-02-22	2012-10-31
L4 – Namur Lake	Water Temperature	2011-10-31	2012-10-31
	Water Level	2012-05-18	2012-10-31
	Water Temperature	2012-05-18	2012-10-31

Historic 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) 1975-1977

<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	2012-10-31
	Daily Minimum Temperature	1995-05-10	2012-10-31
	Daily Mean Temperature	1988-03-11	2012-10-31
	Total Rainfall	1995-05-10	2008-12-31
	Total Snowfall	1996-01-01	2008-12-31
	Total Precipitation	1988-03-10	2012-10-31
	Snow on the Ground	1995-10-26	2012-10-31
	Speed of Extreme Gust	1995-05-10	2012-10-31
	Global Solar Radiation (RF1)	1988-03-11	2012-10-31
	Relative Humidity	1995-05-10	2012-10-31
	Maximum 2-Minute Wind Speed	1995-05-10	2012-10-31
	Maximum 10-Minute Wind Speed	1995-05-10	2012-10-31
	C2 - Horizon Climate Station	Daily Maximum Temperature	2008-10-16
Daily Minimum Temperature		2008-10-16	2012-10-31
Daily Mean Temperature		2008-10-16	2012-10-31
Snow on the Ground		2009-01-01	2012-10-31
Speed of Extreme Gust		2008-10-16	2012-10-31
Global Solar Radiation (RF1)		2008-10-16	2012-10-31
Station pressure		2008-10-16	2012-10-31
Relative Humidity		2008-10-16	2012-10-31
Maximum 2-Minute Wind Speed		2008-10-16	2012-10-31
Maximum 10-Minute Wind Speed		2008-10-16	2012-10-31
Total Precipitation		2009-06-11	2012-10-31
C3 - Steepbank Climate Station	Daily Maximum Temperature	2010-11-03	2012-10-31
	Daily Minimum Temperature	2010-11-03	2012-10-31
	Daily Mean Temperature	2010-11-03	2012-10-31
	Snow on the Ground	2010-11-03	2012-10-31
	Speed of Extreme Gust	2010-11-03	2012-10-31
	Global Solar Radiation (RF1)	2010-11-03	2012-10-31
	Station pressure	2010-11-03	2012-10-31
	Relative Humidity	2010-11-03	2012-10-31
	Maximum 2-Minute Wind Speed	2010-11-03	2012-10-31
	Maximum 10-Minute Wind Speed	2010-11-03	2012-10-31
	Total Precipitation	2009-08-13	2012-10-31
C4 - Pierre Climate Station	Daily Maximum Temperature	2011-07-25	2012-10-31
	Daily Minimum Temperature	2011-07-25	2012-10-31
	Daily Mean Temperature	2011-07-25	2012-10-31
	Snow on the Ground	2011-07-25	2012-10-31
	Speed of Extreme Gust	2011-07-25	2012-10-31
	Global Solar Radiation (RF1)	2011-07-25	2012-10-31
	Station pressure	2011-07-25	2012-10-31
	Relative Humidity	2011-07-25	2012-10-31
	Maximum 2-Minute Wind Speed	2011-07-25	2012-10-31
	Maximum 10-Minute Wind Speed	2011-07-25	2012-10-31
	Total Precipitation	2011-07-25	2012-10-31

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

<b>Climate Station</b>	<b>Data Type</b>	<b>From Date</b>	<b>To Date</b>
C5 – Surmont Climate Station	Daily Maximum Temperature	2011-10-16	2012-10-31
	Daily Minimum Temperature	2011-10-16	2012-10-31
	Daily Mean Temperature	2011-10-16	2012-10-31
	Snow on the Ground	2011-10-16	2012-10-31
	Speed of Extreme Gust	2011-10-16	2012-10-31
	Global Solar Radiation (RF1)	2011-10-16	2012-10-31
	Station pressure	2011-10-16	2012-10-31
	Relative Humidity	2011-10-16	2012-10-31
	Maximum 2-Minute Wind Speed	2011-10-16	2012-10-31
	Maximum 10-Minute Wind Speed	2011-10-16	2012-10-31
	Total Precipitation	2011-10-16	2012-10-31

## **C.7 STATION VISIT RECORDS AND MANUAL MEASUREMENTS**

Records of the manual hydrometric measurements made during each station visit are provided on the following pages. The 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: January 11, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.1	
Air Temperature °C:	-11.6	
RH (%):	66.0	
Snow Depth (cm):	20.9	
Wind Speed (m/s):	0.2	
Wind Direction (deg):	289	
Solar Radiation (W/m <sup>2</sup> ):	0.024	
Barometric Pressure (kpa):	-	
Precipitation (mm):	0.00	
Datalogger Clock:	14:43	
Laptop Clock:	14:44	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	14:35
End Time (MST):	14:55
Station Condition:	good
Weather:	clear, calm
<b>General Notes:</b>	
-replaced battery	

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	11-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: February 7, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.6	
Air Temperature °C:	-16.1	
RH (%):	86.1	
Snow Depth (cm):	29.9	
Wind Speed (m/s):	1.9	
Wind Direction (deg):	219	
Solar Radiation (W/m <sup>2</sup> ):	0.040	
Barometric Pressure (kpa):	-	
Precipitation (mm):	0.00	
Datalogger Clock:	9:29	
Laptop Clock:	9:29	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	9:25
End Time (MST):	9:45
Station Condition:	good
Weather:	clear, calm, -16
<b>General Notes:</b>	
-added antifreeze to precip gauge	

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	7-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	28-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: February 27, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.1	
Air Temperature °C:	-8.3	
RH (%):	54.4	
Snow Depth (cm):	32.4	
Wind Speed (m/s):	6.9	
Wind Direction (deg):	187	
Solar Radiation (W/m <sup>2</sup> ):	0.354	
Barometric Pressure (kpa):	-	
Precipitation (mm):	0.00	
Datalogger Clock:	12:02	
Laptop Clock:	12:02	
Dessicant:	good	
Logger# (if Δ):	26631	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:55
End Time (MST):	12:05
Station Condition:	good
Weather:	clear, calm
<b>General Notes:</b>	
-tested SR50 sensor-good -precip gauge antifreeze-good -replaced padlock on compound gate	

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	27-Feb-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	27-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: March 31, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.6	-
Air Temperature °C:	8.6	-
RH (%):	33.8	-
Snow Depth (cm):	24.4	-
Wind Speed (m/s):	14.7	-
Wind Direction (deg):	227	-
Solar Radiation (W/m <sup>2</sup> ):	0.547	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	44.10	-
Datalogger Clock:	11:58	10:59
Laptop Clock:	10:58	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**  
 - set logger clock  
 - battery min voltage was 9v, but is now operating fine.

<b>Measurement Details:</b>	
Start Time (MST):	11:55
End Time (MST):	12:20
Station Condition:	good
Weather:	sunny, +8

**General Notes:**

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	31-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date:

May 6, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.4	
Air Temperature °C:	18.4	
RH (%):	21.2	
Snow Depth (cm):	0.2	
Wind Speed (m/s):	3.3	
Wind Direction (deg):	2	
Solar Radiation (W/m <sup>2</sup> ):	0.727	
Barometric Pressure (kpa):	-	
Precipitation (mm):	60.40	
Datalogger Clock:	12:06	
Laptop Clock:	12:06	
Dessicant:	replaced	
Logger# (if Δ):	-	

<b>Measurement Details:</b>	
Start Time (MST):	11:45
End Time (MST):	12:10
Station Condition:	good
Weather:	partial cloud, 18

**General Notes:**

**Datalogger / Station Notes:**  
 -set data logger clock to MST

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	6-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: June 13, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.5	
Air Temperature °C:	15.6	
RH (%):	75.4	
Snow Depth (cm):	10.0	
Wind Speed (m/s):	4.1	
Wind Direction (deg):	89	
Solar Radiation (W/m <sup>2</sup> ):	274.800	
Barometric Pressure (kpa):	-	
Precipitation (mm):	88.30	
Datalogger Clock:	8:46	
Laptop Clock:	8:46	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		
-solar rad. only recorded W/m2, not kW/m2		

<b>Measurement Details:</b>	
Start Time (MST):	8:45
End Time (MST):	9:10
Station Condition:	good
Weather:	-
<b>General Notes:</b>	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	13-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	26-Jun-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	28-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: August 1, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.3	13.1
Air Temperature °C:	21.1	25.5
RH (%):	67.0	39.3
Snow Depth (cm):	5.7	0.1
Wind Speed (m/s):	2.3	3.2
Wind Direction (deg):	174	218
Solar Radiation (W/m <sup>2</sup> ):	581.270	783.110
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.00	1.43
Datalogger Clock:	10:10	12:51
Laptop Clock:	10:10	12:51
Dessicant:	replaced	replaced
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**  
 -Pluvio: red -12V, black -G, green-AG, white-C7  
 -need to install new enclosure for temp/RH sensor  
 -Licor mount faulty- set screw missing

<b>Measurement Details:</b>	
Start Time (MST):	10:00
End Time (MST):	13:00
Station Condition:	good
Weather:	partial cloud, 22

**General Notes:**  
 - bear tracks near station  
 - bring two mounting plates and hardware for SR50 & HC2-S3 pole- also bring a level  
 - HC2-S3 cover needs changing  
 - trimmed grass  
 - empty pluvio  
 - completed pluvio accuracy test  
 - RMYOUNG s/n: 85956  
 - Licor: PY 22490  
 - Temp HC2-S3: 60780663

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	1-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: August 10, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.2	
Air Temperature °C:	23.8	
RH (%):	32.5	
Snow Depth (cm):	-0.3	
Wind Speed (m/s):	10.9	
Wind Direction (deg):	254	
Solar Radiation (W/m <sup>2</sup> ):	647.870	
Barometric Pressure (kpa):	-	
Precipitation (mm):	2.97	
Datalogger Clock:	12:00	
Laptop Clock:	12:00	
Dessicant:	good	
Logger# (if Δ):	26631	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	12:45
End Time (MST):	14:00
Station Condition:	good
Weather:	sunny, breezy, 2C

**General Notes:**

- mount brackets for SR50 arm were replaced
- new height of SR50: 1.885 m
- precip. parameter measured as: precip filtered 24 hr

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	10-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: September 10, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.4	-
Air Temperature °C:	16.8	-
RH (%):	71.3	-
Snow Depth (cm):	0.3	-0.4
Wind Speed (m/s):	3.8	-
Wind Direction (deg):	247	-
Solar Radiation (W/m <sup>2</sup> ):	189.580	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.00	0.40
Datalogger Clock:	10:55	-
Laptop Clock:	10:55	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	10:50
End Time (MST):	11:15
Station Condition:	good
Weather:	overcast, calm, 16
<b>General Notes:</b>	
- SR50 height 1.882 m - removed antifreeze from precip gauge - checked precip gauge-ok	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	10-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station  
 UTM Location: 475734E, 6343967 N

Site Visit Date: October 15, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.5	-
Air Temperature °C:	12.4	-
RH (%):	57.6	-
Snow Depth (cm):	-0.5	-
Wind Speed (m/s):	18.8	-
Wind Direction (deg):	247	-
Solar Radiation (W/m <sup>2</sup> ):	344.480	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.00	4.20
Datalogger Clock:	12:39	-
Laptop Clock:	12:39	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	12:30
End Time (MST):	12:50
Station Condition:	good
Weather:	clear, breezy
<b>General Notes:</b>	
Added antifreeze to Pluvio	
Tested SR50- ok	
Tested Pluvio ok 4.2 mm	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	15-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	15-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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: October 29, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.1	
Air Temperature °C:	-8.0	
RH (%):	69.2	
Snow Depth (cm):	10.5	
Wind Speed (m/s):	2.8	
Wind Direction (deg):	263	
Solar Radiation (W/m <sup>2</sup> ):	138.400	
Barometric Pressure (kpa):	-	
Precipitation (mm):	0.00	
Datalogger Clock:	11:42	
Laptop Clock:	11:42	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:15
End Time (MST):	11:45
Station Condition:	good
Weather:	P. Cloudy, light breeze
<b>General Notes:</b>	
Replaced battery and installed a second solar panel.	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	29-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	29-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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: December 2, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.7	-
Air Temperature °C:	-19.9	-
RH (%):	73.1	-
Snow Depth (cm):	35.2	-
Wind Speed (m/s):	3.4	-
Wind Direction (deg):	18	-
Solar Radiation (W/m <sup>2</sup> ):	40.410	-
Barometric Pressure (kpa):	-	-
Precipitation (mm):	0.00	1.00
Datalogger Clock:	10:55	-
Laptop Clock:	10:55	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	10:50
End Time (MST):	11:05
Station Condition:	good
Weather:	overcast, light breeze
<b>General Notes:</b>	
Snow density measurements: Snow depth 41 cm, 42cm. Tested precip gauge and SR 50 -0K Bag and Snow 555.1 g Bag tare 13.0 g	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Dec-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Dec-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	29-Jan-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 12, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.5	
Air Temperature °C:	-8.3	
RH (%):	93.1	
Snow Depth (cm):	16.7	
Wind Speed (m/s):	2.3	
Wind Direction (deg):	226	
Solar Radiation (KW/m <sup>2</sup> ):	0.039	
Barometric Pressure (kpa):	96.20	
Precipitation (mm):	0.00	
Datalogger Clock:	8:44	
Laptop Clock:	8:42	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:30
End Time (MST):	9:00
Station Condition:	good
Weather:	clear, calm, -6
<b>General Notes:</b>	
-installed signal isolator for telemetry -tested snow depth sensor -verified antifreeze level in precip gauge	

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	12-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" 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 14, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.5	
Air Temperature °C:	-3.6	
RH (%):	80.2	
Snow Depth (cm):	22.1	
Wind Speed (m/s):	3.5	
Wind Direction (deg):	316	
Solar Radiation (KW/m <sup>2</sup> ):	0.045	
Barometric Pressure (kpa):	95.40	
Precipitation (mm):	0.00	
Datalogger Clock:	8:23	
Laptop Clock:	8:22	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:15
End Time (MST):	8:45
Station Condition:	good
Weather:	overcast, -3.6
<b>General Notes:</b>	
-added antifreeze to precipitation gauge	

<b>Field Personnel:</b>	DW, SM	<b>Trip Date:</b>	14-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	20-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	25-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" 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 16, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.7	
Air Temperature °C:	-8.5	
RH (%):	96.7	
Snow Depth (cm):	21.9	
Wind Speed (m/s):	2.6	
Wind Direction (deg):	320	
Solar Radiation (KW/m <sup>2</sup> ):	0.166	
Barometric Pressure (kpa):	94.20	
Precipitation (mm):	0.01	
Datalogger Clock:	7:47	
Laptop Clock:	7:39	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:30
End Time (MST):	9:00
Station Condition:	good
Weather:	clear, light breeze, -9
<b>General Notes:</b>	
-tested SR50-good -precip. gauge antifreeze level is good	

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	16-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	24-Apr-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	23-May-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

April 4, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.1	
Air Temperature °C:	2.7	
RH (%):	71.0	
Snow Depth (cm):	0.2	
Wind Speed (m/s):	0.8	
Wind Direction (deg):	296	
Solar Radiation (KW/m <sup>2</sup> ):	0.220	
Barometric Pressure (kpa):	95.30	
Precipitation (mm):	-0.10	
Datalogger Clock:	7:12	
Laptop Clock:	7:09	
Dessicant:	good	
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:	sunny, calm,
<b>General Notes:</b>	
-snow cover is patchy, ~5%	

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	4-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	10-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

May 14, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.7	
Air Temperature °C:	8.7	
RH (%):	74.5	
Snow Depth (cm):	-0.6	
Wind Speed (m/s):	19.0	
Wind Direction (deg):	4	
Solar Radiation (KW/m <sup>2</sup> ):	0.213	
Barometric Pressure (kpa):	96.50	
Precipitation (mm):	0.00	
Datalogger Clock:	7:35	
Laptop Clock:	7:37	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:20
End Time (MST):	9:05
Station Condition:	good
Weather:	cloudy, windy, +8
<b>General Notes:</b>	
-wind is gusty from multiple directions -data records start on May 8, 2012 -spilled few drops of water into Geonor while checking -SP light: s/n: 102601, sensitivity: 72uV/w2, calibration date: 24 August 2012, made in Netherlands	

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	14-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" 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 12, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.6	
Air Temperature °C:	11.0	
RH (%):	96.6	
Snow Depth (cm):	-0.8	
Wind Speed (m/s):	6.6	
Wind Direction (deg):	39	
Solar Radiation (KW/m <sup>2</sup> ):	0.070	
Barometric Pressure (kpa):	96.36	
Precipitation (mm):	0.20	
Datalogger Clock:	7:11	
Laptop Clock:	7:11	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	7:00
End Time (MST):	7:30
Station Condition:	good
Weather:	rain, 10 C
<b>General Notes:</b>	

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	12-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

August 8, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.6	-
Air Temperature °C	16.3	-
RH (%)	64.4	-
Snow Depth (cm)	-1.3	-
Wind Speed (m/s)	3.0	-
Wind Direction (deg)	331	-
Solar Radiation (KW/m <sup>2</sup> )	0.30	-
Barometric Pressure (kpa)	96.90	-
Precipitation (mm)	0.00	2.82
Datalogger Clock	7:01	-
Laptop Clock	7:01	-
Dessicant	replaced	-
Logger# (if Δ)	-	-
<b>Datalogger / Station Notes:</b>		
- Checked SR50 - ok - Checked Geonor-ok: 2.82 mm		

<b>Measurement Details:</b>	
Start Time (MST):	6:45
End Time (MST):	7:30
Station Condition:	good
Weather:	clear, calm, 18 °C

**General Notes:**

- lots of plant growth within compound-cleared brush within
- removed antifreeze from Geonor

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12



# Climate Station Measurement / Site Visit Record

Site: C2 - Horizon (CNRL) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

September 24, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.2	-
Air Temperature °C:	6.9	-
RH (%):	96.1	-
Snow Depth (cm):	-1.5	-
Wind Speed (m/s):	8.7	-
Wind Direction (deg):	319	-
Solar Radiation (KW/m <sup>2</sup> ):	0.136	-
Barometric Pressure (kpa):	96.39	-
Precipitation (mm):	0.00	1.40
Datalogger Clock:	7:13	-
Laptop Clock:	7:14	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	7:10
End Time (MST):	7:35
Station Condition:	good
Weather:	clear, light breeze
<b>General Notes:</b>	
-tested SR50-ok -checked Geonor-ok -trimmed brush in compound	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	24-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" 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 30, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.2	-
Air Temperature °C:	-12.1	-
RH (%):	95.6	-
Snow Depth (cm):	17.8	-
Wind Speed (m/s):	0.8	-
Wind Direction (deg):	4	-
Solar Radiation (KW/m <sup>2</sup> ):	0.035	-
Barometric Pressure (kpa):	96.58	-
Precipitation (mm):	0.14	175.20
Datalogger Clock:	7:46	-
Laptop Clock:	7:46	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	7:44
End Time (MST):	08:00
Station Condition:	good
Weather:	snowing heavily
<b>General Notes:</b>	
Tested SR50 - OK	
Tested Geonor - OK	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	30-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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:

November 30, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.3	
Air Temperature °C:	-18.4	
RH (%):	90.9	
Snow Depth (cm):	32.5	
Wind Speed (m/s):	3.7	
Wind Direction (deg):	45	
Solar Radiation (KW/m <sup>2</sup> ):	0.035	
Barometric Pressure (kpa):	96.26	
Precipitation (mm):	305.66	
Datalogger Clock:	8:15	
Laptop Clock:	8:15	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:00
End Time (MST):	08:45
Station Condition:	good
Weather:	snowing, calm
<b>General Notes:</b>	
Checked geonor -ok. Precip was recorded within past 12 hours tested SR 50- OK replaced battery and solar controller. Installed Solarkeeper solar controller.	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	30-Nov-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	29-Jan-12
<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:

January 23, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	15.4	
Air Temperature °C:	-18.6	
RH (%):	86.6	
Snow Depth (cm):	22.5	
Wind Speed (m/s):	0.2	
Wind Direction (deg):	351	
Solar Radiation (KW/m <sup>2</sup> ):	0.039	
Barometric Pressure (kpa):	95.80	
Precipitation (mm):	0.00	
Datalogger Clock:	9:30	
Laptop Clock:	9:30	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	9:25
End Time (MST):	9:40
Station Condition:	good
Weather:	partial cloud

**General Notes:**

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	23-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

March 14, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	15.1	
Air Temperature °C:	-11.1	
RH (%):	69.6	
Snow Depth (cm):	25.5	
Wind Speed (m/s):	4.0	
Wind Direction (deg):	245	
Solar Radiation (KW/m <sup>2</sup> ):	0.472	
Barometric Pressure (kpa):	96.20	
Precipitation (mm):	0.00	
Datalogger Clock:	10:12	
Laptop Clock:	10:14	
Dessicant:	replaced	
Logger# (if Δ):	-	

**Datalogger / Station Notes:**

<b>Measurement Details:</b>	
Start Time (MST):	11:10
End Time (MST):	11:35
Station Condition:	good
Weather:	partly cloudy

**General Notes:**  
-snow depth under sensor measured as 0.28 m

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	14-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" 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 6, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.9	
Air Temperature °C:	-1.9	
RH (%):	77.3	
Snow Depth (cm):	1.2	
Wind Speed (m/s):	28.9	
Wind Direction (deg):	353	
Solar Radiation (KW/m <sup>2</sup> ):	0.050	
Barometric Pressure (kpa):	97.10	
Precipitation (mm):	0.00	
Datalogger Clock:	8:23	
Laptop Clock:	8:26	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	9:20
End Time (MST):	9:35
Station Condition:	good
Weather:	overcast, windy, 0 C
<b>General Notes:</b>	
-wind: 25m/s gusting to 40m/s	

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	6-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

May 22, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.3	
Air Temperature °C:	16.5	
RH (%):	33.8	
Snow Depth (cm):	1.1	
Wind Speed (m/s):	8.0	
Wind Direction (deg):	115	
Solar Radiation (KW/m <sup>2</sup> ):	0.654	
Barometric Pressure (kpa):	96.70	
Precipitation (mm):	99.40	
Datalogger Clock:	10:52	
Laptop Clock:	10:54	
Dessicant:	replaced	
Logger# (if Δ):	26630	

**Datalogger / Station Notes:**  
 -note: incorrect units for wind speed (logger recorded in km/h, above data was converted to m/s)

<b>Measurement Details:</b>	
Start Time (MST):	10:40
End Time (MST):	11:00
Station Condition:	good
Weather:	clear, windy, +10 C

**General Notes:**  
 -emptied old antifreeze from Pluvio

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	22-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

July 26, 2012



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.1	14.0
Air Temperature °C:	25.2	26.8
RH (%):	50.7	47.6
Snow Depth (cm):	12.5	1.2
Wind Speed (m/s):	3.0	7.1
Wind Direction (deg):	351	28
Solar Radiation (KW/m <sup>2</sup> ):	0.741	0.755
Barometric Pressure (kpa):	97.51	97.50
Precipitation (mm):	0.00	-
Datalogger Clock:	12:09	14:01
Laptop Clock:	12:11	14:01
Dessicant:	replaced	-
Logger# (if Δ):	-	-

<b>Datalogger / Station Notes:</b>
- set clock - uploaded new program to data logger

<b>Measurement Details:</b>	
Start Time (MST):	12:03
End Time (MST):	14:25
Station Condition:	good
Weather:	partial cloud, 25 °C

**General Notes:**

- Tower was lowered, and climate sensors were replaced.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	26-Jul-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12



# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

July 29, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.3	
Air Temperature °C:	17.8	
RH (%):	83.3	
Snow Depth (cm):	1.2	
Wind Speed (m/s):	5.0	
Wind Direction (deg):	176	
Solar Radiation (KW/m <sup>2</sup> ):	0.120	
Barometric Pressure (kpa):	97.52	
Precipitation (mm):	0.00	
Datalogger Clock:	8:02	
Laptop Clock:	8:02	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:00
End Time (MST):	8:25
Station Condition:	good
Weather:	overcast, calm
<b>General Notes:</b>	

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	29-Jul-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

October 29, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.2	
Air Temperature °C:	-8.4	
RH (%):	78.7	
Snow Depth (cm):	1.8	
Wind Speed (m/s):	1.1	
Wind Direction (deg):	239	
Solar Radiation (KW/m <sup>2</sup> ):	0.062	
Barometric Pressure (kpa):	97.87	
Precipitation (mm):	0.00	
Datalogger Clock:	9:15	
Laptop Clock:	9:15	
Dessicant:	replaced	
Logger# (if Δ):	-	

**Datalogger / Station Notes:**

<b>Measurement Details:</b>	
Start Time (MST):	9:14
End Time (MST):	9:30
Station Condition:	good
Weather:	Overcast, calm

**General Notes:**  
 Antifreeze was not added to Pluvio.  
 SR50 tested - OK.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	29-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	29-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	29-Jan-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:

November 29, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	15.4	-
Air Temperature °C:	-23.2	-
RH (%):	70.5	-
Snow Depth (cm):	15.0	-
Wind Speed (m/s):	1.6	-
Wind Direction (deg):	267	-
Solar Radiation (KW/m <sup>2</sup> ):	0.096	-
Barometric Pressure (kpa):	98.42	-
Precipitation (mm):	0.00	0.80
Datalogger Clock:	11:56	-
Laptop Clock:	11:56	-
Dessicant:	good	-
Logger# (if Δ):	-	-
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:51
End Time (MST):	12:05
Station Condition:	good
Weather:	overcast, calm

**General Notes:**  
 tested Pluvio ok  
 tested SR50- ok  
  
 2 snow cores sampled:  
 Snow depth: 16.5 cm, 31.0 cm.  
 Weight Bag + Snow: 269.0 g  
 Bag Tare weight: 12.8 g

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	29-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	29-Nov-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	29-Jan-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:

January 18, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.0	
Air Temperature °C:	-18.6	
RH (%):	53.8	
Snow Depth (cm):	19.1	
Wind Speed (m/s):	4.4	
Wind Direction (deg):	266	
Solar Radiation (KW/m <sup>2</sup> ):	0.058	
Barometric Pressure (kpa):	97.30	
Precipitation (mm):	0.00	
Datalogger Clock:	14:56	
Laptop Clock:	14:56	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	14:45
End Time (MST):	15:10
Station Condition:	good
Weather:	clear, calm
<b>General Notes:</b>	
-added antifreeze to precip. gauge -tested SR50-ok	

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	18-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

February 9, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.5	
Air Temperature °C:	-14.1	
RH (%):	33.9	
Snow Depth (cm):	20.1	
Wind Speed (m/s):	5.0	
Wind Direction (deg):	100	
Solar Radiation (KW/m <sup>2</sup> ):	0.227	
Barometric Pressure (kpa):	100.10	
Precipitation (mm):	-	
Datalogger Clock:	13:42	
Laptop Clock:	13:41	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	13:36
End Time (MST):	13:50
Station Condition:	good
Weather:	clear, sunny
<b>General Notes:</b>	
-added antifreeze to precip. gauge	
-tested SR50-good	

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	9-Feb-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	19-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	2-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

March 11, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.6	
Air Temperature °C:	1.0	
RH (%):	75.1	
Snow Depth (cm):	22.2	
Wind Speed (m/s):	6.6	
Wind Direction (deg):	64	
Solar Radiation (KW/m <sup>2</sup> ):	0.273	
Barometric Pressure (kpa):	96.60	
Precipitation (mm):	0.00	
Datalogger Clock:	10:17	
Laptop Clock:	10:17	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:10
End Time (MST):	11:35
Station Condition:	good
Weather:	clear, calm, +1 C
<b>General Notes:</b>	
-tested SR50 - ok	
-precip. gauge - good	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	11-Mar-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	27-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

March 28, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.6	
Air Temperature °C:	3.3	
RH (%):	63.9	
Snow Depth (cm):	33.2	
Wind Speed (m/s):	4.1	
Wind Direction (deg):	265	
Solar Radiation (KW/m <sup>2</sup> ):	0.156	
Barometric Pressure (kpa):	97.60	
Precipitation (mm):	491.30	
Datalogger Clock:	7:37	
Laptop Clock:	7:36	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	8:37
End Time (MST):	8:45
Station Condition:	good
Weather:	clear
<b>General Notes:</b>	
-vapour pressure: 0.3086 kPa	

<b>Field Personnel:</b>	DW, BL	<b>Trip Date:</b>	28-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station  
 UTM Location: 460853 E, 6378740 N

Site Visit Date: May 17, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.1	
Air Temperature °C:	11.5	
RH (%):	32.8	
Snow Depth (cm):	0.6	
Wind Speed (m/s):	6.5	
Wind Direction (deg):	60	
Solar Radiation (KW/m <sup>2</sup> ):	0.489	
Barometric Pressure (kpa):	97.60	
Precipitation (mm):	10.40	
Datalogger Clock:	9:37	
Laptop Clock:	9:36	
Dessicant:	replaced	
Logger# (if Δ):	31938	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	9:15
End Time (MST):	10:22
Station Condition:	good
Weather:	sunny, calm, +10 C
<b>General Notes:</b>	
-telemetry was installed: ph#: 604-345-3837, RSSI: -88	

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	17-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

June 15, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.4	
Air Temperature °C:	14.7	
RH (%):	71.9	
Snow Depth (cm):	10.4	
Wind Speed (m/s):	4.7	
Wind Direction (deg):	314	
Solar Radiation (KW/m <sup>2</sup> ):	0.701	
Barometric Pressure (kpa):	98.03	
Precipitation (mm):	0.00	
Datalogger Clock:	13:36	
Laptop Clock:	13:35	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	14:25
End Time (MST):	14:45
Station Condition:	good
Weather:	rain, 15 C
<b>General Notes:</b>	
-grass getting long, pulled some out around snow sensor	

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	15-Jun-12
<b>Data Entry Personnel:</b>	XP	<b>Date:</b>	27-Jun-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	4-Jul-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

June 21, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.4	
Air Temperature °C:	26.0	
RH (%):	25.9	
Snow Depth (cm):	-0.6	
Wind Speed (m/s):	10.7	
Wind Direction (deg):	98	
Solar Radiation (KW/m <sup>2</sup> ):	0.713	
Barometric Pressure (kpa):	98.01	
Precipitation (mm):	0.00	
Datalogger Clock:	14:59	
Laptop Clock:	14:58	
Dessicant:	good	
Logger# (if Δ):	31938	

**Datalogger / Station Notes:**  
 -modem needs to be switched to SW12V power

<b>Measurement Details:</b>	
Start Time (MST):	14:55
End Time (MST):	15:15
Station Condition:	good
Weather:	clear, breezy

**General Notes:**  
 -precip gauge should be emptied of antifreeze on next visit  
 -door decal applied to enclosure

<b>Field Personnel:</b>	GB, SM	<b>Trip Date:</b>	21-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-Jul-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	4-Jul-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station

UTM Location: 460853 E, 6378740 N

Site Visit Date:

August 16, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.5	
Air Temperature °C:	22.5	
RH (%):	43.4	
Snow Depth (cm):	-0.4	
Wind Speed (m/s):	3.5	
Wind Direction (deg):	276	
Solar Radiation (KW/m <sup>2</sup> ):	0.620	
Barometric Pressure (kpa):	97.77	
Precipitation (mm):	192.83	
Datalogger Clock:	10:48	
Laptop Clock:	10:47	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	11:35
End Time (MST):	12:00
Station Condition:	good
Weather:	clear, calm

**General Notes:**

- emptied antifreeze from pluvio
- pulled weeds near snow sensor

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	16-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C4 - Pierre Climate Station  
 UTM Location: 460853 E, 6378740 N

Site Visit Date: September 13, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.5	12.8
Air Temperature °C:	20.8	20.1
RH (%):	34.9	38.1
Snow Depth (cm):	-0.7	0.0
Wind Speed (m/s):	13.5	5.3
Wind Direction (deg):	236	221
Solar Radiation (KW/m <sup>2</sup> ):	0.223	0.144
Barometric Pressure (kpa):	98.10	98.00
Precipitation (mm):	0.00	0.00
Datalogger Clock:	4:51	5:14
Laptop Clock:	4:49	5:13
Dessicant:	replaced	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**  
 -changed battery

<b>Measurement Details:</b>	
Start Time (MST):	17:45
End Time (MST):	18:15
Station Condition:	good
Weather:	-

**General Notes:**

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	13-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	12.9	
Air Temperature °C:	-6.0	
RH (%):	88.1	
Snow Depth (cm):	14.2	
Wind Speed (m/s):	0.0	
Wind Direction (deg):	354	
Solar Radiation (KW/m <sup>2</sup> ):	0.759	
Barometric Pressure (kpa):	98.67	
Precipitation (mm):	0.00	
Datalogger Clock:	9:49	
Laptop Clock:	9:51	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		

<b>Measurement Details:</b>	
Start Time (MST):	9:44
End Time (MST):	10:05
Station Condition:	good
Weather:	overcast, calm
<b>General Notes:</b>	
SPLite has 4" snow cover - was not cleared off because we could not reach the instrument. Tested SR 50 - OK Added antifreeze to Pluvio	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Nov-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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: December 15, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.2	13.3
Air Temperature °C:	-14.6	-
RH (%):	87.9	-
Snow Depth (cm):	43.6	-
Wind Speed (m/s):	3.2	-
Wind Direction (deg):	212	-
Solar Radiation (KW/m <sup>2</sup> ):	0.257	-
Barometric Pressure (kpa):	96.79	-
Precipitation (mm):	0.00	-
Datalogger Clock:	10:23	-
Laptop Clock:	10:23	-
Dessicant:	good	-
Logger# (if Δ):	-	-

**Datalogger / Station Notes:**  
 replaced battery  
 telemetry condition good.

<b>Measurement Details:</b>	
Start Time (MST):	10:10
End Time (MST):	10:30
Station Condition:	good
Weather:	clear, calm

**General Notes:**  
 Replaced antifreeze in Pluvio

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	15-Dec-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	15-Dec-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	29-Jan-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: January 16, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.4	
Air Temperature °C:	-29.2	
RH (%):	65.9	
Snow Depth (cm):	7.9	
Wind Speed (m/s):	2.7	
Wind Direction (deg):	278	
Solar Radiation (W/m <sup>2</sup> ):	82.0	
Barometric Pressure (kpa):	96.07	
Precipitation (mm):	0.00	
Datalogger Clock:	10:42	
Laptop Clock:	10:43	
Dessicant:	replaced	
Logger# (if Δ):	-	

**Datalogger / Station Notes:**  
 solar rad. recorded by logger in kW/m<sup>2</sup>, converted to W/m<sup>2</sup>

<b>Measurement Details:</b>	
Start Time (MST):	10:30
End Time (MST):	10:45
Station Condition:	good
Weather:	clear, light breeze, -28

**General Notes:**  
 -added antifreeze to precip gauge, ~2L

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	16-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	4-Jul-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: February 16, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.0	
Air Temperature °C:	-8.4	
RH (%):	79.9	
Snow Depth (cm):	13.3	
Wind Speed (m/s):	0.0	
Wind Direction (deg):	73	
Solar Radiation (W/m <sup>2</sup> ):	76.0	
Barometric Pressure (kpa):	95.00	
Precipitation (mm):	95.80	
Datalogger Clock:	9:44	
Laptop Clock:	9:44	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		
-solar rad. recorded by logger in kW/m <sup>2</sup> , converted to W/m <sup>2</sup>		

<b>Measurement Details:</b>	
Start Time (MST):	9:35
End Time (MST):	10:00
Station Condition:	good
Weather:	overcast, -9
<b>General Notes:</b>	

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	16-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	29-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: March 10, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.8	-
Air Temperature °C:	2.2	-
RH (%):	49.2	-
Snow Depth (cm):	13.7	26.6
Wind Speed (m/s):	10.0	-
Wind Direction (deg):	255	-
Solar Radiation (W/m <sup>2</sup> ):	299	-
Barometric Pressure (kpa):	93.60	-
Precipitation (mm):	0.00	-
Datalogger Clock:	9:33	-
Laptop Clock:	9:34	-
Dessicant:	good	-
Logger# (if Δ):	-	-

<b>Measurement Details:</b>	
Start Time (MST):	9:30
End Time (MST):	9:50
Station Condition:	good
Weather:	clear, breezy,

**General Notes:**  
 -performed 2 snow core measurements

**Datalogger / Station Notes:**  
 -solar rad. recorded by logger in kW/m<sup>2</sup>, converted to W/m<sup>2</sup>  
 -updated C5 program to correct SR50 problem-works fine

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	10-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: March 27, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	15.1	
Air Temperature °C:	-4.1	
RH (%):	56.3	
Snow Depth (cm):	32.6	
Wind Speed (m/s):	0.0	
Wind Direction (deg):	-	
Solar Radiation (W/m <sup>2</sup> ):	271	
Barometric Pressure (kpa):	94.60	
Precipitation (mm):	0.00	
Datalogger Clock:	8:14	
Laptop Clock:	8:14	
Dessicant:	good	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		
-solar rad. recorded by logger in kW/m2, converted to W/m <sup>2</sup>		

<b>Measurement Details:</b>	
Start Time (MST):	9:05
End Time (MST):	9:21
Station Condition:	good
Weather:	clear
<b>General Notes:</b>	
-vapour pressure: 0.255	
-total precip: 140.55	

<b>Field Personnel:</b>	DW, BL	<b>Trip Date:</b>	27-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date:

May 9, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.4	
Air Temperature °C:	13.7	
RH (%):	33.5	
Snow Depth (cm):	3.3	
Wind Speed (m/s):	16.3	
Wind Direction (deg):	354	
Solar Radiation (W/m <sup>2</sup> ):	805	
Barometric Pressure (kpa):	93.80	
Precipitation (mm):	224.60	
Datalogger Clock:	12:32	
Laptop Clock:	12:32	
Dessicant:	replaced	
Logger# (if Δ):	34644	

**Datalogger / Station Notes:**  
 -solar rad. recorded by logger in kW/m2, converted to W/m<sup>2</sup>

<b>Measurement Details:</b>	
Start Time (MST):	12:30
End Time (MST):	13:10
Station Condition:	good
Weather:	partial cloud, 14 C

**General Notes:**  
 -tried installing modem but found very poor signal  
 -need to locate direction of nearest cell tower and try again

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	9-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: June 19, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	14.5	
Air Temperature °C:	12.3	
RH (%):	89.8	
Snow Depth (cm):	-12.5	
Wind Speed (m/s):	12.2	
Wind Direction (deg):	392	
Solar Radiation (W/m <sup>2</sup> ):	173	
Barometric Pressure (kpa):	94.20	
Precipitation (mm):	0.00	
Datalogger Clock:	12:48	
Laptop Clock:	12:48	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		
-solar rad. recorded by logger in kW/m <sup>2</sup> , converted to W/m <sup>2</sup>		

<b>Measurement Details:</b>	
Start Time (MST):	13:30
End Time (MST):	14:00
Station Condition:	good
Weather:	cloudy, 13 C
<b>General Notes:</b>	
-cleared grass around SR50 sensor -public - not showing all variables -added modem, signal isolator, no surge protector-left in truck by mistake-install on next visit	

<b>Field Personnel:</b>	TR, GB	<b>Trip Date:</b>	19-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	26-Jun-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	28-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: August 30, 2012



<b>Datalogger Details:</b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.9	14.0
Air Temperature °C:	9.3	10.4
RH (%):	81.6	78.6
Snow Depth (cm):	35.4	3.0
Wind Speed (m/s):	7.3	14.7
Wind Direction (deg):	297	287
Solar Radiation (W/m <sup>2</sup> ):	78.0	231
Barometric Pressure (kpa):	94.21	94.31
Precipitation (mm):	0.00	0.00
Datalogger Clock:	7:39	-
Laptop Clock:	7:39	-
Dessicant:	replaced	-
Logger# (if Δ):	34644	-

<b>Measurement Details:</b>	
Start Time (MST):	7:30
End Time (MST):	8:30
Station Condition:	good
Weather:	partial cloud, windy, 12

**General Notes:**

- lowered tower to work on telemetry and record sensor serial numbers
- SR50 s/n: 3979
- solar radiation sensor s/n: 113679
- wind sensor s/n: 109382

**Datalogger / Station Notes:**

- Raven # 1212626420 pulled from box, added # 1216687106, ph#: 604-347-5143, RSSI: -67
- solar rad. recorded by logger in kW/m<sup>2</sup>, converted to W/m<sup>2</sup>

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Climate Station Measurement / Site Visit Record

Site: C5 - Surmont Climate Station  
 UTM Location: 502542 E, 6230964 N

Site Visit Date: September 11, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.2	
Air Temperature °C:	4.7	
RH (%):	88.8	
Snow Depth (cm):	4.5	
Wind Speed (m/s):	19.2	
Wind Direction (deg):	300	
Solar Radiation (W/m <sup>2</sup> ):	62.0	
Barometric Pressure (kpa):	93.30	
Precipitation (mm):	0.20	
Datalogger Clock:	11:47	
Laptop Clock:	11:47	
Dessicant:	replaced	
Logger# (if Δ):	-	

**Datalogger / Station Notes:**  
 -solar rad. recorded by logger in kW/m<sup>2</sup>, converted to W/m<sup>2</sup>

<b>Measurement Details:</b>	
Start Time (MST):	11:30
End Time (MST):	11:55
Station Condition:	good
Weather:	heavy rain, windy

**General Notes:**  
 -removed antifreeze from Pluvio

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	11-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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: October 12, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.1	
Air Temperature °C:	-3.9	
RH (%):	93.7	
Snow Depth (cm):	5.3	
Wind Speed (m/s):	7.4	
Wind Direction (deg):	334	
Solar Radiation (W/m <sup>2</sup> ):	45.0	
Barometric Pressure (kpa):	94.17	
Precipitation (mm):	0.00	
Datalogger Clock:	8:36	
Laptop Clock:	8:37	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b>Datalogger / Station Notes:</b>		
-solar rad. recorded by logger in kW/m <sup>2</sup> , converted to W/m <sup>2</sup>		

<b>Measurement Details:</b>	
Start Time (MST):	8:30
End Time (MST):	8:45
Station Condition:	good
Weather:	clear, calm
<b>General Notes:</b>	
added antifreeze to pluvio ran pluvio accuracy test; results - good. Was not able to perform the screen capture in Windows, so the test result was not saved.	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	12-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	12-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<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: December 3, 2012



<b>Datalogger Details:</b>	Before	After
Battery (Main):	13.0	
Air Temperature °C:	-14.7	
RH (%):	84.6	
Snow Depth (cm):	24.3	
Wind Speed (m/s):	3.8	
Wind Direction (deg):	126	
Solar Radiation (W/m <sup>2</sup> ):	400	
Barometric Pressure (kpa):	94.77	
Precipitation (mm):	186.56	
Datalogger Clock:	4:07	
Laptop Clock:	4:06	
Dessicant:	REPLACED	
Logger# (if Δ):	-	

<b>Measurement Details:</b>	
Start Time (MST):	16:04
End Time (MST):	16:20
Station Condition:	Good
Weather:	light snow

**General Notes:**  
 Snow density measurements:  
 snow depth 28.5 cm, and 23.0 cm,  
 total mass excluding weigh bag 268.5g.

**Datalogger / Station Notes:**  
 ADDED snow To Pluvio to TEST  
 -solar rad. recorded by logger in kW/m<sup>2</sup>, converted to W/m<sup>2</sup>

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	3-Dec-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	3-Dec-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	29-Jan-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 20, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.295	
Water (°C):	0.2	
Air Temp (°C):	-24.5	
RH (%):	79.0%	
Precipitation (mm):	1130.80	
Battery (Main):	13.2	
Datalogger Clock:	11:09	
Laptop Clock:	11:11	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	11:00
End Time (MST):	11:40
Station Condition:	Good
Weather:	Clear, Calm, -25

**Datalogger / Station Notes:**

- Added antifreeze to precip. gauge.

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.941	295.027	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	1.103	295.968		294.865	294.865	Iron Rod beside station
Ice/PT:			1.652	294.316		
Water Level:			1.664	294.304		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.929	295.956		295.027	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			1.091	294.865	294.865	Iron Rod beside station
Ice/PT:			1.643	294.313		
Water Level:			1.653	294.303		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	294.304
Transducer Elevation Before	294.009
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	20-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: February 17, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.135	-
Water (°C):	0.0	-
Air Temp (°C):	0.0	-
RH (%):	57.2%	-
Precipitation (mm):	1135.94	1197.34
Battery (Main):	15.0	-
Datalogger Clock:	11:14	-
Laptop Clock:	11:16	-
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	11:15
End Time (MST):	11:43
Station Condition:	Good
Weather:	Calm and Clear, -3 C

**Datalogger / Station Notes:**

- Added antifreeze to precip. gauge.

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.004	295.028	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	1.167	296.032		294.865	294.865	Iron Rod beside station
Ice/PT:			1.700	294.332		
Water Level:			1.713	294.319		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.994	296.022		295.028	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			1.157	294.865	294.865	Iron Rod beside station
Ice/PT:			1.688	294.334		
Water Level:			1.704	294.318		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	294.319
Transducer Elevation Before	294.184
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	17-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	19-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	25-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: March 11, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.125	
Water (°C):	-0.1	
Air Temp (°C):	3.5	
RH (%):	59.3%	
Precipitation (mm):	1202.34	
Battery (Main):	14.8	
Datalogger Clock:	10:54	
Laptop Clock:	10:56	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	9631	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**Datalogger / Station Notes:**

- Checked precip. gauge - ok

<b>Measurement Details:</b>	
Start Time (MST):	11:50
End Time (MST):	12:10
Station Condition:	Good
Weather:	Clear, Light Breeze, +3

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.948	295.029	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	1.112	295.977		294.865	294.865	Iron Rod beside station
Ice/PT:			1.642	294.335		
Water Level:			1.657	294.320		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.939	295.968		295.029	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			1.103	294.865	294.865	Iron Rod beside station
Ice/PT:			1.630	294.338		
Water Level:			1.647	294.321		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	294.321
Transducer Elevation Before	294.196
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, TR	Trip Date:	11-Mar-12
<b>Data Entry Personnel:</b>	CJ	Date:	30-Mar-12
<b>Data Check Personnel:</b>	XP	Date:	24-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: March 28, 2012



Datalogger Details:	Before	After
Transducer Reading (m):	0.078	
Water (°C):	-0.1	
Air Temp (°C):	7.8	
RH (%):	28.6%	
Precipitation (mm):	1232.54	
Battery (Main):	14.7	
Datalogger Clock:	11:42	
Laptop Clock:	11:44	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**Datalogger / Station Notes:**

Measurement Details:	
Start Time (MST):	12:41
End Time (MST):	13:11
Station Condition:	Good
Weather:	Sunny, Slight breeze

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.080	295.029	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	1.244	296.109		294.865	294.865	Iron Rod beside station
Ice/PT:			1.731	294.378		
Water Level:			1.761	294.348		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.065	296.094		295.029	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			1.23	294.864	294.865	Iron Rod beside station
Ice/PT:			1.718	294.376		
Water Level:			1.748	294.346		
Other:						

Closing Error	0.001
WL Check	0.002

Average WL	294.347
Transducer Elevation Before	294.269
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	DW, BL	<b>Trip Date:</b>	28-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: May 15, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.495	0.486
Water (°C):	8.1	8.2
Air Temp (°C):	20.0	17
RH (%):	43.2%	33.5%
Precipitation (mm):	0.10	0.00
Battery (Main):	14.3	12.9
Datalogger Clock:	14:48	17:02
Laptop Clock:	14:50	17:04
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	3:47
End Time (MST):	6:40
Station Condition:	Good
Weather:	Windy, Cloudy

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.745	295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	0.916	295.781		294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.399	294.382		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.728	295.764		295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			0.899	294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.386	294.378		
Other:						

**Datalogger / Station Notes:**

- PLS is a bit noisy but there are no kinks in the vent tube.
- Sent new program.
- installed telemetry, network and service lights are on, RSSI: -91.
- For next trip, bring large hose clamps for antenna mast.

Closing Error	0.000
WL Check	0.004

Average WL	294.380
Transducer Elevation Before	293.885
Transducer Elevation After	293.894

**General Notes:**

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	15-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: June 15, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.400	
Water (°C):	15.6	
Air Temp (°C):	17.9	
RH (%):	52.1%	
Precipitation (mm):	8.40	
Battery (Main):	8.2	
Datalogger Clock:	12:27	
Laptop Clock:	12:28	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	9631	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	13:15
End Time (MST):	14:15
Station Condition:	Good
Weather:	partial cloud, breezy, 15°C

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.768	295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:	0.939	295.804		294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.491	294.313		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.753	295.789		295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:			0.924	294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.476	294.313		
Other:						

**Datalogger / Station Notes:**

- Installed missing signal isolator and proper serial cable, only serial cable available was long, may want to install shorter one in the future. RSSI: -94.
- Battery began to die around April 25, 2012.

Closing Error	0.000
WL Check	0.000

Average WL	294.313
Transducer Elevation Before	293.913
Transducer Elevation After	-

**General Notes:**

- Antifreeze is good.
- No flow in S35 ditch.

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	15-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	28-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	3-Jul-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: June 21, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.401	
Water (°C):	14.7	
Air Temp (°C):	17.9	
RH (%):	48.9%	
Precipitation (mm):	0.00	
Battery (Main):	12.5	
Datalogger Clock:	8:23	
Laptop Clock:	8:25	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	9631	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**Datalogger / Station Notes:**

- Checked logger voltage and battery status, replaced solar controller.

<b>Measurement Details:</b>	
Start Time (MST):	8:15
End Time (MST):	8:30
Station Condition:	good
Weather:	-

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:					294.865	Iron Rod beside station
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						
Bench Mark 3:					294.865	Iron Rod beside station
Ice/PT:						
Water Level:						
Other:						

Closing Error	
WL Check	

Average WL	
Transducer Elevation Before	
Transducer Elevation After	

**General Notes:**

<b>Field Personnel:</b>	SM	<b>Trip Date:</b>	21-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-Jul-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	4-Jul-12
<b>Entered Digitally in the Field:</b>	<input 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: August 13, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.267	
Water (°C):	16.1	
Air Temp (°C):	17.5	
RH (%):	76.3%	
Precipitation (mm):	64.99	
Battery (Main):	13.7	
Datalogger Clock:	16:17	
Laptop Clock:	17:17	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	16:10
End Time (MST):	16:35
Station Condition:	Good
Weather:	Overcast, Breezy

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.830	295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						-
Bench Mark 3:	1.001	295.866		294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.690	294.176		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.796	295.832		295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						-
Bench Mark 3:			0.967	294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.656	294.176		
Other:						

**Datalogger / Station Notes:**

- Antifreeze was emptied from precip gauge into a pail.
- The pail was left at the station, and should be picked up on the next visit.

Closing Error	0.000
WL Check	0.000

Average WL	294.176
Transducer Elevation Before	293.909
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	13-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-Oct-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Nov-12



# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: September 13, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.331	
Water (°C):	12.4	
Air Temp (°C):	17.9	
RH (%):	56.9%	
Precipitation (mm):	166.20	
Battery (Main):	14.2	
Datalogger Clock:	18:47	
Laptop Clock:	18:47	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	18:40
End Time (MST):	19:15
Station Condition:	Good
Weather:	22 C, Sunny

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.693	295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						-
Bench Mark 3:	0.864	295.729		294.865	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.504	294.225		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.747	295.783		295.036	295.029	3/4" Pipe 20 m W of station
Bench Mark 2:						-
Bench Mark 3:			0.919	294.864	294.865	Iron Rod beside station
Ice/PT:						
Water Level:			1.560	294.223		
Other:						

Closing Error	0.001
WL Check	0.002

Average WL	294.224
Transducer Elevation Before	293.893
Transducer Elevation After	-

**Datalogger / Station Notes:**

**General Notes:**

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	13-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: October 25, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.314	0.319
Water (°C):	4.3	4.3
Air Temp (°C):	-3.3	-3.2
RH (%):	91.2%	91.2
Precipitation (mm):	203.50	248.50
Battery (Main):	12.8	12.8
Datalogger Clock:	9:36	9:49
Laptop Clock:	9:35	9:48
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	9:30
End Time (MST):	10:10
Station Condition:	Good
Weather:	Light Snow, Windy, -3C

**Datalogger / Station Notes:**

-Added antifreeze, oil and ethyl alcohol to the precip gauge.

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.705	295.036	295.036	3/4" Pipe 20 m W of station
Bench Mark 2:			1.077	294.664	294.664	3/4" Pipe 10 m W of Station
Bench Mark 3:	0.876	295.741		294.865	294.865	Rod Beside Station
Ice/PT:						
Water Level:			1.522	294.219		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.727	295.763		295.036	295.036	3/4" Pipe 20 m W of station
Bench Mark 2:			1.099	294.664	294.664	3/4" Pipe 10 m W of Station
Bench Mark 3:			0.899	294.864	294.865	Rod Beside Station
Ice/PT:						
Water Level:			1.544	294.219		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	294.219
Transducer Elevation Before	293.905
Transducer Elevation After	293.900

**General Notes:**

<b>Field Personnel:</b>	DW, TR	Trip Date:	25-Oct-12
<b>Data Entry Personnel:</b>	DW	Date:	25-Oct-12
<b>Data Check Personnel:</b>	DW	Date:	1-Nov-12
<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 9, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.329	-
Water (°C):	0.3	-
Air Temp (°C):	-19.8	-
RH (%):	78.5%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.3	12.4
Datalogger Clock:	12:29	-
Laptop Clock:	12:31	-
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	9631	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**Datalogger / Station Notes:**

- Replaced battery.

<b>Measurement Details:</b>	
Start Time (MST):	14:28
End Time (MST):	15:05
Station Condition:	Low battery, Good.
Weather:	Overcast, Calm

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:		0.936		295.034	295.036	3/4" Pipe 20 m W of station
Bench Mark 2:			1.308	294.662	294.664	3/4" Pipe 10 m W of Station
Bench Mark 3:	1.105	295.97		294.865	294.865	Rod Beside Station
Ice/PT:			1.740	294.230		
Water Level:			1.693	294.277		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.924	295.958		295.034	295.036	3/4" Pipe 20 m W of station
Bench Mark 2:			1.296	294.662	294.664	3/4" Pipe 10 m W of Station
Bench Mark 3:			1.092	294.866	294.865	Rod Beside Station
Ice/PT:			1.730	294.228		
Water Level:			1.683	294.275		
Other:						

Closing Error	-0.001
WL Check	0.002

Average WL	294.276
Transducer Elevation Before	293.947
Transducer Elevation After	-

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	9-Dec-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	9-Dec-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	10-Dec-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: January 10, 2012



Datalogger Details:	Before	After
Transducer Reading (m):	1.14	
Water (°C):	4.0	
Air Temp (°C):	-13.8	
RH (%):	74.3%	
Precipitation (mm):	0.02	
Battery (Main):	13.4	
Datalogger Clock:	11:51	
Laptop Clock:	11:51	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	12:15
Station Condition:	good
Weather:	light snow, -13.8 C

**Datalogger / Station Notes:**  
 -installed signal isolator for telemetry

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.502	332.447	332.424	Rebar inside PVC
Bench Mark 2:						
Bench Mark 3:			2.349	331.600		
Ice/PT:						
Water Level:			2.363	331.586		
Other:	0.625	333.949		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.486	333.933		332.447	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:			2.333	331.600		
Water Level:			2.349	331.584		
Other:			0.609	333.324	333.324	rebar w/flagging by trail

Closing Error	0.000
WL Check	0.002

Average WL	331.585
Transducer Elevation	330.445

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	10-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: February 5, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.002	
Water (°C):	3.4	
Air Temp (°C):	-3.4	
RH (%):	75.6%	
Precipitation (mm):	-0.29	0.110
Battery (Main):	15.0	
Datalogger Clock:	10:23	
Laptop Clock:	10:25	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	10:10
End Time (MST):	11:10
Station Condition:	good, full ice cover on lake
Weather:	clear, breezy, -4 C

**Datalogger / Station Notes:**

-added antifreeze to precip. gauge

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.453	332.452	332.424	Rebar inside PVC
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.330	331.575		
Water Level:			2.362	331.543		
Other:	0.581	333.905		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.442	333.894		332.452	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:			2.328	331.566		
Water Level:			2.350	331.544		
Other:			0.568	333.326	333.324	rebar w/flagging by trail

Closing Error	-0.002
WL Check	0.001

Average WL	331.544
Transducer Elevation	330.542

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	5-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	16-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: March 8, 2012



Datalogger Details:	Before	After
Transducer Reading (m):	0.887	
Water (°C):	3.0	
Air Temp (°C):	-1.6	
RH (%):	46.9%	
Precipitation (mm):	0.00	
Battery (Main):	14.7	
Datalogger Clock:	13:46	
Laptop Clock:	13:48	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:15
Station Condition:	good
Weather:	clear, light breeze, -2 C

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.941	332.467	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:			1.865	331.543		
Water Level:			1.890	331.518		
Other:	0.084	333.408		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.935	333.402		332.467	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:			1.858	331.544		
Water Level:			1.883	331.519		
Other:			0.079	333.323	333.324	rebar w/flagging by trail

Closing Error	0.001
WL Check	0.001

Average WL	331.519
Transducer Elevation	330.632

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	16-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: March 26, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.946	
Water (°C):	2.9	
Air Temp (°C):	4.5	
RH (%):	54.1%	
Precipitation (mm):	0.00	
Battery (Main):	14.5	
Datalogger Clock:	12:31	
Laptop Clock:	12:33	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	13:30
End Time (MST):	14:07
Station Condition:	good
Weather:	clear, calm

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.515	332.466	332.424	Rebar inside PVC
Bench Mark 2:						
Bench Mark 3:			2.400	331.581		
Ice/PT:			2.468	331.513		
Water Level:						
Other:	0.657	333.981		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.505	333.971		332.466	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:			2.388	331.583		
Water Level:			2.453	331.518		
Other:			0.647	333.324	333.324	rebar w/flagging by trail

Closing Error	0.000
WL Check	0.005

Average WL	331.516
Transducer Elevation	330.570

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	26-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: May 12, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.926	0.931
Water (°C):	4.1	4.1
Air Temp (°C):	16.2	16.2
RH (%):	25.1%	27.5%
Precipitation (mm):	-0.27	0.00
Battery (Main):	14.4	14.3
Datalogger Clock:	10:28	-
Laptop Clock:	10:30	-
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	11:15
End Time (MST):	12:55
Station Condition:	good
Weather:	windy, light clouds, 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>						
Bench Mark 1:						
Bench Mark 2:			1.216	332.473	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:						
Water Level:			2.140	331.549		
Other:	0.365	333.689		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.203	333.676		332.473	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:						
Water Level:			2.123	331.553		
Other:			0.352	333.324	333.324	rebar w/flagging by trail

Closing Error	0.000
WL Check	0.004

Average WL	331.551
Transducer Elevation	330.625

**General Notes:**

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	12-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	



# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: June 16, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.899	
Water (°C):	9.3	
Air Temp (°C):	18.5	
RH (%):	49.2%	
Precipitation (mm):	0.00	
Battery (Main):	14.2	
Datalogger Clock:	14:35	
Laptop Clock:	14:37	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	15:25
End Time (MST):	16:00
Station Condition:	good
Weather:	cloudy, 18

**Datalogger / Station Notes:**  
 -Geonor has one 15 min spike of 1.25 mm, all other recordings are < 0.5 mm. Wiring and sensor look good, lots of antifreeze, ~half full.

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			1.202	332.477	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:						
Water Level:			2.155	331.524		
Other:	0.355	333.679		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.185	333.662		332.477	332.424	Rebar inside PVC
Bench Mark 3:						
Ice/PT:						
Water Level:			2.139	331.523		
Other:			0.339	333.323	333.324	rebar w/flagging by trail

Closing Error	0.001
WL Check	0.001

Average WL	331.524
Transducer Elevation	330.625

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	16-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	26-Jun-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	6-Jul-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: August 12, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.040	
Water (°C):	13.6	
Air Temp (°C):	19.3	
RH (%):	48.0%	
Precipitation (mm):	0.00	
Battery (Main):	13.8	
Datalogger Clock:	11:00	
Laptop Clock:	11:00	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	12:00
End Time (MST):	13:00
Station Condition:	good
Weather:	calm, clear, 22
Entered Digitally:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			1.237	332.477	332.424	Rebar inside PVC
Bench Mark 3:			1.264	332.450	332.450	3/4" Pipe 8m E of BM1 beside trail
Ice/PT:						
Water Level:			2.041	331.673		
Other:	0.390	333.714		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	1.198	333.675		332.477	332.424	Rebar inside PVC
Bench Mark 3:			1.224	332.451	332.450	3/4" Pipe 8m E of BM1 beside trail
Ice/PT:						
Water Level:			2.002	331.673		
Other:			0.349	333.326	333.324	rebar w/flagging by trail

Closing Error	-0.001
WL Check	0.000

Average WL	331.673
Transducer Elevation	330.633

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	12-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: September 16, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.39	
Water (°C):	13.1	
Air Temp (°C):	13.1	
RH (%):	49.6%	
Precipitation (mm):	0.00	
Battery (Main):	13.9	
Datalogger Clock:	5:10	
Laptop Clock:	5:12	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	6:00
End Time (MST):	7:00
Station Condition:	water level is high
Weather:	sunny, 12

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.463	332.424	332.424	Pipe w/flagging south by trail
Bench Mark 2:			0.630	333.257	333.257	Pipe with coupling by rebar
Bench Mark 3:			1.057	332.830	332.830	Pipe w/flagging north of trail
Ice/PT:						
Water Level:			1.812	332.075		
Other:	0.563	333.887		333.324	333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:	1.407	333.831		332.424	332.424	Pipe w/flagging south by trail
Bench Mark 2:			0.574	333.257	333.257	Pipe with coupling by rebar
Bench Mark 3:			1.003	332.828	332.830	Pipe w/flagging north of trail
Ice/PT:						
Water Level:			1.761	332.070		
Other:			0.508	333.323	333.324	rebar w/flagging by trail

Closing Error	0.002
WL Check	0.005

Average WL	332.073
Transducer Elevation	330.683

**General Notes:**

- installed 2 new 3/4" pipe BMs

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	16-Sep-12
<b>Data Entry Personnel:</b>	DW, TR	<b>Date:</b>	16-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L2 Kears Lake  
 UTM Location: 484839 E, 6351065 N

Site Visit Date: October 23, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.38	
Water (°C):	9.3	
Air Temp (°C):	0.0	
RH (%):	90.7%	
Precipitation (mm):	0.00	
Battery (Main):	13.6 8	
Datalogger Clock:	4:31	
Laptop Clock:	4:32	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	17:25
End Time (MST):	18:30
Station Condition:	GOOD
Weather:	Overcast, OC

**Datalogger / Station Notes:**  
 -Added ethyl alcohol, oil and antifreeze to precip gauge  
 -vent tube replaced

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.090	332.426	332.424	Pipe w/flagging south by trail
Bench Mark 2:			0.258	333.258	333.257	Pipe with coupling by rebar
Bench Mark 3:	0.686	333.516		332.830	332.830	Pipe w/flagging north of trail
Ice/PT:						
Water Level:			1.476	332.040		
Other:					333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:	1.078	333.504		332.426	332.424	Pipe w/flagging south by trail
Bench Mark 2:			0.247	333.257	333.257	Pipe with coupling by rebar
Bench Mark 3:			0.675	332.829	332.830	Pipe w/flagging north of trail
Ice/PT:						
Water Level:			1.467	332.037		
Other:					333.324	rebar w/flagging by trail

Closing Error	0.001
WL Check	0.003

Average WL	332.039
Transducer Elevation	330.659

**General Notes:**

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	23-Oct-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	23-Oct-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Nov-12
<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: December 11, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.291	
Water (°C):	5.0	
Air Temp (°C):	-17.4	
RH (%):	84.4%	
Precipitation (mm):	0.12	0.000
Battery (Main):	14.5	
Datalogger Clock:	11:56	
Laptop Clock:	11:56	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	11:30
End Time (MST):	13:05
Station Condition:	good
Weather:	snowing, -15

**Datalogger / Station Notes:**  
 -emptied Geonor then added antifreeze and jack oil

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.194	333.618		332.424	332.424	Pipe w/flagging south by trail
Bench Mark 2:			0.363	333.255	333.257	Pipe with coupling by rebar
Bench Mark 3:			0.790	332.828	332.830	Pipe w/flagging north of trail
Ice/PT:			1.668	331.950		
Water Level:			1.678	331.940		
Other:					333.324	rebar w/flagging by trail
<b>Setup #2</b>						
Bench Mark 1:			1.185	332.423	332.424	Pipe w/flagging south by trail
Bench Mark 2:	0.353	333.608		333.255	333.257	Pipe with coupling by rebar
Bench Mark 3:			0.781	332.827	332.830	Pipe w/flagging north of trail
Ice/PT:			1.658	331.950		
Water Level:			1.669	331.939		
Other:					333.324	rebar w/flagging by trail

Closing Error	0.001
WL Check	0.001

Average WL	331.940
Transducer Elevation	330.649

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	11-Dec-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	17-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	19-Dec-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

**General Notes:**  
 -Lock is frozen on PT enclosure, use lock deicer on next visit

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: January 20, 2012



Datalogger Details:	Before	After
Transducer Reading (m):	1.150	
Water (°C):	3.6	
Battery (Main):	13.9	
Datalogger Clock:	13:51	
Laptop Clock:	13:51	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:15
Station Condition:	good
Weather:	clear, calm, -17 C

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.520	235.828	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.641	233.707		
Water Level:			2.641	233.707		
Other:	1.842	236.348		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.505	236.333		235.828	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.626	233.707		
Water Level:			2.626	233.707		
Other:			1.826	234.507	234.506	Rebar in PVC Pipe

Closing Error	-0.001
WL Check	0.000

Average WL	233.707
Transducer Elevation	232.557

**General Notes:**

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	20-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	20-Feb-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: February 11, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.166	
Water (°C):	3.1	
Battery (Main):	14.7	
Datalogger Clock:	-	
Laptop Clock:	-	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	13:20
End Time (MST):	13:50
Station Condition:	frozen
Weather:	windy, -10 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>						
Bench Mark 1:				235.834	235.830	
Bench Mark 2:			0.182	235.834	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.302	233.714		
Water Level:			2.308	233.708		
Other:	1.510	236.016		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:				235.834	235.830	
Bench Mark 2:	0.169	236.003		235.834	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.291	233.712		
Water Level:			2.299	233.704		
Other:			1.500	234.503	234.506	Rebar in PVC Pipe

Closing Error	0.003
WL Check	0.004

Average WL	233.706
Transducer Elevation	232.540

**General Notes:**

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	11-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	20-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: February 28, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.140	
Water (°C):	2.9	
Battery (Main):	14.7	
Datalogger Clock:	10:34	
Laptop Clock:	10:34	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	18204	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	10:35
End Time (MST):	10:55
Station Condition:	good
Weather:	overcast, calm, -10 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>						
Bench Mark 1:						
Bench Mark 2:			0.572	235.830	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.690	233.712		
Water Level:			2.690	233.712		
Other:	1.896	236.402		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.562	236.392		235.830	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.680	233.712		
Water Level:			2.680	233.712		
Other:			1.886	234.506	234.506	Rebar in PVC Pipe

Closing Error	0.000
WL Check	0.000

Average WL	233.712
Transducer Elevation	232.572

**General Notes:**

-Ice and water levels are the same

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	28-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	



# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: March 29, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.189	
Water (°C):	2.5	
Battery (Main):	14.3	
Datalogger Clock:	14:49	
Laptop Clock:	14:49	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	15:40
End Time (MST):	16:10
Station Condition:	good
Weather:	cloudy, 6 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>						
Bench Mark 1:				235.835	235.830	
Bench Mark 2:			0.091	235.835	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.141	233.785		
Water Level:			2.159	233.767		
Other:	1.420	235.926		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:				235.835	235.830	
Bench Mark 2:	0.085	235.920		235.835	235.830	Bolt in tree
Bench Mark 3:						
Ice/PT:			2.133	233.787		
Water Level:			2.150	233.770		
Other:			1.413	234.507	234.506	Rebar in PVC Pipe

Closing Error	-0.001
WL Check	0.003

Average WL	233.769
Transducer Elevation	232.580

**General Notes:**

-ice is slushy and soft on top

<b>Field Personnel:</b>	DW, TR	Trip Date:	29-Mar-12
<b>Data Entry Personnel:</b>	CJ	Date:	11-Apr-12
<b>Data Check Personnel:</b>	XP	Date:	26-Apr-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: May 19, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.183	
Water (°C):	8.0	
Battery (Main):	13.9	
Datalogger Clock:	17:02	
Laptop Clock:	17:02	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	18204	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	17:00
End Time (MST):	17:15
Station Condition:	good
Weather:	rain, 10 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>						
Bench Mark 1:						
Bench Mark 2:			0.473	235.831	235.830	Bolt in tree
Bench Mark 3:			0.403	235.901	235.901	Nail in root
Ice/PT:						
Water Level:			2.513	233.791		
Other:	1.798	236.304		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.462	236.293		235.831	235.830	Bolt in tree
Bench Mark 3:			0.390	235.903	235.901	Nail in root
Ice/PT:						
Water Level:			2.502	233.791		
Other:			1.786	234.507	234.506	Rebar in PVC Pipe

Closing Error	-0.001
WL Check	0.000

Average WL	233.791
Transducer Elevation	232.608

**General Notes:**

<b>Field Personnel:</b>	SM, TR, GB	<b>Trip Date:</b>	19-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: June 18, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.220	1.220
Water (°C):	11.4	11.4
Battery (Main):	13.9	13.2
Datalogger Clock:	15:47	0:69
Laptop Clock:	15:47	0:69
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	18204	-
PT# (if Δ):	-	-
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	15:45
End Time (MST):	16:45
Station Condition:	good
Weather:	overcast, calm, 17 C

**Datalogger / Station Notes:**  
 telemetry installed: RSSI: -91

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.418	235.832	235.830	Bolt in tree
Bench Mark 3:			1.630	234.620	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.417	233.833		
Other:	1.744	236.250		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.385	236.217		235.832	235.830	Bolt in tree
Bench Mark 3:			1.598	234.619	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.384	233.833		
Other:			1.710	234.507	234.506	Rebar in PVC Pipe

Closing Error	0.001
WL Check	0.000

Average WL	233.833
Transducer Elevation	232.613

**General Notes:**  
 -length of pipe near bolt in tree needs another section of pipe attached to be driven in ground as a benchmark.  
 -installed two pipe BMs.

<b>Field Personnel:</b>	SM, TR, CJ, GE	<b>Trip Date:</b>	18-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-Jun-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: August 3, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.279	
Water (°C):	15.2	
Air Temp (°C):	-	
RH (%):	-	
Precipitation (mm):	-	
Battery (Main):	13.5	
Datalogger Clock:	16:48	
Laptop Clock:	16:48	
Dessicant Replaced:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Logger# (if Δ):	18024	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	16:45
End Time (MST):	17:05
Station Condition:	good
Weather:	clear, calm, 20
Entered Digitally:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.830	234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.667	235.537	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.585	234.619	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.297	233.907		
Other:	1.698	236.204		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:	1.818	236.192		234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.656	235.536	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.575	234.617	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.287	233.905		
Other:			1.682	234.510	234.506	Rebar in PVC Pipe

Closing Error	0.002
WL Check	0.002

Average WL	233.906
Transducer Elevation	232.627

**General Notes:**

-installed 3rd BM

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	3-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: September 15, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.301	
Water (°C):	13.9	
Air Temp (°C):	-	
RH (%):	-	
Precipitation (mm):	-	
Battery (Main):	13.3	
Datalogger Clock:	11:16	
Laptop Clock:	11:16	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	18204	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	17:40
End Time (MST):	18:30
Station Condition:	good
Weather:	clear, breezy, 11

**Datalogger / Station Notes:**

-on next visit, bring 2" Pipe and coupler to lengthen mast and raise solar panel

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.827	234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.666	235.535	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.583	234.618	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.278	233.923		
Other:	1.695	236.201		234.506	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:	1.811	236.185		234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.647	235.538	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.566	234.619	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.261	233.924		
Other:			1.678	234.507	234.506	Rebar in PVC Pipe

Closing Error	-0.001
WL Check	0.001

Average WL	233.924
Transducer Elevation	232.623

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	15-Sep-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	15-Sep-12
<b>Data Check Personnel:</b>	C.J	<b>Date:</b>	9-Oct-12
<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 16, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.303	
Water (°C):	9.9	
Air Temp (°C):	-	
RH (%):	-	
Precipitation (mm):	-	
Battery (Main):	12.8	
Datalogger Clock:	15:12	
Laptop Clock:	15:12	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	18204	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	15:10
End Time (MST):	15:25
Station Condition:	Good
Weather:	Rain, 7C, 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>						
Bench Mark 1:	1.876	236.250		234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.713	235.537	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.631	234.619	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.329	233.921		
Other:			1.743	234.507	234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:			1.827	234.373	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:	0.663	236.200		235.537	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.584	234.616	234.619	3/4" Pipe 30m S of data logger
Ice/PT:						
Water Level:			2.283	233.917		
Other:			1.694	234.506	234.506	Rebar in PVC Pipe

Closing Error	0.001
WL Check	0.004

Average WL	233.919
Transducer Elevation	232.616

**General Notes:**

<b>Field Personnel:</b>	SM, TR, ACM	<b>Trip Date:</b>	16-Oct-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	21-Oct-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	26-Oct-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake  
 UTM Location: 463305 E, 6342967 N

Site Visit Date: December 14, 2012



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.092	
Water (°C):	4.3	
Air Temp (°C):	-	
RH (%):	-	
Precipitation (mm):	-	
Battery (Main):	12.8	
Datalogger Clock:	12:41	
Laptop Clock:	12:41	
Dessicant Replaced:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Checked	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

<b>Measurement Details:</b>	
Start Time (MST):	12:40
End Time (MST):	13:10
Station Condition:	Good
Weather:	Partial, calm, -10

**Datalogger / Station Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.580	235.954		234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:			0.417	235.537	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.333	234.621	234.619	3/4" Pipe 30m S of data logger
Ice/PT:			2.264	233.690		
Water Level:			2.281	233.673		
Other:					234.506	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:			1.538	234.374	234.374	3/4" Pipe 35m SE of data logger
Bench Mark 2:	0.375	235.912		235.537	235.537	3/4" Pipe 35m S of data logger
Bench Mark 3:			1.992	233.920	234.619	3/4" Pipe 30m S of data logger
Ice/PT:			2.221	233.691		
Water Level:			2.241	233.671		
Other:					234.506	Rebar in PVC Pipe

Closing Error	0.000
WL Check	0.002

Average WL	233.672
Transducer Elevation	232.580

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	14-Dec-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	14-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	2-Jan-13
<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 (Flow): 402900 E, 6370580 N

Site Visit Date:

May 18, 2012



## 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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
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27																
28																
29																
30																
LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	15:30
End Time (MST):	17:25
Equipment:	-
Method:	-
Lake/River Condition:	Good
Quality/Error (see reverse):	-
Weather:	cloudy, calm, 10 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:	-

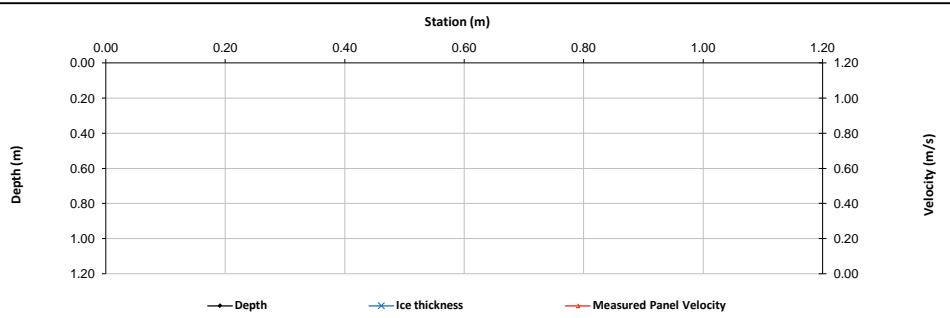
Logger Details:	Before	After
Transducer Reading (m):	1.166	
Water (°C):	6.8	
Battery (Main):	12.0	
Datalogger Clock:	15:58	
Laptop Clock:	15:58	
Dessicant Replaced:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Logger# (if Δ):	20962	
PT# (if Δ):	262389	
Vent Tube Checked:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

**Datalogger / Station Notes:**

-PLS installed at depth of 0.81 m. PLS needs calibration

**General Notes:**

-GOES 227 will work great  
 -One benchmark hit a rock layer and was not recoverable. Station needs one length of 3/4" pipe to add a third benchmark.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.038	101.038		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.986	100.052	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:					100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			3.19	97.848		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.026	99.999	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:	0.973	101.025		100.052	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:					100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			3.177	97.848		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	97.848
Transducer Elevation	96.682

<b>Field Personnel:</b>	SM, CJ	Trip Date:	18-May-12
Data Entry Personnel:	CJ	Date:	24-Oct-12
Data Check Personnel:	DW	Date:	27-Nov-12
Entered Digitally in the Field:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

June 14, 2012

UTM Location (Flow): 402900 E, 6370580 N



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																
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30																
LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	10:50
End Time (MST):	11:45
Equipment:	-
Method:	-
Lake/River Condition:	good
Quality/Error (see reverse):	-
Weather:	light rain, 11 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:	-

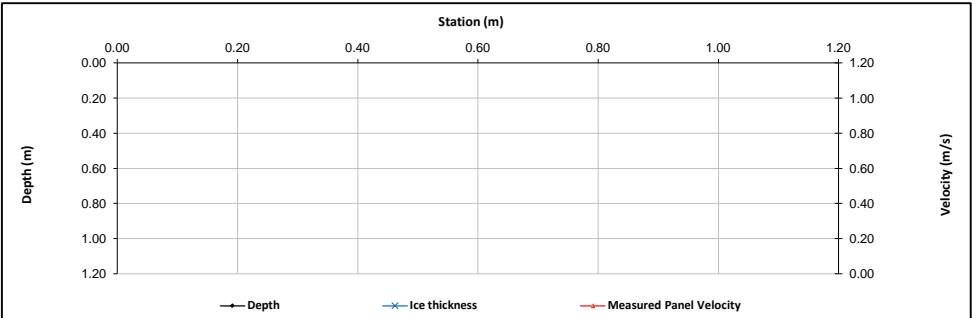
Logger Details:		
	Before	After
Transducer Reading (m):	1.182	1.324
Water (°C):	11.9	12.6
Battery (Main):	13.9	14.0
Datalogger Clock:	10:53	11:26
Laptop Clock:	10:53	11:26
Dessicant Replaced:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Logger# (if Δ):	20962	-
PT# (if Δ):	-	-
Vent Tube Checked:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

**Datalogger / Station Notes:**

-45m PLS installed to depth of 1.3 m

**General Notes:**

-BM3 installed- 3/4" pipe 2 m E of logger  
-need to extend PLS anchor cable



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.783	100.783		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.727	100.056	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.654	100.129	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			2.898	97.885		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.772	100.001	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.717	100.056	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:	0.644	100.773		100.129	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			2.886	97.887		
Other:						

Closing Error	-0.001	Average WL	97.886
WL Check	0.002	Transducer Elevation	96.704

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	14-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	24-Oct-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	11-Dec-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" 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:

August 16, 2012

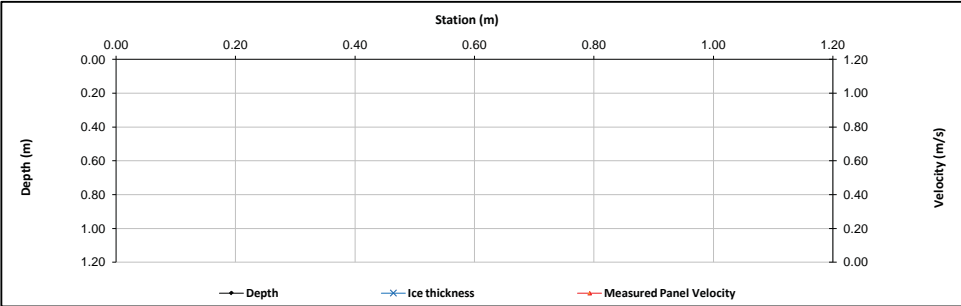


Measured Data							Calculated Data									
Bank/ Mnt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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																
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LB																

No Flow Measurement Conducted

Total Flow -

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	16:45
Equipment:	-
Method:	-
Lake/River Condition:	Good
Quality/Error (see reverse):	-
Weather:	Partial Cloud, Breezy, 25



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):	1.368	
Water (°C):	18.4	
Battery (Main):	14.0	
Datalogger Clock:	15:02	
Laptop Clock:	15:02	
Dessicant Replaced:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Logger# (if Δ):	20962	
PT# (if Δ):	262389	
Vent Tube Checked:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Datalogger / Station Notes:	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.823	100.823		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.768	100.055	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.696	100.127	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			2.832	97.991		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.814	100.001	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:	0.760	100.815		100.055	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.687	100.128	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			2.824	97.991		
Other:						

Closing Error	-0.001	Average WL	97.991
WL Check	0.000	Transducer Elevation	96.623

**General Notes:**

-longer PT anchor cable installed

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	16-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

UTM Location (Flow):

Site Visit Date:

August 23, 2012



## Flow Measurement:

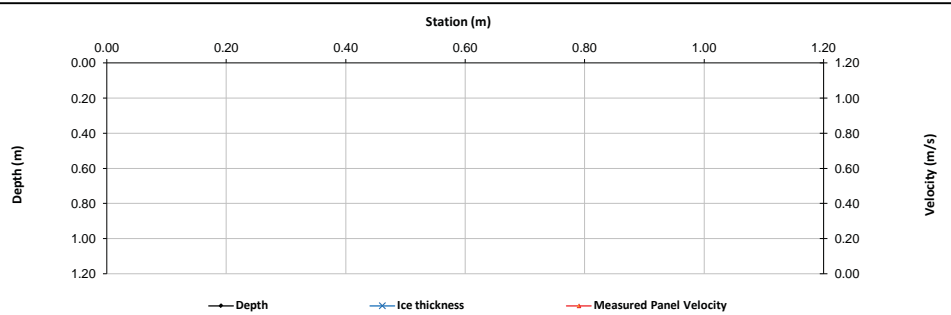
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
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11																
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25																
26																
27																
28																
29																
30																
LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	14:00
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	1.358	1.357
Water (°C):	17.8	17.9
Battery (Main):	13.8	14.0
Datalogger Clock:	11:41	12:36
Laptop Clock:	11:40	12:36
Dessicant:	good	-
Logger# (if Δ):	20962	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
-installed GOES antenna on 2' mast	
-antenna: 2a67025	
-gps: 317110680	
-tx sn: 45734	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:					100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:					100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:					100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:					100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:						
Other:						

Closing Error	-
WL Check	-

Average WL	-
Transducer Elevation	-

General Notes:	

<b>Field Personnel:</b>	XP, HH	Trip Date:	23-Aug-12
Data Entry Personnel:	CJ	Date:	9-Oct-12
Data Check Personnel:	DW	Date:	11-Dec-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):

Site Visit Date:

September 20, 2012



## 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	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	4.50	0.50	0.05	0.005	0.005	0.03	0.000	0%
1	5.00	0.20		0.019			1.0	4.50	5.13	0.63	0.20	0.019	0.019	0.13	0.002	1%
2	5.25	0.24		-0.003			1.0	5.13	5.38	0.25	0.24	-0.003	-0.003	0.06	0.000	0%
3	5.50	0.26		-0.008			1.0	5.38	5.63	0.25	0.26	-0.008	-0.008	0.07	-0.001	0%
4	5.75	0.31		0.111			1.0	5.63	5.88	0.25	0.31	0.111	0.111	0.08	0.009	2%
5	6.00	0.38		0.200			1.0	5.88	6.13	0.25	0.38	0.200	0.200	0.10	0.019	5%
6	6.25	0.40		0.226			1.0	6.13	6.38	0.25	0.40	0.226	0.226	0.10	0.023	5%
7	6.50	0.43		0.217			1.0	6.38	6.63	0.25	0.43	0.217	0.217	0.11	0.023	6%
8	6.75	0.46		0.152			1.0	6.63	6.88	0.25	0.46	0.152	0.152	0.12	0.017	4%
9	7.00	0.44		0.206			1.0	6.88	7.13	0.25	0.44	0.206	0.206	0.11	0.023	5%
10	7.25	0.47		0.226			1.0	7.13	7.38	0.25	0.47	0.226	0.226	0.12	0.027	6%
11	7.50	0.47		0.232			1.0	7.38	7.63	0.25	0.47	0.232	0.232	0.12	0.027	7%
12	7.75	0.47		0.218			1.0	7.63	7.88	0.25	0.47	0.218	0.218	0.12	0.026	6%
13	8.00	0.46		0.195			1.0	7.88	8.13	0.25	0.46	0.195	0.195	0.12	0.022	5%
14	8.25	0.44		0.196			1.0	8.13	8.38	0.25	0.44	0.196	0.196	0.11	0.022	5%
15	8.50	0.41		0.231			1.0	8.38	8.63	0.25	0.41	0.231	0.231	0.10	0.024	6%
16	8.75	0.40		0.200			1.0	8.63	8.88	0.25	0.40	0.200	0.200	0.10	0.020	5%
17	9.00	0.38		0.175			1.0	8.88	9.13	0.25	0.38	0.175	0.175	0.10	0.017	4%
18	9.25	0.38		0.220			1.0	9.13	9.38	0.25	0.38	0.220	0.220	0.10	0.021	5%
19	9.50	0.36		0.194			1.0	9.38	9.63	0.25	0.36	0.194	0.194	0.09	0.017	4%
20	9.75	0.36		0.181			1.0	9.63	9.88	0.25	0.36	0.181	0.181	0.09	0.016	4%
21	10.00	0.35		0.225			1.0	9.88	10.13	0.25	0.35	0.225	0.225	0.09	0.020	5%
22	10.25	0.32		0.186			1.0	10.13	10.38	0.25	0.32	0.186	0.186	0.08	0.015	4%
23	10.50	0.30		0.160			1.0	10.38	10.63	0.25	0.30	0.160	0.160	0.08	0.012	3%
24	10.75	0.28		0.099			1.0	10.63	10.88	0.25	0.28	0.099	0.099	0.07	0.007	2%
25	11.00	0.24		0.101			1.0	10.88	11.13	0.25	0.24	0.101	0.101	0.06	0.006	1%
26	11.25	0.22		0.055			1.0	11.13	11.33	0.20	0.22	0.055	0.055	0.04	0.002	1%
LB	11.40	0.00	0.00	0.00	0.00	0.00	1.0	11.33	11.40	0.08	0.06	0.014	0.014	0.00	0.000	0%

**Total Flow 0.416**

### Measurement Details:

Start Time (MST):	9:45
End Time (MST):	11:10
Equipment:	ADV
Method:	Wading
River Condition:	Open, good
Quality/Error (see reverse):	Excellent
Weather:	Sunny, windy

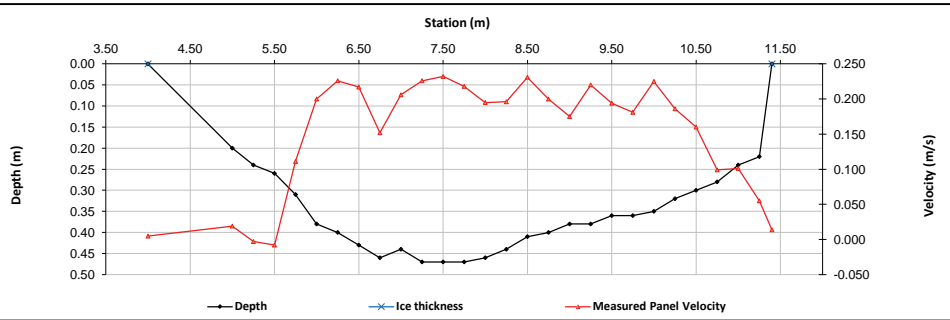
### Flow characteristics:

Total Flow:	0.416	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.45	(m <sup>2</sup> )
Wetted Width:	7.40	(m)
Hydraulic Depth:	0.331	(m)
Mean Velocity:	0.170	(m/s)
Froude Number:	0.094	

### Logger Details:

	Before	After
Transducer Reading (m):	1.265	1.261
Water (°C):	11.8	11.3
Battery (Main):	12.9	12.8
Datalogger Clock:	9:51	10:05
Laptop Clock:	9:50	10:05
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	298676	-

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:	0.929	100.929		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.875	100.054	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.802	100.127	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			3.025	97.904		
Other:						
Setup #2						
Bench Mark 1:			0.869	100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:	0.815	100.869		100.054	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.743	100.126	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			2.968	97.901		
Other:						

Closing Error	0.000	Average WL	97.903
WL Check	0.003	Transducer Elevation	96.638

### General Notes:

Field Personnel:	SG, TR	Trip Date:	20-Sep-12
Data Entry Personnel:	CJ	Date:	9-Oct-12
Data Check Personnel:	DW	Date:	27-Nov-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

Site Visit Date:

November 5, 2012

UTM Location (Flow):



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
LB	2.40	0.00	0.00	0.000	0.000	0.000	1.0	2.40	2.50	0.10	0.04	0.007	0.007	0.00	0.000	0%
1	2.60	0.17		0.026			1.0	2.50	2.75	0.25	0.17	0.026	0.026	0.04	0.001	0%
2	2.90	0.20		0.090			1.0	2.75	3.05	0.30	0.20	0.090	0.090	0.06	0.005	2%
3	3.20	0.26		0.111			1.0	3.05	3.35	0.30	0.26	0.111	0.111	0.08	0.009	3%
4	3.50	0.30		0.142			1.0	3.35	3.65	0.30	0.30	0.142	0.142	0.09	0.013	4%
5	3.80	0.31		0.133			1.0	3.65	3.95	0.30	0.31	0.133	0.133	0.09	0.012	4%
6	4.10	0.35		0.149			1.0	3.95	4.25	0.30	0.35	0.149	0.149	0.11	0.016	5%
7	4.40	0.37		0.121			1.0	4.25	4.55	0.30	0.37	0.121	0.121	0.11	0.013	4%
8	4.70	0.35		0.137			1.0	4.55	4.85	0.30	0.35	0.137	0.137	0.11	0.014	5%
9	5.00	0.34		0.158			1.0	4.85	5.15	0.30	0.34	0.158	0.158	0.10	0.016	5%
10	5.30	0.34		0.179			1.0	5.15	5.45	0.30	0.34	0.179	0.179	0.10	0.018	6%
11	5.60	0.38		0.145			1.0	5.45	5.75	0.30	0.38	0.145	0.145	0.11	0.017	5%
12	5.90	0.38		0.142			1.0	5.75	6.05	0.30	0.38	0.142	0.142	0.11	0.016	5%
13	6.20	0.39		0.193			1.0	6.05	6.35	0.30	0.39	0.193	0.193	0.12	0.023	7%
14	6.50	0.38		0.183			1.0	6.35	6.65	0.30	0.38	0.183	0.183	0.11	0.021	7%
15	6.80	0.36		0.241			1.0	6.65	6.95	0.30	0.36	0.241	0.241	0.11	0.026	9%
16	7.10	0.34		0.157			1.0	6.95	7.25	0.30	0.34	0.157	0.157	0.10	0.016	5%
17	7.40	0.35		0.209			1.0	7.25	7.55	0.30	0.35	0.209	0.209	0.11	0.022	7%
18	7.70	0.33		0.146			1.0	7.55	7.85	0.30	0.33	0.146	0.146	0.10	0.014	5%
19	8.00	0.28		0.146			1.0	7.85	8.15	0.30	0.28	0.146	0.146	0.08	0.012	4%
20	8.30	0.26		0.137			1.0	8.15	8.45	0.30	0.26	0.137	0.137	0.08	0.011	4%
21	8.60	0.23		0.097			1.0	8.45	8.80	0.35	0.23	0.097	0.097	0.08	0.008	3%
RB	9.00	0.00	0.00	0.00	0.00	0.00	1.0	8.80	9.00	0.20	0.06	0.024	0.024	0.01	0.000	0%
<b>Total Flow</b>														<b>0.304</b>		

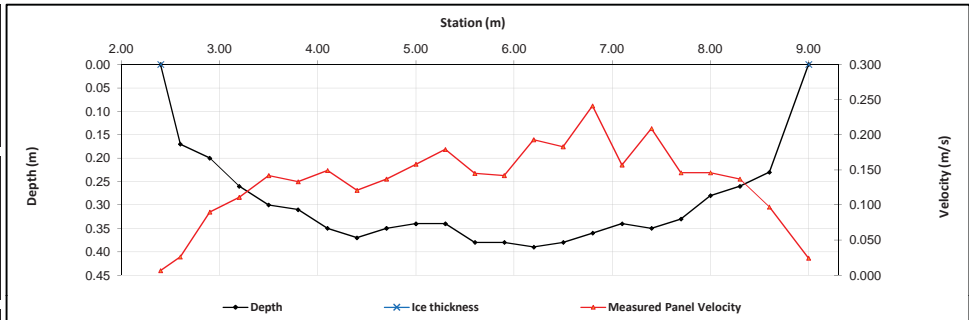
Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	9:50
Equipment:	ADV
Method:	Wading
River Condition:	No ice cover
Quality/Error (see reverse):	excellent
Weather:	Overcast, windy, 5C

Flow characteristics:	
Total Flow:	0.304 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	2.02 (m <sup>2</sup> )
Wetted Width:	6.60 (m)
Hydraulic Depth:	0.306 (m)
Mean Velocity:	0.151 (m/s)
Froude Number:	0.087

Logger Details:		
	Before	After
Transducer Reading (m):	1.176	
Water (°C):	0.6	
Battery (Main):	12.6	
Datalogger Clock:	8:59	
Laptop Clock:	8:58	
Dessicant:	replaced	
Logger# (if Δ):	20962	
PT# (if Δ):	-	

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>						
Bench Mark 1:	0.824	100.824		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.767	100.057	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.695	100.129	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			3.012	97.812		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.813	100.001	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.758	100.056	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:	0.685	100.814		100.129	100.127	3/4" Pipe 2m SE of logger
Ice/PT:						
Water Level:			3.003	97.811		
Other:						

Closing Error	-0.001	Average WL	97.812
WL Check	0.001	Transducer Elevation	96.636

<b>Field Personnel:</b>	SM, TR	Trip Date:	5-Nov-12
<b>Data Entry Personnel:</b>	SM	Date:	5-Nov-12
<b>Data Check Personnel:</b>	DW	Date:	27-Nov-12
<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 (Flow):

Site Visit Date:

December 5, 2012



## 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	2.90	0.00	0.00	0.000	0.000	0.000	1.0	2.90	3.20	0.30	0.05	-0.001	-0.001	0.02	0.000	0%
1	3.50	0.20		-0.002			1.0	3.20	3.60	0.40	0.20	-0.002	-0.002	0.08	0.000	0%
2	3.70	0.10		0.378			1.0	3.60	3.80	0.20	0.10	0.378	0.378	0.02	0.008	3%
3	3.90	0.10		0.558			1.0	3.80	4.00	0.20	0.10	0.558	0.558	0.02	0.011	4%
4	4.10	0.08		0.418			1.0	4.00	4.15	0.15	0.08	0.418	0.418	0.01	0.005	2%
5	4.20	0.10		0.464			1.0	4.15	4.30	0.15	0.10	0.464	0.464	0.02	0.007	2%
6	4.40	0.30		0.509			1.0	4.30	4.50	0.20	0.30	0.509	0.509	0.06	0.031	10%
7	4.60	0.27		0.265			1.0	4.50	4.75	0.25	0.27	0.265	0.265	0.07	0.018	6%
8	4.90	0.22		0.064			1.0	4.75	5.00	0.25	0.22	0.064	0.064	0.06	0.004	1%
9	5.10	0.22		0.427			1.0	5.00	5.30	0.30	0.22	0.427	0.427	0.07	0.028	9%
10	5.50	0.19		0.523			1.0	5.30	5.60	0.30	0.19	0.523	0.523	0.06	0.030	10%
11	5.70	0.15		0.764			1.0	5.60	5.85	0.25	0.15	0.764	0.764	0.04	0.029	10%
12	6.00	0.18		0.702			1.0	5.85	6.05	0.20	0.18	0.702	0.702	0.04	0.025	9%
13	6.10	0.10		0.488			1.0	6.05	6.25	0.20	0.10	0.488	0.488	0.02	0.010	3%
14	6.40	0.18		0.506			1.0	6.25	6.50	0.25	0.18	0.506	0.506	0.05	0.023	8%
15	6.60	0.12		-0.001			1.0	6.50	6.80	0.30	0.12	-0.001	-0.001	0.04	0.000	0%
16	7.00	0.19		0.020			1.0	6.80	7.15	0.35	0.19	0.020	0.020	0.07	0.001	0%
17	7.30	0.20		0.000			1.0	7.15	7.50	0.35	0.20	0.000	0.000	0.07	0.000	0%
18	7.70	0.08		0.404			1.0	7.50	7.95	0.45	0.08	0.404	0.404	0.04	0.015	5%
19	8.20	0.20		0.284			1.0	7.95	8.45	0.50	0.20	0.284	0.284	0.10	0.028	10%
20	8.70	0.12		0.424			1.0	8.45	8.95	0.50	0.12	0.424	0.424	0.06	0.025	9%
LB	9.20	0.00	0.00	0.00	0.00	0.00	1.0	8.95	9.20	0.25	0.03	0.106	0.106	0.01	0.001	0%
<b>Total Flow</b>														<b>0.297</b>		

## Measurement Details:

Start Time (MST):	10:00
End Time (MST):	11:47
Equipment:	ADV
Method:	Wading
River Condition:	Ice is above WL
Quality/Error (see reverse):	Good
Weather:	LIGHT snow

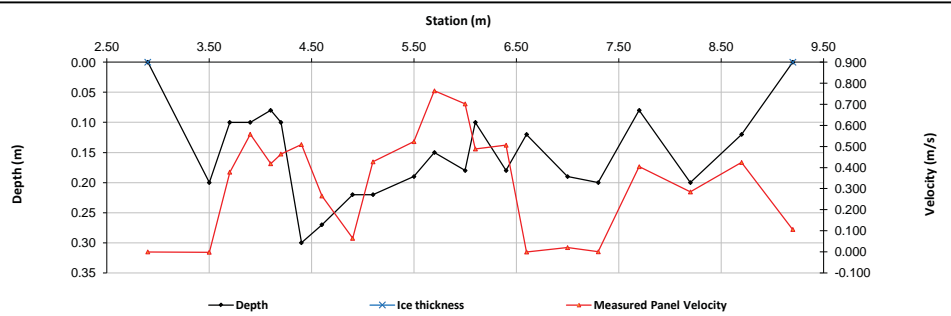
## Flow characteristics:

Total Flow:	0.297	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.98	(m <sup>2</sup> )
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.156	(m)
Mean Velocity:	0.302	(m/s)
Froude Number:	0.245	

## Logger Details:

	Before	After
Transducer Reading (m):	1.181	1.172
Water (°C):	1.1	1.1
Battery (Main):	12.4	17.76
Datalogger Clock:	10:59	11:30
Laptop Clock:	10:59	11:30
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.848	100.848		100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:			0.794	100.054	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.721	100.127	100.127	3/4" Pipe 2m SE of logger
Ice/PT:			3.072	97.776		
Water Level:			3.031	97.817		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.773	100.000	100.000	3/4" Pipe 4m NW of logger
Bench Mark 2:	0.719	100.773		100.054	100.055	3/4" Pipe 5m SE of logger
Bench Mark 3:			0.647	100.126	100.127	3/4" Pipe 2m SE of logger
Ice/PT:			3.005	97.768		
Water Level:			2.958	97.815		
Other:						

Closing Error	0.000	Average WL	97.816
WL Check	0.002	Transducer Elevation	96.635

## General Notes:

- Bottom of ice is above WL
- woody debris at 2.9 m
- 6.6m to 7.3 m is slush affected
- Water is above the ice at the lake

<b>Field Personnel:</b>	DW, TR	Trip Date:	5-Dec-12
<b>Data Entry Personnel:</b>	DW	Date:	5-Dec-12
<b>Data Check Personnel:</b>	DW	Date:	11-Dec-12
<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: January 11, 2012



## Flow Measurement:

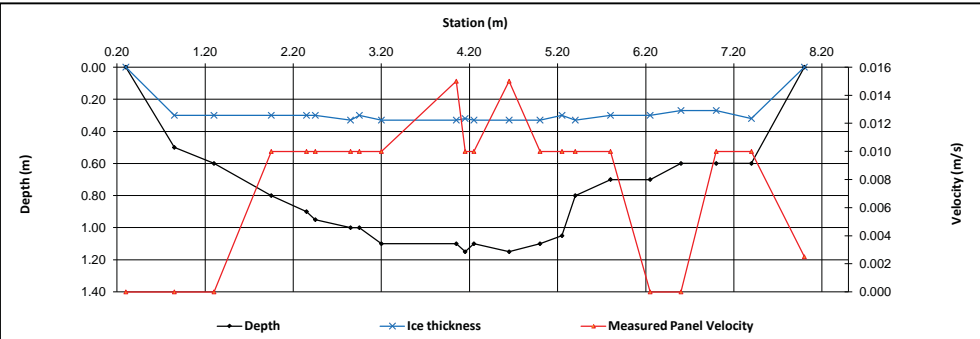
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
L	0.30	0.00	0.00	0.000	0.000	0.000	1.0	0.30	0.58	0.28	0.05	0.000	0.000	0.01	0.000	0%
1	0.85	0.50	0.30	0.000			1.0	0.58	1.08	0.50	0.20	0.000	0.000	0.10	0.000	0%
2	1.30	0.60	0.30	0.000			1.0	1.08	1.63	0.55	0.30	0.000	0.000	0.17	0.000	0%
3	1.95	0.80	0.30	0.010			0.9	1.63	2.15	0.53	0.50	0.010	0.009	0.26	0.002	7%
4	2.35	0.90	0.30	0.010			0.9	2.15	2.40	0.25	0.60	0.010	0.009	0.15	0.001	4%
5	2.45	0.95	0.30	0.010			0.9	2.40	2.65	0.25	0.65	0.010	0.009	0.16	0.001	4%
6	2.85	1.00	0.33	0.010			0.9	2.65	2.90	0.25	0.67	0.010	0.009	0.17	0.002	4%
7	2.95	1.00	0.30	0.010			0.9	2.90	3.08	0.18	0.70	0.010	0.009	0.12	0.001	3%
8	3.20	1.10	0.33		0.010	0.010	1.0	3.08	3.63	0.55	0.77	0.010	0.010	0.42	0.004	13%
9	4.05	1.10	0.33		0.010	0.020	1.0	3.63	4.10	0.48	0.77	0.010	0.015	0.37	0.005	16%
10	4.15	1.15	0.32		0.010	0.010	1.0	4.10	4.20	0.10	0.83	0.010	0.010	0.08	0.001	2%
11	4.25	1.10	0.33		0.010	0.010	1.0	4.20	4.45	0.25	0.77	0.010	0.010	0.19	0.002	6%
12	4.65	1.15	0.33		0.020	0.010	1.0	4.45	4.83	0.38	0.82	0.015	0.015	0.31	0.005	14%
13	5.00	1.10	0.33		0.010	0.010	1.0	4.83	5.13	0.30	0.77	0.010	0.010	0.23	0.002	7%
14	5.25	1.05	0.30	0.010			0.9	5.13	5.33	0.20	0.75	0.010	0.009	0.15	0.001	4%
15	5.40	0.80	0.33	0.010			0.9	5.33	5.60	0.27	0.47	0.010	0.009	0.13	0.001	3%
16	5.80	0.70	0.30	0.010			0.9	5.60	6.03	0.43	0.40	0.010	0.009	0.17	0.002	5%
17	6.25	0.70	0.30	0.000			1.0	6.03	6.43	0.40	0.40	0.000	0.000	0.16	0.000	0%
18	6.60	0.60	0.27	0.000			1.0	6.43	6.80	0.38	0.33	0.000	0.000	0.12	0.000	0%
19	7.00	0.60	0.27	0.010			0.9	6.80	7.20	0.40	0.33	0.010	0.009	0.13	0.001	4%
20	7.40	0.60	0.32	0.010			0.9	7.20	7.70	0.50	0.28	0.010	0.009	0.14	0.001	4%
R	8.00	0.00	0.00	0.000	0.000	0.000	1.0	7.70	8.00	0.30	0.07	0.003	0.003	0.02	0.000	0%
<b>Total Flow</b>														<b>0.034</b>		

Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	16:00
Equipment:	MARSH
Method:	Ice
River Condition:	Ice
Quality/Error (see reverse):	Fair
Weather:	Clear, Calm, -11

Flow characteristics:	
Total Flow:	0.034 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Fair
Cross Section Area:	3.77 (m <sup>2</sup> )
Wetted Width:	7.70 (m)
Hydraulic Depth:	0.490 (m)
Mean Velocity:	0.009 (m/s)
Froude Number:	0.004

Datalogger Details:		Before	After
Transducer Reading (m):		0.532	
Water (°C):		0.1	
Battery (Main):		14.3	
Datalogger Clock:		15:20	
Laptop Clock:		15:21	
Dessicant:		replaced	
Logger# (if Δ):		-	
PT# (if Δ):		-	

**Datalogger / Station Notes:**  
 - Good



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.720	298.093	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:			1.854	296.959		
Water Level:			2.073	296.740		
Other:	0.823	298.813		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.706	298.799		298.093	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:			1.842	296.957		
Water Level:			2.061	296.738		
Other:			0.808	297.991	297.990	Rebar in PVC Pipe

Closing Error	-0.001	Average WL	296.739
WL Check	0.002	Transducer Elevation	296.207

**General Notes:**

<b>Field Personnel:</b>	DW, SM	<b>Trip Date:</b>	11-Jan-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	18-Jan-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	18-Jan-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: February 7, 2012



## Flow Measurement:

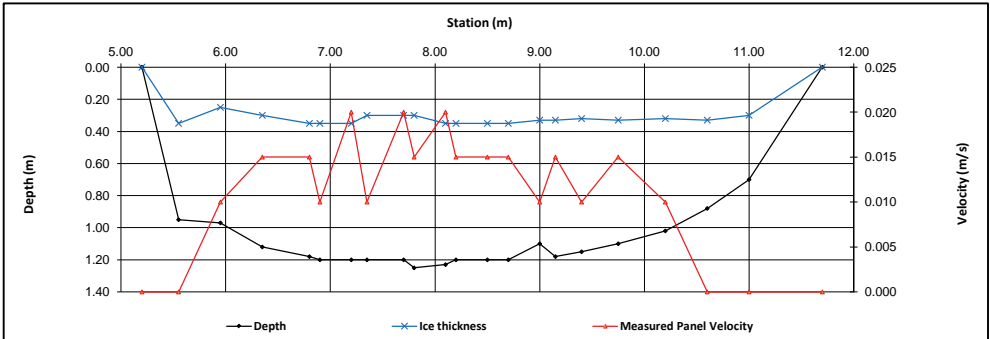
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	5.20	0.00	0.00	0.000	0.000	0.000	1.0	5.20	5.38	0.18	0.15	0.000	0.000	0.03	0.000	0%
1	5.55	0.95	0.35	0.000			1.0	5.38	5.75	0.38	0.60	0.000	0.000	0.23	0.000	0%
2	5.95	0.97	0.25	0.010			0.9	5.75	6.15	0.40	0.72	0.010	0.009	0.29	0.003	5%
3	6.35	1.12	0.30		0.010	0.020	1.0	6.15	6.58	0.42	0.82	0.015	0.015	0.35	0.005	10%
4	6.80	1.18	0.35		0.010	0.020	1.0	6.58	6.85	0.28	0.83	0.015	0.015	0.23	0.003	7%
5	6.90	1.20	0.35		0.010	0.010	1.0	6.85	7.05	0.20	0.85	0.010	0.010	0.17	0.002	3%
6	7.20	1.20	0.35		0.020	0.020	1.0	7.05	7.28	0.23	0.85	0.020	0.020	0.19	0.004	7%
7	7.35	1.20	0.30		0.010	0.010	1.0	7.28	7.53	0.25	0.90	0.010	0.010	0.23	0.002	4%
8	7.70	1.20	0.30		0.010	0.030	1.0	7.53	7.75	0.23	0.90	0.020	0.020	0.20	0.004	8%
9	7.80	1.25	0.30		0.010	0.020	1.0	7.75	7.95	0.20	0.95	0.015	0.015	0.19	0.003	5%
10	8.10	1.23	0.35		0.010	0.030	1.0	7.95	8.15	0.20	0.88	0.020	0.020	0.18	0.004	7%
11	8.20	1.20	0.35		0.010	0.020	1.0	8.15	8.35	0.20	0.85	0.015	0.015	0.17	0.003	5%
12	8.50	1.20	0.35		0.010	0.020	1.0	8.35	8.60	0.25	0.85	0.015	0.015	0.21	0.003	6%
13	8.70	1.20	0.35		0.010	0.020	1.0	8.60	8.85	0.25	0.85	0.015	0.015	0.21	0.003	6%
14	9.00	1.10	0.33		0.010	0.010	1.0	8.85	9.08	0.23	0.77	0.010	0.010	0.17	0.002	3%
15	9.15	1.18	0.33		0.020	0.010	1.0	9.08	9.28	0.20	0.85	0.015	0.015	0.17	0.003	5%
16	9.40	1.15	0.32		0.010	0.010	1.0	9.28	9.58	0.30	0.83	0.010	0.010	0.25	0.002	5%
17	9.75	1.10	0.33		0.020	0.010	1.0	9.58	9.98	0.40	0.77	0.015	0.015	0.31	0.005	9%
18	10.20	1.02	0.32	0.010			0.9	9.98	10.40	0.42	0.70	0.010	0.009	0.30	0.003	5%
19	10.60	0.88	0.33	0.000			1.0	10.40	10.80	0.40	0.55	0.000	0.000	0.22	0.000	0%
20	11.00	0.70	0.30	0.000			1.0	10.80	11.35	0.55	0.40	0.000	0.000	0.22	0.000	0%
LB	11.70	0.00	0.00	0.000	0.000	0.000	1.0	11.35	11.70	0.35	0.10	0.000	0.000	0.04	0.000	0%
<b>Total Flow</b>															<b>0.052</b>	

Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	12:35
Equipment:	Marsh McBirney
Method:	Ice
River Condition:	Ice
Quality/Error (see reverse):	Good
Weather:	clear, calm -15

Flow characteristics:	
Total Flow:	0.052 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	4.54 (m <sup>2</sup> )
Wetted Width:	6.50 (m)
Hydraulic Depth:	0.698 (m)
Mean Velocity:	0.012 (m/s)
Froude Number:	0.004

Logger Details:		
	Before	After
Transducer Reading (m):		0.532
Water (°C):	0.1	
Battery (Main):	15.0	
Datalogger Clock:	11:58	
Laptop Clock:	11:58	
Dessicant:	good	
Logger# (if Δ):		
PT# (if Δ):		

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.801	298.090	298.106	T-post w/lagging
Bench Mark 3:						
Ice/PT:			1.944	296.947		
Water Level:			2.161	296.730		
Other:	0.901	298.891		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.739	298.829		298.090	298.106	T-post w/lagging
Bench Mark 3:						
Ice/PT:			1.881	296.948		
Water Level:			2.103	296.726		
Other:			0.848	297.981	297.990	Rebar in PVC Pipe

Closing Error	0.009	Average WL	296.728
WL Check	0.004	Transducer Elevation	296.196

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	7-Feb-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	24-Feb-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	16-Mar-12



# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: February 27, 2012



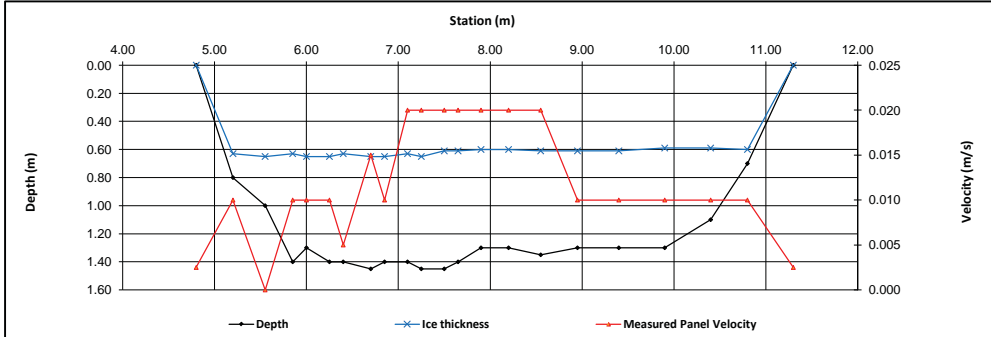
## Flow Measurement:

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
1	4.80	0.00	0.00	0.000	0.000	0.000	0.9	4.80	5.00	0.20	0.04	0.003	0.002	0.01	0.000	0%
2	5.20	0.80	0.63	0.010			0.9	5.00	5.38	0.38	0.17	0.010	0.009	0.06	0.001	1%
3	5.55	1.00	0.65	0.000			1.0	5.38	5.70	0.32	0.35	0.000	0.000	0.11	0.000	0%
4	5.85	1.40	0.63		0.010	0.010	1.0	5.70	5.93	0.23	0.77	0.010	0.010	0.17	0.002	4%
5	6.00	1.30	0.65		0.010	0.010	1.0	5.93	6.13	0.20	0.65	0.010	0.010	0.13	0.001	3%
6	6.25	1.40	0.65		0.010	0.010	1.0	6.13	6.33	0.20	0.75	0.010	0.010	0.15	0.002	3%
7	6.40	1.40	0.63		0.000	0.010	1.0	6.33	6.55	0.22	0.77	0.005	0.005	0.17	0.001	2%
8	6.70	1.45	0.65		0.020	0.010	1.0	6.55	6.78	0.23	0.80	0.015	0.015	0.18	0.003	6%
9	6.85	1.40	0.65		0.010	0.010	1.0	6.78	6.98	0.20	0.75	0.010	0.010	0.15	0.001	3%
10	7.10	1.40	0.63		0.020	0.020	1.0	6.98	7.18	0.20	0.77	0.020	0.020	0.15	0.003	7%
11	7.25	1.45	0.65		0.020	0.020	1.0	7.18	7.38	0.20	0.80	0.020	0.020	0.16	0.003	7%
12	7.50	1.45	0.61		0.020	0.020	1.0	7.38	7.58	0.20	0.84	0.020	0.020	0.17	0.003	7%
13	7.65	1.40	0.61		0.020	0.020	1.0	7.58	7.78	0.20	0.79	0.020	0.020	0.16	0.003	7%
14	7.90	1.30	0.60	0.020			0.9	7.78	8.05	0.28	0.70	0.020	0.018	0.19	0.003	7%
15	8.20	1.30	0.60	0.020			0.9	8.05	8.38	0.32	0.70	0.020	0.018	0.23	0.004	9%
16	8.55	1.35	0.61	0.020			0.9	8.38	8.75	0.38	0.74	0.020	0.018	0.28	0.005	11%
17	8.95	1.30	0.61	0.010			0.9	8.75	9.18	0.43	0.69	0.010	0.009	0.29	0.003	6%
18	9.40	1.30	0.61	0.010			0.9	9.18	9.65	0.48	0.69	0.010	0.009	0.33	0.003	6%
19	9.90	1.30	0.59	0.010			0.9	9.65	10.15	0.50	0.71	0.010	0.009	0.36	0.003	7%
20	10.40	1.10	0.59	0.010			0.9	10.15	10.60	0.45	0.51	0.010	0.009	0.23	0.002	4%
21	10.80	0.70	0.60	0.010			0.9	10.60	11.05	0.45	0.10	0.010	0.009	0.04	0.000	1%
22	11.30	0.00	0.00	0.000	0.000	0.000	1.0	11.05	11.30	0.25	0.03	0.003	0.003	0.01	0.000	0%
<b>Total Flow</b>															<b>0.047</b>	

Measurement Details:	
Start Time (MST):	12:30
End Time (MST):	14:20
Equipment:	Marsh
Method:	Ice
River Condition:	backwater-see below
Quality/Error (see reverse):	fair
Weather:	-

Flow characteristics:	
Total Flow:	0.047 (m <sup>3</sup> /s)
Perceived Measurement Quality:	fair
Cross Section Area:	3.74 (m <sup>2</sup> )
Wetted Width:	6.50 (m)
Hydraulic Depth:	0.575 (m)
Mean Velocity:	0.013 (m/s)
Froude Number:	0.005

Logger Details:		
	Before	After
Transducer Reading (m):	0.1	0.859
Water (°C):	14.9	-
Battery (Main):	12:36	-
Datalogger Clock:	12:36	-
Laptop Clock:	good	-
Dessicant:	14563	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.698	298.105	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			1.746	297.057		
Other:	0.813	298.803		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.686	298.791		298.105	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			1.731	297.060		
Other:			0.802	297.989	297.990	Rebar in PVC Pipe

Closing Error	0.001	Average WL	297.059
WL Check	0.003	Transducer Elevation	296.200

### General Notes:

- backwater and overflow downstream of station, see photos.
- very hard ice
- surface layer of ice collapses under weight at water level survey

Field Personnel:	SM, GB	Trip Date:	27-Feb-12
Data Entry Personnel:	CJ	Date:	20-Mar-12
Data Check Personnel:	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road

UTM Location: 474961 E, 6344087 N

Site Visit Date:

March 31, 2012



## Flow Measurement:

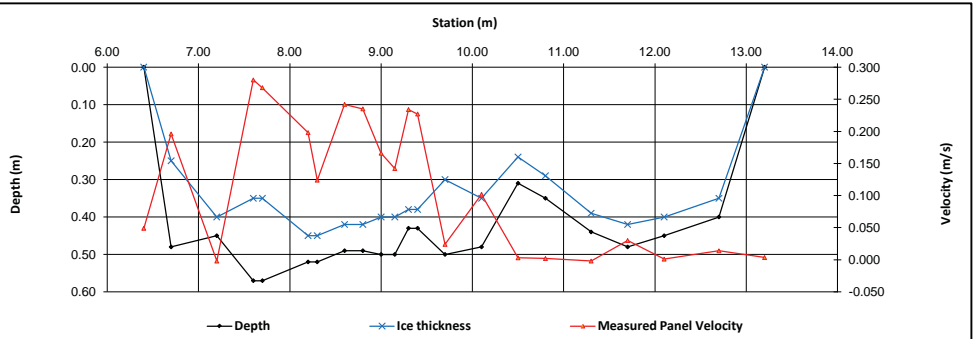
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	6.40	0.00	0.00	0.000	0.000	0.000	0.9	6.40	6.55	0.15	0.06	0.049	0.044	0.01	0.000	1%
1	6.70	0.48	0.25	0.196			0.9	6.55	6.95	0.40	0.23	0.196	0.176	0.09	0.016	22%
2	7.20	0.45	0.40	-0.002			0.9	6.95	7.40	0.45	0.05	-0.002	-0.002	0.02	0.000	0%
3	7.60	0.57	0.35	0.280			0.9	7.40	7.65	0.25	0.22	0.280	0.252	0.06	0.014	19%
4	7.70	0.57	0.35	0.268			0.9	7.65	7.95	0.30	0.22	0.268	0.241	0.07	0.016	22%
5	8.20	0.52	0.45	0.198			0.9	7.95	8.25	0.30	0.07	0.198	0.178	0.02	0.004	5%
6	8.30	0.52	0.45	0.124			0.9	8.25	8.45	0.20	0.07	0.124	0.112	0.01	0.002	2%
7	8.60	0.49	0.42	0.242			0.9	8.45	8.70	0.25	0.07	0.242	0.218	0.02	0.004	5%
8	8.80	0.49	0.42	0.235			0.9	8.70	8.90	0.20	0.07	0.235	0.212	0.01	0.003	4%
9	9.00	0.50	0.40	0.166			0.9	8.90	9.08	0.17	0.10	0.166	0.149	0.02	0.003	4%
10	9.15	0.50	0.40	0.142			0.9	9.08	9.23	0.15	0.10	0.142	0.128	0.02	0.002	3%
11	9.30	0.43	0.38	0.234			0.9	9.23	9.35	0.13	0.05	0.234	0.211	0.01	0.001	2%
12	9.40	0.43	0.38	0.227			0.9	9.35	9.55	0.20	0.05	0.227	0.204	0.01	0.002	3%
13	9.70	0.50	0.30	0.024			0.9	9.55	9.90	0.35	0.20	0.024	0.022	0.07	0.002	2%
14	10.10	0.48	0.35	0.102			0.9	9.90	10.30	0.40	0.13	0.102	0.092	0.05	0.005	6%
15	10.50	0.31	0.24	0.003			0.9	10.30	10.65	0.35	0.07	0.003	0.003	0.02	0.000	0%
16	10.80	0.35	0.29	0.002			0.9	10.65	11.05	0.40	0.06	0.002	0.002	0.02	0.000	0%
17	11.30	0.44	0.39	-0.002			0.9	11.05	11.50	0.45	0.05	-0.002	-0.002	0.02	0.000	0%
18	11.70	0.48	0.42	0.030			0.9	11.50	11.90	0.40	0.06	0.030	0.027	0.02	0.001	1%
19	12.10	0.45	0.40	0.001			0.9	11.90	12.40	0.50	0.05	0.001	0.001	0.03	0.000	0%
20	12.70	0.40	0.35	0.014			0.9	12.40	12.95	0.55	0.05	0.014	0.013	0.03	0.000	0%
LB	13.20	0.00	0.00	0.000	0.000	0.000	1.0	12.95	13.20	0.25	0.01	0.004	0.004	0.00	0.000	0%
<b>Total Flow</b>															<b>0.074</b>	

## Measurement Details:

Start Time (MST):	12:25
End Time (MST):	13:35
Equipment:	ADV
Method:	Ice
River Condition:	very slushy ice
Quality/Error (see reverse):	poor
Weather:	sunny, +9

## Flow characteristics:

Total Flow:	0.074	(m <sup>3</sup> /s)
Perceived Measurement Quality:	poor	
Cross Section Area:	6.63	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.093	(m)
Mean Velocity:	0.117	(m/s)
Froude Number:	0.122	



## Datalogger Details:

	Before	After
Transducer Reading (m):		1.019
Water (°C):	0.1	-
Battery (Main):	14.5	-
Datalogger Clock:	11:34	-
Laptop Clock:	11:34	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

-0.5 m fluctuations in water level  
-wiring ok

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.949	298.097	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:			1.888	297.158		
Water Level:			1.772	297.274		
Other:	1.056	299.046		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.927	299.024		298.097	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:			1.867	297.157		
Water Level:			1.747	297.277		
Other:			1.034	297.990	297.990	Rebar in PVC Pipe

Closing Error	0.000
WL Check	0.003

Average WL	297.276
Transducer Elevation	296.257

## General Notes:

-ice is degrading and slushy  
-3 m from RB was frozen to depth  
-lots of slush under ice

Field Personnel:	DW, TR	Trip Date:	31-Mar-12
Data Entry Personnel:	CJ	Date:	11-Apr-12
Data Check Personnel:	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: April 22, 2012



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
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																
NO DISCHARGE MEASUREMENT COMPLETED																
<b>Total Flow</b>																

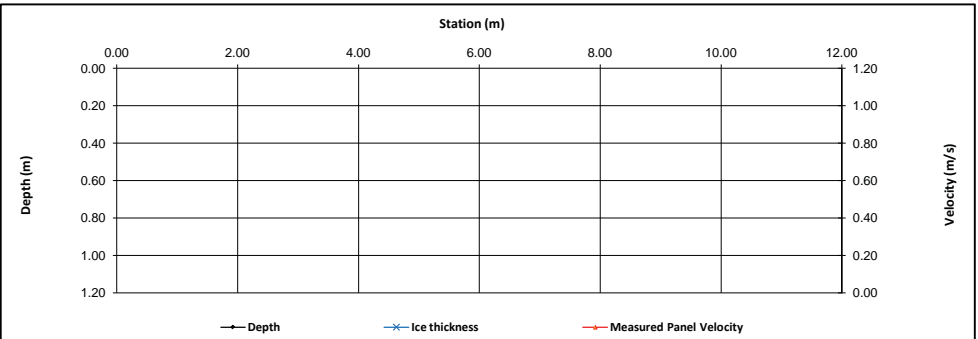
Measurement Details:	
Start Time (MST):	-
End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:	
Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	0.00 (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:	-	-
Dessicant:	-	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

-modem 604-345-3721; -71/64 RSSI



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:					298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:					298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					297.990	Rebar in PVC Pipe

Closing Error	#VALUE!	Average WL	#DIV/0!
WL Check	#VALUE!	Transducer Elevation	

**General Notes:**

-installed 3 db omni antenna  
 -beaver may be back, watch for backwater.

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	22-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date:

May 7, 2012



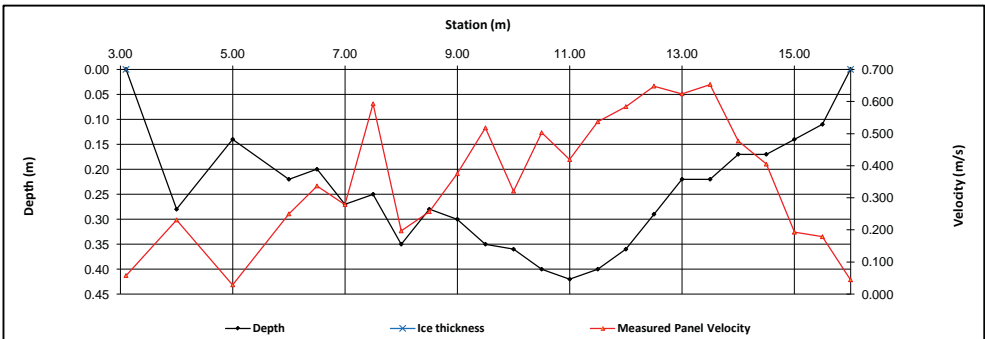
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	3.10	0.00	0.00	0.000	0.000	0.000	1.0	3.10	3.55	0.45	0.07	0.058	0.058	0.03	0.002	0%
1	4.00	0.28		0.231			1.0	3.55	4.50	0.95	0.28	0.231	0.231	0.27	0.061	5%
2	5.00	0.14		0.029			1.0	4.50	5.50	1.00	0.14	0.029	0.029	0.14	0.004	0%
3	6.00	0.22		0.250			1.0	5.50	6.25	0.75	0.22	0.250	0.250	0.17	0.041	3%
4	6.50	0.20		0.337			1.0	6.25	6.75	0.50	0.20	0.337	0.337	0.10	0.034	3%
5	7.00	0.27		0.279			1.0	6.75	7.25	0.50	0.27	0.279	0.279	0.14	0.038	3%
6	7.50	0.25		0.593			1.0	7.25	7.75	0.50	0.25	0.593	0.593	0.13	0.074	6%
7	8.00	0.35		0.197			1.0	7.75	8.25	0.50	0.35	0.197	0.197	0.18	0.034	3%
8	8.50	0.28		0.257			1.0	8.25	8.75	0.50	0.28	0.257	0.257	0.14	0.036	3%
9	9.00	0.30		0.375			1.0	8.75	9.25	0.50	0.30	0.375	0.375	0.15	0.056	4%
10	9.50	0.35		0.518			1.0	9.25	9.75	0.50	0.35	0.518	0.518	0.18	0.091	7%
11	10.00	0.36		0.321			1.0	9.75	10.25	0.50	0.36	0.321	0.321	0.18	0.058	5%
12	10.50	0.40		0.503			1.0	10.25	10.75	0.50	0.40	0.503	0.503	0.20	0.101	8%
13	11.00	0.42		0.419			1.0	10.75	11.25	0.50	0.42	0.419	0.419	0.21	0.088	7%
14	11.50	0.40		0.537			1.0	11.25	11.75	0.50	0.40	0.537	0.537	0.20	0.107	9%
15	12.00	0.36		0.584			1.0	11.75	12.25	0.50	0.36	0.584	0.584	0.18	0.105	8%
16	12.50	0.29		0.648			1.0	12.25	12.75	0.50	0.29	0.648	0.648	0.15	0.094	7%
17	13.00	0.22		0.624			1.0	12.75	13.25	0.50	0.22	0.624	0.624	0.11	0.069	5%
18	13.50	0.22		0.653			1.0	13.25	13.75	0.50	0.22	0.653	0.653	0.11	0.072	6%
19	14.00	0.17		0.477			1.0	13.75	14.25	0.50	0.17	0.477	0.477	0.09	0.041	3%
20	14.50	0.17		0.405			1.0	14.25	14.75	0.50	0.17	0.405	0.405	0.09	0.034	3%
21	15.00	0.14		0.193			1.0	14.75	15.25	0.50	0.14	0.193	0.193	0.07	0.014	1%
22	15.50	0.11		0.179			1.0	15.25	15.75	0.50	0.11	0.179	0.179	0.06	0.010	1%
RB	16.00	0.00	0.00	0.000	0.000	0.000	1.0	15.75	16.00	0.25	0.03	0.045	0.045	0.01	0.000	0%
<b>Total Flow</b>															<b>1.26</b>	

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	13:20
Equipment:	ADV
Method:	Wading
River Condition:	high flow, no ice
Quality/Error (see reverse):	Excellent
Weather:	clear, breezy, +18

Flow Characteristics:		
Total Flow:	1.26	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.24	(m <sup>2</sup> )
Wetted Width:	12.90	(m)
Hydraulic Depth:	0.251	(m)
Mean Velocity:	0.389	(m/s)
Froude Number:	0.248	

Logger Details:		
	Before	After
Transducer Reading (m):	0.702	-
Water (°C):	8.4	-
Battery (Main):	14.2	-
Datalogger Clock:	12:30	-
Laptop Clock:	12:30	-
Dessicant:	good	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.767	298.105	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			1.952	296.920		
Other:	0.882	298.872		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.758	298.863		298.105	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			1.943	296.920		
Other:			0.874	297.989	297.990	Rebar in PVC Pipe

Closing Error	0.001	Average WL	296.920
WL Check	0.000	Transducer Elevation	288.520

**General Notes:**

-TSS taken at 10 m on measuring tape (7m from LB)

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	7-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: June 13, 2012



## Flow Measurement:

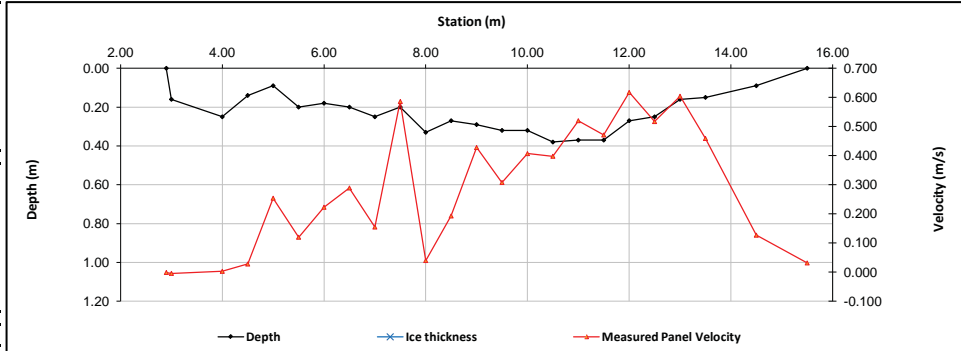
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	2.90	0.00	0.00	0.000	0.000	0.000	1.0	2.90	2.95	0.05	0.04	-0.001	-0.001	0.00	0.000	0%
1	3.00	0.16		-0.004			1.0	2.95	3.50	0.55	0.16	-0.004	-0.004	0.09	0.000	0%
2	4.00	0.25		0.003			1.0	3.50	4.25	0.75	0.25	0.003	0.003	0.19	0.001	0%
3	4.50	0.14		0.028			1.0	4.25	4.75	0.50	0.14	0.028	0.028	0.07	0.002	0%
4	5.00	0.09		0.254			1.0	4.75	5.25	0.50	0.09	0.254	0.254	0.05	0.011	1%
5	5.50	0.20		0.120			1.0	5.25	5.75	0.50	0.20	0.120	0.120	0.10	0.012	1%
6	6.00	0.18		0.223			1.0	5.75	6.25	0.50	0.18	0.223	0.223	0.09	0.020	2%
7	6.50	0.20		0.289			1.0	6.25	6.75	0.50	0.20	0.289	0.289	0.10	0.029	3%
8	7.00	0.25		0.155			1.0	6.75	7.25	0.50	0.25	0.155	0.155	0.13	0.019	2%
9	7.50	0.20		0.586			1.0	7.25	7.75	0.50	0.20	0.586	0.586	0.10	0.059	7%
10	8.00	0.33		0.040			1.0	7.75	8.25	0.50	0.33	0.040	0.040	0.17	0.007	1%
11	8.50	0.27		0.193			1.0	8.25	8.75	0.50	0.27	0.193	0.193	0.14	0.026	3%
12	9.00	0.29		0.428			1.0	8.75	9.25	0.50	0.29	0.428	0.428	0.15	0.062	7%
13	9.50	0.32		0.308			1.0	9.25	9.75	0.50	0.32	0.308	0.308	0.16	0.049	6%
14	10.00	0.32		0.407			1.0	9.75	10.25	0.50	0.32	0.407	0.407	0.16	0.065	7%
15	10.50	0.38		0.398			1.0	10.25	10.75	0.50	0.38	0.398	0.398	0.19	0.076	9%
16	11.00	0.37		0.520			1.0	10.75	11.25	0.50	0.37	0.520	0.520	0.19	0.096	11%
17	11.50	0.37		0.471			1.0	11.25	11.75	0.50	0.37	0.471	0.471	0.19	0.087	10%
18	12.00	0.27		0.617			1.0	11.75	12.25	0.50	0.27	0.617	0.617	0.14	0.083	9%
19	12.50	0.25		0.517			1.0	12.25	12.75	0.50	0.25	0.517	0.517	0.13	0.065	7%
20	13.00	0.16		0.604			1.0	12.75	13.25	0.50	0.16	0.604	0.604	0.08	0.048	5%
21	13.50	0.15		0.459			1.0	13.25	14.00	0.75	0.15	0.459	0.459	0.11	0.052	6%
22	14.50	0.09		0.127			1.0	14.00	15.00	1.00	0.09	0.127	0.127	0.09	0.011	1%
RB	15.50	0.00	0.00	0.000	0.000	0.000	1.0	15.00	15.50	0.50	0.02	0.032	0.032	0.01	0.000	0%
<b>Total Flow</b>														<b>0.880</b>		

Measurement Details:	
Start Time (MST):	9:25
End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	Good
Weather:	overcast, calm, 15

Flow characteristics:		
Total Flow:	0.880	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.79	(m <sup>2</sup> )
Wetted Width:	12.60	(m)
Hydraulic Depth:	0.221	(m)
Mean Velocity:	0.316	(m/s)
Froude Number:	0.215	

Logger Details:		
	Before	After
Transducer Reading (m):	0.666	-
Water (°C):	15.3	-
Battery (Main):	14.3	-
Datalogger Clock:	9:26	-
Laptop Clock:	9:26	-
Dessicant:	replaced	-
Logger# (if Δ):	14563	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.807	298.106	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			2.023	296.890		
Other:	0.923	298.913		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.799	298.905		298.106	298.106	T-post w/flagging
Bench Mark 3:						
Ice/PT:						
Water Level:			2.013	296.892		
Other:			0.914	297.991	297.990	Rebar in PVC Pipe

Closing Error	-0.001	Average WL	296.891
WL Check	0.002	Transducer Elevation	296.225

**General Notes:**

- installed 1 BM- 1 length of pipe. Try pounding further next visit.
- TSS sampled at offset 11.5 m

<b>Field Personnel:</b>	SM, TR	Trip Date:	13-Jun-12
<b>Data Entry Personnel:</b>	CJ	Date:	26-Jun-12
<b>Data Check Personnel:</b>	DW	Date:	28-Jun-12

# Hydrometric Measurement/ Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date:

August 10, 2012



**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	6.00	0.00	0.00	0.000	0.000	0.000	1.0	6.00	6.25	0.25	0.07	0.051	0.051	0.02	0.001	0%
1	6.50	0.26		0.202			1.0	6.25	6.75	0.50	0.26	0.202	0.13	0.026	0.026	7%
2	7.00	0.20		0.000			1.0	6.75	7.13	0.38	0.20	0.000	0.000	0.08	0.000	0%
3	7.25	0.18		0.000			1.0	7.13	7.38	0.25	0.18	0.000	0.000	0.05	0.000	0%
4	7.50	0.22		0.204			1.0	7.38	7.63	0.25	0.22	0.204	0.204	0.06	0.011	3%
5	7.75	0.22		0.269			1.0	7.63	7.88	0.25	0.22	0.269	0.269	0.06	0.015	4%
6	8.00	0.23		0.223			1.0	7.88	8.25	0.38	0.23	0.223	0.223	0.09	0.019	5%
7	8.50	0.30		0.195			1.0	8.25	8.75	0.50	0.30	0.195	0.195	0.15	0.029	8%
8	9.00	0.36		0.220			1.0	8.75	9.25	0.50	0.36	0.220	0.220	0.18	0.040	10%
9	9.50	0.33		0.176			1.0	9.25	9.75	0.50	0.33	0.176	0.176	0.17	0.029	8%
10	10.00	0.28		0.177			1.0	9.75	10.25	0.50	0.28	0.177	0.177	0.14	0.025	7%
11	10.50	0.32		0.186			1.0	10.25	10.75	0.50	0.32	0.186	0.186	0.16	0.030	8%
12	11.00	0.39		0.146			1.0	10.75	11.25	0.50	0.39	0.146	0.146	0.20	0.028	7%
13	11.50	0.40		0.123			1.0	11.25	11.75	0.50	0.40	0.123	0.123	0.20	0.025	6%
14	12.00	0.40		0.126			1.0	11.75	12.25	0.50	0.40	0.126	0.126	0.20	0.025	7%
15	12.50	0.43		0.116			1.0	12.25	12.75	0.50	0.43	0.116	0.116	0.22	0.025	7%
16	13.00	0.43		0.085			1.0	12.75	13.25	0.50	0.43	0.085	0.085	0.22	0.018	5%
17	13.50	0.20		0.098			1.0	13.25	13.75	0.50	0.20	0.098	0.098	0.10	0.010	3%
18	14.00	0.26		0.080			1.0	13.75	14.25	0.50	0.26	0.080	0.080	0.13	0.010	3%
19	14.50	0.33		0.085			1.0	14.25	14.75	0.50	0.33	0.085	0.085	0.17	0.014	4%
20	15.00	0.22		0.009			1.0	14.75	15.25	0.50	0.22	0.009	0.009	0.11	0.001	0%
21	15.50	0.22		0.000			1.0	15.25	16.15	0.90	0.22	0.000	0.000	0.20	0.000	0%
LB	16.80	0.00	0.00	0.00	0.00	0.00	1.0	16.15	16.80	0.65	0.06	0.000	0.000	0.04	0.000	0%
<b>Total Flow</b>															<b>0.381</b>	

**Measurement Details:**

Start Time (MST):	1:17
End Time (MST):	2:30
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	sunny, breezy, 25

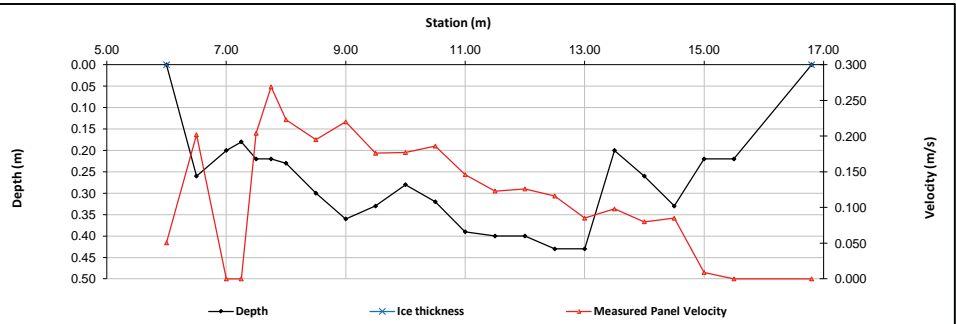
**Flow characteristics:**

Total Flow:	0.381	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.02	(m <sup>2</sup> )
Wetted Width:	10.80	(m)
Hydraulic Depth:	0.280	(m)
Mean Velocity:	0.126	(m/s)
Froude Number:	0.076	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.594	
Water (°C):	19.5	
Battery (Main):	14.0	
Datalogger Clock:	1:20	
Laptop Clock:	1:21	
Dessicant:	replaced	
Logger# (if Δ):	14563	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.872	298.106	298.106	T-post w/flagging
Bench Mark 3:			1.643	297.335	297.336	3/4" Pipe southwest of Logger
Ice/PT:						
Water Level:			2.168	296.810		
Other:	0.988	298.978		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.829	298.105	298.106	T-post w/flagging
Bench Mark 3:	1.599	298.934		297.335	297.336	3/4" Pipe southwest of Logger
Ice/PT:						
Water Level:			2.124	296.810		
Other:			0.944	297.990	297.990	Rebar in PVC Pipe
Closing Error	0.000					
WL Check	0.000					
Average WL				296.810		
Transducer Elevation				296.216		

**General Notes:**

3rd BM would not go further in hit solid bottom. BM close to ground-approx. 4" above grade, need PVC tube for winter (one already on site)

TSS taken at offset 10 m

**Field Personnel:**

TR, CJ	Trip Date:	10-Aug-12
CJ (Field)	Date:	10-Aug-12
CJ	Date:	22-Aug-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: September 10, 2012



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	2.50	0.00	0.00	0.000	0.000	0.000	1.0	2.50	2.75	0.25	0.08	0.045	0.045	0.02	0.001	0%
1	3.00	0.32		0.178			1.0	2.75	3.25	0.50	0.32	0.178	0.178	0.16	0.028	2%
2	3.50	0.35		0.121			1.0	3.25	3.75	0.50	0.35	0.121	0.121	0.18	0.021	1%
3	4.00	0.45		0.275			1.0	3.75	4.25	0.50	0.45	0.275	0.275	0.23	0.062	4%
4	4.50	0.56		0.343			1.0	4.25	4.75	0.50	0.56	0.343	0.343	0.28	0.096	6%
5	5.00	0.34		0.347			1.0	4.75	5.25	0.50	0.34	0.347	0.347	0.17	0.059	4%
6	5.50	0.56		0.351			1.0	5.25	5.75	0.50	0.56	0.351	0.351	0.28	0.098	7%
7	6.00	0.55		0.318			1.0	5.75	6.25	0.50	0.55	0.318	0.318	0.28	0.087	6%
8	6.50	0.54		0.356			1.0	6.25	6.75	0.50	0.54	0.356	0.356	0.27	0.096	6%
9	7.00	0.56		0.363			1.0	6.75	7.25	0.50	0.56	0.363	0.363	0.28	0.102	7%
10	7.50	0.50		0.358			1.0	7.25	7.75	0.50	0.50	0.358	0.358	0.25	0.090	6%
11	8.00	0.47		0.435			1.0	7.75	8.25	0.50	0.47	0.435	0.435	0.24	0.102	7%
12	8.50	0.43		0.371			1.0	8.25	8.75	0.50	0.43	0.371	0.371	0.22	0.080	5%
13	9.00	0.40		0.420			1.0	8.75	9.13	0.38	0.40	0.420	0.420	0.15	0.063	4%
14	9.25	0.48		0.414			1.0	9.13	9.38	0.25	0.48	0.414	0.414	0.12	0.050	3%
15	9.50	0.43		0.307			1.0	9.38	9.75	0.38	0.43	0.307	0.307	0.16	0.050	3%
16	10.00	0.42		0.372			1.0	9.75	10.25	0.50	0.42	0.372	0.372	0.21	0.078	5%
17	10.50	0.36		0.438			1.0	10.25	10.75	0.50	0.36	0.438	0.438	0.18	0.079	5%
18	11.00	0.30		0.427			1.0	10.75	11.25	0.50	0.30	0.427	0.427	0.15	0.064	4%
19	11.50	0.39		0.420			1.0	11.25	11.75	0.50	0.39	0.420	0.420	0.20	0.082	5%
20	12.00	0.48		0.453			1.0	11.75	12.25	0.50	0.48	0.453	0.453	0.24	0.109	7%
RB	12.50	0.00	0.00	0.00	0.00	0.00	1.0	12.25	12.50	0.25	0.12	0.113	0.113	0.03	0.003	0%
<b>Total Flow</b>															<b>1.50</b>	

<b>Measurement Details:</b>	
Start Time (MST):	11:35
End Time (MST):	12:30
Equipment:	ADV
Method:	Wading
River Condition:	Med-high Flow
Quality/Error (see reverse):	Excellent
Weather:	16" light rain

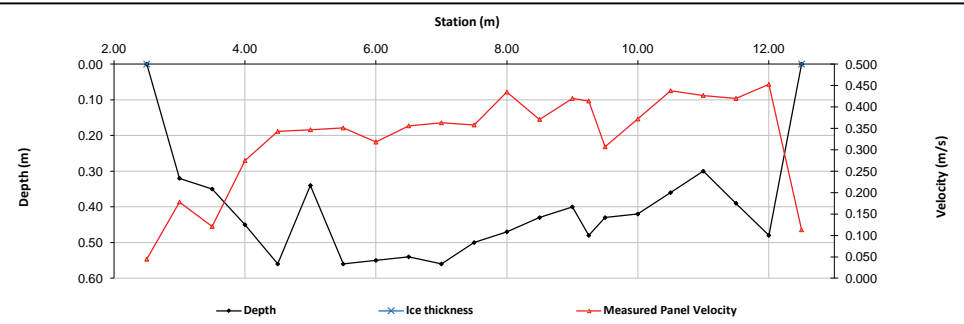
<b>Flow characteristics:</b>		
Total Flow:	1.5	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.27	(m <sup>2</sup> )
Wetted Width:	10.00	(m)
Hydraulic Depth:	0.427	(m)
Mean Velocity:	0.351	(m/s)
Froude Number:	0.172	

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
Water (°C):	0.723	12.9
Battery (Main):	14.3	
Datalogger Clock:	11:39	
Laptop Clock:	11:39	
Dessicant:	replaced	
Logger# (if Δ):	14563	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

**General Notes:**

Installed 2 BMS  
 TSS sample taken @ 10.5 m in cross-section  
 2" post is unstable and should consider replacing or stabilizing with concrete



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.707	297.256	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:			0.857	298.106	298.106	T-post w/lagging
Bench Mark 3:			1.627	297.336	297.336	3/4" Pipe southwest of Logger
Ice/PT:			1.707	297.256		
Water Level:				296.952		
Other:	0.973	298.963		297.990	297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:			1.695	297.255	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:			0.845	298.105	298.106	T-post w/lagging
Bench Mark 3:	1.614	298.950	1.695	297.336	297.336	3/4" Pipe southwest of Logger
Ice/PT:						
Water Level:				296.950		
Other:			0.961	297.989	297.990	Rebar in PVC Pipe
Closing Error			0.001	Average WL		296.951
WL Check			0.002	Transducer Elevation		296.228

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	10-Sep-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	11-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date:

October 15, 2012



## 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
LB	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.75	0.25	0.06	0.061	0.061	0.02	0.001	0%
1	1.00	0.25		0.245			1.0	0.75	1.30	0.55	0.25	0.245	0.245	0.14	0.034	2%
2	1.60	0.24		0.553			1.0	1.30	1.90	0.60	0.24	0.553	0.553	0.14	0.080	4%
3	2.20	0.22		0.170			1.0	1.90	2.50	0.60	0.22	0.170	0.170	0.13	0.022	1%
4	2.80	0.22		0.669			1.0	2.50	3.10	0.60	0.22	0.669	0.669	0.13	0.088	4%
5	3.40	0.25		0.798			1.0	3.10	3.70	0.60	0.25	0.798	0.798	0.15	0.120	6%
6	4.00	0.24		0.901			1.0	3.70	4.30	0.60	0.24	0.901	0.901	0.14	0.130	6%
7	4.60	0.30		0.833			1.0	4.30	4.90	0.60	0.30	0.833	0.833	0.18	0.150	7%
8	5.20	0.34		0.563			1.0	4.90	5.50	0.60	0.34	0.563	0.563	0.20	0.115	5%
9	5.80	0.33		0.545			1.0	5.50	6.10	0.60	0.33	0.545	0.545	0.20	0.108	5%
10	6.40	0.32		0.606			1.0	6.10	6.70	0.60	0.32	0.606	0.606	0.19	0.116	5%
11	7.00	0.42		0.449			1.0	6.70	7.30	0.60	0.42	0.449	0.449	0.25	0.113	5%
12	7.60	0.40		0.416			1.0	7.30	7.90	0.60	0.40	0.416	0.416	0.24	0.100	5%
13	8.20	0.45		0.350			1.0	7.90	8.50	0.60	0.45	0.350	0.350	0.27	0.095	4%
14	8.80	0.46		0.389			1.0	8.50	9.10	0.60	0.46	0.389	0.389	0.28	0.107	5%
15	9.40	0.50		0.565			1.0	9.10	9.70	0.60	0.50	0.565	0.565	0.30	0.169	8%
16	10.00	0.44		0.695			1.0	9.70	10.30	0.60	0.44	0.695	0.695	0.26	0.183	9%
17	10.60	0.40		0.584			1.0	10.30	10.90	0.60	0.40	0.584	0.584	0.24	0.140	7%
18	11.20	0.28		0.659			1.0	10.90	11.50	0.60	0.28	0.659	0.659	0.17	0.111	5%
19	11.80	0.32		0.438			1.0	11.50	12.10	0.60	0.32	0.438	0.438	0.19	0.084	4%
20	12.40	0.28		0.426			1.0	12.10	12.70	0.60	0.28	0.426	0.426	0.17	0.072	3%
RB	13.00	0.00	0.00	0.00	0.00	0.00	1.0	12.70	13.00	0.30	0.07	0.107	0.107	0.02	0.002	0%

**Total Flow 2.14**

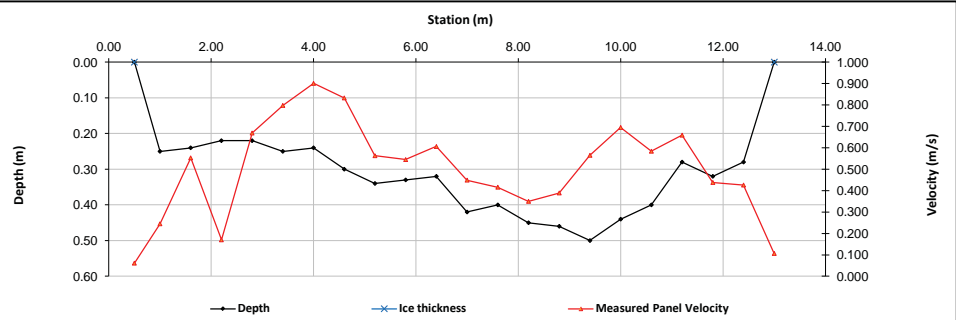
Measurement Details:	
Start Time (MST):	13:13
End Time (MST):	14:25
Equipment:	ADV
Method:	Wading
River Condition:	med-high flow
Quality/Error (see reverse):	Excellent
Weather:	12 deg, clear, breezy

Flow characteristics:		
Total Flow:	2.14	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.02	(m <sup>2</sup> )
Wetted Width:	12.50	(m)
Hydraulic Depth:	0.322	(m)
Mean Velocity:	0.532	(m/s)
Froude Number:	0.300	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.780	3.3
Battery (Main):	14.3	
Datalogger Clock:	13:15	
Laptop Clock:	13:15	
Dessicant:	replaced	
Logger# (if Δ):	14563	
PT# (if Δ):	-	

Datalogger / Station Notes:	
Stabilized mast with concrete.	

General Notes:	
TSS@ 6.4 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.517	298.773		297.256	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:			0.667	298.106	298.106	T-post w/flagging
Bench Mark 3:			1.437	297.336	297.336	3/4" Pipe southwest of Logger
Ice/PT:						
Water Level:			1.773	297.000		
Other:					297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:			1.506	297.256	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:	0.656	298.762		298.106	298.106	T-post w/flagging
Bench Mark 3:			1.426	297.336	297.336	3/4" Pipe southwest of Logger
Ice/PT:						
Water Level:			1.762	297.000		
Other:					297.990	Rebar in PVC Pipe

Closing Error	0.000
WL Check	0.000

Average WL	297.000
Transducer Elevation	296.220

Field Personnel:	SM, TR	Trip Date:	15-Oct-12
Data Entry Personnel:	SM	Date:	15-Oct-12
Data Check Personnel:	CJ	Date:	7-Nov-12
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: December 2, 2012



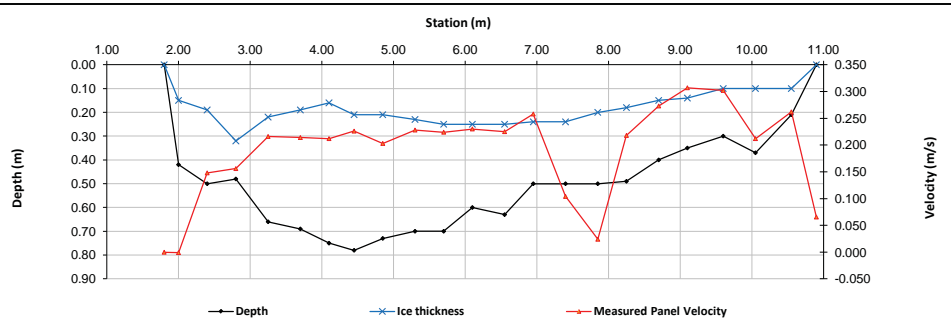
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.80	0.00	0.00	0.000	0.000	0.000	0.9	1.80	1.90	0.10	0.07	0.000	0.000	0.01	0.000	0%
1	2.00	0.42	0.15	-0.001			0.9	1.90	2.20	0.30	0.27	-0.001	-0.001	0.08	0.000	0%
2	2.40	0.50	0.19	0.148			0.9	2.20	2.60	0.40	0.31	0.148	0.133	0.12	0.017	3%
3	2.80	0.48	0.32	0.156			0.9	2.60	3.03	0.43	0.16	0.156	0.140	0.07	0.010	2%
4	3.25	0.66	0.22	0.216			0.9	3.03	3.48	0.45	0.44	0.216	0.194	0.20	0.038	7%
5	3.70	0.69	0.19	0.214			0.9	3.48	3.90	0.43	0.50	0.214	0.193	0.21	0.041	7%
6	4.10	0.75	0.16	0.212			0.9	3.90	4.28	0.38	0.59	0.212	0.191	0.22	0.042	8%
7	4.45	0.78	0.21	0.226			0.9	4.28	4.65	0.38	0.57	0.226	0.203	0.21	0.043	8%
8	4.85	0.73	0.21	0.203			0.9	4.65	5.08	0.42	0.52	0.203	0.183	0.22	0.040	7%
9	5.30	0.70	0.23	0.228			0.9	5.08	5.50	0.43	0.47	0.228	0.205	0.20	0.041	7%
10	5.70	0.70	0.25	0.224			0.9	5.50	5.90	0.40	0.45	0.224	0.202	0.18	0.036	7%
11	6.10	0.60	0.25	0.230			0.9	5.90	6.33	0.42	0.35	0.230	0.207	0.15	0.031	6%
12	6.55	0.63	0.25	0.225			0.9	6.33	6.75	0.43	0.38	0.225	0.203	0.16	0.033	6%
13	6.95	0.50	0.24	0.258			0.9	6.75	7.18	0.43	0.26	0.258	0.232	0.11	0.026	5%
14	7.40	0.50	0.24	0.104			0.9	7.18	7.63	0.45	0.26	0.104	0.094	0.12	0.011	2%
15	7.85	0.50	0.20	0.024			0.9	7.63	8.05	0.43	0.30	0.024	0.022	0.13	0.003	0%
16	8.25	0.49	0.18	0.218			0.9	8.05	8.48	0.42	0.31	0.218	0.196	0.13	0.026	5%
17	8.70	0.40	0.15	0.273			0.9	8.48	8.90	0.42	0.25	0.273	0.246	0.11	0.026	5%
18	9.10	0.35	0.14	0.307			0.9	8.90	9.35	0.45	0.21	0.307	0.276	0.09	0.026	5%
19	9.60	0.30	0.10	0.302			0.9	9.35	9.83	0.48	0.20	0.302	0.272	0.09	0.026	5%
20	10.05	0.37	0.10	0.212			0.9	9.83	10.30	0.48	0.27	0.212	0.191	0.13	0.024	4%
21	10.55	0.21	0.10	0.262			0.9	10.30	10.73	0.43	0.11	0.262	0.236	0.05	0.011	2%
RB	10.90	0.00	0.00	0.00	0.00	0.00	1.0	10.73	10.90	0.17	0.03	0.066	0.066	0.00	0.000	0%
<b>Total Flow</b>															<b>0.551</b>	

Measurement Details:	
Start Time (MST):	11:34
End Time (MST):	12:35
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	clear, -18

Flow characteristics:		
Total Flow:	0.551	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.00	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	0.330	(m)
Mean Velocity:	0.184	(m/s)
Froude Number:	0.102	

Logger Details:		
	Before	After
Transducer Reading (m):	0.686	
Water (°C):	0.1	
Battery (Main):	14.6	
Datalogger Clock:	11:36	
Laptop Clock:	11:36	
Dessicant:	good	
Logger# (if Δ):	14563	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.558	297.651	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:	1.103	299.209		298.106	298.106	T-post w/flagging
Bench Mark 3:					297.336	3/4" Pipe southwest of Logger
Ice/PT:			1.849	297.360		
Water Level:			2.291	296.918		
Other:					297.990	Rebar in PVC Pipe
<b>Setup #2</b>						
Bench Mark 1:	1.545	299.196		297.651	297.256	3/4" Pipe 3 m southeast of Logger
Bench Mark 2:			1.090	298.106	298.106	T-post w/flagging
Bench Mark 3:					297.336	3/4" Pipe southwest of Logger
Ice/PT:			1.837	297.359		
Water Level:			2.281	296.915		
Other:					297.990	Rebar in PVC Pipe
Closing Error	0.000				Average WL	296.917
WL Check	0.003				Transducer Elevation	296.231

**General Notes:**  
 -BM3 covered with ice

<b>Field Personnel:</b>	SM, TR	Trip Date:	2-Dec-12
<b>Data Entry Personnel:</b>	SM, TR	Date:	2-Dec-12
<b>Data Check Personnel:</b>	SG	Date:	3-Dec-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S3 - Iyininim Creek above Kearn Lake

UTM Location: 489491 E, 6345029 N

Site Visit Date: April 25, 2012



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	0.05	0.00	0.00	0.000	0.000	0.000	1.0	0.05	0.08	0.03	0.03	0.030	0.030	0.00	0.000	0%
1	0.10	0.10		0.120			1.0	0.08	0.15	0.08	0.10	0.120	0.120	0.01	0.001	1%
2	0.20	0.20		0.149			1.0	0.15	0.25	0.10	0.20	0.149	0.149	0.02	0.003	3%
3	0.30	0.21		0.223			1.0	0.25	0.35	0.10	0.21	0.223	0.223	0.02	0.005	5%
4	0.40	0.21		0.278			1.0	0.35	0.45	0.10	0.21	0.278	0.278	0.02	0.006	6%
5	0.50	0.22		0.327			1.0	0.45	0.55	0.10	0.22	0.327	0.327	0.02	0.007	7%
6	0.60	0.22		0.435			1.0	0.55	0.65	0.10	0.22	0.435	0.435	0.02	0.010	9%
7	0.70	0.22		0.470			1.0	0.65	0.75	0.10	0.22	0.470	0.470	0.02	0.010	10%
8	0.80	0.20		0.473			1.0	0.75	0.85	0.10	0.20	0.473	0.473	0.02	0.009	9%
9	0.90	0.20		0.427			1.0	0.85	0.95	0.10	0.20	0.427	0.427	0.02	0.009	8%
10	1.00	0.20		0.374			1.0	0.95	1.05	0.10	0.20	0.374	0.374	0.02	0.007	7%
11	1.10	0.20		0.319			1.0	1.05	1.15	0.10	0.20	0.319	0.319	0.02	0.006	6%
12	1.20	0.21		0.367			1.0	1.15	1.25	0.10	0.21	0.367	0.367	0.02	0.008	7%
13	1.30	0.21		0.445			1.0	1.25	1.35	0.10	0.21	0.445	0.445	0.02	0.009	9%
14	1.40	0.18		0.445			1.0	1.35	1.45	0.10	0.18	0.445	0.445	0.02	0.008	8%
15	1.50	0.16		0.179			1.0	1.45	1.55	0.10	0.16	0.179	0.179	0.02	0.003	3%
16	1.60	0.16		0.046			1.0	1.55	1.65	0.10	0.16	0.046	0.046	0.02	0.001	1%
17	1.70	0.16		0.027			1.0	1.65	1.75	0.10	0.16	0.027	0.027	0.02	0.000	0%
18	1.80	0.09		0.027			1.0	1.75	1.85	0.10	0.09	0.027	0.027	0.01	0.000	0%
19	1.90	0.07		0.035			1.0	1.85	1.95	0.10	0.07	0.035	0.035	0.01	0.000	0%
20	2.00	0.08		0.006			1.0	1.95	2.05	0.10	0.08	0.006	0.006	0.01	0.000	0%
LB	2.10	0.00	0.00	0.000	0.000	0.000	1.0	2.05	2.10	0.05	0.02	0.002	0.002	0.00	0.000	0%
<b>Total Flow</b>														<b>0.103</b>		

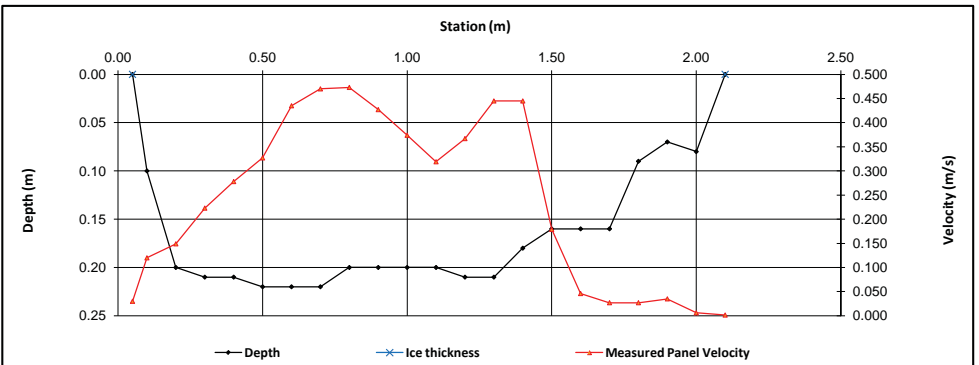
Measurement Details:	
Start Time (MST):	12:45
End Time (MST):	14:20
Equipment:	ADV
Method:	Wading
River Condition:	open, bed ice
Quality/Error (see reverse):	good
Weather:	clear, light breeze, +6

Flow characteristics:		
Total Flow:	0.103	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.35	(m <sup>2</sup> )
Wetted Width:	2.05	(m)
Hydraulic Depth:	0.170	(m)
Mean Velocity:	0.295	(m/s)
Froude Number:	0.228	

Logger Details:		
	Before	After
Transducer Reading (m):	0.16	0.2
Water (°C):	7.2	0.7
Rainfall (mm):	-	-
Battery (Main):	14:28	13:23
Datalogger Clock:	13:13	14:13
Laptop Clock:	13:13	14:13
Dessicant:	replaced	-
Logger# (if Δ):	18202	-
PT# (if Δ):	284721	-

**Datalogger / Station Notes:**

(604) 345-6423



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as	Description
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:	1.002	362.384		361.382	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			2.380	360.004		
Other:			1.144	361.240	360.514	Rebar
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:			0.992	361.383	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			2.370	360.005		
Other:	1.135	362.375		361.240	360.514	Rebar

Closing Error	-0.001	Average WL	360.005
WL Check	0.001	Transducer Elevation	359.845

**General Notes:**

-bed ice, PT installed on ice

<b>Field Personnel:</b>	SM, SG	<b>Trip Date:</b>	25-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S3 - Iyininim Creek above Kearl Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: May 31, 2012



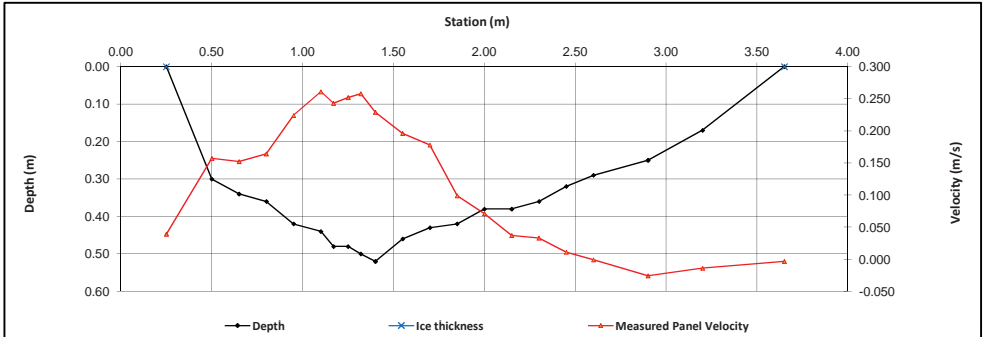
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.25	0.00	0.00	0.000	0.000	0.000	1.0	0.25	0.38	0.13	0.08	0.039	0.039	0.01	0.000	0%
1	0.50	0.30		0.157			1.0	0.38	0.58	0.20	0.30	0.157	0.157	0.06	0.009	7%
2	0.65	0.34		0.152			1.0	0.58	0.73	0.15	0.34	0.152	0.152	0.05	0.008	6%
3	0.80	0.36		0.164			1.0	0.73	0.88	0.15	0.36	0.164	0.164	0.05	0.009	7%
4	0.95	0.42		0.224			1.0	0.88	1.03	0.15	0.42	0.224	0.224	0.06	0.014	11%
5	1.10	0.44		0.261			1.0	1.03	1.14	0.11	0.44	0.261	0.261	0.05	0.013	10%
6	1.17	0.48		0.243			1.0	1.14	1.21	0.08	0.48	0.243	0.243	0.04	0.009	7%
7	1.25	0.48		0.252			1.0	1.21	1.29	0.08	0.48	0.252	0.252	0.04	0.009	7%
8	1.32	0.50		0.258			1.0	1.29	1.36	0.07	0.50	0.258	0.258	0.04	0.010	7%
9	1.40	0.52		0.229			1.0	1.36	1.48	0.12	0.52	0.229	0.229	0.06	0.014	10%
10	1.55	0.46		0.196			1.0	1.48	1.63	0.15	0.46	0.196	0.196	0.07	0.014	10%
11	1.70	0.43		0.178			1.0	1.63	1.78	0.15	0.43	0.178	0.178	0.06	0.011	9%
12	1.85	0.42		0.099			1.0	1.78	1.93	0.15	0.42	0.099	0.099	0.06	0.006	5%
13	2.00	0.38		0.071			1.0	1.93	2.08	0.15	0.38	0.071	0.071	0.06	0.004	3%
14	2.15	0.38		0.037			1.0	2.08	2.23	0.15	0.38	0.037	0.037	0.06	0.002	2%
15	2.30	0.36		0.033			1.0	2.23	2.38	0.15	0.36	0.033	0.033	0.05	0.002	1%
16	2.45	0.32		0.011			1.0	2.38	2.53	0.15	0.32	0.011	0.011	0.05	0.001	0%
17	2.60	0.29		-0.001			1.0	2.53	2.75	0.23	0.29	-0.001	-0.001	0.07	0.000	0%
18	2.90	0.25		-0.026			1.0	2.75	3.05	0.30	0.25	-0.026	-0.026	0.08	-0.002	-1%
19	3.20	0.17		-0.014			1.0	3.05	3.43	0.38	0.17	-0.014	-0.014	0.06	-0.001	-1%
LB	3.65	0.00	0.00	0.000	0.000	0.000	1.0	3.43	3.65	0.23	0.04	-0.004	-0.004	0.01	0.000	0%
<b>Total Flow</b>														<b>0.131</b>		

Measurement Details:	
Start Time (MST):	12:55
End Time (MST):	13:55
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	clear, calm, +25

Flow characteristics:	
Total Flow:	0.131 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.08 (m <sup>2</sup> )
Wetted Width:	3.40 (m)
Hydraulic Depth:	0.318 (m)
Mean Velocity:	0.121 (m/s)
Froude Number:	0.069

Logger Details:		
	Before	After
Transducer Reading (m):	0.173	0.262
Water (°C):	13.0	13.1
Rainfall (mm):	0	0.2
Battery (Main):	13.6	13.5
Datalogger Clock:	12:57	13:10
Laptop Clock:	12:57	13:10
Dessicant:	replaced	-
Logger# (if Δ):	18202	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
-repaired antenna cable	
-RSSI: -110	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:	1.087	362.469		361.382	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			3.497	358.972		
Other:			1.260	361.209	360.514	Rebar
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:			1.074	361.382	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			3.485	358.971		
Other:	1.247	362.456			360.514	Rebar

Closing Error	0.000	Average WL	358.972
WL Check	0.001	Transducer Elevation	358.799

General Notes:	
-antenna cable severed at antenna connector	
-moved PLS deeper	
-tipped rain gauge 1 tip	

Field Personnel:	SM, TR	Trip Date:	31-May-12
Data Entry Personnel:	CJ	Date:	7-Jun-12
Data Check Personnel:	DW	Date:	12-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S3 - Iyininim Creek above Kearl Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date:

August 13, 2012



## Flow Measurement:

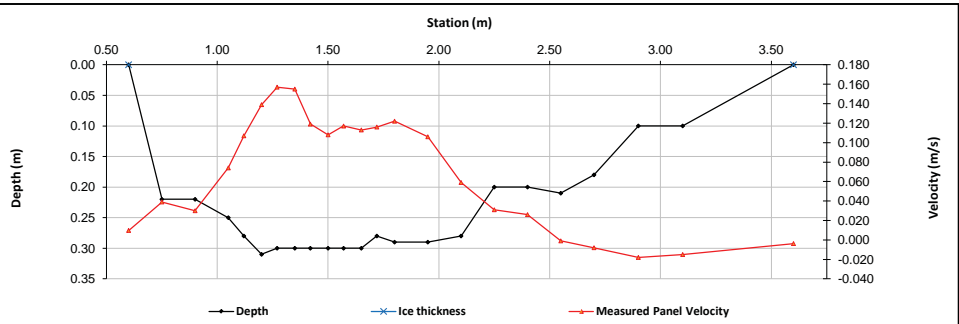
Measured Data										Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.60	0.00	0.00	0.000	0.000	0.000	1.0	0.60	0.68	0.08	0.06	0.010	0.010	0.00	0.000	0%			
1	0.75	0.22		0.039			1.0	0.68	0.83	0.15	0.22	0.039	0.039	0.03	0.001	3%			
2	0.90	0.22		0.030			1.0	0.83	0.98	0.15	0.22	0.030	0.030	0.03	0.001	2%			
3	1.05	0.25		0.074			1.0	0.98	1.09	0.11	0.25	0.074	0.074	0.03	0.002	5%			
4	1.12	0.28		0.107			1.0	1.09	1.16	0.08	0.28	0.107	0.107	0.02	0.002	5%			
5	1.20	0.31		0.139			1.0	1.16	1.24	0.07	0.31	0.139	0.139	0.02	0.003	8%			
6	1.27	0.30		0.157			1.0	1.24	1.31	0.08	0.30	0.157	0.157	0.02	0.004	9%			
7	1.35	0.30		0.155			1.0	1.31	1.39	0.08	0.30	0.155	0.155	0.02	0.003	8%			
8	1.42	0.30		0.119			1.0	1.39	1.46	0.08	0.30	0.119	0.119	0.02	0.003	6%			
9	1.50	0.30		0.108			1.0	1.46	1.54	0.08	0.30	0.108	0.108	0.02	0.002	6%			
10	1.57	0.30		0.117			1.0	1.54	1.61	0.07	0.30	0.117	0.117	0.02	0.003	6%			
11	1.65	0.30		0.113			1.0	1.61	1.69	0.08	0.30	0.113	0.113	0.02	0.003	6%			
12	1.72	0.28		0.116			1.0	1.69	1.76	0.08	0.28	0.116	0.116	0.02	0.002	6%			
13	1.80	0.29		0.122			1.0	1.76	1.88	0.12	0.29	0.122	0.122	0.03	0.004	10%			
14	1.95	0.29		0.106			1.0	1.88	2.03	0.15	0.29	0.106	0.106	0.04	0.005	11%			
15	2.10	0.28		0.059			1.0	2.03	2.18	0.15	0.28	0.059	0.059	0.04	0.002	6%			
16	2.25	0.20		0.031			1.0	2.18	2.33	0.15	0.20	0.031	0.031	0.03	0.001	2%			
17	2.40	0.20		0.026			1.0	2.33	2.48	0.15	0.20	0.026	0.026	0.03	0.001	2%			
18	2.55	0.21		-0.001			1.0	2.48	2.63	0.15	0.21	-0.001	-0.001	0.03	0.000	0%			
19	2.70	0.18		-0.008			1.0	2.63	2.80	0.18	0.18	-0.008	-0.008	0.03	0.000	-1%			
20	2.90	0.10		-0.018			1.0	2.80	3.00	0.20	0.10	-0.018	-0.018	0.02	0.000	-1%			
21	3.10	0.10		-0.015			1.0	3.00	3.35	0.35	0.10	-0.015	-0.015	0.04	-0.001	-1%			
LB	3.60	0.00	0.00	0.00	0.00	0.00	1.0	3.35	3.60	0.25	0.03	-0.004	-0.004	0.01	0.000	0%			
<b>Total Flow</b>														<b>0.0412</b>					

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	15:15
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	Rain, calm, 15

Flow characteristics:		
Total Flow:	0.0412	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.60	(m <sup>2</sup> )
Wetted Width:	3.00	(m)
Hydraulic Depth:	0.200	(m)
Mean Velocity:	0.069	(m/s)
Froude Number:	0.049	

Logger Details:		
	Before	After
Transducer Reading (m):	0.166	0.226
Water (°C):	13.8	-
Battery (Main):	12.6	-
Datalogger Clock:	2:21	-
Laptop Clock:	3:21	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
Antenna cable was replaced. moved PLS deeper 0.226 m Installed 3rd. BM	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:	1.037	362.419		361.382	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			3.548	358.871		
Other:			1.217	361.202	360.514	Rebar
<b>Setup #2</b>						
Bench Mark 1:					361.565	3/4" Pipe 5 m W of logger
Bench Mark 2:		1.015		361.381	361.382	3/4" Pipe 4 m NE of logger
Bench Mark 3:					361.588	3/4" Pipe 10 m NW of logger
Ice/PT:						
Water Level:			3.524	358.872		
Other:	1.194	362.396		361.202	360.514	Rebar
Closing Error	0.001					
WL Check	0.001					
Average WL					358.872	
Transducer Elevation					358.706	

General Notes:	

Field Personnel:		Trip Date:	13-Aug-12
Data Entry Personnel:	SM, CJ	Date:	13-Aug-12
Data Check Personnel:	CJ	Date:	4-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S3 - Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: September 14, 2012



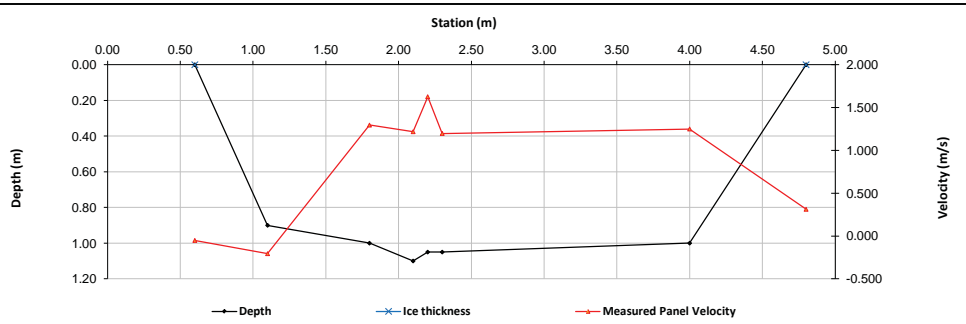
Flow Measurement:																
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel 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	0.60	0.00	0.00	0.000	0.000	0.000	1.0	0.60	0.85	0.25	0.23	-0.052	-0.052	0.06	-0.003	0%
1	1.10	0.90		-0.170	-0.242		1.0	0.85	1.45	0.60	0.90	-0.206	-0.206	0.54	-0.111	-3%
2	1.80	1.00		0.526	2.065		1.0	1.45	1.95	0.50	1.00	1.296	1.296	0.50	0.648	18%
3	2.10	1.10		0.395	2.041		1.0	1.95	2.15	0.20	1.10	1.218	1.218	0.22	0.268	7%
4	2.20	1.05		1.040	2.214		1.0	2.15	2.25	0.10	1.05	1.627	1.627	0.11	0.171	5%
5	2.30	1.05		0.343	2.053		1.0	2.25	3.15	0.90	1.05	1.198	1.198	0.95	1.132	31%
	4.00	1.00		0.500	2.000		1.0	3.15	4.40	1.25	1.00	1.250	1.250	1.25	1.563	42%
LB	4.80	0.00	0.00	0.00	0.00	0.00	1.0	4.40	4.80	0.40	0.25	0.313	0.313	0.10	0.031	1%
<b>Total Flow</b>															<b>3.7</b>	

Measurement Details:	
Start Time (MST):	4:30
End Time (MST):	5:15
Equipment:	ADV
Method:	Wading
River Condition:	HIGH, FLOODED
Quality/Error (see reverse):	Poor
Weather:	-

Flow characteristics:	
Total Flow:	3.7 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	3.72 (m <sup>2</sup> )
Wetted Width:	4.20 (m)
Hydraulic Depth:	0.885 (m)
Mean Velocity:	0.996 (m/s)
Froude Number:	0.338

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.804	
Battery (Main):	9.4	
Datalogger Clock:	14.4	
Laptop Clock:	11:13	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.985	361.565	361.565	3/4 PIPE 5m W of LOGGER
Bench Mark 2:	1.168	362.55		361.382	361.382	3/4" Pipe 4m NE
Bench Mark 3:			0.962	361.588	361.588	Pipe 10m NW
Ice/PT:						
Water Level:			2.813	359.737		
Other:					360.514	Rebar
<b>Setup #2</b>						
Bench Mark 1:	0.962	362.527		361.565	361.565	3/4 PIPE 5m W of LOGGER
Bench Mark 2:			1.144	361.383	361.382	3/4" Pipe 4m NE
Bench Mark 3:			0.937	361.590	361.588	Pipe 10m NW
Ice/PT:						
Water Level:			2.789	359.738		
Other:					360.514	

Closing Error	-0.001	Average WL	359.738
WL Check	0.001	Transducer Elevation	358.934

**General Notes:**

- INSTALLED 3/4" PIPE BM
- ATTEMPTED TO CROSS THE RIVER A COUPLE OF TIMES BUT IT COULD NOT BE CROSSED BECAUSE OF SAFTY CONCERNS WITH THE VERY HIGH FLOW AND A LOT OF DEBRIS.
- TOOK A COUPLE MEASUREMENTS FROM A SAFE POSITION NEAR THE SHORE
- AVERAGE DEPTH ESTIMATE: 1.05 m
- ADV VALUES JUMPING ALL OVER THE PLACE IN AREAS OF HIGH FLOW
- EDDIE LINE AROUND 2.2 m

Field Personnel:		Trip Date:	14-Sep-12
Data Entry Personnel:	DW, TR	Date:	14-Sep-12
Data Check Personnel:	TR	Date:	9-Oct-12
	CJ		

# Hydrometric Measurement / Site Visit Record

Site: S3 - Iyininin Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date:

November 5, 2012



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							
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	0.08	0.08	0.09	-0.029	-0.029	0.01	0.000	0%							
1	0.15	0.34		-0.115			1.0	0.08	0.23	0.15	0.34	-0.115	-0.115	0.05	-0.006	-2%							
2	0.30	0.38		-0.074			1.0	0.23	0.38	0.15	0.38	-0.074	-0.074	0.06	-0.004	-1%							
3	0.45	0.43		0.015			1.0	0.38	0.53	0.15	0.43	0.015	0.015	0.06	0.001	0%							
4	0.60	0.48		0.089			1.0	0.53	0.68	0.15	0.48	0.089	0.089	0.07	0.006	2%							
5	0.75	0.60		0.134			1.0	0.68	0.83	0.15	0.60	0.134	0.134	0.09	0.012	4%							
6	0.90	0.60		0.228			1.0	0.83	0.98	0.15	0.60	0.228	0.228	0.09	0.021	7%							
7	1.05	0.62		0.280			1.0	0.98	1.13	0.15	0.62	0.280	0.280	0.09	0.026	8%							
8	1.20	0.60		0.155			1.0	1.13	1.28	0.15	0.60	0.155	0.155	0.09	0.014	5%							
9	1.35	0.59		0.115			1.0	1.28	1.43	0.15	0.59	0.115	0.115	0.09	0.010	3%							
10	1.50	0.63		0.203			1.0	1.43	1.58	0.15	0.63	0.203	0.203	0.09	0.019	6%							
11	1.65	0.63		0.320			1.0	1.58	1.69	0.12	0.63	0.320	0.320	0.07	0.023	8%							
12	1.73	0.65		0.307			1.0	1.69	1.77	0.08	0.65	0.307	0.307	0.05	0.015	5%							
13	1.80	0.62		0.381			1.0	1.77	1.88	0.11	0.62	0.381	0.381	0.07	0.026	8%							
14	1.95	0.58		0.246			1.0	1.88	2.03	0.15	0.58	0.246	0.246	0.09	0.021	7%							
15	2.10	0.56		0.181			1.0	2.03	2.18	0.15	0.56	0.181	0.181	0.08	0.015	5%							
16	2.25	0.55		0.323			1.0	2.18	2.33	0.15	0.55	0.323	0.323	0.08	0.027	9%							
17	2.40	0.50		0.252			1.0	2.33	2.45	0.13	0.50	0.252	0.252	0.06	0.016	5%							
18	2.50	0.53		0.381			1.0	2.45	2.53	0.07	0.53	0.381	0.381	0.04	0.015	5%							
19	2.55	0.52		0.361			1.0	2.53	2.78	0.25	0.52	0.361	0.361	0.13	0.047	15%							
RB	3.00	0.00	0.00	0.00	0.00	0.00	1.0	2.78	3.00	0.23	0.13	0.090	0.090	0.03	0.003	1%							
<b>Total Flow</b>														<b>0.307</b>									

Measurement Details:	
Start Time (MST):	11:40
End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	med flow, partial ice cover
Quality/Error (see reverse):	Fair
Weather:	overcast, calm, +8

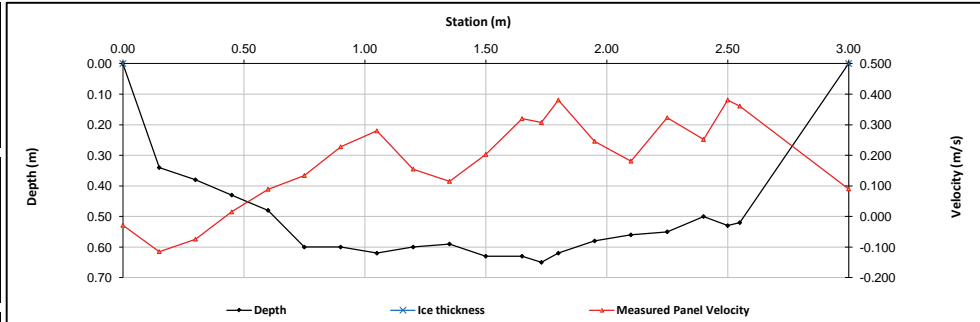
Flow characteristics:	
Total Flow:	0.307 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	1.50 (m <sup>2</sup> )
Wetted Width:	3.00 (m)
Hydraulic Depth:	0.500 (m)
Mean Velocity:	0.204 (m/s)
Froude Number:	0.092

Logger Details:		
	Before	After
Transducer Reading (m):	0.295	
Water (°C):	0.3	
Battery (Main):	11.7	
Datalogger Clock:	11:49	
Laptop Clock:	11:49	
Dessicant:	replaced	
Logger# (if Δ):	18202	
PT# (if Δ):	284721	

**Datalogger / Station Notes:**

ANCHOR CABLE attached to CONIFER BESIDE CULVERT

PT was PULLED 3 m DS of CULVERT  
 Note: PLS moved about 3 m down stream by high flows.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.032	361.563	361.565	3/4" Pipe 5m W of logger
Bench Mark 2:	1.213	362.595	1.213	361.382	361.382	3/4" Pipe 4m NE of logger
Bench Mark 3:			1.007	361.588	361.588	3/4" Pipe 10m NW of logger
Ice/PT:						
Water Level:			3.334	359.261		
Other:					360.514	Rebar
<b>Setup #2</b>						
Bench Mark 1:	1.016	362.579		361.563	361.565	3/4" Pipe 5m W of logger
Bench Mark 2:			1.198	361.381	361.382	3/4" Pipe 4m NE of logger
Bench Mark 3:			0.993	361.586	361.588	3/4" Pipe 10m NW of logger
Ice/PT:						
Water Level:			3.322	359.257		
Other:					360.514	Rebar

Closing Error	0.001
WL Check	0.004

Average WL	359.259
Transducer Elevation	358.964

**General Notes:**

Station was damaged by wildlife - pulled solar panel cable, corrected  
 BROKE THROUGH ICE to Take MEASUREMENT.  
 A NUMBER of TREES HAVE FALLEN into CHANNEL

TSS @ 1.5 m

<b>Field Personnel:</b>	TR and SM	<b>Trip Date:</b>	5-Nov-12
<b>Data Entry Personnel:</b>	TR and SM	<b>Date:</b>	5-Nov-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	7-Nov-12
<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 Dat

January 19, 2012



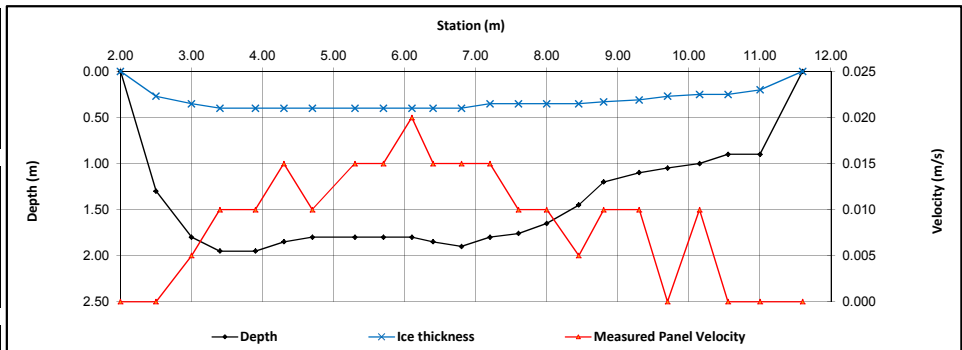
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.25	0.25	0.28	0.000	0.06	0.000	0.000	0%
1	2.50	1.30	0.27	-0.010	0.010	0.010	1.0	2.25	2.75	0.50	1.03	0.000	0.000	0.52	0.000	0%
2	3.00	1.80	0.35	0.010	0.010	0.010	1.0	2.75	3.20	0.45	1.45	0.005	0.005	0.65	0.003	3%
3	3.40	1.95	0.40	0.010	0.010	0.010	1.0	3.20	3.65	0.45	1.55	0.010	0.010	0.70	0.007	6%
4	3.90	1.95	0.40	0.010	0.010	0.010	1.0	3.65	4.10	0.45	1.55	0.010	0.010	0.70	0.007	6%
5	4.30	1.85	0.40	0.010	0.020	0.020	1.0	4.10	4.50	0.40	1.45	0.015	0.015	0.58	0.009	8%
6	4.70	1.80	0.40	0.010	0.010	0.010	1.0	4.50	5.00	0.50	1.40	0.010	0.010	0.70	0.007	6%
7	5.30	1.80	0.40	0.010	0.020	0.020	1.0	5.00	5.50	0.50	1.40	0.015	0.015	0.70	0.011	9%
8	5.70	1.80	0.40	0.010	0.020	0.020	1.0	5.50	5.90	0.40	1.40	0.015	0.015	0.56	0.008	8%
9	6.10	1.80	0.40	0.020	0.020	0.020	1.0	5.90	6.25	0.35	1.40	0.020	0.020	0.49	0.010	9%
10	6.40	1.85	0.40	0.010	0.020	0.020	1.0	6.25	6.60	0.35	1.45	0.015	0.015	0.51	0.008	7%
11	6.80	1.90	0.40	0.010	0.020	0.020	1.0	6.60	7.00	0.40	1.50	0.015	0.015	0.60	0.009	8%
12	7.20	1.80	0.35	0.010	0.020	0.020	1.0	7.00	7.40	0.40	1.45	0.015	0.015	0.58	0.009	8%
13	7.60	1.76	0.35	0.000	0.020	0.020	1.0	7.40	7.80	0.40	1.41	0.010	0.010	0.56	0.006	5%
14	8.00	1.65	0.35	0.010	0.010	0.010	1.0	7.80	8.23	0.43	1.30	0.010	0.010	0.55	0.006	5%
15	8.45	1.45	0.35	0.000	0.010	0.010	1.0	8.23	8.63	0.40	1.10	0.005	0.005	0.44	0.002	2%
16	8.80	1.20	0.33	0.010	0.010	0.010	1.0	8.63	9.05	0.43	0.87	0.010	0.010	0.37	0.004	3%
17	9.30	1.10	0.31	0.010	0.010	0.010	1.0	9.05	9.50	0.45	0.79	0.010	0.010	0.36	0.004	3%
18	9.70	1.05	0.27	0.000	0.000	0.000	1.0	9.50	9.93	0.43	0.78	0.000	0.000	0.33	0.000	0%
19	10.15	1.00	0.25	0.010	0.010	0.010	1.0	9.93	10.35	0.43	0.75	0.010	0.010	0.32	0.003	3%
20	10.55	0.90	0.25	0.000	0.000	0.000	1.0	10.35	10.78	0.42	0.65	0.000	0.000	0.28	0.000	0%
21	11.00	0.90	0.20	0.000	0.000	0.000	1.0	10.78	11.30	0.53	0.70	0.000	0.000	0.37	0.000	0%
RB	11.60	0.00	0.00	0.000	0.000	0.000	1.0	10.55	11.60	1.05	0.19	0.000	0.000	0.20	0.000	0%
<b>Total Flow</b>															<b>0.111</b>	

Measurement Details:	
Start Time (MST):	11:25
End Time (MST):	12:35
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -20

Flow Characteristics:		
Total Flow:	0.111	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.12	(m <sup>2</sup> )
Wetted Width:	9.60	(m)
Hydraulic Depth:	1.158	(m)
Mean Velocity:	0.010	(m/s)
Froude Number:	0.003	

Datalogger Details:		
Transducer Reading (m):	Before	After
Water (°C):	14.1	1.499
Battery (Main):	0.6	
Datalogger Clock:	12:03	
Laptop Clock:	12:02	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.242	99.611		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:				98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.227	98.384	98.404	T-post close to logger
Ice/PT:			2.185	97.426		
Water Level:			2.220	97.391		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.234	98.370	98.369	Old 3/4" Pipe
Bench Mark 2:				98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.220	99.604		98.384	98.404	T-post close to logger
Ice/PT:			2.174	97.430		
Water Level:			2.212	97.392		
Other:						
Closing Error: -0.001						
WL Check: 0.001						
Average WL: 97.392						
Transducer Elevation: 95.893						

**General Notes:**

-appears a sonde was placed through hole in ice at station and anchored to culvert

Field Personnel:	SM, GB	Trip Date:	19-Jan-12
Data Entry Personnel:	CJ	Date:	9-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

February 17, 2012



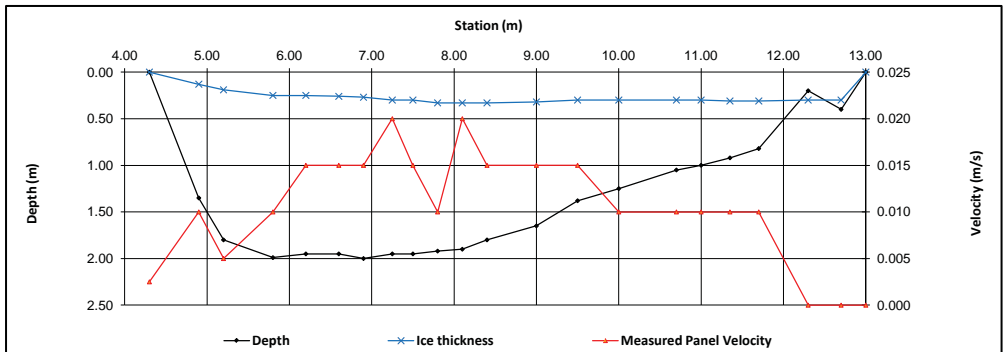
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	1.0	4.30	4.60	0.30	0.31	0.003	0.003	0.09	0.000	0%
1	4.90	1.35	0.13	0.010	0.010	0.010	1.0	4.60	5.05	0.45	1.22	0.010	0.010	0.55	0.005	5%
2	5.20	1.80	0.19	0.000	0.010	0.010	1.0	5.05	5.50	0.45	1.61	0.005	0.005	0.72	0.004	3%
3	5.80	1.99	0.25	0.000	0.020	0.020	1.0	5.50	6.00	0.50	1.74	0.010	0.010	0.87	0.009	7%
4	6.20	1.95	0.25	0.010	0.020	0.020	1.0	6.00	6.40	0.40	1.70	0.015	0.015	0.68	0.010	8%
5	6.60	1.95	0.26	0.010	0.020	0.020	1.0	6.40	6.75	0.35	1.69	0.015	0.015	0.59	0.009	7%
6	6.90	2.00	0.27	0.020	0.010	0.010	1.0	6.75	7.08	0.33	1.73	0.015	0.015	0.56	0.008	7%
7	7.25	1.95	0.30	0.020	0.020	0.020	1.0	7.08	7.38	0.30	1.65	0.020	0.020	0.50	0.010	8%
8	7.50	1.95	0.30	0.010	0.020	0.020	1.0	7.38	7.65	0.28	1.65	0.015	0.015	0.45	0.007	6%
9	7.80	1.92	0.33	0.010	0.010	0.010	1.0	7.65	7.95	0.30	1.59	0.010	0.010	0.48	0.005	4%
10	8.10	1.90	0.33	0.020	0.020	0.020	1.0	7.95	8.25	0.30	1.57	0.020	0.020	0.47	0.009	8%
11	8.40	1.80	0.33	0.010	0.020	0.020	1.0	8.25	8.70	0.45	1.47	0.015	0.015	0.66	0.010	8%
12	9.00	1.65	0.32	0.010	0.020	0.020	1.0	8.70	9.25	0.55	1.33	0.015	0.015	0.73	0.011	9%
13	9.50	1.38	0.30	0.020	0.010	0.010	1.0	9.25	9.75	0.50	1.08	0.015	0.015	0.54	0.008	7%
14	10.00	1.25	0.30	0.010	0.010	0.010	1.0	9.75	10.35	0.60	0.95	0.010	0.010	0.57	0.006	5%
15	10.70	1.05	0.30	0.010	0.010	0.010	1.0	10.35	10.85	0.50	0.75	0.010	0.010	0.38	0.004	3%
16	11.00	1.00	0.30	0.010	0.010	0.010	0.9	10.85	11.18	0.33	0.70	0.010	0.009	0.23	0.002	2%
17	11.35	0.92	0.31	0.010	0.010	0.010	0.9	11.18	11.53	0.35	0.61	0.010	0.009	0.21	0.002	2%
18	11.70	0.82	0.31	0.010	0.010	0.010	0.9	11.53	12.00	0.48	0.51	0.010	0.009	0.24	0.002	2%
19	12.30	0.20	0.30	0.000	0.000	0.000	1.0	12.00	12.50	0.50	-0.10	0.000	0.000	-0.05	0.000	0%
20	12.70	0.40	0.30	0.000	0.000	0.000	1.0	12.50	12.85	0.35	0.10	0.000	0.000	0.04	0.000	0%
RB	13.00	0.00	0.00	0.000	0.000	0.000	1.0	12.70	13.00	0.30	0.03	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>														<b>0.121</b>		

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	14:55
Equipment:	Marsh
Method:	ice
River Condition:	full ice cover
Quality/Error (see reverse):	good
Weather:	clear, calm, 0

Flow characteristics:	
Total Flow:	0.121 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	9.52 (m <sup>2</sup> )
Wetted Width:	8.70 (m)
Hydraulic Depth:	1.094 (m)
Mean Velocity:	0.013 (m/s)
Froude Number:	0.004

Datalogger Details:		Before	After
Transducer Reading (m):		1.491	
Water (°C):		0.6	
Battery (Main):		14.4	
Datalogger Clock:		14:09	
Laptop Clock:		14:07	
Dessicant:		good	
Logger# (if Δ):		-	
PT# (if Δ):		-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.317	99.686		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:					98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.301	98.385	98.404	T-post close to logger
Ice/PT:			2.288	97.398		
Water Level:			2.318	97.368		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.305	98.372	98.369	Old 3/4" Pipe
Bench Mark 2:					98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.292	99.677		98.385	98.404	T-post close to logger
Ice/PT:			2.278	97.399		
Water Level:			2.308	97.369		
Other:						

Closing Error	-0.003	Average WL	97.369
WL Check	0.001	Transducer Elevation	95.878

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	17-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	19-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	23-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

February 28, 2012



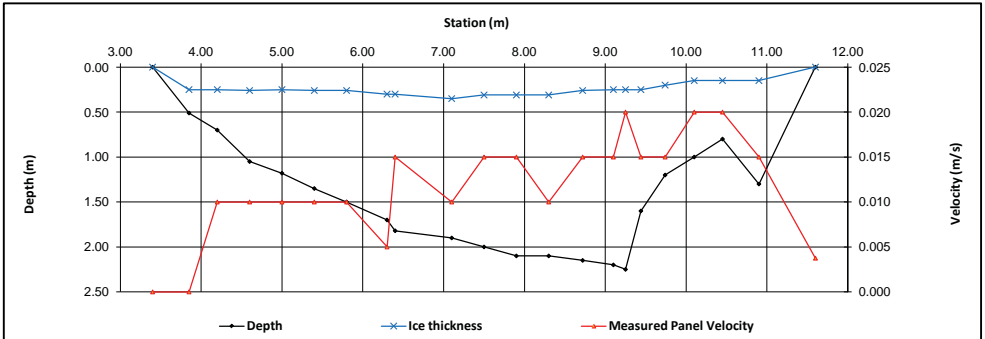
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	1.0	3.40	3.63	0.23	0.07	0.000	0.000	0.01	0.000	0%
1	3.85	0.51	0.25	0.000			1.0	3.63	4.03	0.40	0.26	0.000	0.000	0.10	0.000	0%
2	4.20	0.70	0.25	0.010			1.0	4.03	4.40	0.38	0.45	0.010	0.010	0.17	0.002	1%
3	4.60	1.05	0.26	0.010			1.0	4.40	4.80	0.40	0.79	0.010	0.010	0.32	0.003	3%
4	5.00	1.18	0.25	0.010	0.010	0.010	1.0	4.80	5.20	0.40	0.93	0.010	0.010	0.37	0.004	3%
5	5.40	1.35	0.26	0.010	0.010	0.010	1.0	5.20	5.60	0.40	1.09	0.010	0.010	0.44	0.004	4%
6	5.80	1.50	0.26	0.010	0.010	0.010	1.0	5.60	6.05	0.45	1.24	0.010	0.010	0.56	0.006	5%
7	6.30	1.70	0.30	0.000	0.010	0.010	1.0	6.05	6.35	0.30	1.40	0.005	0.005	0.42	0.002	2%
8	6.40	1.82	0.30	0.010	0.020	0.020	1.0	6.35	6.75	0.40	1.52	0.015	0.015	0.61	0.009	7%
9	7.10	1.90	0.35	0.010	0.010	0.010	1.0	6.75	7.30	0.55	1.55	0.010	0.010	0.85	0.009	7%
10	7.50	2.00	0.31	0.010	0.020	0.020	1.0	7.30	7.70	0.40	1.69	0.015	0.015	0.68	0.010	8%
11	7.90	2.10	0.31	0.020	0.010	0.010	1.0	7.70	8.10	0.40	1.79	0.015	0.015	0.72	0.011	9%
12	8.30	2.10	0.31	0.010	0.010	0.010	1.0	8.10	8.51	0.41	1.79	0.010	0.010	0.73	0.007	6%
13	8.72	2.15	0.26	0.010	0.020	0.020	1.0	8.51	8.91	0.40	1.89	0.015	0.015	0.76	0.011	9%
14	9.10	2.20	0.25	0.010	0.020	0.020	1.0	8.91	9.18	0.27	1.95	0.015	0.015	0.52	0.008	6%
15	9.25	2.25	0.25	0.020	0.020	0.020	1.0	9.18	9.35	0.17	2.00	0.020	0.020	0.34	0.007	5%
16	9.44	1.60	0.25	0.010	0.020	0.020	1.0	9.35	9.59	0.25	1.35	0.015	0.015	0.33	0.005	4%
17	9.74	1.20	0.20	0.010	0.020	0.020	1.0	9.59	9.92	0.33	1.00	0.015	0.015	0.33	0.005	4%
18	10.10	1.00	0.15	0.020	0.020	0.020	1.0	9.92	10.28	0.35	0.85	0.020	0.020	0.30	0.006	5%
19	10.45	0.80	0.15	0.020	0.010	0.010	1.0	10.28	10.68	0.40	0.65	0.020	0.020	0.26	0.005	4%
20	10.90	1.30	0.15	0.010	0.010	0.020	1.0	10.68	11.25	0.57	1.15	0.015	0.015	0.66	0.010	8%
LB	11.60	0.00	0.00	0.000	0.000	0.000	1.0	11.25	11.60	0.35	0.29	0.004	0.004	0.10	0.000	0%
<b>Total Flow</b>														<b>0.124</b>		

Measurement Details:	
Start Time (MST):	8:35
End Time (MST):	10:00
Equipment:	Marsh
Method:	Ice
River Condition:	beaver dam 50m down
Quality/Error (see reverse):	good
Weather:	clear, calm, -15

Flow characteristics:		
Total Flow:	0.124	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	9.57	(m <sup>2</sup> )
Wetted Width:	8.20	(m)
Hydraulic Depth:	1.167	(m)
Mean Velocity:	0.013	(m/s)
Froude Number:	0.004	

Datalogger Details:		
	Before	After
Transducer Reading (m):		1.489
Water (°C):	0.5	-
Battery (Main):	13.5	-
Datalogger Clock:	8:42	-
Laptop Clock:	8:40	-
Dessicant:	good	-
Logger# (if Δ):	13900	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.138	99.507		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:				98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.124	98.383	98.404	T-post close to logger
Ice/PT:			2.087	97.420		
Water Level:			2.143	97.364		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.126	98.365	98.369	Old 3/4" Pipe
Bench Mark 2:				98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.108	99.491		98.383	98.404	T-post close to logger
Ice/PT:			2.076	97.415		
Water Level:			2.128	97.363		
Other:						
Closing Error:			0.004			Average WL
WL Check:			0.001			Transducer Elevation
						97.364
						95.875

**General Notes:**

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	28-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date:

March 29, 2012



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)	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	1.0	4.10	4.30	0.20	0.07	0.000	0.000	0.01	0.000	0%
1	4.50	0.53	0.25	-0.001			1.0	4.30	4.70	0.40	0.28	-0.001	-0.001	0.11	0.000	0%
2	4.90	0.70	0.25	0.004			1.0	4.70	5.10	0.40	0.45	0.004	0.004	0.18	0.001	0%
3	5.30	0.92	0.26	0.004			1.0	5.10	5.45	0.35	0.66	0.004	0.004	0.23	0.001	1%
4	5.60	0.95	0.25	0.002			1.0	5.45	5.80	0.35	0.70	0.002	0.002	0.25	0.000	0%
5	6.00	1.20	0.23		0.008	0.013	1.0	5.80	6.15	0.35	0.97	0.011	0.011	0.34	0.004	2%
6	6.30	1.35	0.24		0.007	0.001	1.0	6.15	6.45	0.30	1.11	0.004	0.004	0.33	0.001	1%
7	6.60	1.54	0.25		0.012	0.013	1.0	6.45	6.80	0.35	1.29	0.013	0.013	0.45	0.006	3%
8	7.00	1.68	0.26		0.010	0.008	1.0	6.80	7.20	0.40	1.42	0.009	0.009	0.57	0.005	3%
9	7.40	1.80	0.31		0.016	0.019	1.0	7.20	7.65	0.45	1.49	0.018	0.018	0.67	0.012	7%
10	7.90	1.95	0.30		0.013	0.015	1.0	7.65	8.10	0.45	1.65	0.014	0.014	0.74	0.010	6%
11	8.30	2.10	0.30		0.009	0.015	1.0	8.10	8.60	0.50	1.80	0.012	0.012	0.90	0.011	6%
12	8.90	2.34	0.30		0.013	0.021	1.0	8.60	9.05	0.45	2.04	0.017	0.017	0.92	0.016	9%
13	9.20	2.40	0.29		0.017	0.020	1.0	9.05	9.40	0.35	2.11	0.019	0.019	0.74	0.014	8%
14	9.60	2.41	0.29		0.018	0.021	1.0	9.40	9.75	0.35	2.12	0.020	0.020	0.74	0.014	8%
15	9.90	2.40	0.27		0.019	0.020	1.0	9.75	10.10	0.35	2.13	0.020	0.020	0.75	0.015	9%
16	10.30	2.44	0.25		0.007	0.024	1.0	10.10	10.45	0.35	2.19	0.016	0.016	0.77	0.012	7%
17	10.60	2.45	0.22		0.029	0.022	1.0	10.45	10.80	0.35	2.23	0.026	0.026	0.78	0.020	12%
18	11.00	2.47	0.20		0.017	0.022	1.0	10.80	11.20	0.40	2.27	0.020	0.020	0.91	0.018	10%
19	11.40	2.48	0.15		0.014	0.010	1.0	11.20	11.55	0.35	2.33	0.012	0.012	0.82	0.010	6%
20	11.70	1.30	0.10		0.002	0.004	1.0	11.55	12.30	0.75	1.20	0.003	0.003	0.90	0.003	2%
LB	12.90	0.00	0.00	0.000	0.000	0.000	1.0	12.30	12.90	0.60	0.30	0.001	0.001	0.18	0.000	0%
<b>Total Flow</b>															<b>0.171</b>	

**Measurement Details:**

Start Time (MST):	12:11
End Time (MST):	13:23
Equipment:	ADV
Method:	Ice
River Condition:	ice poor on station
Quality/Error (see reverse):	good
Weather:	cloudy, +2

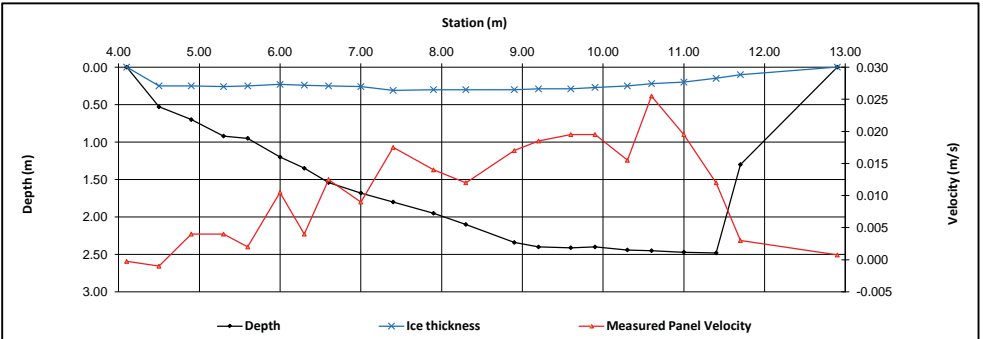
**Flow characteristics:**

Total Flow:	0.171	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	12.28	(m <sup>2</sup> )
Wetted Width:	8.80	(m)
Hydraulic Depth:	1.396	(m)
Mean Velocity:	0.014	(m/s)
Froude Number:	0.004	

**Datalogger Details:**

	Before	After
Transducer Reading (m):	1.491	
Water (°C):	0.5	-
Battery (Main):	14.5	-
Datalogger Clock:	11:21	-
Laptop Clock:	11:20	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.131	99.500		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:				98.527	98.527	3/4" Pipe 12m SW of logger
Bench Mark 3:			1.112	98.388	98.404	T-post close to logger
Ice/PT:			2.106	97.394		
Water Level:			2.132	97.368		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.117	98.369	98.369	Old 3/4" Pipe
Bench Mark 2:				98.525	98.525	3/4" Pipe 12m SW of logger
Bench Mark 3:	1.098	99.486		98.388	98.404	T-post close to logger
Ice/PT:			2.093	97.393		
Water Level:			2.119	97.367		
Other:						

Closing Error	0.000	Average WL	97.368
WL Check	0.001	Transducer Elevation	95.877

**General Notes:**

-ice within 1 m of left bank was less than 10 cm thick, stopped drilling two holes short

<b>Field Personnel:</b>	DW, TR	Trip Date:	29-Mar-12
<b>Data Entry Personnel:</b>	CJ	Date:	11-Apr-12
<b>Data Check Personnel:</b>	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: May 31, 2012



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	2.20	0.00	0.00	0.000	0.000	0.000	1.0	2.20	2.85	0.65	0.24	0.001	0.001	0.15	0.000	0%
1	3.50	0.94		0.007	0.003		1.0	2.85	3.75	0.90	0.94	0.005	0.005	0.85	0.004	1%
2	4.00	1.31		0.015	0.023		1.0	3.75	4.25	0.50	1.31	0.019	0.019	0.66	0.012	2%
3	4.50	1.47		0.033	0.027		1.0	4.25	4.75	0.50	1.47	0.030	0.030	0.74	0.022	3%
4	5.00	1.64		0.024	0.034		1.0	4.75	5.25	0.50	1.64	0.029	0.029	0.82	0.024	4%
5	5.50	1.71		0.022	0.031		1.0	5.25	5.75	0.50	1.71	0.027	0.027	0.86	0.023	4%
6	6.00	1.66		0.045	0.054		1.0	5.75	6.25	0.50	1.66	0.050	0.050	0.83	0.041	6%
7	6.50	1.59		0.055	0.033		1.0	6.25	6.63	0.38	1.59	0.044	0.044	0.60	0.026	4%
8	6.75	1.60		0.069	0.046		1.0	6.63	6.88	0.25	1.60	0.058	0.058	0.40	0.023	4%
9	7.00	1.62		0.062	0.057		1.0	6.88	7.13	0.25	1.62	0.060	0.060	0.41	0.024	4%
10	7.25	1.64		0.072	0.057		1.0	7.13	7.38	0.25	1.64	0.065	0.065	0.41	0.026	4%
11	7.50	1.66		0.075	0.069		1.0	7.38	7.63	0.25	1.66	0.072	0.072	0.42	0.030	5%
12	7.75	1.66		0.077	0.069		1.0	7.63	7.88	0.25	1.66	0.073	0.073	0.42	0.030	5%
13	8.00	1.66		0.066	0.078		1.0	7.88	8.13	0.25	1.66	0.072	0.072	0.42	0.030	5%
14	8.25	1.65		0.063	0.072		1.0	8.13	8.38	0.25	1.65	0.068	0.068	0.41	0.028	4%
15	8.50	1.65		0.062	0.071		1.0	8.38	8.75	0.38	1.65	0.067	0.067	0.62	0.041	6%
16	9.00	1.66		0.052	0.071		1.0	8.75	9.25	0.50	1.66	0.062	0.062	0.83	0.051	8%
17	9.50	1.60		0.050	0.074		1.0	9.25	9.75	0.50	1.60	0.062	0.062	0.80	0.050	8%
18	10.00	1.62		0.055	0.074		1.0	9.75	10.25	0.50	1.62	0.065	0.065	0.81	0.052	8%
19	10.50	1.60		0.061	0.063		1.0	10.25	10.75	0.50	1.60	0.062	0.062	0.80	0.050	8%
20	11.00	1.60		0.055	0.052		1.0	10.75	11.30	0.55	1.60	0.054	0.054	0.88	0.047	7%
LB	11.60	0.00	0.00	0.000	0.000	0.000	1.0	11.30	11.60	0.30	0.40	0.013	0.013	0.12	0.002	0%
<b>Total Flow</b>															<b>0.636</b>	

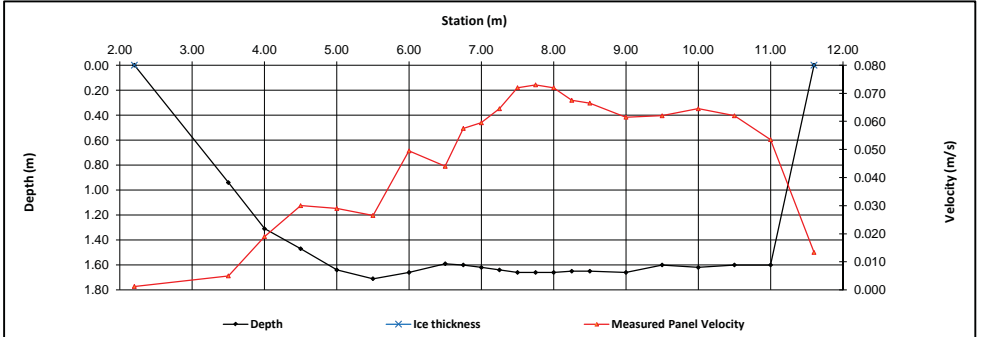
Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	12:35
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow, no ice
Quality/Error (see reverse):	excellent
Weather:	clear, breezy, +20

Flow Characteristics:		
Total Flow:	0.636	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	13.22	(m <sup>2</sup> )
Wetted Width:	9.40	(m)
Hydraulic Depth:	1.407	(m)
Mean Velocity:	0.048	(m/s)
Froude Number:	0.013	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	12.6	12.7
Battery (Main):	14.0	14.0
Datalogger Clock:	11:08	11:55
Laptop Clock:	11:07	11:53
Dessicant:	replaced	-
Logger# (if Δ):	13900	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

-uploaded new program



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.228	99.597		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:					98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.192	98.405	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.156	97.441		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.217	98.370	98.369	Old 3/4" Pipe
Bench Mark 2:					98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.182	99.587		98.405	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.146	97.441		
Other:						

Closing Error	-0.001	Average WL	97.441
WL Check	0.000	Transducer Elevation	95.869

**General Notes:**

-no cell service

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	31-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	7-Jun-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 15, 2012



## 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	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	2.50	0.00	0.00	0.000	0.000	0.000	1.0	2.50	3.00	0.50	0.15	-0.001	-0.001	0.07	0.000	0%
1	3.50	0.58		-0.005			1.0	3.00	3.75	0.75	0.58	-0.005	-0.005	0.44	-0.002	-1%
2	4.00	0.80			0.008	0.011	1.0	3.75	4.25	0.50	0.80	0.010	0.010	0.40	0.004	1%
3	4.50	0.92			0.011	0.014	1.0	4.25	4.75	0.50	0.92	0.013	0.013	0.46	0.006	2%
4	5.00	1.14			0.013	0.021	1.0	4.75	5.25	0.50	1.14	0.017	0.017	0.57	0.010	3%
5	5.50	1.28			0.013	0.025	1.0	5.25	5.75	0.50	1.28	0.019	0.019	0.64	0.012	3%
6	6.00	1.40			0.019	0.011	1.0	5.75	6.25	0.50	1.40	0.015	0.015	0.70	0.011	3%
7	6.50	1.44			0.019	0.018	1.0	6.25	6.75	0.50	1.44	0.019	0.019	0.72	0.013	4%
8	7.00	1.48			0.026	0.041	1.0	6.75	7.25	0.50	1.48	0.034	0.034	0.74	0.025	7%
9	7.50	1.58			0.032	0.044	1.0	7.25	7.75	0.50	1.58	0.038	0.038	0.79	0.030	8%
10	8.00	1.67			0.024	0.046	1.0	7.75	8.25	0.50	1.67	0.035	0.035	0.84	0.029	8%
11	8.50	1.71			0.022	0.046	1.0	8.25	8.75	0.50	1.71	0.034	0.034	0.86	0.029	8%
12	9.00	1.71			0.025	0.044	1.0	8.75	9.25	0.50	1.71	0.035	0.035	0.86	0.029	8%
13	9.50	1.73			0.024	0.043	1.0	9.25	9.75	0.50	1.73	0.034	0.034	0.87	0.029	8%
14	10.00	1.76			0.032	0.033	1.0	9.75	10.25	0.50	1.76	0.033	0.033	0.88	0.029	8%
15	10.50	1.78			0.020	0.051	1.0	10.25	10.75	0.50	1.78	0.036	0.036	0.89	0.032	8%
16	11.00	1.62			0.033	0.031	1.0	10.75	11.25	0.50	1.62	0.032	0.032	0.81	0.026	7%
17	11.50	1.55			0.020	0.021	1.0	11.25	11.75	0.50	1.55	0.021	0.021	0.78	0.016	4%
18	12.00	1.36			0.018	0.022	1.0	11.75	12.25	0.50	1.36	0.020	0.020	0.68	0.014	4%
19	12.50	1.16			0.001	0.010	1.0	12.25	12.75	0.50	1.16	0.006	0.006	0.58	0.003	1%
20	13.00	0.76			0.093	-0.004	1.0	12.75	13.75	1.00	0.76	0.045	0.045	0.76	0.034	9%
LB	14.50	0.00	0.00	0.000	0.000	0.000	1.0	13.75	14.50	0.75	0.19	0.011	0.011	0.14	0.002	0%

**Total Flow 0.379**

## Measurement Details:

Start Time (MST):	15:00
End Time (MST):	17:15
Equipment:	ADV
Method:	Fishcat
River Condition:	good, poor flow
Quality/Error (see reverse):	excellent
Weather:	p. cloudy, 15°C

## Flow characteristics:

Total Flow:	0.379	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	14.46	(m <sup>2</sup> )
Wetted Width:	12.00	(m)
Hydraulic Depth:	1.205	(m)
Mean Velocity:	0.026	(m/s)
Froude Number:	0.008	

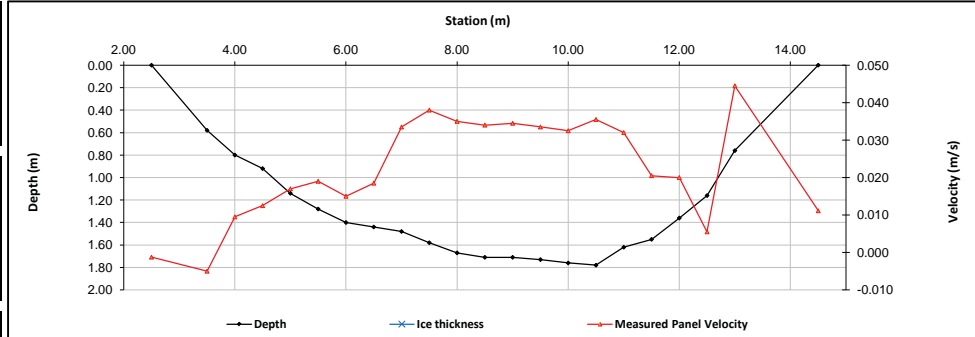
## Logger Details:

	Before	After
Transducer Reading (m):	1.486	
Water (°C):	12.2	
Battery (Main):	14.2	
Datalogger Clock:	14:21	
Laptop Clock:	14:19	
Dessicant:	replaced	
Logger# (if Δ):	13900	
PT# (if Δ):	-	

## Datalogger / Station Notes:

## General Notes:

- beaver dam approximately 30 m downstream.  
 - TSS sampled at offset 7 m.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.124	99.493		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			0.978	98.515	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.089	98.404	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.138	97.355		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.084	98.370	98.369	Old 3/4" Pipe
Bench Mark 2:	0.939	99.454		98.515	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.050	98.404	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.099	97.355		
Other:						

Closing Error	-0.001	Average WL	97.355
WL Check	0.000	Transducer Elevation	95.869

## Field Personnel:

Data Entry Personnel:	TR, CJ	Trip Date:	15-Jun-12
Data Check Personnel:	CJ	Date:	4-Jul-12
	MY	Date:	4-Jul-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date:

August 15, 2012



## 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																
1																
2																
3																
LB																

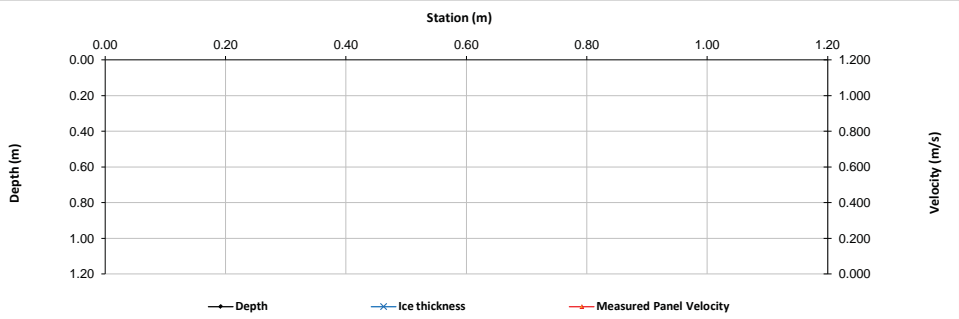
## Total Flow

Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	16:20
Equipment:	ADV
Method:	Wading
River Condition:	high flow,
Quality/Error (see reverse):	-
Weather:	20 deg. clear, calm

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):	1.512	1.509
Water (°C):	14.5	-
Battery (Main):	14.0	-
Datalogger Clock:	14:36	-
Laptop Clock:	14:34	-
Dessicant:	replaced	-
Logger# (if Δ):	13900	-
PT# (if Δ):	1.509	-

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.248	99.617		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			1.100	98.517	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.215	98.402	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.25	97.367		
<b>Other:</b>						
<b>Setup #2</b>						
Bench Mark 1:			1.229	98.368	98.369	Old 3/4" Pipe
Bench Mark 2:			1.080	98.517	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.195	99.597		98.402	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.232	97.365		
<b>Other:</b>						

Closing Error	0.001
WL Check	0.002

Average WL	97.366
Transducer Elevation	95.854

## General Notes:

-Flow measurement was abandoned several measurements in due to large leak in Fishcat causing safety concerns.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	15-Aug-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	15-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date:

August 24, 2012



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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.40	0.20	0.38	0.005	0.005	0.08	0.000	0%	
1	0.60	1.52		0.024	0.017		1.0	0.40	0.80	0.40	1.52	0.021	0.021	0.61	0.012	6%	
2	1.00	1.53		0.017	0.019		1.0	0.80	1.20	0.40	1.53	0.018	0.018	0.61	0.011	5%	
3	1.40	1.64		0.020	0.023		1.0	1.20	1.60	0.40	1.64	0.022	0.022	0.66	0.014	7%	
4	1.80	1.70		0.022	0.019		1.0	1.60	2.00	0.40	1.70	0.021	0.021	0.68	0.014	7%	
5	2.20	1.76		0.014	0.015		1.0	2.00	2.40	0.40	1.76	0.015	0.015	0.70	0.010	5%	
6	2.60	1.72		0.021	0.032		1.0	2.40	2.70	0.30	1.72	0.027	0.027	0.52	0.014	7%	
7	2.80	1.70		0.019	0.035		1.0	2.70	2.90	0.20	1.70	0.027	0.027	0.34	0.009	5%	
8	3.00	1.70		0.023	0.035		1.0	2.90	3.20	0.30	1.70	0.029	0.029	0.51	0.015	7%	
9	3.40	1.68		0.011	0.037		1.0	3.20	3.60	0.40	1.68	0.024	0.024	0.67	0.016	8%	
10	3.80	1.68		0.015	0.022		1.0	3.60	4.00	0.40	1.68	0.019	0.019	0.67	0.012	6%	
11	4.20	1.67		0.017	0.020		1.0	4.00	4.40	0.40	1.67	0.019	0.019	0.67	0.012	6%	
12	4.60	1.62		0.021	0.015		1.0	4.40	4.80	0.40	1.62	0.018	0.018	0.65	0.012	6%	
13	5.00	1.60		0.025	0.017		1.0	4.80	5.20	0.40	1.60	0.021	0.021	0.64	0.013	7%	
14	5.40	1.58		0.012	0.012		1.0	5.20	5.60	0.40	1.58	0.012	0.012	0.63	0.008	4%	
15	5.80	1.62		0.009	0.019		1.0	5.60	6.00	0.40	1.62	0.014	0.014	0.65	0.009	4%	
16	6.20	1.66		0.005	0.021		1.0	6.00	6.40	0.40	1.66	0.013	0.013	0.66	0.009	4%	
17	6.60	1.64		-0.001	0.010		1.0	6.40	6.80	0.40	1.64	0.005	0.005	0.66	0.003	1%	
18	7.00	1.60		0.004	0.009		1.0	6.80	7.20	0.40	1.60	0.007	0.007	0.64	0.004	2%	
19	7.40	1.32		0.007	0.007		1.0	7.20	7.60	0.40	1.32	0.007	0.007	0.53	0.004	2%	
20	7.80	1.20		-0.005	0.008		1.0	7.60	8.15	0.55	1.20	0.002	0.002	0.66	0.001	0%	
LB	8.50	0.00	0.00	0.00	0.00		1.0	8.15	8.50	0.35		0.000	0.000	0.11	0.000	0%	

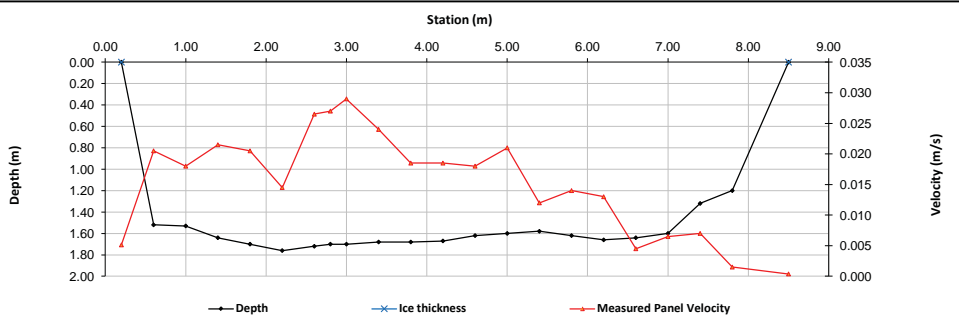
**Total Flow 0.203**

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	13:59
Equipment:	ADV
Method:	Wading
River Condition:	OPEN
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud

Flow characteristics:	
Total Flow:	0.203 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	12.54 (m <sup>2</sup> )
Wetted Width:	8.30 (m)
Hydraulic Depth:	1.510 (m)
Mean Velocity:	0.016 (m/s)
Froude Number:	0.004

Logger Details:		
	Before	After
Transducer Reading (m):	1.682	
Water (°C):	14.7	
Battery (Main):	13.1	
Datalogger Clock:	13:29	
Laptop Clock:	13:27	
Dessicant:	good	
Logger# (if Δ):	13900	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.034	99.403		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			0.887	98.516	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.000	98.403	98.404	T-post close to logger
Ice/PT:						
Water Level:			1.958	97.445		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.128	98.335	98.369	Old 3/4" Pipe
Bench Mark 2:			0.947	98.516	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:	1.06	99.463		98.403	98.404	T-post close to logger
Ice/PT:						
Water Level:			2.016	97.447		
Other:						

Closing Error	0.034	Average WL	97.446
WL Check	0.002	Transducer Elevation	95.764

**General Notes:**

<b>Field Personnel:</b>	SM, XP	<b>Trip Date:</b>	24-Aug-12
<b>Data Entry Personnel:</b>	SM (Field)	<b>Date:</b>	24-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: September 14, 2012



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	4.30	0.00	0.00	0.000	0.000	0.000	1.0	4.30	4.75	0.45	0.36	-0.005	-0.005	0.16	-0.001	0%
1	5.20	1.43		-0.023	-0.017		1.0	4.75	5.45	0.70	1.43	-0.020	-0.020	1.00	-0.020	0%
2	5.70	1.74		0.095	0.014		1.0	5.45	5.85	0.40	1.74	0.055	0.055	0.70	0.038	1%
3	6.00	1.85		0.126	0.067		1.0	5.85	6.25	0.40	1.85	0.097	0.097	0.74	0.071	1%
4	6.50	2.05		0.222	0.128		1.0	6.25	6.75	0.50	2.05	0.175	0.175	1.03	0.179	3%
5	7.00	2.16		0.298	0.178		1.0	6.75	7.25	0.50	2.16	0.238	0.238	1.08	0.257	5%
6	7.50	2.44		0.279	0.183		1.0	7.25	7.75	0.50	2.44	0.231	0.231	1.22	0.282	5%
7	8.00	2.44		0.292	0.248		1.0	7.75	8.25	0.50	2.44	0.270	0.270	1.22	0.329	6%
8	8.50	2.41		0.356	0.241		1.0	8.25	8.75	0.50	2.41	0.299	0.299	1.21	0.360	7%
9	9.00	2.43		0.322	0.267		1.0	8.75	9.25	0.50	2.43	0.295	0.295	1.22	0.358	7%
10	9.50	2.46		0.353	0.341		1.0	9.25	9.75	0.50	2.46	0.347	0.347	1.23	0.427	8%
11	10.00	2.54		0.393	0.329		1.0	9.75	10.13	0.38	2.54	0.361	0.361	0.95	0.344	6%
12	10.25	2.55		0.426	0.301		1.0	10.13	10.38	0.25	2.55	0.364	0.364	0.64	0.232	4%
13	10.50	2.52		0.353	0.318		1.0	10.38	10.75	0.38	2.52	0.336	0.336	0.95	0.317	6%
14	11.00	2.54		0.387	0.306		1.0	10.75	11.25	0.50	2.54	0.347	0.347	1.27	0.440	8%
15	11.50	2.59		0.365	0.321		1.0	11.25	11.75	0.50	2.59	0.343	0.343	1.30	0.444	8%
16	12.00	2.40		0.392	0.277		1.0	11.75	12.25	0.50	2.40	0.335	0.335	1.20	0.401	8%
17	12.50	2.32		0.317	0.197		1.0	12.25	12.75	0.50	2.32	0.257	0.257	1.16	0.298	6%
18	13.00	2.32		0.310	0.186		1.0	12.75	13.25	0.50	2.32	0.248	0.248	1.16	0.288	5%
19	13.50	2.24		0.197	0.140		1.0	13.25	13.75	0.50	2.24	0.169	0.169	1.12	0.189	4%
20	14.00	2.15		0.052	0.069		1.0	13.75	14.25	0.50	2.15	0.061	0.061	1.08	0.065	1%
LB	14.50	0.00	0.00	0.00	0.00	0.00	1.0	14.25	14.50	0.25	0.54	0.015	0.015	0.13	0.002	0%

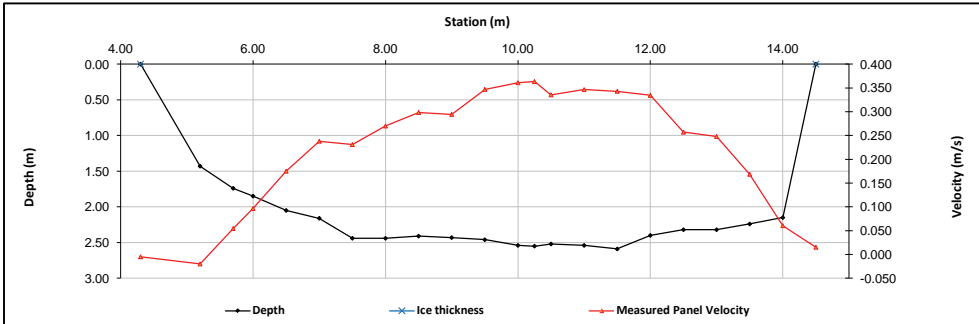
**Total Flow 5.3**

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	15:20
Equipment:	ADV
Method:	Fishcat
River Condition:	flooded
Quality/Error (see reverse):	Excellent
Weather:	SUNNY, 20

Flow characteristics:		
Total Flow:	5.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	21.74	(m <sup>2</sup> )
Wetted Width:	10.20	(m)
Hydraulic Depth:	2.132	(m)
Mean Velocity:	0.244	(m/s)
Froude Number:	0.053	

Logger Details:		
	Before	After
Transducer Reading (m):	2.465	
Water (°C):	10.3	
Battery (Main):	13.1	
Datalogger Clock:	12:27	
Laptop Clock:	12:25	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.337	99.706		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			1.174	98.532	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.300	98.406	98.404	T-post close to logger
Ice/PT:						
Water Level:			1.479	98.227		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.288	98.371	98.369	Old 3/4" Pipe
Bench Mark 2:	1.127	99.659		98.532	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.252	98.407	98.404	T-post close to logger
Ice/PT:						
Water Level:			1.433	98.226		
Other:						

Closing Error	-0.002	Average WL	98.227
WL Check	0.001	Transducer Elevation	95.762

**General Notes:**

- TSS@10.25 M
- SITE VERY FLOODED.
- DEPTH MEASURED WITH STADIA ROD.
- BANKS VERY OVERFLOWN BUT NO SIGNIFICANT FLOW IN FLOODED AREAS
- SUBSTATION FLOW VISIBLE ON SURFACE
- DEPTHS TOO DEEP FOR WADING ROD HAVE 0.8d TAKEN AT 1.8 m

Field Personnel:		DW, TR	Trip Date:	14-Sep-12
Data Entry Personnel:		DW	Date:	14-Sep-12
Data Check Personnel:		CJ	Date:	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S5 - Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: October 28, 2012



## Flow Measurement:

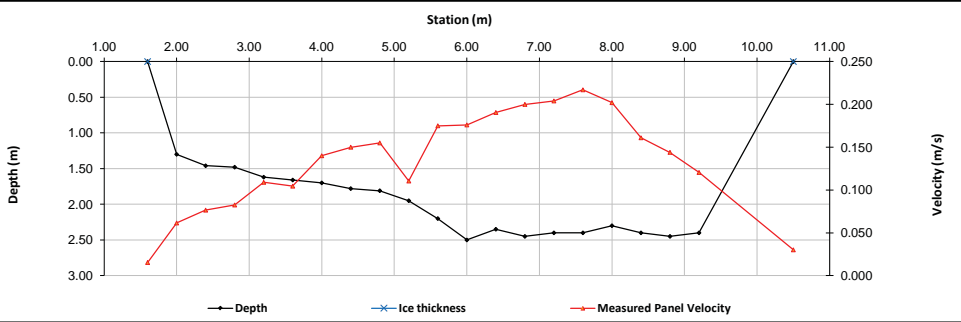
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.60	0.00	0.00	0.000	0.000	0.000	1.0	1.60	1.80	0.20	0.33	0.015	0.015	0.07	0.001	0%
1	2.00	1.30		0.061	0.062		1.0	1.80	2.20	0.40	1.30	0.062	0.062	0.52	0.032	1%
2	2.40	1.46		0.072	0.081		1.0	2.20	2.60	0.40	1.46	0.077	0.077	0.58	0.045	2%
3	2.80	1.48		0.076	0.089		1.0	2.60	3.00	0.40	1.48	0.083	0.083	0.59	0.049	2%
4	3.20	1.62		0.095	0.123		1.0	3.00	3.40	0.40	1.62	0.109	0.109	0.65	0.071	3%
5	3.60	1.66		0.091	0.118		1.0	3.40	3.80	0.40	1.66	0.105	0.105	0.66	0.069	3%
6	4.00	1.70		0.124	0.156		1.0	3.80	4.20	0.40	1.70	0.140	0.140	0.68	0.095	4%
7	4.40	1.78		0.159	0.141		1.0	4.20	4.60	0.40	1.78	0.150	0.150	0.71	0.107	4%
8	4.80	1.81		0.156	0.154		1.0	4.60	5.00	0.40	1.81	0.155	0.155	0.72	0.112	4%
9	5.20	1.95		0.163	0.058		1.0	5.00	5.40	0.40	1.95	0.111	0.111	0.78	0.086	3%
10	5.60	2.20		0.201	0.149		1.0	5.40	5.80	0.40	2.20	0.175	0.175	0.88	0.154	6%
11	6.00	2.50		0.178	0.174		1.0	5.80	6.20	0.40	2.50	0.176	0.176	1.00	0.176	7%
12	6.40	2.35		0.175	0.206		1.0	6.20	6.60	0.40	2.35	0.191	0.191	0.94	0.179	7%
13	6.80	2.45		0.203	0.197		1.0	6.60	7.00	0.40	2.45	0.200	0.200	0.98	0.196	8%
14	7.20	2.40		0.192	0.216		1.0	7.00	7.40	0.40	2.40	0.204	0.204	0.96	0.196	8%
15	7.60	2.40		0.190	0.244		1.0	7.40	7.80	0.40	2.40	0.217	0.217	0.96	0.208	8%
16	8.00	2.30		0.157	0.247		1.0	7.80	8.20	0.40	2.30	0.202	0.202	0.92	0.186	7%
17	8.40	2.40		0.143	0.179		1.0	8.20	8.60	0.40	2.40	0.161	0.161	0.96	0.155	6%
18	8.80	2.45		0.164	0.124		1.0	8.60	9.00	0.40	2.45	0.144	0.144	0.98	0.141	6%
19	9.20	2.40		0.151	0.090		1.0	9.00	9.85	0.85	2.40	0.121	0.121	2.04	0.246	10%
LB	10.50	0.00	0.00	0.00	0.00	0.00	1.0	9.85	10.50	0.65	0.60	0.030	0.030	0.39	0.012	0%
<b>Total Flow</b>															<b>2.52</b>	

Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	10:45
Equipment:	ADV
Method:	Fishcat
River Condition:	Med - High Flow
Quality/Error (see reverse):	Good
Weather:	-7 deg, high cloud, calm

Flow characteristics:	
Total Flow:	2.52 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	16.98 (m <sup>2</sup> )
Wetted Width:	8.90 (m)
Hydraulic Depth:	1.908 (m)
Mean Velocity:	0.148 (m/s)
Froude Number:	0.034

Logger Details:		
	Before	After
Transducer Reading (m):	2.068	
Water (°C):	0.3	
Battery (Main):	12.7	
Datalogger Clock:	8:51	
Laptop Clock:	8:49	
Dessicant:	replaced	
Logger# (if Δ):	13900	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.215	99.584		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			1.057	98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.175	98.409	98.404	T-post close to logger
Ice/PT:			1.741	97.843		
Water Level:			1.748	97.836		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.203	98.369	98.369	Old 3/4" Pipe
Bench Mark 2:	1.045	99.572		98.527	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.164	98.408	98.404	T-post close to logger
Ice/PT:			1.729	97.843		
Water Level:			1.736	97.836		
Other:						

Closing Error	0.000	Average WL	97.836
WL Check	0.000	Transducer Elevation	95.768

**General Notes:**

-partial ice cover

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	28-Oct-12
<b>Data Entry Personnel:</b>	SM, TR	<b>Date:</b>	28-Oct-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	7-Nov-12
<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: December 14, 2012



## Flow Measurement:

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	3.00	0.00	0.00	0.000	0.000	0.000	0.9	3.00	3.40	0.40	0.14	0.004	0.003	0.06	0.000	0%
1	3.80	1.12	0.56	0.015			0.9	3.40	4.00	0.60	0.56	0.015	0.014	0.34	0.005	1%
2	4.20	1.38	0.63	0.035			0.9	4.00	4.35	0.35	0.75	0.035	0.032	0.26	0.008	2%
3	4.50	1.51	0.65		0.066	0.047	1.0	4.35	4.85	0.50	0.86	0.057	0.057	0.43	0.024	6%
4	5.20	1.75	0.65		0.033	0.046	1.0	4.85	5.35	0.50	1.10	0.040	0.040	0.55	0.022	5%
5	5.50	1.77	0.67		0.041	0.044	1.0	5.35	5.70	0.35	1.10	0.043	0.043	0.39	0.016	4%
6	5.90	1.75	0.66		0.028	0.060	1.0	5.70	6.15	0.45	1.09	0.044	0.044	0.49	0.022	5%
7	6.40	1.70	0.66		0.054	0.064	1.0	6.15	6.55	0.40	1.04	0.059	0.059	0.42	0.025	6%
8	6.70	1.69	0.65		0.049	0.052	1.0	6.55	6.90	0.35	1.04	0.051	0.051	0.36	0.018	4%
9	7.10	1.72	0.65		0.058	0.076	1.0	6.90	7.30	0.40	1.07	0.067	0.067	0.43	0.029	7%
10	7.50	1.73	0.65		0.060	0.069	1.0	7.30	7.55	0.25	1.08	0.065	0.065	0.27	0.017	4%
11	7.60	1.72	0.64		0.053	0.071	1.0	7.55	7.75	0.20	1.08	0.062	0.062	0.22	0.013	3%
12	7.90	1.71	0.65		0.058	0.071	1.0	7.75	7.95	0.20	1.06	0.065	0.065	0.21	0.014	3%
13	8.00	1.72	0.69		0.056	0.079	1.0	7.95	8.20	0.25	1.03	0.068	0.068	0.26	0.017	4%
14	8.40	1.70	0.65		0.050	0.066	1.0	8.20	8.60	0.40	1.05	0.058	0.058	0.42	0.024	6%
15	8.80	1.71	0.62		0.061	0.069	1.0	8.60	9.00	0.40	1.09	0.065	0.065	0.44	0.028	7%
16	9.20	1.70	0.62		0.067	0.068	1.0	9.00	9.40	0.40	1.08	0.068	0.068	0.43	0.029	7%
17	9.60	1.77	0.59		0.036	0.058	1.0	9.40	9.95	0.55	1.18	0.047	0.047	0.65	0.031	7%
18	10.30	1.72	0.59		0.049	0.051	1.0	9.95	10.45	0.50	1.13	0.050	0.050	0.57	0.028	7%
19	10.60	1.68	0.55		0.039	0.055	1.0	10.45	10.80	0.35	1.13	0.047	0.047	0.40	0.019	4%
20	11.00	1.59	0.54		0.037	0.052	1.0	10.80	11.50	0.70	1.05	0.045	0.045	0.73	0.033	8%
LB	12.00	0.00	0.00	0.00	0.00	0.00	1.0	11.50	12.00	0.50	0.26	0.011	0.011	0.13	0.001	0%
<b>Total Flow</b>															<b>0.424</b>	

### Measurement Details:

Start Time (MST):	10:45
End Time (MST):	12:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, evidence of overflow
Quality/Error (see reverse):	Good
Weather:	P. CLOUDY, -12 deg

### Flow Characteristics:

Total Flow:	0.424	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.44	(m <sup>2</sup> )
Wetted Width:	9.00	(m)
Hydraulic Depth:	0.937	(m)
Mean Velocity:	0.050	(m/s)
Froude Number:	0.017	

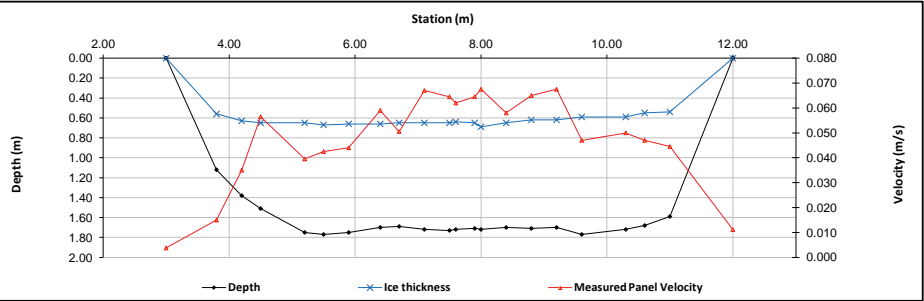
### Logger Details:

	Before	After
Transducer Reading (m):	1.696	-
Water (°C):	0.5	-
Battery (Main):	11.9	12.9
Datalogger Clock:	10:51	-
Laptop Clock:	10:49	-
Dessicant:	CHANGED	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:

### General Notes:

-Replaced battery  
 -Poor ice quality, overflow ice and lots of slush present



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	1.058	99.427		98.369	98.369	Old 3/4" Pipe
Bench Mark 2:			0.902	98.525	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 3:			1.021	98.406	98.404	T-post close to logger
Ice/PT:			1.935	97.492		
Water Level:			1.942	97.485		
Other:						
Setup #2			1.048	98.369	98.369	Old 3/4" Pipe
Bench Mark 1:				98.525	98.527	3/4" Pipe 12 m SW of logger
Bench Mark 2:	0.892	99.417		98.406	98.404	T-post close to logger
Bench Mark 3:			1.011	98.406		
Ice/PT:			1.926	97.491		
Water Level:			1.934	97.483		
Other:						

Closing Error	0.000	Average WL	97.484
WL Check	0.002	Transducer Elevation	95.788

### Field Personnel:

Data Entry Personnel:	TR AND CJ	Trip Date:	14-Dec-12
Data Check Personnel:	CJ	Date:	14-Dec-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	2-Jan-13

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: January 9, 2012



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)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
R	2.90	0.00	0.00	0.000	0.000	0.000	0.9	2.90	3.35	0.45	0.06	-0.001	-0.001	0.03	0.000	0%
1	3.80	0.60	0.35	-0.005			0.9	3.35	4.03	0.68	0.25	-0.005	-0.005	0.17	-0.001	0%
2	4.25	0.78	0.35	0.003			0.9	4.03	4.58	0.55	0.43	0.003	0.003	0.24	0.001	0%
3	4.90	1.02	0.30	0.000			1.0	4.58	5.10	0.52	0.72	0.000	0.000	0.38	0.000	0%
4	5.30	1.30	0.35		0.009	-0.001	1.0	5.10	5.60	0.50	0.95	0.004	0.004	0.48	0.002	1%
5	5.90	1.40	0.35		0.015	0.010	1.0	5.60	6.18	0.58	1.05	0.013	0.013	0.60	0.008	3%
6	6.45	1.44	0.35		0.019	0.014	1.0	6.18	6.73	0.55	1.09	0.017	0.017	0.60	0.010	4%
7	7.00	1.58	0.37		0.028	0.037	1.0	6.73	7.23	0.50	1.21	0.033	0.033	0.61	0.020	9%
8	7.45	1.55	0.47		0.020	0.024	1.0	7.23	7.73	0.50	1.08	0.022	0.022	0.54	0.012	5%
9	8.00	1.58	0.45		0.044	0.044	1.0	7.73	8.25	0.53	1.13	0.044	0.044	0.59	0.026	11%
10	8.50	1.50	0.45		0.050	0.050	1.0	8.25	8.65	0.40	1.05	0.050	0.050	0.42	0.021	9%
11	8.80	1.50	0.45		0.054	0.058	1.0	8.65	8.98	0.33	1.05	0.056	0.056	0.34	0.019	8%
12	9.15	1.45	0.40		0.057	0.056	1.0	8.98	9.35	0.38	1.05	0.057	0.057	0.39	0.022	10%
13	9.55	1.50	0.45		0.041	0.037	1.0	9.35	9.78	0.42	1.05	0.039	0.039	0.45	0.017	8%
14	10.00	1.55	0.45		0.047	0.033	1.0	9.78	10.28	0.50	1.10	0.040	0.040	0.55	0.022	10%
15	10.55	1.55	0.40		0.040	0.036	1.0	10.28	10.83	0.55	1.15	0.038	0.038	0.63	0.024	11%
16	11.10	1.50	0.40		0.034	0.017	1.0	10.83	11.30	0.48	1.10	0.026	0.026	0.52	0.013	6%
17	11.50	1.52	0.45		0.025	0.021	1.0	11.30	11.75	0.45	1.07	0.023	0.023	0.48	0.011	5%
18	12.00	1.15	0.43	0.009			0.9	11.75	12.25	0.50	0.72	0.009	0.008	0.36	0.003	1%
19	12.50	1.10	0.45	0.009			0.9	12.25	12.78	0.53	0.65	0.009	0.008	0.34	0.003	1%
20	13.05	0.95	0.35	-0.008			0.9	12.78	13.88	1.10	0.60	-0.006	-0.005	0.66	-0.004	-2%
L	14.70	0.00	0.00	0.000	0.000	0.000	1.0	13.05	14.70	1.65	0.28	-0.002	-0.002	0.45	-0.001	0%
<b>Total Flow</b>															<b>0.228</b>	

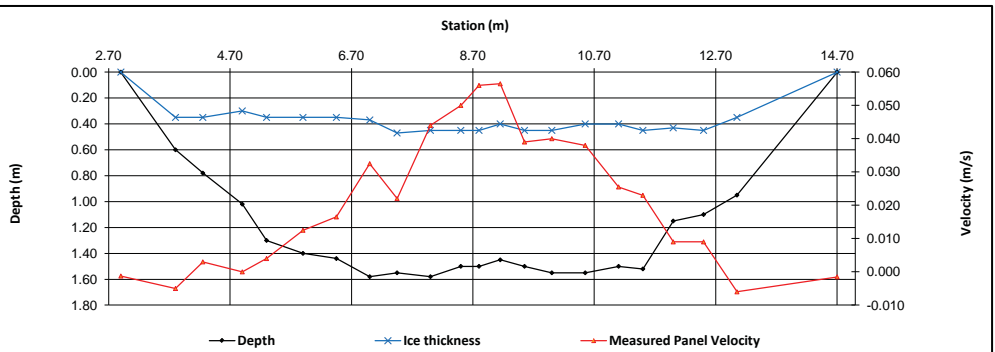
Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Full Ice Cover
Quality/Error (see reverse):	Good
Weather:	Calm, Overcast, 0°C

Flow characteristics:	
Total Flow:	0.228 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good
Cross Section Area:	9.83 (m <sup>2</sup> )
Wetted Width:	11.80 (m)
Hydraulic Depth:	0.833 (m)
Mean Velocity:	0.023 (m/s)
Froude Number:	0.008

Datalogger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.386	1.391
Barometric Pressure (kPa):	0.6	0.6
Battery (Main):	11.5	12.5
Datalogger Clock:	11:54	
Laptop Clock:	11:59	
Dessicant:	replaced	
Logger# (if Δ):		
PT# (if Δ):		

**Datalogger / Station Notes:**

- Solar panel 15.5 V replaced solar Controller



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.293	283.452		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.776	282.676		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.444	281.008		
Water Level:			2.480	280.972		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.278	282.161	282.159	Pipe 10 m W of logger
Bench Mark 2:	0.763	283.439		282.676		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.428	281.011		
Water Level:			2.463	280.976		
Other:						
Closing Error		-0.002		Average WL		280.974
WL Check		0.004		Transducer Elevation		279.588

**General Notes:**

<b>Field Personnel:</b>	DW, SM	<b>Trip Date:</b>	9-Jan-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	18-Jan-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	18-Jan-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: February 6, 2012



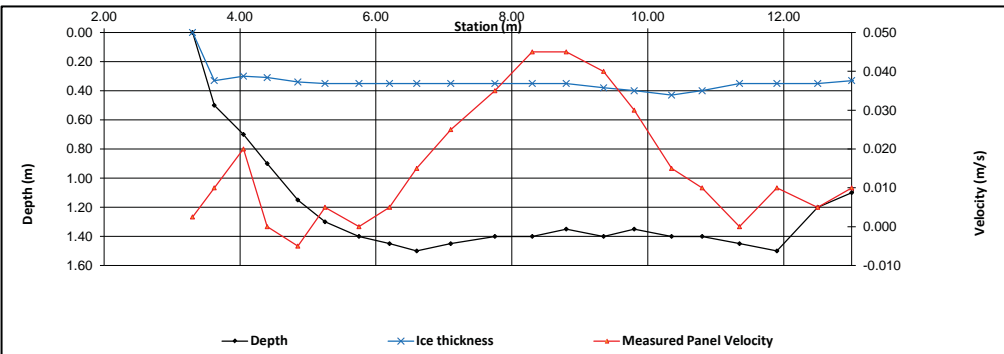
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	0.9	3.30	3.46	0.16	0.04	0.003	0.002	0.01	0.000	0%
1	3.62	0.50	0.33	0.010			0.9	3.46	3.84	0.38	0.17	0.010	0.009	0.06	0.001	0%
2	4.05	0.70	0.30	0.020			0.9	3.84	4.23	0.39	0.40	0.020	0.018	0.16	0.003	2%
3	4.40	0.90	0.31	0.000			1.0	4.23	4.63	0.40	0.59	0.000	0.000	0.24	0.000	0%
4	4.85	1.15	0.34		0.000	-0.010	1.0	4.63	5.05	0.43	0.81	-0.005	-0.005	0.34	-0.002	-1%
5	5.25	1.30	0.35		0.000	0.010	1.0	5.05	5.50	0.45	0.95	0.005	0.005	0.43	0.002	1%
6	5.75	1.40	0.35		0.000	0.000	1.0	5.50	5.98	0.48	1.05	0.000	0.000	0.50	0.000	0%
7	6.20	1.45	0.35		0.010	0.000	1.0	5.98	6.40	0.43	1.10	0.005	0.005	0.47	0.002	1%
8	6.60	1.50	0.35		0.020	0.010	1.0	6.40	6.85	0.45	1.15	0.015	0.015	0.52	0.008	5%
9	7.10	1.45	0.35		0.020	0.030	1.0	6.85	7.43	0.58	1.10	0.025	0.025	0.63	0.016	10%
10	7.75	1.40	0.35		0.040	0.030	1.0	7.43	8.03	0.60	1.05	0.035	0.035	0.63	0.022	14%
11	8.30	1.40	0.35		0.050	0.040	1.0	8.03	8.55	0.53	1.05	0.045	0.045	0.55	0.025	15%
12	8.80	1.35	0.35		0.040	0.050	1.0	8.55	9.08	0.52	1.00	0.045	0.045	0.52	0.024	15%
13	9.35	1.40	0.38		0.040	0.040	1.0	9.08	9.58	0.50	1.02	0.040	0.040	0.51	0.020	13%
14	9.80	1.35	0.40		0.030	0.030	1.0	9.58	10.08	0.50	0.95	0.030	0.030	0.48	0.014	9%
15	10.35	1.40	0.43		0.010	0.020	1.0	10.08	10.58	0.50	0.97	0.015	0.015	0.49	0.007	5%
16	10.80	1.40	0.40		0.010	0.010	1.0	10.58	11.08	0.50	1.00	0.010	0.010	0.50	0.005	3%
17	11.35	1.45	0.35		0.000	0.000	1.0	11.08	11.63	0.55	1.10	0.000	0.000	0.61	0.000	0%
18	11.90	1.50	0.35		0.010	0.010	1.0	11.63	12.20	0.57	1.15	0.010	0.010	0.66	0.007	4%
19	12.50	1.20	0.35		0.000	0.010	1.0	12.20	12.75	0.55	0.85	0.005	0.005	0.47	0.002	1%
20	13.00	1.10	0.33	0.010			0.9	12.75	13.30	0.55	0.77	0.010	0.009	0.42	0.004	2%
21	13.60	0.80	0.34	0.000			1.0	13.30	13.80	0.50	0.46	0.000	0.000	0.23	0.000	0%
22	14.00	0.60	0.33	0.010			0.9	13.80	14.40	0.60	0.27	0.010	0.009	0.16	0.001	1%
RB	14.80	0.00	0.00	0.000	0.000	0.000	1.0	14.40	14.80	0.40	0.07	0.003	0.003	0.03	0.000	0%
<b>Total Flow</b>														<b>0.161</b>		

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	11:15
Equipment:	Marsh McBirney
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Fair
Weather:	Clear, Calm -16°C

Flow characteristics:	
Total Flow:	0.161 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Fair
Cross Section Area:	9.60 (m <sup>2</sup> )
Wetted Width:	11.50 (m)
Hydraulic Depth:	0.835 (m)
Mean Velocity:	0.017 (m/s)
Froude Number:	0.006

Datalogger Details:		Before	After
Transducer Reading (m):			1.371
Water (°C):		0.4	
Barometric Pressure (kPa):		13.7	
Battery (Main):		13.7	
Datalogger Clock:		10:02	
Laptop Clock:		10:04	
Dessicant:		Good	
Logger# (if Δ):			
PT# (if Δ):			

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.583	283.742		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			1.062	282.680		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.718	281.024		
Water Level:			2.790	280.952		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.571	282.158	282.159	Pipe 10 m W of logger
Bench Mark 2:	1.049	283.729		282.680		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.704	281.025		
Water Level:			2.776	280.953		
Other:						
Closing Error		0.001	Average WL		280.953	
WL Check		0.001	Transducer Elevation		279.582	

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	6-Feb-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	24-Feb-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	16-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: February 29, 2012



## 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	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
1	3.20	0.00	0.00	0.000	0.000	0.000	0.9	3.20	3.35	0.15	0.06	0.003	0.002	0.01	0.000	0%
2	3.50	0.65	0.40	0.010			0.9	3.35	3.75	0.40	0.25	0.010	0.009	0.10	0.001	0%
3	4.00	0.85	0.35	0.000			1.0	3.75	4.25	0.50	0.50	0.000	0.000	0.25	0.000	0%
4	4.50	1.00	0.35	0.010			0.9	4.25	4.75	0.50	0.65	0.010	0.009	0.33	0.003	2%
5	5.00	1.25	0.40		0.000	0.010	1.0	4.75	5.23	0.48	0.85	0.005	0.005	0.40	0.002	1%
6	5.45	1.40	0.40		0.010	0.010	1.0	5.23	5.70	0.48	1.00	0.010	0.010	0.48	0.005	3%
7	5.95	1.40	0.40		0.030	0.010	1.0	5.70	6.18	0.48	1.00	0.020	0.020	0.48	0.010	5%
8	6.40	1.50	0.40		0.040	0.020	1.0	6.18	6.65	0.48	1.10	0.030	0.030	0.52	0.016	9%
9	6.90	1.50	0.41		0.040	0.040	1.0	6.65	7.18	0.53	1.09	0.040	0.040	0.57	0.023	12%
10	7.45	1.50	0.41		0.030	0.050	1.0	7.18	7.70	0.52	1.09	0.040	0.040	0.57	0.023	12%
11	7.95	1.50	0.45		0.050	0.070	1.0	7.70	8.20	0.50	1.05	0.060	0.060	0.52	0.032	17%
12	8.45	1.50	0.45		0.060	0.040	1.0	8.20	8.73	0.53	1.05	0.050	0.050	0.55	0.028	15%
13	9.00	1.50	0.45		0.040	0.040	1.0	8.73	9.25	0.53	1.05	0.040	0.040	0.55	0.022	12%
14	9.50	1.50	0.47		0.030	0.020	1.0	9.25	9.78	0.53	1.03	0.025	0.025	0.54	0.014	7%
15	10.05	1.53	0.47		0.000	0.010	1.0	9.78	10.33	0.55	1.06	0.005	0.005	0.58	0.003	2%
16	10.60	1.40	0.45		0.010	0.010	1.0	10.33	10.84	0.52	0.95	0.010	0.010	0.49	0.005	3%
17	11.08	1.30	0.45		0.000	0.000	1.0	10.84	11.33	0.49	0.85	0.000	0.000	0.42	0.000	0%
18	11.58	1.10	0.35		0.000	0.000	1.0	11.33	11.83	0.50	0.75	0.000	0.000	0.38	0.000	0%
19	12.08	1.00	0.35	0.000			1.0	11.83	12.32	0.49	0.65	0.000	0.000	0.32	0.000	0%
	12.55	0.90	0.35	0.000			1.0	12.32	12.73	0.41	0.55	0.000	0.000	0.23	0.000	0%
	12.90	0.00	0.00	0.000	0.000	0.000	1.0	12.73	12.90	0.17	0.14	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>															<b>0.184</b>	

## Measurement Details:

Start Time (MST):	10:20
End Time (MST):	11:25
Equipment:	Marsh
Method:	ice
River Condition:	ice cover
Quality/Error (see reverse):	fair
Weather:	overcast, windy, -12

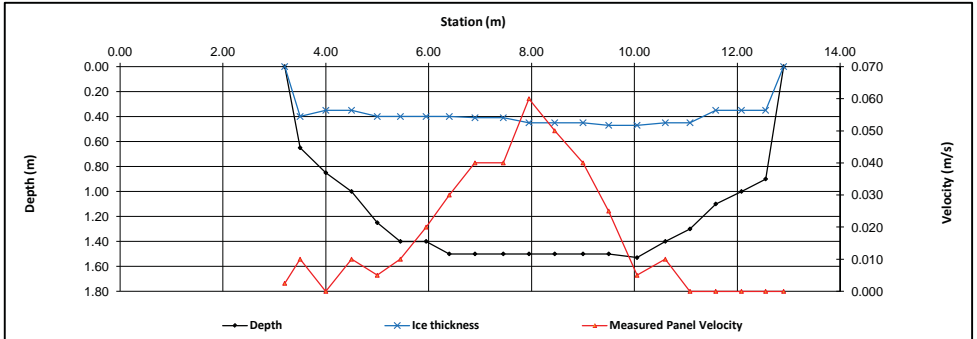
## Flow characteristics:

Total Flow:	0.184	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Cross Section Area:	8.30	(m <sup>2</sup> )
Wetted Width:	9.70	(m)
Hydraulic Depth:	0.856	(m)
Mean Velocity:	0.022	(m/s)
Froude Number:	0.008	

## Logger Details:

	Before	After
Transducer Reading (m):	1.400	
Water (°C):	0.4	-
Barometric Pressure (kPa):	97.7	-
Battery (Main):	15.1	-
Datalogger Clock:	10:23	-
Laptop Clock:	10:25	-
Dessicant:	good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.574	283.733		282.159	282.159	Pipe 10m W of logger
Bench Mark 2:			1.043	282.690		T-post 4m NW of logger
Bench Mark 3:						
Water Level:			2.718	281.015		
Other:			2.747	280.986		
<b>Setup #2</b>						
Bench Mark 1:			1.557	282.159	282.159	Pipe 10m W of logger
Bench Mark 2:	1.026	283.716		282.690		T-post 4m NW of logger
Bench Mark 3:						
Ice/PT:			2.702	281.014		
Water Level:			2.730	280.986		
Other:						
Closing Error	0.000				Average WL	280.986
WL Check	0.000				Transducer Elevation	279.586

## General Notes:

-snow drifts on ice, depths 30 cm+  
 -BM1: 0.545 m  
 -BM2: 0.235 m

Field Personnel:	SM, GB	Trip Date:	29-Feb-12
Data Entry Personnel:	CJ	Date:	20-Mar-12
Data Check Personnel:	XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

April 3, 2012



## 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	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	3.30	0.00	0.00	0.000	0.000	0.000	0.9	3.30	3.65	0.35	0.05	0.000	0.000	0.02	0.000	0%
1	4.00	0.74	0.54	0.001			0.9	3.65	4.28	0.63	0.20	0.001	0.001	0.13	0.000	0%
2	4.55	0.75	0.56	0.007			0.9	4.28	4.83	0.55	0.19	0.007	0.006	0.10	0.001	0%
3	5.10	0.89	0.55	0.005			0.9	4.83	5.33	0.50	0.34	0.005	0.005	0.17	0.001	0%
4	5.55	1.22	0.58	-0.008			0.9	5.33	5.73	0.40	0.64	-0.008	-0.007	0.26	-0.002	0%
5	5.90	1.30	0.60	0.005			0.9	5.73	6.20	0.48	0.70	0.005	0.005	0.33	0.001	0%
6	6.50	1.50	0.62		0.009	0.024	1.0	6.20	6.70	0.50	0.88	0.017	0.017	0.44	0.007	2%
7	6.90	1.62	0.62		0.022	0.031	1.0	6.70	7.20	0.50	1.00	0.027	0.027	0.50	0.013	3%
8	7.50	1.60	0.63		0.095	0.111	1.0	7.20	7.65	0.45	0.97	0.103	0.103	0.44	0.045	11%
9	7.80	1.61	0.62		0.113	0.117	1.0	7.65	8.00	0.35	0.99	0.115	0.115	0.35	0.040	9%
10	8.20	1.63	0.59		0.125	0.135	1.0	8.00	8.53	0.52	1.04	0.130	0.130	0.55	0.071	17%
11	8.85	1.63	0.56		0.122	0.119	1.0	8.53	9.03	0.50	1.07	0.121	0.121	0.54	0.064	15%
12	9.20	1.59	0.55		0.119	0.106	1.0	9.03	9.40	0.38	1.04	0.113	0.113	0.39	0.044	10%
13	9.60	1.52	0.53		0.109	0.087	1.0	9.40	9.88	0.48	0.99	0.098	0.098	0.47	0.046	11%
14	10.15	1.45	0.54		0.059	0.076	1.0	9.88	10.43	0.55	0.91	0.068	0.068	0.50	0.034	8%
15	10.70	1.43	0.55		0.081	0.080	1.0	10.43	11.00	0.57	0.88	0.081	0.081	0.51	0.041	10%
16	11.30	1.22	0.55	0.028			0.9	11.00	11.65	0.65	0.67	0.028	0.025	0.44	0.011	3%
17	12.00	0.95	0.53	0.019			0.9	11.65	12.38	0.73	0.42	0.019	0.017	0.30	0.005	1%
18	12.75	0.78	0.52	0.002			0.9	12.38	12.93	0.55	0.26	0.002	0.002	0.14	0.000	0%
LB	13.10	0.00	0.00	0.000	0.000	0.000	1.0	12.93	13.10	0.17	0.07	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>															<b>0.423</b>	

## Measurement Details:

Start Time (MST):	11:20
End Time (MST):	12:45
Equipment:	ADV
Method:	Ice
River Condition:	Very degraded ice
Quality/Error (see reverse):	fair
Weather:	cloudy, +5

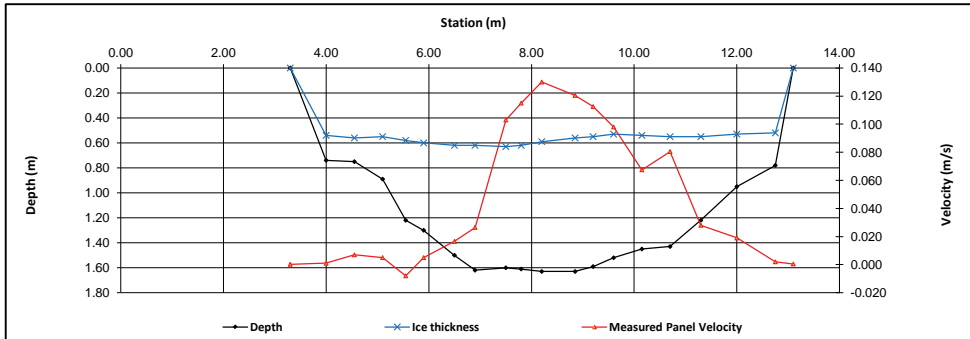
## Flow characteristics:

Total Flow:	0.423	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Cross Section Area:	6.57	(m <sup>2</sup> )
Wetted Width:	9.80	(m)
Hydraulic Depth:	0.670	(m)
Mean Velocity:	0.064	(m/s)
Froude Number:	0.025	

## Logger Details:

	Before	After
Transducer Reading (m):	1.549	
Water (°C):	0.4	-
Barometric Pressure (kPa):	97.5	-
Battery (Main):	14.5	-
Datalogger Clock:	10:31	-
Laptop Clock:	10:32	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.605	283.764		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			1.069	282.695		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.701	281.063		
Water Level:			2.628	281.136		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.587	282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:	1.051	283.746		282.695		T-post 4 m NW of logger
Bench Mark 3:						
Ice/PT:			2.682	281.064		
Water Level:			2.610	281.136		
Other:						

Closing Error	0.000	Average WL	281.136
WL Check	0.000	Transducer Elevation	279.587

## General Notes:

-2 layers of ice with 4" of water in between  
 -top layer is weak

Field Personnel:	DW, TR	Trip Date:	3-Apr-12
Data Entry Personnel:	CJ	Date:	11-Apr-12
Data Check Personnel:	XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

May 11, 2012



## 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
LB	5.60	0.00	0.00	0.000	0.000	0.000	1.0	5.60	5.80	0.20	0.14	0.001	0.001	0.03	0.000	0%
1	6.00	0.54		0.002			1.0	5.80	6.25	0.45	0.54	0.002	0.002	0.24	0.000	0%
2	6.50	0.64		0.030			1.0	6.25	6.75	0.50	0.64	0.030	0.030	0.32	0.010	1%
3	7.00	0.85			0.002	0.034	1.0	6.75	7.25	0.50	0.85	0.018	0.018	0.43	0.008	1%
4	7.50	1.12			0.012	0.052	1.0	7.25	7.75	0.50	1.12	0.032	0.032	0.56	0.018	1%
5	8.00	1.35			0.060	0.086	1.0	7.75	8.25	0.50	1.35	0.073	0.073	0.68	0.049	4%
6	8.50	1.43			0.070	0.106	1.0	8.25	8.75	0.50	1.43	0.088	0.088	0.72	0.063	5%
7	9.00	1.48			0.072	0.129	1.0	8.75	9.25	0.50	1.48	0.101	0.101	0.74	0.074	6%
8	9.50	1.52			0.088	0.119	1.0	9.25	9.75	0.50	1.52	0.104	0.104	0.76	0.079	6%
9	10.00	1.66			0.113	0.138	1.0	9.75	10.25	0.50	1.66	0.126	0.126	0.83	0.104	8%
10	10.50	1.68			0.111	0.145	1.0	10.25	10.75	0.50	1.68	0.128	0.128	0.84	0.108	8%
11	11.00	1.66			0.123	0.136	1.0	10.75	11.25	0.50	1.66	0.130	0.130	0.83	0.107	8%
12	11.50	1.60			0.129	0.159	1.0	11.25	11.75	0.50	1.60	0.144	0.144	0.80	0.115	9%
13	12.00	1.62			0.127	0.142	1.0	11.75	12.25	0.50	1.62	0.135	0.135	0.81	0.109	8%
14	12.50	1.62			0.136	0.150	1.0	12.25	12.75	0.50	1.62	0.143	0.143	0.81	0.116	9%
15	13.00	1.60			0.105	0.168	1.0	12.75	13.25	0.50	1.60	0.137	0.137	0.80	0.109	8%
16	13.50	1.49			0.106	0.163	1.0	13.25	13.75	0.50	1.49	0.135	0.135	0.75	0.100	8%
17	14.00	1.30			0.085	0.162	1.0	13.75	14.25	0.50	1.30	0.124	0.124	0.65	0.080	6%
18	14.50	1.22			0.044	0.115	1.0	14.25	14.75	0.50	1.22	0.080	0.080	0.61	0.048	4%
19	15.00	1.10			0.017	0.135	1.0	14.75	15.25	0.50	1.10	0.076	0.076	0.55	0.042	3%
20	15.50	0.82			0.005	-0.003	1.0	15.25	15.75	0.50	0.82	0.001	0.001	0.41	0.000	0%
21	16.00	0.56			-0.013		1.0	15.75	16.50	0.75	0.56	-0.013	-0.013	0.42	-0.005	0%
RB	17.00	0.00	0.00	0.000	0.000	0.000	1.0	16.50	17.00	0.50	0.14	-0.003	-0.003	0.07	0.000	0%
<b>Total Flow</b>														<b>1.33</b>		

## Measurement Details:

Start Time (MST):	9:15
End Time (MST):	10:45
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow, no ice
Quality/Error (see reverse):	excellent
Weather:	overcast, windy, +6

## Flow characteristics:

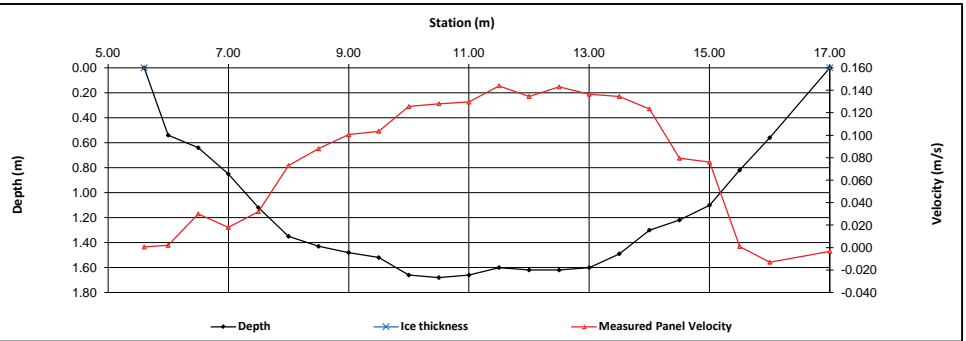
Total Flow:	1.33	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	13.64	(m <sup>2</sup> )
Wetted Width:	11.40	(m)
Hydraulic Depth:	1.196	(m)
Mean Velocity:	0.098	(m/s)
Froude Number:	0.028	

## Logger Details:

	Before	After
Transducer Reading (m):	1.530	1.530
Water (°C):	7.6	7.5
Barometric Pressure (kPa):	97.26	972.66
Battery (Main):	14.4	14.4
Datalogger Clock:	9:28	9:31
Laptop Clock:	9:29	9:33
Dessicant:	replaced	-
Logger# (if Δ):	6105	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

- uploaded new program  
 -NOTE: barometric pressure units changed (to hPa)



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.384	283.543		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.850	282.693		T-post 4 m NW of logger
Bench Mark 3:						
Water Level:			2.422	281.121		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.372	282.158	282.159	Pipe 10 m W of logger
Bench Mark 2:	0.837	283.530		282.693		T-post 4 m NW of logger
Bench Mark 3:						
Water Level:			2.407	281.123		
Other:						
Closing Error	0.001					
WL Check	0.002					
Average WL					281.122	
Transducer Elevation					279.592	

## General Notes:

-TSS sampled at 10 m

Field Personnel:	SM, TR	Trip Date:	11-May-12
Data Entry Personnel:	CJ	Date:	30-May-12
Data Check Personnel:	DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

June 11, 2012



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	4.30	0.00	0.00	0.000	0.000	0.000	1.0	4.30	4.65	0.35	0.18	0.001	0.001	0.06	0.000	0%
1	5.00	0.72		0.004			1.0	4.65	5.25	0.60	0.72	0.004	0.004	0.43	0.002	0%
2	5.50	0.88			-0.014	-0.013	1.0	5.25	5.75	0.50	0.88	-0.014	-0.014	0.44	-0.006	-1%
3	6.00	1.14		0.000	0.004		1.0	5.75	6.25	0.50	1.14	0.002	0.002	0.57	0.001	0%
4	6.50	1.15		0.016	0.001		1.0	6.25	6.75	0.50	1.15	0.009	0.009	0.58	0.005	1%
5	7.00	1.47		0.044	0.036		1.0	6.75	7.25	0.50	1.47	0.040	0.040	0.74	0.029	4%
6	7.50	1.54		0.064	0.056		1.0	7.25	7.75	0.50	1.54	0.060	0.060	0.77	0.046	7%
7	8.00	1.58		0.075	0.076		1.0	7.75	8.25	0.50	1.58	0.076	0.076	0.79	0.060	9%
8	8.50	1.49		0.086	0.083		1.0	8.25	8.75	0.50	1.49	0.085	0.085	0.75	0.063	9%
9	9.00	1.54		0.094	0.085		1.0	8.75	9.25	0.50	1.54	0.080	0.080	0.77	0.061	9%
10	9.50	1.46		0.100	0.093		1.0	9.25	9.75	0.50	1.46	0.097	0.097	0.73	0.070	11%
11	10.00	1.46		0.072	0.082		1.0	9.75	10.25	0.50	1.46	0.077	0.077	0.73	0.056	8%
12	10.50	1.50		0.061	0.079		1.0	10.25	10.75	0.50	1.50	0.070	0.070	0.75	0.053	8%
13	11.00	1.46		0.052	0.072		1.0	10.75	11.25	0.50	1.46	0.062	0.062	0.73	0.045	7%
14	11.50	1.40		0.057	0.079		1.0	11.25	11.75	0.50	1.40	0.068	0.068	0.70	0.048	7%
15	12.00	1.39		0.053	0.071		1.0	11.75	12.25	0.50	1.39	0.062	0.062	0.70	0.043	6%
16	12.50	1.26		0.067	0.030		1.0	12.25	12.75	0.50	1.26	0.049	0.049	0.63	0.031	5%
17	13.00	1.03		0.030	0.068		1.0	12.75	13.25	0.50	1.03	0.049	0.049	0.52	0.025	4%
18	13.50	0.90		0.021	0.060		1.0	13.25	13.75	0.50	0.90	0.041	0.041	0.45	0.018	3%
19	14.00	0.58		0.034			1.0	13.75	14.25	0.50	0.58	0.034	0.034	0.29	0.010	1%
20	14.50	0.47		0.016			1.0	14.25	14.75	0.50	0.47	0.016	0.016	0.24	0.004	1%
LB	15.00	0.00	0.00	0.000	0.000	0.000	1.0	14.75	15.00	0.25	0.12	0.004	0.004	0.03	0.000	0%
<b>Total Flow</b>															<b>0.664</b>	

Measurement Details:	
Start Time (MST):	10:50
End Time (MST):	12:30
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow
Quality/Error (see reverse):	good
Weather:	clear, calm, 12

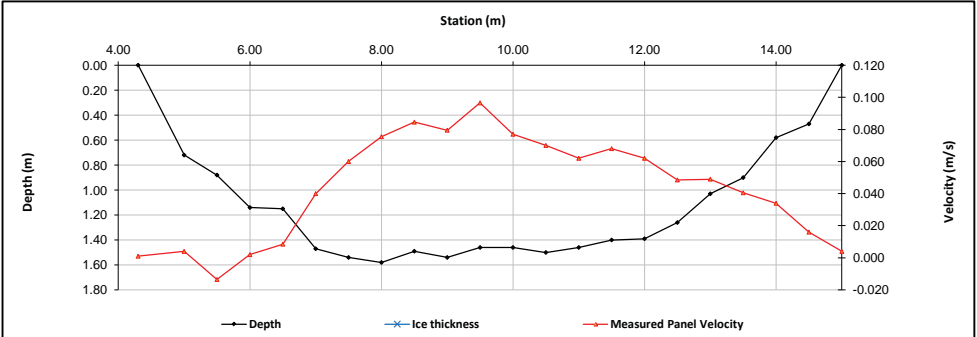
Flow characteristics:		
Total Flow:	0.664	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	12.37	(m <sup>2</sup> )
Wetted Width:	10.70	(m)
Hydraulic Depth:	1.156	(m)
Mean Velocity:	0.054	(m/s)
Froude Number:	0.016	

Logger Details:		
	Before	After
Transducer Reading (m):	1.420	
Water (°C):	13.3	
Battery (Main):	14.1	
Datalogger Clock:	10:59	
Laptop Clock:	11:01	
Dessicant:	replaced	
Logger# (if Δ):	6105	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

**General Notes:**

-TSS collected at offset=9.5m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.479	283.638		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.946	282.692		T-post 4 m NW of logger
Bench Mark 3:			1.287	282.351	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:		2.628		281.010		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.465	282.158	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.932	282.691		T-post 4 m NW of logger
Bench Mark 3:	1.272	283.623		282.351	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:			2.613	281.010		
Other:						

Closing Error	0.001	Average WL	281.010
WL Check	0.000	Transducer Elevation	279.590

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	11-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

August 7, 2012



## 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	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	5.20	0.00	0.00	0.000	0.000	0.000	1.0	5.20	5.35	0.15	0.16	0.001	0.001	0.02	0.000	0%
1	5.50	0.62		0.003			1.0	5.35	5.75	0.40	0.62	0.003	0.003	0.25	0.001	0%
2	6.00	0.52		0.004			1.0	5.75	6.25	0.50	0.52	0.004	0.004	0.26	0.001	0%
3	6.50	0.66		0.018			1.0	6.25	6.75	0.50	0.66	0.018	0.018	0.33	0.006	1%
4	7.00	0.92			0.034	0.033	1.0	6.75	7.25	0.50	0.92	0.034	0.034	0.46	0.015	3%
5	7.50	1.24			0.000	0.023	1.0	7.25	7.75	0.50	1.24	0.012	0.012	0.62	0.007	1%
6	8.00	1.38			0.013	0.012	1.0	7.75	8.25	0.50	1.38	0.013	0.013	0.69	0.009	2%
7	8.50	1.50			0.033	0.016	1.0	8.25	8.75	0.50	1.50	0.025	0.025	0.75	0.018	4%
8	9.00	1.58			0.041	0.082	1.0	8.75	9.25	0.50	1.58	0.062	0.062	0.79	0.049	10%
9	9.50	1.58			0.083	0.075	1.0	9.25	9.75	0.50	1.58	0.079	0.079	0.79	0.062	12%
10	10.00	1.66			0.078	0.090	1.0	9.75	10.25	0.50	1.66	0.084	0.084	0.83	0.070	14%
11	10.50	1.66			0.079	0.060	1.0	10.25	10.75	0.50	1.66	0.070	0.070	0.83	0.058	11%
12	11.00	1.60			0.067	0.051	1.0	10.75	11.25	0.50	1.60	0.059	0.059	0.80	0.047	9%
13	11.50	1.61			0.060	0.040	1.0	11.25	11.75	0.50	1.61	0.050	0.050	0.81	0.040	8%
14	12.00	1.64			0.046	0.041	1.0	11.75	12.25	0.50	1.64	0.044	0.044	0.82	0.036	7%
15	12.50	1.62			0.042	0.032	1.0	12.25	12.75	0.50	1.62	0.037	0.037	0.81	0.030	6%
16	13.00	1.63			0.029	0.014	1.0	12.75	13.25	0.50	1.63	0.022	0.022	0.82	0.018	3%
17	13.50	1.62			0.032	0.011	1.0	13.25	13.75	0.50	1.62	0.022	0.022	0.81	0.017	3%
18	14.00	1.44			0.038	0.015	1.0	13.75	14.25	0.50	1.44	0.027	0.027	0.72	0.019	4%
19	14.50	1.28			0.006	0.009	1.0	14.25	15.00	0.75	1.28	0.008	0.008	0.96	0.007	1%
20	15.50	0.95			-0.002	0.003	1.0	15.00	15.90	0.90	0.95	0.001	0.001	0.86	0.000	0%
LB	16.30	0.00	0.00	0.00	0.00	0.00	1.0	15.90	16.30	0.40	0.24	0.000	0.000	0.10	0.000	0%
<b>Total Flow</b>															<b>0.510</b>	

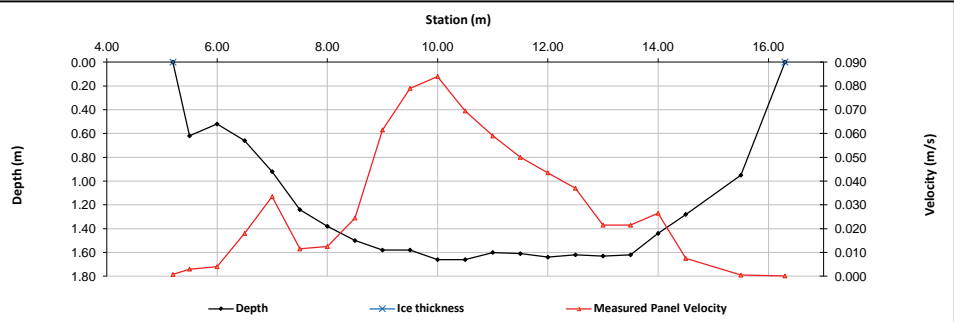
Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	13:11
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow
Quality/Error (see reverse):	good
Weather:	clear, breezy, 25

Flow characteristics:		
Total Flow:	0.510	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	14.11	(m <sup>2</sup> )
Wetted Width:	11.70	(m)
Hydraulic Depth:	1.271	(m)
Mean Velocity:	0.036	(m/s)
Froude Number:	0.010	

Logger Details:		
	Before	After
Transducer Reading (m):	1.547	1.546
Water (°C):	16.4	22.2
Battery (Main):	12.3	12.59
Datalogger Clock:	11:33	11:52
Laptop Clock:	11:35	11:53
Dessicant:	replaced	
Logger# (if Δ):	6105	
PT# (if Δ):		298577

**Datalogger / Station Notes:**

-installed PLS s/n: 298577  
 -PLS removed s/n: 268453  
 -reconnected solar panel cables- pulled out by wildlife



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.353	283.512		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.818	282.694		T-post 4 m NW of logger
Bench Mark 3:			1.160	282.352	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:			2.367	281.145		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.341	282.160	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.808	282.693		T-post 4 m NW of logger
Bench Mark 3:	1.149	283.501		282.352	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:			2.359	281.142		
Other:						

Closing Error	-0.001
WL Check	0.003

Average WL	281.144
Transducer Elevation	279.597

**General Notes:**

-TSS sampled at offset 10.5 m

Field Personnel:		SM, TR	Trip Date:	7-Aug-12
Data Entry Personnel:	CJ		Date:	22-Aug-12
Data Check Personnel:	DW		Date:	23-Aug-12



# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: September 25, 2012



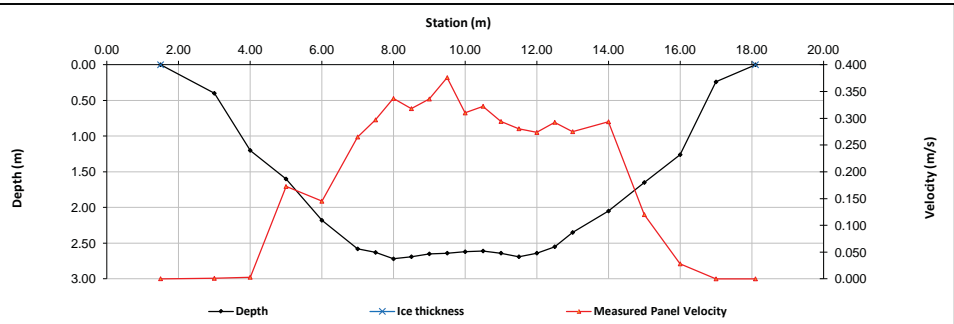
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.50	0.00	0.00	0.000	0.000	0.000	1.0	1.50	2.25	0.75	0.10	0.000	0.000	0.08	0.000	0%
1	3.00	0.40		0.001			1.0	2.25	3.50	1.25	0.40	0.001	0.001	0.50	0.001	0%
2	4.00	1.20			0.009	-0.003	1.0	3.50	4.50	1.00	1.20	0.003	0.003	1.20	0.004	0%
3	5.00	1.60			0.176	0.169	1.0	4.50	5.50	1.00	1.60	0.173	0.173	1.60	0.276	4%
4	6.00	2.18			0.099	0.191	1.0	5.50	6.50	1.00	2.18	0.145	0.145	1.18	0.316	5%
5	7.00	2.58			0.214	0.316	1.0	6.50	7.25	0.75	2.58	0.265	0.265	1.94	0.513	7%
6	7.50	2.63			0.258	0.336	1.0	7.25	7.75	0.50	2.63	0.297	0.297	1.32	0.391	6%
7	8.00	2.72			0.266	0.408	1.0	7.75	8.25	0.50	2.72	0.337	0.337	1.36	0.458	7%
8	8.50	2.69			0.252	0.384	1.0	8.25	8.75	0.50	2.69	0.318	0.318	1.35	0.428	6%
9	9.00	2.65			0.308	0.364	1.0	8.75	9.25	0.50	2.65	0.336	0.336	1.33	0.445	6%
10	9.50	2.64			0.353	0.399	1.0	9.25	9.75	0.50	2.64	0.376	0.376	1.32	0.496	7%
11	10.00	2.62			0.277	0.343	1.0	9.75	10.25	0.50	2.62	0.310	0.310	1.31	0.406	6%
12	10.50	2.61			0.271	0.374	1.0	10.25	10.75	0.50	2.61	0.323	0.323	1.31	0.421	6%
13	11.00	2.64			0.227	0.361	1.0	10.75	11.25	0.50	2.64	0.294	0.294	1.32	0.388	6%
14	11.50	2.69			0.207	0.354	1.0	11.25	11.75	0.50	2.69	0.281	0.281	1.35	0.377	5%
15	12.00	2.64			0.226	0.321	1.0	11.75	12.25	0.50	2.64	0.274	0.274	1.32	0.361	5%
16	12.50	2.55			0.240	0.345	1.0	12.25	12.75	0.50	2.55	0.293	0.293	1.28	0.373	5%
17	13.00	2.35			0.236	0.314	1.0	12.75	13.50	0.75	2.35	0.275	0.275	1.76	0.485	7%
18	14.00	2.05			0.230	0.357	1.0	13.50	14.50	1.00	2.05	0.294	0.294	2.05	0.602	9%
19	15.00	1.65			0.169	0.071	1.0	14.50	15.50	1.00	1.65	0.120	0.120	1.65	0.198	3%
20	16.00	1.26			0.049	0.007	1.0	15.50	16.50	1.00	1.26	0.028	0.028	1.26	0.035	1%
21	17.00	0.24		0.000			1.0	16.50	17.55	1.05	0.24	0.000	0.000	0.25	0.000	0%
RB	18.10	0.00	0.00	0.00	0.00	0.00	1.0	17.55	18.10	0.55	0.06	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>														<b>6.97</b>		

Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	10:10
Equipment:	ADV
Method:	fishcat
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	overcast, calm 10 deg.

Flow characteristics:		
Total Flow:	6.97	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	29.04	(m <sup>2</sup> )
Wetted Width:	16.60	(m)
Hydraulic Depth:	1.749	(m)
Mean Velocity:	0.240	(m/s)
Froude Number:	0.058	

Logger Details:		
	Before	After
Transducer Reading (m):	2.614	
Water (°C):	10.5	
Battery (Main):	13.8	
Datalogger Clock:	8:58	
Laptop Clock:	8:59	
Dessicant:	replaced	
Logger# (if Δ):	6105	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-air pressure 97.78	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.441	283.600		282.159	282.159	Pipe 10 m W of logger
Bench Mark 2:			0.903	282.697		T-post 4 m NW of logger
Bench Mark 3:			1.247	282.353	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:			1.478	282.122		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.429	282.160	282.159	Pipe 10 m W of logger
Bench Mark 2:	0.892	283.589		282.697		T-post 4 m NW of logger
Bench Mark 3:			1.236	282.353	282.353	Pipe 3 m N of logger
Ice/PT:						
Water Level:			1.466	282.123		
Other:						
Closing Error		-0.001		Average WL		282.123
WL Check		0.001		Transducer Elevation		279.509

**General Notes:**  
 Flow Measurement: water depth greater than extent of flow rod  
 Measurement Quality - Good  
 TSS collected at 10 m

Field Personnel:		SM, TR	Trip Date:	25-Sep-12
Data Entry Personnel:	TR (data entered in field)		Date:	25-Sep-12
Data Check Personnel:	MY		Date:	2-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S5A - Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date:

Oct 22, 2012



## 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	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	1.50	0.00	0.00	0.000	0.000	0.000	1.0	1.50	2.00	0.50	0.28	0.001	0.001	0.14	0.000	0%
1	2.50	1.13		-0.003	0.013		1.0	2.00	2.75	0.75	1.13	0.005	0.005	0.85	0.004	0%
2	3.00	1.42		0.070	0.033		1.0	2.75	3.25	0.50	1.42	0.052	0.052	0.71	0.037	1%
3	3.50	1.62		0.028	0.090		1.0	3.25	3.75	0.50	1.62	0.059	0.059	0.81	0.048	2%
4	4.00	1.90		0.051	0.102		1.0	3.75	4.25	0.50	1.90	0.077	0.077	0.95	0.073	2%
5	4.50	1.96		0.065	0.101		1.0	4.25	4.75	0.50	1.96	0.083	0.083	0.98	0.081	3%
6	5.00	2.13		0.105	0.166		1.0	4.75	5.25	0.50	2.13	0.136	0.136	1.07	0.144	5%
7	5.50	2.19		0.128	0.204		1.0	5.25	5.75	0.50	2.19	0.166	0.166	1.10	0.182	6%
8	6.00	2.22		0.128	0.192		1.0	5.75	6.25	0.50	2.22	0.160	0.160	1.11	0.178	6%
9	6.50	2.19		0.146	0.206		1.0	6.25	6.75	0.50	2.19	0.176	0.176	1.10	0.193	7%
10	7.00	2.19		0.181	0.198		1.0	6.75	7.25	0.50	2.19	0.190	0.190	1.10	0.208	7%
11	7.50	2.11		0.169	0.267		1.0	7.25	7.75	0.50	2.11	0.218	0.218	1.06	0.230	8%
12	8.00	2.13		0.203	0.264		1.0	7.75	8.25	0.50	2.13	0.234	0.234	1.07	0.249	8%
13	8.50	2.13		0.130	0.239		1.0	8.25	8.75	0.50	2.13	0.185	0.185	1.07	0.196	7%
14	9.00	2.13		0.114	0.203		1.0	8.75	9.25	0.50	2.13	0.159	0.159	1.07	0.169	6%
15	9.50	2.82		0.103	0.229		1.0	9.25	9.75	0.50	2.82	0.166	0.166	1.41	0.234	8%
16	10.00	1.96		0.182	0.215		1.0	9.75	10.25	0.50	1.96	0.199	0.199	0.98	0.195	7%
17	10.50	2.05		0.137	0.209		1.0	10.25	10.75	0.50	2.05	0.173	0.173	1.03	0.177	6%
18	11.00	1.82		0.111	0.214		1.0	10.75	11.25	0.50	1.82	0.163	0.163	0.91	0.148	5%
19	11.50	1.64		0.074	0.172		1.0	11.25	11.75	0.50	1.64	0.123	0.123	0.82	0.101	3%
20	12.00	1.40		0.088	0.162		1.0	11.75	12.25	0.50	1.40	0.125	0.125	0.70	0.088	3%
21	12.50	1.22		0.027	0.033		1.0	12.25	12.75	0.50	1.22	0.030	0.030	0.61	0.018	1%
22	13.00	0.40					1.0	12.75	13.50	0.75	0.40	0.001	0.001	0.30	0.000	0%
RB	14.00	0.00	0.00	0.000	0.000	0.000	1.0	13.50	14.00	0.50	0.10	0.000	0.000	0.05	0.000	0%

**Total Flow 2.95**

## Measurement Details:

Start Time (MST):	15:00
End Time (MST):	16:14
Equipment:	ADV
Method:	Fishcat
River Condition:	medium-high
Quality/Error (see reverse):	Good
Weather:	snowing, OC

## Flow characteristics:

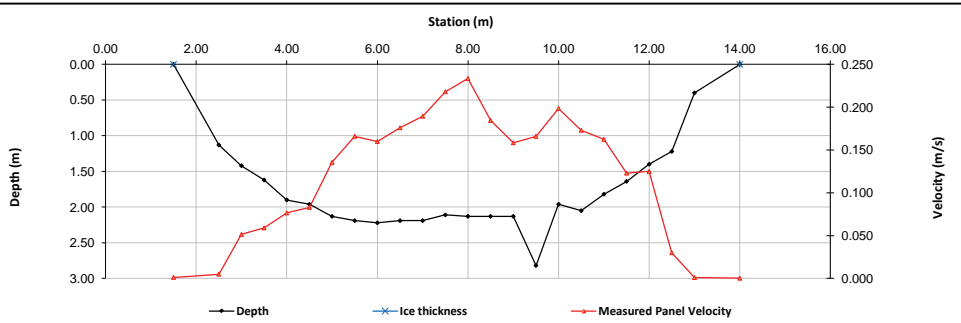
Total Flow:	2.95	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	20.95	(m <sup>2</sup> )
Wetted Width:	12.50	(m)
Hydraulic Depth:	1.676	(m)
Mean Velocity:	0.141	(m/s)
Froude Number:	0.035	

## Logger Details:

	Before	After
Transducer Reading (m):	2.113	
Water (°C):	1.5	
Battery (Main):	13.6	
Datalogger Clock:	3:06	
Laptop Clock:	3:07	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:

Barometric pressure: 97.67 KPA



## Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.245	282.160	282.159	Pipe 10m W of logger
Bench Mark 2:			0.711	282.694	282.697	T-post 4m NW of logger
Bench Mark 3:	1.052	283.405		282.353	282.353	Pipe 3m N of logger
Ice/PT:						
Water Level:			1.794	281.611		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.231	283.391		282.160	282.159	Pipe 10m W of logger
Bench Mark 2:			0.698	282.693	282.697	T-post 4m NW of logger
Bench Mark 3:			1.040	282.351	282.353	Pipe 3m N of logger
Ice/PT:						
Water Level:			1.779	281.612		
Other:						

Closing Error	0.002
WL Check	0.001

Average WL	281.612
Transducer Elevation	279.499

## General Notes:

-Depths over 2.2 were measured at 1.8 m for the 0.8 d measurement  
 -TSS at 7 m

## Field Personnel:

Field Personnel:	DW, TR	Trip Date:	22-Oct-12
Data Entry Personnel:	DW	Date:	22-Oct-12
Data Check Personnel:	CJ	Date:	7-Nov-12
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: December 10, 2012



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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.63	0.23	0.28	-0.001	-0.001	0.06	0.000	0%
1	0.85	1.40	0.30	0.007	-0.013	0.007	1.0	0.63	1.03	0.40	1.10	-0.003	-0.003	0.44	-0.001	0%
2	1.20	1.40	0.35	0.044	0.012	0.044	1.0	1.03	1.43	0.40	1.05	0.028	0.028	0.42	0.012	2%
3	1.65	1.65	0.35	0.026	0.021	0.026	1.0	1.43	1.93	0.50	1.30	0.024	0.024	0.65	0.015	2%
4	2.20	1.70	0.35	0.039	0.000	0.039	1.0	1.93	2.43	0.50	1.35	0.020	0.020	0.68	0.013	2%
5	2.65	1.80	0.35	0.069	0.031	0.069	1.0	2.43	2.88	0.45	1.45	0.050	0.050	0.65	0.033	5%
6	3.10	1.80	0.40	0.078	0.052	0.078	1.0	2.88	3.35	0.48	1.40	0.065	0.065	0.67	0.043	6%
7	3.60	1.70	0.40	0.104	0.104	0.104	1.0	3.35	3.78	0.43	1.30	0.104	0.104	0.55	0.057	8%
8	3.95	1.70	0.40	0.106	0.110	0.106	1.0	3.78	4.18	0.40	1.30	0.108	0.108	0.52	0.056	8%
9	4.40	1.70	0.40	0.106	0.124	0.106	1.0	4.18	4.60	0.42	1.30	0.115	0.115	0.55	0.064	9%
10	4.80	1.70	0.40	0.109	0.110	0.109	1.0	4.60	5.00	0.40	1.30	0.110	0.110	0.52	0.057	8%
11	5.20	1.80	0.40	0.097	0.104	0.097	1.0	5.00	5.43	0.43	1.40	0.101	0.101	0.60	0.060	8%
12	5.65	1.80	0.40	0.099	0.098	0.099	1.0	5.43	5.88	0.45	1.40	0.099	0.099	0.63	0.062	9%
13	6.10	1.85	0.40	0.093	0.090	0.093	1.0	5.88	6.30	0.43	1.45	0.092	0.092	0.62	0.056	8%
14	6.50	1.85	0.35	0.081	0.063	0.081	1.0	6.30	6.75	0.45	1.50	0.072	0.072	0.68	0.049	7%
15	7.00	1.80	0.35	0.077	0.047	0.077	1.0	6.75	7.20	0.45	1.45	0.062	0.062	0.65	0.040	6%
16	7.40	1.80	0.35	0.054	0.047	0.054	1.0	7.20	7.55	0.35	1.45	0.051	0.051	0.51	0.026	4%
17	7.70	1.80	0.35	0.062	0.017	0.062	1.0	7.55	7.90	0.35	1.45	0.040	0.040	0.51	0.020	3%
18	8.10	1.70	0.35	0.033	0.014	0.033	1.0	7.90	8.30	0.40	1.35	0.024	0.024	0.54	0.013	2%
19	8.50	1.55	0.30	0.052	0.010	0.052	1.0	8.30	8.83	0.52	1.25	0.031	0.031	0.66	0.020	3%
20	9.15	1.30	0.25	0.029	0.024	0.029	1.0	8.83	9.43	0.60	1.05	0.027	0.027	0.63	0.017	2%
LB	9.70	0.00	0.00	0.00	0.00	0.00	1.0	9.43	9.70	0.27	0.26	0.007	0.007	0.07	0.000	0%

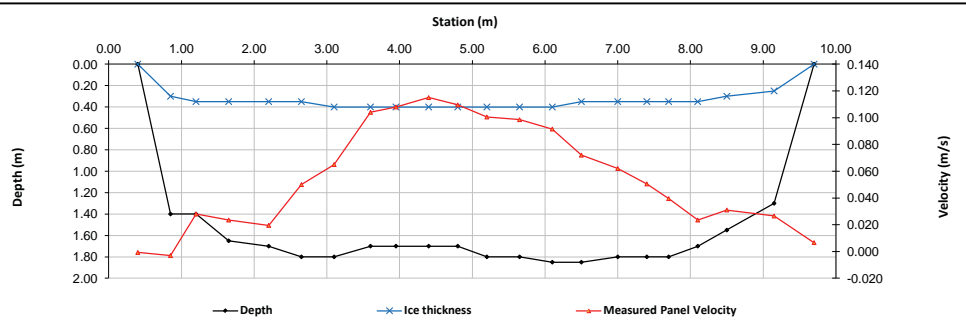
**Total Flow 0.712**

Measurement Details:	
Start Time (MST):	2:00
End Time (MST):	4:00
Equipment:	ADV
Method:	Ice
River Condition:	frozen
Quality/Error (see reverse):	Good
Weather:	sunny, calm, -15

Flow characteristics:	
Total Flow:	0.712 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	11.79 (m <sup>2</sup> )
Wetted Width:	9.30 (m)
Hydraulic Depth:	1.268 (m)
Mean Velocity:	0.060 (m/s)
Froude Number:	0.017

Logger Details:		
	Before	After
Transducer Reading (m):	1.700	1.7
Water (°C):	0.1	0.1
Battery (Main):	13.4	12.3
Datalogger Clock:	2:20	
Laptop Clock:	2:20	
Dessicant:	Replaced	
Logger# (if Δ):		
PT# (if Δ):		

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>						
Bench Mark 1:			1.558	282.162	282.159	Pipe 10 m W of logger
Bench Mark 2:	1.023	283.720		282.697	282.697	T-post 4 m NW of logger
Bench Mark 3:			1.365	282.355	282.353	Pipe 3 m N of logger
Ice/PT:			2.645	281.075		
Water Level:			2.512	281.208		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.546	283.708		282.162	282.159	Pipe 10 m W of logger
Bench Mark 2:			1.010	282.698	282.697	T-post 4 m NW of logger
Bench Mark 3:			1.363	282.355	282.353	Pipe 3 m N of logger
Ice/PT:			2.634	281.074		
Water Level:			2.498	281.210		
Other:						

Closing Error	-0.001	Average WL	281.209
WL Check	0.002	Transducer Elevation	279.509

General Notes:	
Barometric pressure = 98.049	

Field Personnel:	SM, C.J	Trip Date:	10-Dec-12
Data Entry Personnel:	SM, C.J	Date:	10-Dec-12
Data Check Personnel:	SG	Date:	18-Dec-12
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 Dat

January 9, 2012



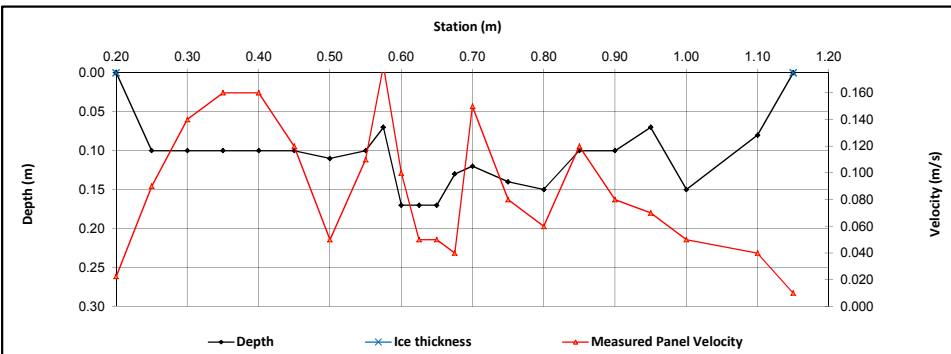
Measured Data							Calculated Data									
Bank/ Mmnt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel 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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.23	0.03	0.03	0.023	0.023	0.00	0.000	0%
1	0.25	0.10		0.090			1.0	0.23	0.28	0.05	0.10	0.090	0.090	0.01	0.000	5%
2	0.30	0.10		0.140			1.0	0.28	0.33	0.05	0.10	0.140	0.140	0.00	0.001	8%
3	0.35	0.10		0.160			1.0	0.33	0.38	0.05	0.10	0.160	0.160	0.01	0.001	9%
4	0.40	0.10		0.160			1.0	0.38	0.43	0.05	0.10	0.160	0.160	0.01	0.001	9%
5	0.45	0.10		0.120			1.0	0.43	0.48	0.05	0.10	0.120	0.120	0.00	0.001	6%
6	0.50	0.11		0.050			1.0	0.48	0.53	0.05	0.11	0.050	0.050	0.01	0.000	3%
7	0.55	0.10		0.110			1.0	0.53	0.56	0.04	0.10	0.110	0.110	0.00	0.000	4%
8	0.58	0.07		0.180			1.0	0.56	0.59	0.02	0.07	0.180	0.180	0.00	0.000	3%
9	0.60	0.17		0.100			1.0	0.59	0.61	0.03	0.17	0.100	0.100	0.00	0.000	5%
10	0.63	0.17		0.050			1.0	0.61	0.64	0.02	0.17	0.050	0.050	0.00	0.000	2%
11	0.65	0.17		0.050			1.0	0.64	0.66	0.03	0.17	0.050	0.050	0.00	0.000	2%
12	0.68	0.13		0.040			1.0	0.66	0.69	0.02	0.13	0.040	0.040	0.00	0.000	1%
13	0.70	0.12		0.150			1.0	0.69	0.73	0.04	0.12	0.150	0.150	0.00	0.001	7%
14	0.75	0.14		0.080			1.0	0.73	0.78	0.05	0.14	0.080	0.080	0.01	0.001	6%
15	0.80	0.15		0.060			1.0	0.78	0.83	0.05	0.15	0.060	0.060	0.01	0.000	5%
16	0.85	0.10		0.120			1.0	0.83	0.88	0.05	0.10	0.120	0.120	0.01	0.001	6%
17	0.90	0.10		0.080			1.0	0.88	0.93	0.05	0.10	0.080	0.080	0.01	0.000	4%
18	0.95	0.07		0.070			1.0	0.93	0.98	0.05	0.07	0.070	0.070	0.00	0.000	3%
19	1.00	0.15		0.050			1.0	0.98	1.05	0.08	0.15	0.050	0.050	0.01	0.001	6%
20	1.10	0.08		0.040			1.0	1.05	1.13	0.08	0.08	0.040	0.040	0.01	0.000	3%
LB	1.15	0.00	0.00	0.000	0.000	0.000	1.0	0.68	1.15	0.48	0.04	0.010	0.010	0.02	0.000	2%
<b>Total Flow</b>															<b>0.009</b>	

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	17:00
Equipment:	ADV
Method:	Wading
River Condition:	open
Quality/Error (see reverse):	Good
Weather:	overcast, calm, 0

Flow characteristics:	
Total Flow:	0.009 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.12 (m <sup>2</sup> )
Wetted Width:	0.95 (m)
Hydraulic Depth:	0.129 (m)
Mean Velocity:	0.076 (m/s)
Froude Number:	0.067

Datalogger Details:		
	Before	After
Transducer Reading (m):		0.596
Water (°C):	1.5	
Battery (Main):	13.1	
Datalogger Clock:	16:28	
Laptop Clock:	16:28	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-good	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.165	274.765		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.735	272.030		
Other:			0.614	274.151	274.139	Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.144	273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.714	272.030		
Other:	0.593	274.744		274.151	274.139	Equipment Mast
Closing Error	0.000	Average WL		272.030		
WL Check	0.000	Transducer Elevation		271.434		

General Notes:	

Field Personnel:	SM, DW	Trip Date:	9-Jan-12
Data Entry Personnel:	CJ	Date:	9-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: February 5, 2012



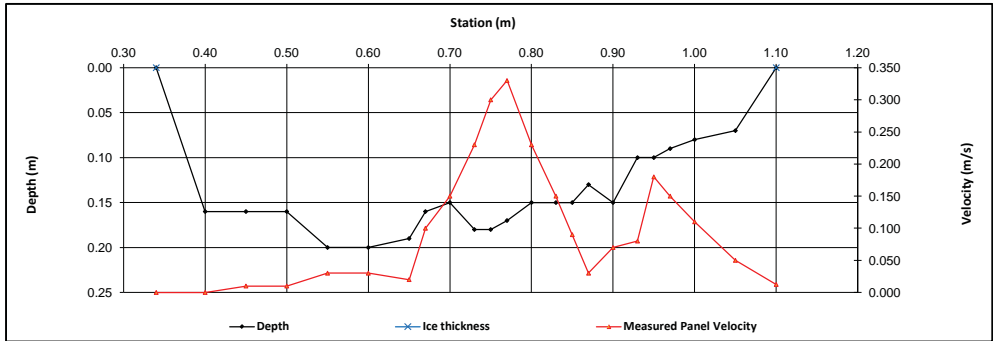
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1	0.34	0.00	0.00	0.000	0.000	0.000	1.0	0.34	0.37	0.03	0.04	0.000	0.000	0.00	0.000	0%
2	0.40	0.16		0.000			1.0	0.37	0.43	0.06	0.16	0.000	0.000	0.01	0.000	0%
3	0.45	0.16		0.010			1.0	0.43	0.48	0.05	0.16	0.010	0.010	0.01	0.000	1%
4	0.50	0.16		0.010			1.0	0.48	0.53	0.05	0.16	0.010	0.010	0.01	0.000	1%
5	0.55	0.20		0.030			1.0	0.53	0.58	0.05	0.20	0.030	0.030	0.01	0.000	3%
6	0.60	0.20		0.030			1.0	0.58	0.63	0.05	0.20	0.030	0.030	0.01	0.000	3%
7	0.65	0.19		0.020			1.0	0.63	0.66	0.04	0.19	0.020	0.020	0.01	0.000	1%
8	0.67	0.16		0.100			1.0	0.66	0.69	0.03	0.16	0.100	0.100	0.00	0.000	4%
9	0.70	0.15		0.150			1.0	0.69	0.72	0.03	0.15	0.150	0.150	0.00	0.001	7%
10	0.73	0.18		0.230			1.0	0.72	0.74	0.03	0.18	0.230	0.230	0.00	0.001	11%
11	0.75	0.18		0.300			1.0	0.74	0.76	0.02	0.18	0.300	0.300	0.00	0.001	12%
12	0.77	0.17		0.330			1.0	0.76	0.79	0.03	0.17	0.330	0.330	0.00	0.001	15%
13	0.80	0.15		0.230			1.0	0.79	0.82	0.03	0.15	0.230	0.230	0.00	0.001	11%
14	0.83	0.15		0.150			1.0	0.82	0.84	0.03	0.15	0.150	0.150	0.00	0.001	6%
15	0.85	0.15		0.090			1.0	0.84	0.86	0.02	0.15	0.090	0.090	0.00	0.000	3%
16	0.87	0.13		0.030			1.0	0.86	0.89	0.03	0.13	0.030	0.030	0.00	0.000	1%
17	0.90	0.15		0.070			1.0	0.89	0.92	0.03	0.15	0.070	0.070	0.00	0.000	3%
18	0.93	0.10		0.080			1.0	0.92	0.94	0.02	0.10	0.080	0.080	0.00	0.000	2%
19	0.95	0.10		0.180			1.0	0.94	0.96	0.02	0.10	0.180	0.180	0.00	0.000	4%
20	0.97	0.09		0.150			1.0	0.96	0.99	0.03	0.09	0.150	0.150	0.00	0.000	4%
21	1.00	0.08		0.110			1.0	0.99	1.03	0.04	0.08	0.110	0.110	0.00	0.000	4%
	1.05	0.07		0.050			1.0	1.03	1.08	0.05	0.07	0.050	0.050	0.00	0.000	2%
	1.10	0.00	0.00	0.000	0.000	0.000	1.0	1.08	1.10	0.02	0.02	0.013	0.013	0.00	0.000	0%
<b>Total Flow</b>														<b>0.009</b>		

Measurement Details:	
Start Time (MST):	16:10
End Time (MST):	17:15
Equipment:	Marsh
Method:	Open
River Condition:	Open
Quality/Error (see reverse):	good
Weather:	clear, calm, -5

Flow Characteristics:		
Total Flow:	0.009	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.11	(m <sup>2</sup> )
Wetted Width:	0.76	(m)
Hydraulic Depth:	0.140	(m)
Mean Velocity:	0.086	(m/s)
Froude Number:	0.074	

Logger Details:		
	Before	After
Transducer Reading (m):	0.605	
Water (°C):	1.2	-
Battery (Main):	14.1	-
Datalogger Clock:	16:15	-
Laptop Clock:	16:17	-
Dessicant:	good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.600	275.200		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.184	272.016		
Other:			1.034	274.166	274.139	Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.590	273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.170	272.020		
Other:	1.024	275.190		274.166	274.139	Equipment Mast

Closing Error	0.000	Average WL	272.018
WL Check	0.004	Transducer Elevation	271.413

**General Notes:**

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, CJ	Date:	5-Feb-12
Data Check Personnel:	CJ	Date:	28-Mar-12
	XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

February 29, 2012



## Flow Measurement:

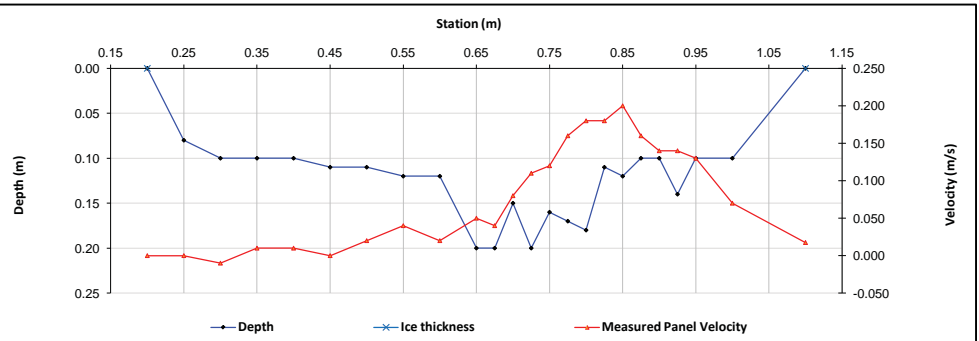
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	1.0	0.20	0.23	0.03	0.02	0.000	0.000	0.00	0.000	0%
1	0.25	0.08		0.00			1.0	0.23	0.28	0.05	0.08	0.000	0.000	0.00	0.000	0%
2	0.30	0.10		-0.01			1.0	0.28	0.33	0.05	0.10	-0.010	-0.010	0.00	0.000	-1%
3	0.35	0.10		0.01			1.0	0.33	0.38	0.05	0.10	0.010	0.010	0.01	0.000	1%
4	0.40	0.10		0.01			1.0	0.38	0.43	0.05	0.10	0.010	0.010	0.01	0.000	1%
5	0.45	0.11		0.00			1.0	0.43	0.48	0.05	0.11	0.000	0.000	0.01	0.000	0%
6	0.50	0.11		0.02			1.0	0.48	0.53	0.05	0.11	0.020	0.020	0.01	0.000	2%
7	0.55	0.12		0.04			1.0	0.53	0.58	0.05	0.12	0.040	0.040	0.01	0.000	3%
8	0.60	0.12		0.02			1.0	0.58	0.63	0.05	0.12	0.020	0.020	0.01	0.000	2%
9	0.65	0.20		0.05			1.0	0.63	0.66	0.04	0.20	0.050	0.050	0.01	0.000	5%
10	0.675	0.20		0.04			1.0	0.66	0.69	0.02	0.20	0.040	0.040	0.00	0.000	3%
11	0.70	0.15		0.08			1.0	0.69	0.71	0.02	0.15	0.080	0.080	0.00	0.000	4%
12	0.725	0.20		0.11			1.0	0.71	0.74	0.03	0.20	0.110	0.110	0.01	0.001	8%
13	0.75	0.16		0.12			1.0	0.74	0.76	0.02	0.16	0.120	0.120	0.00	0.000	7%
14	0.775	0.17		0.16			1.0	0.76	0.79	0.03	0.17	0.160	0.160	0.00	0.001	9%
15	0.80	0.18		0.18			1.0	0.79	0.81	0.02	0.18	0.180	0.180	0.00	0.001	11%
16	0.825	0.11		0.18			1.0	0.81	0.84	0.02	0.11	0.180	0.180	0.00	0.000	7%
17	0.85	0.12		0.20			1.0	0.84	0.86	0.03	0.12	0.200	0.200	0.00	0.001	8%
18	0.875	0.10		0.16			1.0	0.86	0.89	0.02	0.10	0.160	0.160	0.00	0.000	5%
19	0.90	0.10		0.14			1.0	0.89	0.91	0.03	0.10	0.140	0.140	0.00	0.000	5%
20	0.925	0.14		0.14			1.0	0.91	0.94	0.02	0.14	0.140	0.140	0.00	0.000	7%
21	0.95	0.10		0.13			1.0	0.94	0.98	0.04	0.10	0.130	0.130	0.00	0.000	7%
22	1.00	0.10		0.07			1.0	0.98	1.05	0.08	0.10	0.070	0.070	0.01	0.001	7%
RB	1.10	0.00	0.00	0.000	0.000	0.000	1.0	1.05	1.10	0.05	0.03	0.018	0.018	0.00	0.000	0%
<b>Total Flow</b>														<b>0.007</b>		

## Measurement Details:

Start Time (MST):	13:50
End Time (MST):	14:30
Equipment:	Marsh
Method:	Open
River Condition:	-
Quality/Error (see reverse):	poor
Weather:	overcast, calm, -6

## Flow characteristics:

Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	poor	
Cross Section Area:	0.10	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.115	(m)
Mean Velocity:	0.071	(m/s)
Froude Number:	0.067	



## Datalogger Details:

	Before	After
Transducer Reading (m):		0.586
Water (°C):	0.9	-
Battery (Main):	15.1	-
Datalogger Clock:	13:59	-
Laptop Clock:	14:01	-
Dessicant:	replaced	-
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.254	274.854		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.824	272.030		
Other:			0.662	274.192	274.139	Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.243	273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.810	272.033		
Other:	0.651	274.843		274.192	274.139	Equipment Mast

Closing Error	0.000	Average WL	272.032
WL Check	0.003	Transducer Elevation	271.446

## General Notes:

<b>Field Personnel:</b>	SM, GB	Trip Date:	29-Feb-12
Data Entry Personnel:	CJ	Date:	30-Mar-12
Data Check Personnel:	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

April 3, 2012



## Flow Measurement:

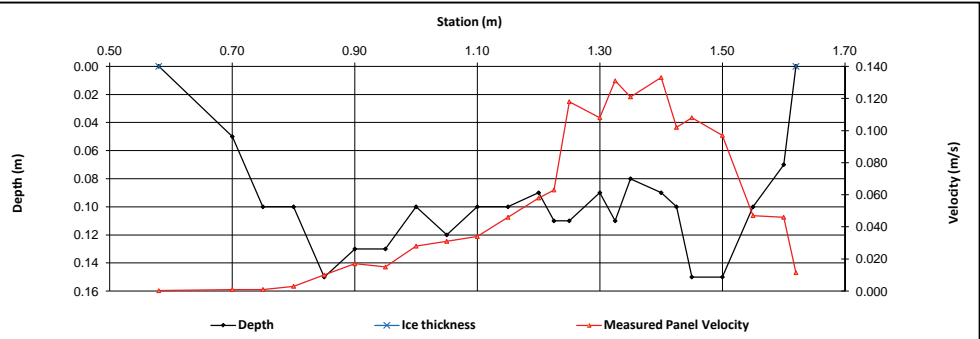
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	0.58	0.00	0.00	0.000	0.000	0.000	1.0	0.58	0.64	0.06	0.01	0.000	0.000	0.00	0.000	0%
1	0.70	0.05		0.001			1.0	0.64	0.73	0.09	0.05	0.001	0.001	0.00	0.000	0%
2	0.75	0.10		0.001			1.0	0.73	0.78	0.05	0.10	0.001	0.001	0.01	0.000	0%
3	0.80	0.10		0.003			1.0	0.78	0.83	0.05	0.10	0.003	0.003	0.00	0.000	0%
4	0.85	0.15		0.010			1.0	0.83	0.88	0.05	0.15	0.010	0.010	0.01	0.000	1%
5	0.90	0.13		0.017			1.0	0.88	0.93	0.05	0.13	0.017	0.017	0.01	0.000	2%
6	0.95	0.13		0.015			1.0	0.93	0.98	0.05	0.13	0.015	0.015	0.01	0.000	2%
7	1.00	0.10		0.028			1.0	0.98	1.03	0.05	0.10	0.028	0.028	0.00	0.000	3%
8	1.05	0.12		0.031			1.0	1.03	1.08	0.05	0.12	0.031	0.031	0.01	0.000	3%
9	1.10	0.10		0.034			1.0	1.08	1.13	0.05	0.10	0.034	0.034	0.00	0.000	3%
10	1.15	0.10		0.046			1.0	1.13	1.18	0.05	0.10	0.046	0.046	0.00	0.000	4%
11	1.20	0.09		0.058			1.0	1.18	1.21	0.04	0.09	0.058	0.058	0.00	0.000	4%
12	1.23	0.11		0.063			1.0	1.21	1.24	0.03	0.11	0.063	0.063	0.00	0.000	3%
13	1.25	0.11		0.118			1.0	1.24	1.28	0.04	0.11	0.118	0.118	0.00	0.000	9%
14	1.30	0.09		0.108			1.0	1.28	1.31	0.04	0.09	0.108	0.108	0.00	0.000	7%
15	1.325	0.11		0.131			1.0	1.31	1.34	0.02	0.11	0.131	0.131	0.00	0.000	7%
16	1.35	0.08		0.121			1.0	1.34	1.38	0.04	0.08	0.121	0.121	0.00	0.000	7%
17	1.40	0.09		0.133			1.0	1.38	1.41	0.04	0.09	0.133	0.133	0.00	0.000	8%
18	1.425	0.10		0.102			1.0	1.41	1.44	0.02	0.10	0.102	0.102	0.00	0.000	5%
19	1.450	0.15		0.108			1.0	1.44	1.48	0.04	0.15	0.108	0.108	0.01	0.001	11%
20	1.50	0.15		0.097			1.0	1.48	1.53	0.05	0.15	0.097	0.097	0.01	0.001	14%
21	1.55	0.10		0.047			1.0	1.53	1.58	0.05	0.10	0.047	0.047	0.01	0.000	4%
22	1.60	0.07		0.046			1.0	1.58	1.61	0.03	0.07	0.046	0.046	0.00	0.000	2%
RB	1.62	0.00	0.00	0.000	0.000	0.000	1.0	1.61	1.62	0.01	0.02	0.012	0.012	0.00	0.000	0%
<b>Total Flow</b>														<b>0.005</b>		

Measurement Details:	
Start Time (MST):	13:30
End Time (MST):	14:20
Equipment:	ADV
Method:	Open
River Condition:	open, low flow
Quality/Error (see reverse):	good
Weather:	cloudy, +5

Flow characteristics:	
Total Flow:	0.005 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	0.10 (m <sup>2</sup> )
Wetted Width:	1.04 (m)
Hydraulic Depth:	0.099 (m)
Mean Velocity:	0.052 (m/s)
Froude Number:	0.053

Datalogger Details:		Before	After
Transducer Reading (m):		0.589	
Water (°C):		1.0	-
Battery (Main):		14.66	-
Datalogger Clock:		12:29	-
Laptop Clock:		12:30	-
Dessicant:		replaced	-
Logger# (if Δ):		-	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.885	274.485		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.443	272.042		
Other:			0.292	274.193	274.139	Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			0.899	273.599	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.458	272.040		
Other:	0.305	274.498		274.193	274.139	Equipment Mast

Closing Error	0.001	Average WL	272.041
WL Check	0.002	Transducer Elevation	271.452

**General Notes:**

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	3-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

May 7, 2012



## Flow Measurement:

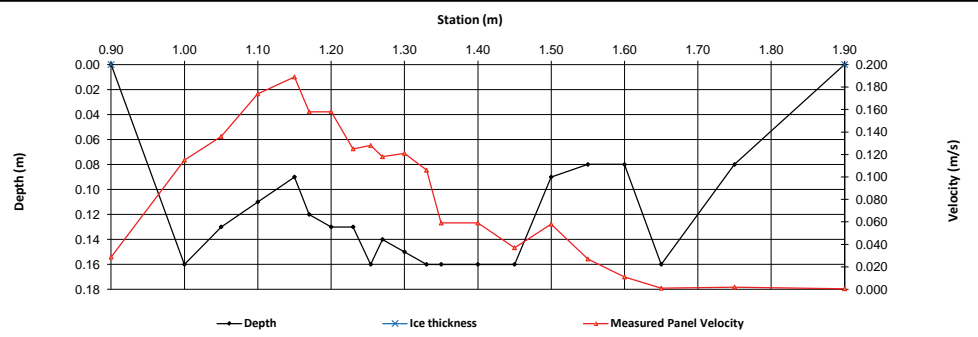
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.90	0.00	0.00	0.000	0.000	0.000	1.0	0.90	0.95	0.05	0.04	0.029	0.029	0.00	0.000	1%
1	1.00	0.16		0.115			1.0	0.95	1.03	0.08	0.16	0.115	0.115	0.01	0.001	16%
2	1.05	0.13		0.136			1.0	1.03	1.08	0.05	0.13	0.136	0.136	0.01	0.001	10%
3	1.10	0.11		0.174			1.0	1.08	1.13	0.05	0.11	0.174	0.174	0.01	0.001	11%
4	1.15	0.09		0.189			1.0	1.13	1.16	0.03	0.09	0.189	0.189	0.00	0.001	7%
5	1.17	0.12		0.158			1.0	1.16	1.19	0.03	0.12	0.158	0.158	0.00	0.000	5%
6	1.20	0.13		0.158			1.0	1.19	1.22	0.03	0.13	0.158	0.158	0.00	0.001	7%
7	1.23	0.13		0.125			1.0	1.22	1.24	0.03	0.13	0.125	0.125	0.00	0.000	5%
8	1.25	0.16		0.128			1.0	1.24	1.26	0.02	0.16	0.128	0.128	0.00	0.000	5%
9	1.27	0.14		0.118			1.0	1.26	1.29	0.02	0.14	0.118	0.118	0.00	0.000	4%
10	1.30	0.15		0.121			1.0	1.29	1.32	0.03	0.15	0.121	0.121	0.00	0.001	6%
11	1.33	0.16		0.106			1.0	1.32	1.34	0.03	0.16	0.106	0.106	0.00	0.000	5%
12	1.35	0.16		0.059			1.0	1.34	1.38	0.03	0.16	0.059	0.059	0.01	0.000	4%
13	1.40	0.16		0.059			1.0	1.38	1.43	0.05	0.16	0.059	0.059	0.01	0.000	5%
14	1.45	0.16		0.037			1.0	1.43	1.48	0.05	0.16	0.037	0.037	0.01	0.000	3%
15	1.50	0.09		0.058			1.0	1.48	1.53	0.05	0.09	0.058	0.058	0.00	0.000	3%
16	1.55	0.08		0.027			1.0	1.53	1.58	0.05	0.08	0.027	0.027	0.00	0.000	1%
17	1.60	0.08		0.011			1.0	1.58	1.63	0.05	0.08	0.011	0.011	0.00	0.000	1%
18	1.65	0.16		0.001			1.0	1.63	1.70	0.08	0.16	0.001	0.001	0.01	0.000	0%
19	1.75	0.08		0.002			1.0	1.70	1.83	0.13	0.08	0.002	0.002	0.01	0.000	0%
LB	1.90	0.00	0.00	0.000	0.000	0.000	1.0	1.83	1.90	0.08	0.02	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.009</b>	

Measurement Details:	
Start Time (MST):	15:10
End Time (MST):	16:07
Equipment:	ADV
Method:	Fishcat
River Condition:	normal flow
Quality/Error (see reverse):	fair
Weather:	clear, breezy, +20

Flow characteristics:	
Total Flow:	0.009 (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:	0.112 (m)
Mean Velocity:	0.078 (m/s)
Froude Number:	0.074

Logger Details:		
	Before	After
Transducer Reading (m):	0.606	-
Water (°C):	3.6	-
Battery (Main):	14.2	-
Datalogger Clock:	15:12	-
Laptop Clock:	15:14	-
Dessicant:	replaced	-
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.122	274.722		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.670	272.052		
Other:			0.598	274.124	274.139	Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.113	273.599	273.600	Rebar in PVC Pipe
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.660	272.052		
Other:	0.588	274.712		274.124	274.139	Equipment Mast

Closing Error	0.001	Average WL	272.052
WL Check	0.000	Transducer Elevation	271.446

**General Notes:**

- RSSI: -95
- usual stream flow, no ice, water slightly turbid
- TSS sampled at weir

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	7-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Jun-12



# Hydrometric Measurement / Site Visit Record

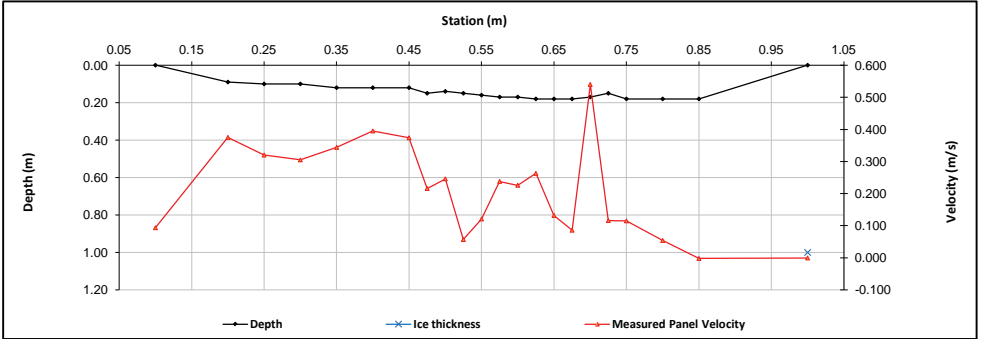
Site: S6 - Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: June 11, 2012



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	0.094	0.094	0.00	0.000	0%
1	0.20	0.09		0.375			1.0	0.15	0.23	0.08	0.09	0.375	0.375	0.01	0.003	11%
2	0.25	0.10		0.320			1.0	0.23	0.28	0.05	0.10	0.320	0.320	0.01	0.002	7%
3	0.30	0.10		0.305			1.0	0.28	0.33	0.05	0.10	0.305	0.305	0.00	0.002	7%
4	0.35	0.12		0.344			1.0	0.33	0.38	0.05	0.12	0.344	0.344	0.01	0.002	9%
5	0.40	0.12		0.395			1.0	0.38	0.43	0.05	0.12	0.395	0.395	0.01	0.002	11%
6	0.45	0.12		0.374			1.0	0.43	0.46	0.04	0.12	0.374	0.374	0.00	0.002	8%
7	0.48	0.15		0.216			1.0	0.46	0.49	0.03	0.15	0.216	0.216	0.00	0.001	4%
8	0.50	0.14		0.246			1.0	0.49	0.51	0.03	0.14	0.246	0.246	0.00	0.001	4%
9	0.53	0.15		0.057			1.0	0.51	0.54	0.03	0.15	0.057	0.057	0.00	0.000	1%
10	0.55	0.16		0.121			1.0	0.54	0.56	0.02	0.16	0.121	0.121	0.00	0.000	2%
11	0.58	0.17		0.238			1.0	0.56	0.59	0.02	0.17	0.238	0.238	0.00	0.001	5%
12	0.60	0.17		0.226			1.0	0.59	0.61	0.03	0.17	0.226	0.226	0.00	0.001	4%
13	0.63	0.18		0.263			1.0	0.61	0.64	0.02	0.18	0.263	0.263	0.00	0.001	5%
14	0.65	0.18		0.132			1.0	0.64	0.66	0.03	0.18	0.132	0.132	0.00	0.001	3%
15	0.68	0.18		0.086			1.0	0.66	0.69	0.02	0.18	0.086	0.086	0.00	0.000	2%
16	0.70	0.17		0.540			1.0	0.69	0.71	0.02	0.17	0.540	0.540	0.00	0.002	10%
17	0.73	0.15		0.116			1.0	0.71	0.74	0.03	0.15	0.116	0.116	0.00	0.000	2%
18	0.75	0.18		0.115			1.0	0.74	0.78	0.04	0.18	0.115	0.115	0.01	0.001	3%
19	0.80	0.18		0.054			1.0	0.78	0.83	0.05	0.18	0.054	0.054	0.01	0.001	2%
20	0.85	0.18		-0.002			1.0	0.83	0.93	0.10	0.18	-0.002	-0.002	0.02	0.000	0%
LB	1.00	0.00	0.00	0.000	0.000	0.000	1.0	0.93	1.00	0.08	0.05	-0.001	-0.001	0.00	0.000	0%
<b>Total Flow</b>														<b>0.022</b>		

Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	9:24
Equipment:	ADV
Method:	Wading
River Condition:	normal flow
Quality/Error (see reverse):	good
Weather:	clear, calm, 8°



Flow characteristics:		
Total Flow:	0.022	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.12	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.129	(m)
Mean Velocity:	0.192	(m/s)
Froude Number:	0.170	

Logger Details:		
	Before	After
Transducer Reading (m):	0.63	
Water (°C):	4.8	
Battery (Main):	14.6	
Datalogger Clock:	8:06	
Laptop Clock:	8:08	
Dessicant:	replaced	
Logger# (if Δ):	14562	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.522	275.122		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:					274.118	3/4" Pipe 6m NW of data logger
Bench Mark 3:			1.007	274.115	274.113	3/4" Pipe 7m W of data logger
Ice/PT:						
Water Level:			3.031	272.091		
Other:			1.000	274.122		Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.508	273.602	273.600	Rebar in PVC Pipe
Bench Mark 2:					274.118	3/4" Pipe 6m NW of data logger
Bench Mark 3:	0.995	275.110		274.115	274.113	3/4" Pipe 7m W of data logger
Ice/PT:						
Water Level:			3.017	272.093		
Other:			0.987	274.123		Equipment Mast

Closing Error	-0.002
WL Check	0.002

Average WL	272.092
Transducer Elevation	271.462

**General Notes:**

Field Personnel:	SM, CJ	Trip Date:	11-Jun-12
Data Entry Personnel:	CJ	Date:	26-Jun-12
Data Check Personnel:	XP	Date:	28-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

August 7, 2012



## 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	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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.25	0.05	0.03	0.000	0.000	0.00	0.000	0%
1	0.30	0.13		-0.001			1.0	0.25	0.33	0.08	0.13	-0.001	-0.001	0.01	0.000	0%
2	0.35	0.14		0.038			1.0	0.33	0.38	0.05	0.14	0.038	0.038	0.01	0.000	2%
3	0.40	0.14		0.067			1.0	0.38	0.43	0.05	0.14	0.067	0.067	0.01	0.000	4%
4	0.45	0.16		0.062			1.0	0.43	0.48	0.05	0.16	0.062	0.062	0.01	0.000	4%
5	0.50	0.16		0.073			1.0	0.48	0.53	0.05	0.16	0.073	0.073	0.01	0.001	5%
6	0.55	0.16		0.075			1.0	0.53	0.56	0.04	0.16	0.075	0.075	0.01	0.000	4%
7	0.57	0.16		0.076			1.0	0.56	0.59	0.02	0.16	0.076	0.076	0.00	0.000	3%
8	0.60	0.16		0.027			1.0	0.59	0.62	0.03	0.16	0.027	0.027	0.00	0.000	1%
9	0.63	0.16		0.162			1.0	0.62	0.64	0.03	0.16	0.162	0.162	0.00	0.001	6%
10	0.65	0.13		0.179			1.0	0.64	0.66	0.02	0.13	0.179	0.179	0.00	0.000	4%
11	0.67	0.14		0.318			1.0	0.66	0.69	0.03	0.14	0.318	0.318	0.00	0.001	10%
12	0.70	0.14		0.318			1.0	0.69	0.72	0.03	0.14	0.318	0.318	0.00	0.001	12%
13	0.73	0.14		0.132			1.0	0.72	0.74	0.03	0.14	0.132	0.132	0.00	0.000	4%
14	0.75	0.13		0.093			1.0	0.74	0.76	0.02	0.13	0.093	0.093	0.00	0.000	2%
15	0.77	0.11		0.114			1.0	0.76	0.79	0.03	0.11	0.114	0.114	0.00	0.000	3%
16	0.80	0.11		0.151			1.0	0.79	0.82	0.03	0.11	0.151	0.151	0.00	0.000	4%
17	0.83	0.10		0.144			1.0	0.82	0.84	0.03	0.10	0.144	0.144	0.00	0.000	3%
18	0.85	0.10		0.154			1.0	0.84	0.88	0.04	0.10	0.154	0.154	0.00	0.001	5%
19	0.90	0.06		0.197			1.0	0.88	0.93	0.05	0.06	0.197	0.197	0.00	0.001	5%
20	0.95	0.08		0.218			1.0	0.93	1.03	0.10	0.08	0.218	0.218	0.01	0.002	16%
RB	1.10	0.00	0.00	0.00	0.00	0.00	1.0	1.03	1.10	0.08	0.02	0.055	0.055	0.00	0.000	1%

**Total Flow 0.011**

### Measurement Details:

Start Time (MST):	8:00
End Time (MST):	9:40
Equipment:	ADV
Method:	Wading
River Condition:	usual flow
Quality/Error (see reverse):	fair
Weather:	clear, calm, 20

### Flow characteristics:

Total Flow:	0.0111	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Cross Section Area:	0.10	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.112	(m)
Mean Velocity:	0.110	(m/s)
Froude Number:	0.105	

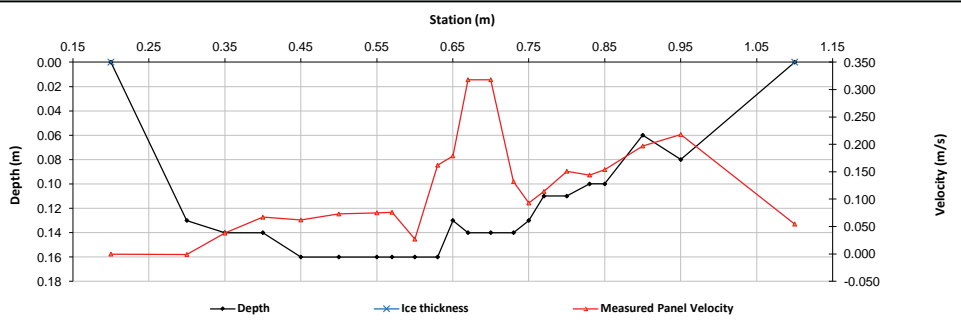
### Logger Details:

	Before	After
Transducer Reading (m):	0.645	0.746
Water (°C):	12.3	19.2
Battery (Main):	13.9	14.36
Datalogger Clock:	8:02	8:43
Laptop Clock:	8:03	8:44
Dessicant:	replaced	-
Logger# (if Δ):	14562	-
PT# (if Δ):	262386	298710

### Datalogger / Station Notes:

-Removed PLS s/n: 262386, tried short (6m) PLS s/n: 273449-didn't work, installed 15 m PLS s/n: 298710-worked normally

-installed one 3/4" Pipe BM



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.394	274.994		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:			0.875	274.119	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:			0.881	274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.907	272.087		
Other:			0.873	274.121		Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.387	273.598	273.600	Rebar in PVC Pipe
Bench Mark 2:	0.866	274.985		274.119	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:			0.873	274.112	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.900	272.085		
Other:			0.864	274.121		Equipment Mast

Closing Error	0.002	Average WL	272.086
WL Check	0.002	Transducer Elevation	271.340

### General Notes:

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	7-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63

UTM Location: 463829 E, 6344743 N

Site Visit Date:

September 24, 2012



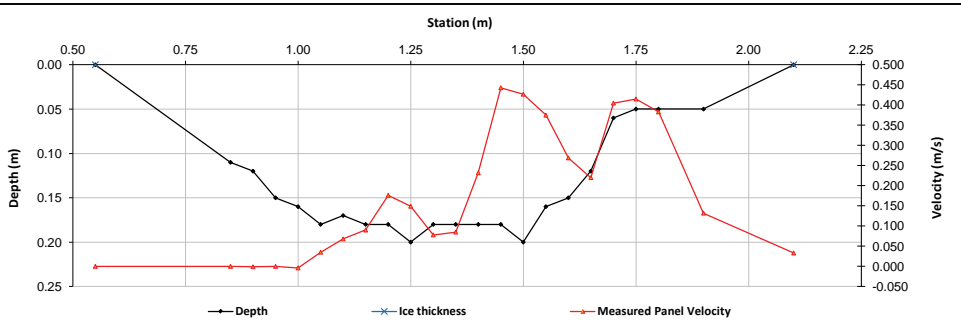
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel 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	0.55	0.00	0.00	0.000	0.000	0.000	1.0	0.55	0.70	0.15	0.03	0.000	0.000	0.00	0.000	0%
1	0.85	0.11		0.000			1.0	0.70	0.88	0.18	0.11	0.000	0.000	0.02	0.000	0%
2	0.90	0.12		-0.001			1.0	0.88	0.93	0.05	0.12	-0.001	-0.001	0.01	0.000	0%
3	0.95	0.15		0.000			1.0	0.93	0.98	0.05	0.15	0.000	0.000	0.01	0.000	0%
4	1.00	0.16		-0.004			1.0	0.98	1.03	0.05	0.16	-0.004	-0.004	0.01	0.000	0%
5	1.05	0.18		0.035			1.0	1.03	1.08	0.05	0.18	0.035	0.035	0.01	0.000	1%
6	1.10	0.17		0.068			1.0	1.08	1.13	0.05	0.17	0.068	0.068	0.01	0.001	2%
7	1.15	0.18		0.090			1.0	1.13	1.18	0.05	0.18	0.090	0.090	0.01	0.001	3%
8	1.20	0.18		0.176			1.0	1.18	1.23	0.05	0.18	0.176	0.176	0.01	0.002	6%
9	1.25	0.20		0.149			1.0	1.23	1.28	0.05	0.20	0.149	0.149	0.01	0.001	5%
10	1.30	0.18		0.078			1.0	1.28	1.33	0.05	0.18	0.078	0.078	0.01	0.001	3%
11	1.35	0.18		0.085			1.0	1.33	1.38	0.05	0.18	0.085	0.085	0.01	0.001	3%
12	1.40	0.18		0.232			1.0	1.38	1.43	0.05	0.18	0.232	0.232	0.01	0.002	8%
13	1.45	0.18		0.443			1.0	1.43	1.48	0.05	0.18	0.443	0.443	0.01	0.004	14%
14	1.50	0.20		0.427			1.0	1.48	1.53	0.05	0.20	0.427	0.427	0.01	0.004	15%
15	1.55	0.16		0.375			1.0	1.53	1.58	0.05	0.16	0.375	0.375	0.01	0.003	11%
16	1.60	0.15		0.269			1.0	1.58	1.63	0.05	0.15	0.269	0.269	0.01	0.002	7%
17	1.65	0.12		0.220			1.0	1.63	1.68	0.05	0.12	0.220	0.220	0.01	0.001	5%
18	1.70	0.06		0.405			1.0	1.68	1.73	0.05	0.06	0.405	0.405	0.00	0.001	4%
19	1.75	0.05		0.415			1.0	1.73	1.78	0.05	0.05	0.415	0.415	0.00	0.001	4%
20	1.80	0.05		0.383			1.0	1.78	1.85	0.08	0.05	0.383	0.383	0.00	0.001	5%
21	1.90	0.05		0.132			1.0	1.85	2.00	0.15	0.05	0.132	0.132	0.01	0.001	4%
RB	2.10	0.00	0.00	0.00	0.00	0.00	1.0	2.00	2.10	0.10	0.01	0.033	0.033	0.00	0.000	0%
<b>Total Flow</b>														<b>0.028</b>		

Measurement Details:	
Start Time (MST):	14:45
End Time (MST):	15:35
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	Fair
Weather:	clear, calm, 20

Flow characteristics:	
Total Flow:	0.028 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.18 (m <sup>2</sup> )
Wetted Width:	1.55 (m)
Hydraulic Depth:	0.113 (m)
Mean Velocity:	0.157 (m/s)
Froude Number:	0.149

Logger Details:		
	Before	After
Transducer Reading (m):	0.737	
Water (°C):	9.8	
Battery (Main):	14.2	
Datalogger Clock:	14:49	
Laptop Clock:	14:51	
Dessicant:	replaced	
Logger# (if Δ):	14562	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.574	275.174		273.600	273.600	Rebar in PVC Pipe
Bench Mark 2:			1.056	274.118	274.118	3/4" Pipe 6m NW of data logger
Bench Mark 3:			1.061	274.113	274.113	3/4" Pipe 7m W of data logger
Ice/PT:						
Water Level:			3.039	272.135		
Other:			1.053	274.121		Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:			1.565	273.599	273.600	Rebar in PVC Pipe
Bench Mark 2:	1.046	275.164		274.118	274.118	3/4" Pipe 6m NW of data logger
Bench Mark 3:			1.052	274.112	274.113	3/4" Pipe 7m W of data logger
Ice/PT:						
Water Level:			3.028	272.136		
Other:			1.043	274.121		Equipment Mast
Closing Error	0.001	Average WL		272.136		
WL Check	0.001	Transducer Elevation		271.399		

**General Notes:**

- Installed BM tags
- TSS collected at offset 1.4 m

Field Personnel:		SM, TR	Trip Date:	24-Sep-12
Data Entry Personnel:	CJ		Date:	4-Oct-12
Data Check Personnel:	MY		Date:	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S6 - Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: October 15, 2012



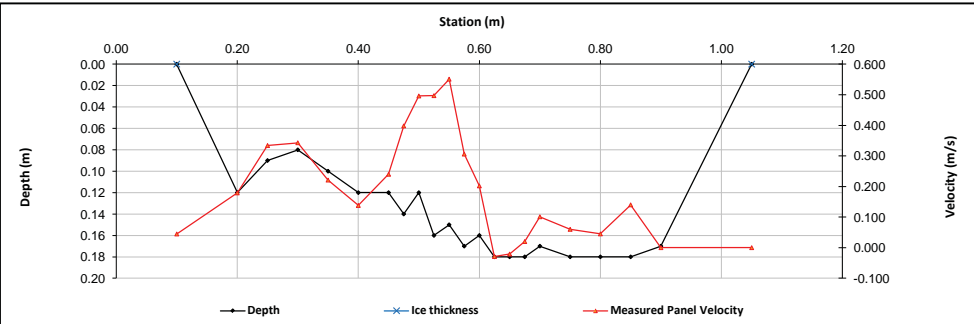
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.10	0.00	0.00	0.000	0.000	0.000	1.0	0.10	0.15	0.05	0.03	0.045	0.045	0.00	0.000	0%
1	0.20	0.12		0.179			1.0	0.15	0.23	0.08	0.12	0.179	0.179	0.01	0.002	8%
2	0.25	0.09		0.334			1.0	0.23	0.28	0.05	0.09	0.334	0.334	0.00	0.002	8%
3	0.30	0.08		0.343			1.0	0.28	0.33	0.05	0.08	0.343	0.343	0.00	0.001	7%
4	0.35	0.10		0.221			1.0	0.33	0.38	0.05	0.10	0.221	0.221	0.01	0.001	6%
5	0.40	0.12		0.138			1.0	0.38	0.43	0.05	0.12	0.138	0.138	0.01	0.001	4%
6	0.45	0.12		0.240			1.0	0.43	0.46	0.04	0.12	0.240	0.240	0.00	0.001	6%
7	0.48	0.14		0.398			1.0	0.46	0.49	0.03	0.14	0.398	0.398	0.00	0.001	7%
8	0.50	0.12		0.496			1.0	0.49	0.51	0.03	0.12	0.496	0.496	0.00	0.001	8%
9	0.53	0.16		0.497			1.0	0.51	0.54	0.03	0.16	0.497	0.497	0.00	0.002	10%
10	0.55	0.15		0.551			1.0	0.54	0.56	0.02	0.15	0.551	0.551	0.00	0.002	11%
11	0.58	0.17		0.306			1.0	0.56	0.59	0.02	0.17	0.306	0.306	0.00	0.001	7%
12	0.60	0.16		0.202			1.0	0.59	0.61	0.03	0.16	0.202	0.202	0.01	0.001	4%
13	0.63	0.18		-0.029			1.0	0.61	0.64	0.02	0.18	-0.029	-0.029	0.00	0.000	-1%
14	0.65	0.18		-0.021			1.0	0.64	0.66	0.03	0.18	-0.021	-0.021	0.00	0.000	0%
15	0.68	0.18		0.020			1.0	0.66	0.69	0.02	0.18	0.020	0.020	0.00	0.000	0%
16	0.70	0.17		0.101			1.0	0.69	0.73	0.04	0.17	0.101	0.101	0.01	0.001	3%
17	0.75	0.18		0.060			1.0	0.73	0.78	0.05	0.18	0.060	0.060	0.01	0.001	3%
18	0.80	0.18		0.045			1.0	0.78	0.83	0.05	0.18	0.045	0.045	0.01	0.000	2%
19	0.85	0.18		0.140			1.0	0.83	0.88	0.05	0.18	0.140	0.140	0.01	0.001	7%
20	0.90	0.17		0.000			1.0	0.88	0.98	0.10	0.17	0.000	0.000	0.02	0.000	0%
LB	1.05	0.00	0.00	0.00	0.00	0.00	1.0	0.98	1.05	0.08	0.04	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.019</b>		

<b>Measurement Details:</b>	
Start Time (MST):	15:45
End Time (MST):	16:40
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	10 deg clear, breezy

<b>Flow characteristics:</b>	
Total Flow:	0.019 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.12 (m <sup>2</sup> )
Wetted Width:	0.95 (m)
Hydraulic Depth:	0.131 (m)
Mean Velocity:	0.156 (m/s)
Froude Number:	0.138

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
Water (°C):	7.2	
Battery (Main):	14.5	
Datalogger Clock:	15:46	
Laptop Clock:	15:47	
Dessicant:	replaced	
Logger# (if Δ):	14562	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.540	273.604	273.600	Rebar in PVC Pipe
Bench Mark 2:	1.026	275.144		274.118	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:			1.019	274.125	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.042	272.102		
Other:						Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:	1.533	275.137		273.604	273.600	Rebar in PVC Pipe
Bench Mark 2:			1.019	274.118	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:			1.013	274.124	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			3.033	272.104		
Other:						Equipment Mast

Closing Error	0.000	Average WL	272.103
WL Check	0.002	Transducer Elevation	271.395

**General Notes:**

TSS @ Weir

<b>Field Personnel:</b>		SM, TR	Trip Date:	15-Oct-12
Data Entry Personnel:		TR	Date:	15-Oct-12
Data Check Personnel:		CJ	Date:	7-Nov-12
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:

December 2, 2012



## 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	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	0.23	0.03	0.03	0.075	0.075	0.00	0.000	0%	
1	0.25	0.12		0.298			1.0	0.23	0.28	0.05	0.12	0.298	0.298	0.01	0.002	9%	
2	0.30	0.10		0.231			1.0	0.28	0.33	0.05	0.10	0.231	0.231	0.00	0.001	5%	
3	0.35	0.11		0.170			1.0	0.33	0.38	0.05	0.11	0.170	0.170	0.01	0.001	4%	
4	0.40	0.10		0.188			1.0	0.38	0.43	0.05	0.10	0.188	0.188	0.01	0.001	4%	
5	0.45	0.09		0.318			1.0	0.43	0.46	0.04	0.09	0.318	0.318	0.00	0.001	5%	
6	0.48	0.16		0.363			1.0	0.46	0.49	0.03	0.16	0.363	0.363	0.00	0.001	7%	
7	0.50	0.16		0.433			1.0	0.49	0.51	0.03	0.16	0.433	0.433	0.00	0.002	8%	
8	0.53	0.15		0.471			1.0	0.51	0.54	0.03	0.15	0.471	0.471	0.00	0.002	8%	
9	0.55	0.16		0.286			1.0	0.54	0.56	0.02	0.16	0.286	0.286	0.00	0.001	5%	
10	0.58	0.15		0.338			1.0	0.56	0.59	0.02	0.15	0.338	0.338	0.00	0.001	6%	
11	0.60	0.14		0.223			1.0	0.59	0.63	0.04	0.14	0.223	0.223	0.01	0.001	6%	
12	0.65	0.14		0.115			1.0	0.63	0.68	0.05	0.14	0.115	0.115	0.01	0.001	4%	
13	0.70	0.18		0.074			1.0	0.68	0.73	0.05	0.18	0.074	0.074	0.01	0.001	3%	
14	0.75	0.15		0.047			1.0	0.73	0.78	0.05	0.15	0.047	0.047	0.01	0.000	2%	
15	0.80	0.20		0.070			1.0	0.78	0.83	0.05	0.20	0.070	0.070	0.01	0.001	3%	
16	0.85	0.21		0.370			1.0	0.83	0.88	0.05	0.21	0.370	0.370	0.01	0.004	19%	
17	0.90	0.20		0.003			1.0	0.88	0.93	0.05	0.20	0.003	0.003	0.01	0.000	0%	
18	0.95	0.19		0.004			1.0	0.93	1.03	0.10	0.19	0.004	0.004	0.02	0.000	0%	
LB	1.10	0.00	0.00	0.00	0.00	0.00	1.0	1.03	1.10	0.07	0.05	0.001	0.001	0.00	0.000	0%	

**Total Flow 0.021**

### Measurement Details:

Start Time (MST):	14:50
End Time (MST):	15:30
Equipment:	ADV
Method:	Wading
River Condition:	low flow, no ice cover
Quality/Error (see reverse):	Fair
Weather:	overcast, calm, -16

### Flow characteristics:

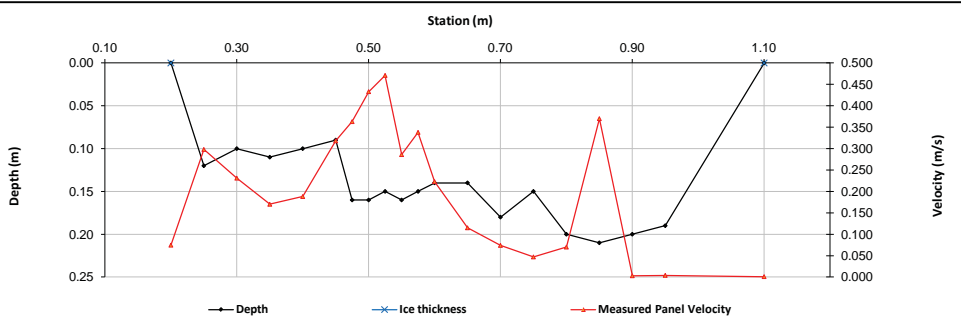
Total Flow:	0.021	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.141	(m)
Mean Velocity:	0.165	(m/s)
Froude Number:	0.141	

### Logger Details:

	Before	After
Transducer Reading (m):	0.688	-
Water (°C):	2.8	-
Battery (Main):	12.8	-
Datalogger Clock:	14:51	-
Laptop Clock:	14:51	-
Dessicant:	replaced	-
Logger# (if Δ):	14562	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:


### General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.201	273.595	273.600	Rebar in PVC Pipe
Bench Mark 2:			0.682	274.114	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:	0.683	274.796		274.113	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.716	272.080		
Other:						Equipment Mast
<b>Setup #2</b>						
Bench Mark 1:	1.187	274.782		273.595	273.600	Rebar in PVC Pipe
Bench Mark 2:			0.669	274.113	274.118	3/4" Pipe 6 m NW of data logger
Bench Mark 3:			0.668	274.114	274.113	3/4" Pipe 7 m W of data logger
Ice/PT:						
Water Level:			2.701	272.081		
Other:						Equipment Mast

Closing Error	-0.001	Average WL	272.081
WL Check	0.001	Transducer Elevation	271.393

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Dec-12
<b>Data Entry Personnel:</b>	SM, TR	<b>Date:</b>	2-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	19-Dec-12
<b>Entered Digitally in the Field:</b>	<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: January 14, 2012



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)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
R	18.80	0.00	0.00	0.000	0.000	0.000	0.9	18.80	18.38	0.43	0.04	0.003	0.002	0.02	0.000	0%
1	17.95	0.50	0.35	0.010			0.9	18.38	17.70	0.68	0.15	0.010	0.009	0.10	0.001	0%
2	17.45	0.56	0.35	0.020			0.9	17.70	17.10	0.60	0.21	0.020	0.018	0.13	0.002	1%
3	16.75	0.58	0.33	0.080			0.9	17.10	16.53	0.58	0.25	0.080	0.072	0.14	0.010	4%
4	16.30	0.51	0.30	0.090			0.9	16.53	16.00	0.52	0.21	0.090	0.081	0.11	0.009	3%
5	15.70	0.57	0.30	0.110			0.9	16.00	15.25	0.75	0.27	0.110	0.099	0.20	0.020	8%
6	14.80	0.57	0.31	0.120			0.9	15.25	14.45	0.80	0.26	0.120	0.108	0.21	0.022	9%
7	14.10	0.50	0.31	0.140			0.9	14.45	13.63	0.82	0.19	0.140	0.126	0.16	0.020	8%
8	13.15	0.47	0.32	0.140			0.9	13.63	12.73	0.90	0.15	0.140	0.126	0.14	0.017	7%
9	12.30	0.57	0.34	0.120			0.9	12.73	11.85	0.88	0.23	0.120	0.108	0.20	0.022	8%
10	11.40	0.50	0.33	0.150			0.9	11.85	11.25	0.60	0.17	0.150	0.135	0.10	0.014	5%
11	11.10	0.50	0.35	0.140			0.9	11.25	10.90	0.35	0.15	0.140	0.126	0.05	0.007	3%
12	10.70	0.50	0.35	0.140			0.9	10.90	10.53	0.38	0.15	0.140	0.126	0.06	0.007	3%
13	10.35	0.55	0.35	0.130			0.9	10.53	10.03	0.50	0.20	0.130	0.117	0.10	0.012	5%
14	9.70	0.50	0.35	0.090			0.9	10.03	9.43	0.60	0.15	0.090	0.081	0.09	0.007	3%
15	9.15	0.52	0.35	0.070			0.9	9.43	8.83	0.60	0.17	0.070	0.063	0.10	0.006	3%
16	8.50	0.55	0.31	0.110			0.9	8.83	8.15	0.67	0.24	0.110	0.099	0.16	0.016	6%
17	7.80	0.50	0.31	0.110			0.9	8.15	7.45	0.70	0.19	0.110	0.099	0.13	0.013	5%
18	7.10	0.50	0.30	0.120			0.9	7.45	6.65	0.80	0.20	0.120	0.108	0.16	0.017	7%
19	6.20	0.57	0.33	0.100			0.9	6.65	5.75	0.90	0.24	0.100	0.090	0.22	0.019	8%
20	5.30	0.35	0.25	0.110			0.9	5.75	4.85	0.90	0.10	0.110	0.099	0.09	0.009	3%
21	4.40	0.39	0.25	0.060			0.9	4.85	4.15	0.70	0.14	0.060	0.054	0.10	0.005	2%
L	3.90	0.00	0.00	0.000	0.000	0.000	1.0	4.40	3.90	0.50	0.05	0.015	0.015	0.02	0.000	0%

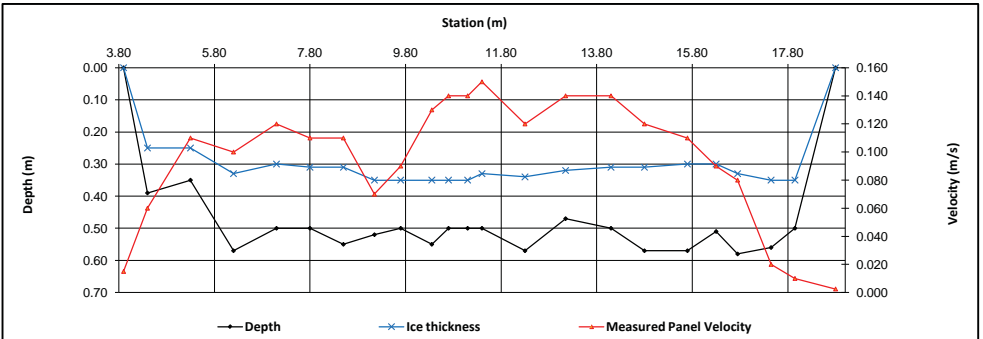
**Total Flow 0.257**

Measurement Details:	
Start Time (MST):	13:15
End Time (MST):	14:20
Equipment:	Marsh
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Good
Weather:	Light Snow, -15

Flow characteristics:	
Total Flow:	0.257 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.79 (m <sup>2</sup> )
Wetted Width:	13.98 (m)
Hydraulic Depth:	0.199 (m)
Mean Velocity:	0.092 (m/s)
Froude Number:	0.066

Datalogger Details:		
	Before	After
Transducer Reading (m):		0.702
Water (°C):	0.7	
Battery (Main):	12.4	
Datalogger Clock:	13:34	
Laptop Clock:	13:37	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.677	275.498	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	0.610	276.175		275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.327	271.848		
Water Level:			4.348	271.827		
Other:			0.764	275.411	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.666	275.496	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			0.599	275.563	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.314	271.848		
Water Level:			4.334	271.828		
Other:	0.751	276.162		275.411	275.406	Rebar 2 m SW of data logger

Closing Error	0.002	Average WL	271.828
WL Check	0.001	Transducer Elevation	271.126

**General Notes:**

-Installed signal isolator for telemetry

<b>Field Personnel:</b>	DW, SM	Trip Date:	14-Jan-12
<b>Data Entry Personnel:</b>	DW	Date:	18-Jan-12
<b>Data Check Personnel:</b>	CJ	Date:	18-Jan-12

# Hydrometric Measurement / Site Visit Record

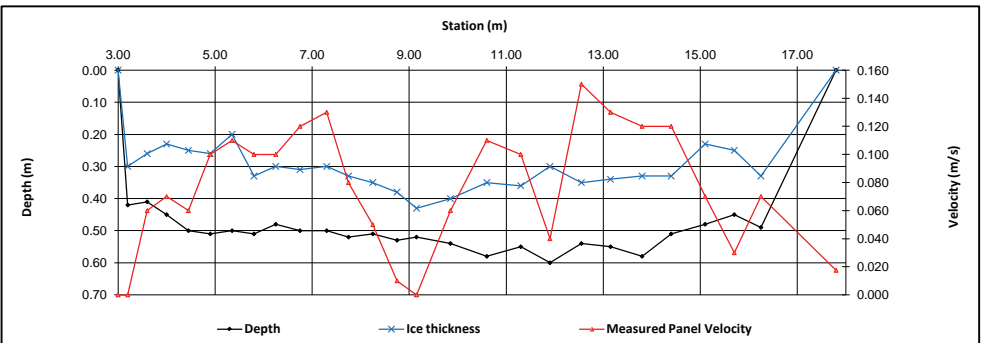
Site: S7 - Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: February 6, 2012



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)	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	1.0	3.00	3.10	0.10	0.03	0.000	0.000	0.00	0.000	0%
1	3.20	0.42	0.30	0.000			1.0	3.10	3.40	0.30	0.12	0.000	0.000	0.04	0.000	0%
2	3.60	0.41	0.26	0.060			0.9	3.40	3.80	0.40	0.15	0.060	0.054	0.06	0.003	2%
3	4.00	0.45	0.23	0.070			0.9	3.80	4.23	0.43	0.22	0.070	0.063	0.09	0.006	3%
4	4.45	0.50	0.25	0.060			0.9	4.23	4.68	0.45	0.25	0.060	0.054	0.11	0.006	3%
5	4.90	0.51	0.26	0.100			0.9	4.68	5.13	0.45	0.25	0.100	0.090	0.11	0.010	5%
6	5.35	0.50	0.20	0.110			0.9	5.13	5.58	0.45	0.30	0.110	0.099	0.14	0.013	6%
7	5.80	0.51	0.33	0.100			0.9	5.58	6.03	0.45	0.18	0.100	0.090	0.08	0.007	3%
8	6.25	0.48	0.30	0.100			0.9	6.03	6.50	0.48	0.18	0.100	0.090	0.09	0.008	4%
9	6.75	0.50	0.31	0.120			0.9	6.50	7.03	0.53	0.19	0.120	0.108	0.10	0.011	5%
10	7.30	0.50	0.30	0.130			0.9	7.03	7.53	0.50	0.20	0.130	0.117	0.10	0.012	6%
11	7.75	0.52	0.33	0.080			0.9	7.53	8.00	0.48	0.19	0.080	0.072	0.09	0.006	3%
12	8.25	0.51	0.35	0.050			0.9	8.00	8.50	0.50	0.16	0.050	0.045	0.08	0.004	2%
13	8.75	0.53	0.38	0.010			0.9	8.50	8.95	0.45	0.15	0.010	0.009	0.07	0.001	0%
14	9.15	0.52	0.43	0.000			1.0	8.95	9.50	0.55	0.09	0.000	0.000	0.05	0.000	0%
15	9.85	0.54	0.40	0.060			0.9	9.50	10.23	0.73	0.14	0.060	0.054	0.10	0.005	3%
16	10.60	0.58	0.35	0.110			0.9	10.23	10.95	0.73	0.23	0.110	0.099	0.17	0.017	8%
17	11.30	0.55	0.36	0.100			0.9	10.95	11.60	0.65	0.19	0.100	0.090	0.12	0.011	5%
18	11.90	0.60	0.30	0.040			0.9	11.60	12.23	0.63	0.30	0.040	0.036	0.19	0.007	3%
19	12.55	0.54	0.35	0.150			0.9	12.23	12.85	0.63	0.19	0.150	0.135	0.12	0.016	8%
20	13.15	0.55	0.34	0.130			0.9	12.85	13.48	0.63	0.21	0.130	0.117	0.13	0.015	7%
21	13.80	0.58	0.33	0.120			0.9	13.48	14.10	0.63	0.25	0.120	0.108	0.16	0.017	8%
22	14.40	0.51	0.33	0.120			0.9	14.10	14.75	0.65	0.18	0.120	0.108	0.12	0.013	6%
23	15.10	0.48	0.23	0.070			0.9	14.75	15.40	0.65	0.25	0.070	0.063	0.16	0.010	5%
24	15.70	0.45	0.25	0.030			0.9	15.40	15.98	0.58	0.20	0.030	0.027	0.12	0.003	1%
25	16.25	0.49	0.33	0.070			0.9	15.98	17.03	1.05	0.16	0.070	0.063	0.17	0.011	5%
RB	17.80	0.00	0.00	0.000	0.000	0.000	1.0	17.03	17.80	0.78	0.04	0.018	0.018	0.03	0.001	0%
<b>Total Flow</b>															<b>0.212</b>	

Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	15:55
Equipment:	Marsh McBirney
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Good
Weather:	Clear, Breezy -5°C



Flow characteristics:		
Total Flow:	0.212	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.79	(m <sup>2</sup> )
Wetted Width:	14.80	(m)
Hydraulic Depth:	0.188	(m)
Mean Velocity:	0.076	(m/s)
Froude Number:	0.056	

Datalogger Details:	Before	After
Transducer Reading (m):	-	0.706
Water (°C):	0.6	
Battery (Main):	13.3	
Datalogger Clock:	15:28	
Laptop Clock:	15:29	
Dessicant:	OK	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-log in water/ ice at RB

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.648	275.503	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	0.586	276.151		275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.324	271.827		
Water Level:			4.320	271.831		
Other:			0.734	275.417	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.639	275.502	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			0.575	275.566	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.310	271.831		
Water Level:			4.308	271.833		
Other:	0.724	276.141		275.417	275.406	Rebar 2 m SW of data logger

Closing Error	-0.001	Average WL	271.832
WL Check	0.002	Transducer Elevation	271.126

**General Notes:**

-log in water/ ice at RB

Field Personnel:	SM, CJ	Trip Date:	6-Feb-12
Data Entry Personnel:	SG	Date:	24-Feb-12
Data Check Personnel:	CJ	Date:	16-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: February 27, 2012



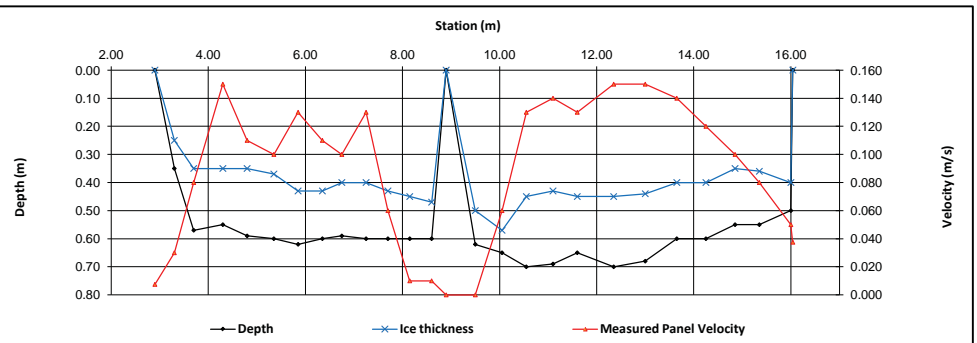
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	0.9	2.90	3.10	0.20	0.03	0.008	0.007	0.00	0.000	0%
1	3.30	0.35	0.25	0.030			0.9	3.10	3.50	0.40	0.10	0.030	0.027	0.04	0.001	0%
2	3.70	0.57	0.35	0.080			0.9	3.50	4.00	0.50	0.22	0.080	0.072	0.11	0.008	3%
3	4.30	0.55	0.35	0.150			0.9	4.00	4.55	0.55	0.20	0.150	0.135	0.11	0.015	6%
4	4.80	0.59	0.35	0.110			0.9	4.55	5.08	0.52	0.24	0.110	0.099	0.13	0.012	5%
5	5.35	0.60	0.37	0.100			0.9	5.08	5.60	0.53	0.23	0.100	0.090	0.12	0.011	5%
6	5.85	0.62	0.43	0.130			0.9	5.60	6.10	0.50	0.19	0.130	0.117	0.10	0.011	5%
7	6.35	0.60	0.43	0.110			0.9	6.10	6.55	0.45	0.17	0.110	0.099	0.08	0.008	3%
8	6.75	0.59	0.40	0.100			0.9	6.55	7.00	0.45	0.19	0.100	0.090	0.09	0.008	3%
9	7.25	0.60	0.40	0.130			0.9	7.00	7.48	0.48	0.20	0.130	0.117	0.09	0.011	5%
10	7.70	0.60	0.43	0.060			0.9	7.48	7.93	0.45	0.17	0.060	0.054	0.08	0.004	2%
11	8.15	0.60	0.45	0.010			0.9	7.93	8.38	0.45	0.15	0.010	0.009	0.07	0.001	0%
12	8.60	0.60	0.47	0.010			0.9	8.38	8.75	0.38	0.13	0.010	0.009	0.05	0.000	0%
13	8.90	0.00	0.00	0.000			1.0	8.75	9.20	0.45	0.03	0.000	0.000	0.01	0.000	0%
14	9.50	0.62	0.50	0.000			1.0	9.20	9.78	0.58	0.12	0.000	0.000	0.07	0.000	0%
15	10.05	0.65	0.57	0.060			0.9	9.78	10.30	0.53	0.08	0.060	0.054	0.04	0.002	1%
16	10.55	0.70	0.45	0.130			0.9	10.30	10.83	0.52	0.25	0.130	0.117	0.13	0.015	6%
17	11.10	0.69	0.43	0.140			0.9	10.83	11.35	0.53	0.26	0.140	0.126	0.14	0.017	7%
18	11.60	0.65	0.45	0.130			0.9	11.35	11.98	0.63	0.20	0.130	0.117	0.13	0.015	6%
19	12.35	0.70	0.45	0.150			0.9	11.98	12.68	0.70	0.25	0.150	0.135	0.18	0.024	10%
20	13.00	0.68	0.44	0.150			0.9	12.68	13.33	0.65	0.24	0.150	0.135	0.16	0.021	9%
21	13.65	0.60	0.40	0.140			0.9	13.33	13.95	0.63	0.20	0.140	0.126	0.13	0.016	7%
22	14.25	0.60	0.40	0.120			0.9	13.95	14.55	0.60	0.20	0.120	0.108	0.12	0.013	5%
23	14.85	0.55	0.35	0.100			0.9	14.55	15.10	0.55	0.20	0.100	0.090	0.11	0.010	4%
24	15.35	0.55	0.36	0.080			0.9	15.10	15.68	0.58	0.19	0.080	0.072	0.11	0.008	3%
25	16.00	0.50	0.40	0.050			0.9	15.68	16.02	0.34	0.10	0.050	0.045	0.03	0.002	1%
RB	16.04	0.00	0.00	0.000	0.000	0.000	1.0	13.00	16.04	3.04	0.06	0.038	0.038	0.19	0.007	3%
<b>Total Flow</b>															<b>0.239</b>	

Measurement Details:	
Start Time (MST):	14:50
End Time (MST):	16:00
Equipment:	Marsh
Method:	Ice
River Condition:	full ice, snow cover
Quality/Error (see reverse):	Good
Weather:	clear, light breeze, -8

Flow Characteristics:		
Total Flow:	0.239	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.59	(m <sup>2</sup> )
Wetted Width:	13.14	(m)
Hydraulic Depth:	0.197	(m)
Mean Velocity:	0.092	(m/s)
Froude Number:	0.066	

Datalogger Details:		
Transducer Reading (m):	Before	After
	0.742	
Water (°C):	0.5	-
Battery (Main):	14.2	-
Datalogger Clock:	14:51	-
Laptop Clock:	14:52	-
Dessicant:	good	-
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS (+m)	HI (m)	FS (-m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.643	275.499	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	0.577	276.142		275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.260	271.882		
Water Level:			4.276	271.866		
Other:			0.725	275.417	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.632	275.499	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			0.566	275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.250	271.881		
Water Level:			4.267	271.864		
Other:	0.714	276.131		275.417	275.406	Rebar 2 m SW of data logger

Closing Error	0.000	Average WL	271.865
WL Check	0.002	Transducer Elevation	271.123

**General Notes:**

Field Personnel:	SM, GB	Trip Date:	27-Feb-12
Data Entry Personnel:	CJ	Date:	19-Mar-12
Data Check Personnel:	SG	Date:	20-Mar-12



# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

March 31, 2012



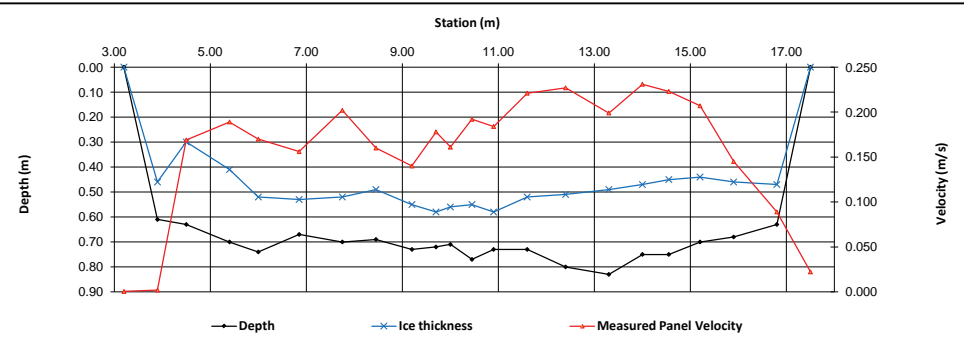
Measured Data							Calculated Data									
Bank/	Offset	Depth	Ice	Velocity	Velocity	Velocity	Velocity	Pannel	Pannel	Pannel	Effective	Measured Pannel	Average	Pannel	Pannel	Percent of
Mmt #	(m)	(m)	Thickness	@ 0.6	@ 0.8	@ 0.2	Correction	Start	End	Width	Pannel	Velocity	Pannel	Area	Discharge	total flow
			(m)	Depth	Depth	Depth	(m)	(m)	(m)	(m)	Depth	(m/s)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	(%)
LB	3.20	0.00	0.00	0.000	0.000	0.000	0.9	3.20	3.55	0.35	0.04	0.001	0.000	0.01	0.000	0%
1	3.90	0.61	0.46	0.002			0.9	3.55	4.20	0.65	0.15	0.002	0.002	0.10	0.000	0%
2	4.50	0.63	0.30	0.169			0.9	4.20	4.95	0.75	0.33	0.169	0.152	0.25	0.038	8%
3	5.40	0.70	0.41	0.189			0.9	4.95	5.70	0.75	0.29	0.189	0.170	0.22	0.037	7%
4	6.00	0.74	0.52	0.170			0.9	5.70	6.43	0.73	0.22	0.170	0.153	0.16	0.024	5%
5	6.85	0.67	0.53	0.156			0.9	6.43	7.30	0.88	0.14	0.156	0.140	0.12	0.017	3%
6	7.75	0.70	0.52	0.202			0.9	7.30	8.10	0.80	0.18	0.202	0.182	0.14	0.026	5%
7	8.45	0.69	0.49	0.160			0.9	8.10	8.83	0.73	0.20	0.160	0.144	0.15	0.021	4%
8	9.20	0.73	0.55	0.140			0.9	8.83	9.45	0.63	0.18	0.140	0.126	0.11	0.014	3%
9	9.70	0.72	0.58	0.178			0.9	9.45	9.85	0.40	0.14	0.178	0.160	0.06	0.009	2%
10	10.00	0.71	0.56	0.161			0.9	9.85	10.23	0.38	0.15	0.161	0.145	0.06	0.008	2%
11	10.45	0.77	0.55	0.192			0.9	10.23	10.68	0.45	0.22	0.192	0.173	0.10	0.017	3%
12	10.90	0.73	0.58	0.184			0.9	10.68	11.25	0.57	0.15	0.184	0.166	0.09	0.014	3%
13	11.60	0.73	0.52	0.221			0.9	11.25	12.00	0.75	0.21	0.221	0.199	0.16	0.031	6%
14	12.40	0.80	0.51	0.227			0.9	12.00	12.85	0.85	0.29	0.227	0.204	0.25	0.050	10%
15	13.30	0.83	0.49	0.199			0.9	12.85	13.65	0.80	0.34	0.199	0.179	0.27	0.049	10%
16	14.00	0.75	0.47	0.231			0.9	13.65	14.28	0.63	0.28	0.231	0.208	0.18	0.036	7%
17	14.55	0.75	0.45	0.223			0.9	14.28	14.88	0.60	0.30	0.223	0.201	0.18	0.036	7%
18	15.20	0.70	0.44	0.207			0.9	14.88	15.55	0.68	0.26	0.207	0.186	0.18	0.033	7%
19	15.90	0.68	0.46	0.145			0.9	15.55	16.35	0.80	0.22	0.145	0.131	0.18	0.023	5%
20	16.80	0.63	0.47	0.089			0.9	16.35	17.15	0.80	0.16	0.089	0.080	0.13	0.010	2%
RB	17.50	0.00	0.00	0.000	0.000	0.000	1.0	17.15	17.50	0.35	0.04	0.022	0.022	0.01	0.000	0%
<b>Total Flow</b>															<b>0.495</b>	

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	15:15
Equipment:	ADV
Method:	Ice
River Condition:	water on top of ice
Quality/Error (see reverse):	good
Weather:	sunny, windy, +11

Flow characteristics:	
Total Flow:	0.495 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	3.08 (m <sup>2</sup> )
Wetted Width:	14.30 (m)
Hydraulic Depth:	0.215 (m)
Mean Velocity:	0.161 (m/s)
Froude Number:	0.111

Datalogger Details:		
	Before	After
Transducer Reading (m):	0.875	
Water (°C):	0.5	-
Battery (Main):	14.3	-
Datalogger Clock:	13:08	-
Laptop Clock:	13:10	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.807	275.500	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	0.742	276.307		275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.421	271.886		
Water Level:			4.318	271.989		
Other:			0.893	275.414	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.789	275.501	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			0.725	275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:			4.403	271.887		
Water Level:			4.300	271.990		
Other:	0.876	276.290		275.414	275.406	Rebar 2 m SW of data logger

Closing Error	0.000	Average WL	271.990
WL Check	0.001	Transducer Elevation	271.115

**General Notes:**

- very slushy on top of ice
- water also on top of ice

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	31-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date:

May 7, 2012



## 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
LB	3.70	0.00	0.00	0.000	0.000	0.000	1.0	3.70	3.85	0.15	0.10	0.006	0.006	0.01	0.000	0%
1	4.00	0.39		0.025			1.0	3.85	4.38	0.53	0.39	0.025	0.025	0.20	0.005	0%
2	4.75	0.58		0.149			1.0	4.38	5.13	0.75	0.58	0.149	0.149	0.44	0.065	2%
3	5.50	0.64		0.240			1.0	5.13	5.88	0.75	0.64	0.240	0.240	0.48	0.115	4%
4	6.25	0.66		0.261			1.0	5.88	6.63	0.75	0.66	0.261	0.261	0.50	0.129	4%
5	7.00	0.68		0.316			1.0	6.63	7.38	0.75	0.68	0.316	0.316	0.51	0.161	5%
6	7.75	0.69		0.315			1.0	7.38	8.13	0.75	0.69	0.315	0.315	0.52	0.163	6%
7	8.50	0.66		0.342			1.0	8.13	8.88	0.75	0.66	0.342	0.342	0.50	0.169	6%
8	9.25	0.70		0.314			1.0	8.88	9.63	0.75	0.70	0.314	0.314	0.53	0.165	6%
9	10.00	0.70		0.318			1.0	9.63	10.38	0.75	0.70	0.318	0.318	0.53	0.167	6%
10	10.75	0.66		0.352			1.0	10.38	11.13	0.75	0.66	0.352	0.352	0.50	0.174	6%
11	11.50	0.70		0.347			1.0	11.13	11.88	0.75	0.70	0.347	0.347	0.53	0.182	6%
12	12.25	0.71		0.335			1.0	11.88	12.63	0.75	0.71	0.335	0.335	0.53	0.178	6%
13	13.00	0.70		0.321			1.0	12.63	13.38	0.75	0.70	0.321	0.321	0.53	0.169	6%
14	13.75	0.68		0.328			1.0	13.38	14.13	0.75	0.68	0.328	0.328	0.51	0.167	6%
15	14.50	0.66		0.328			1.0	14.13	14.88	0.75	0.66	0.328	0.328	0.50	0.162	6%
16	15.25	0.68		0.313			1.0	14.88	15.63	0.75	0.68	0.313	0.313	0.51	0.160	5%
17	16.00	0.67		0.319			1.0	15.63	16.38	0.75	0.67	0.319	0.319	0.50	0.160	5%
18	16.75	0.67		0.313			1.0	16.38	17.13	0.75	0.67	0.313	0.313	0.50	0.157	5%
19	17.50	0.68		0.291			1.0	17.13	17.88	0.75	0.68	0.291	0.291	0.51	0.148	5%
20	18.25	0.69		0.118			1.0	17.88	18.63	0.75	0.69	0.118	0.118	0.52	0.061	2%
21	19.00	0.60		0.154			1.0	18.63	19.38	0.75	0.60	0.154	0.154	0.45	0.069	2%
22	19.75	0.32		0.131			1.0	19.38	19.88	0.50	0.32	0.131	0.131	0.16	0.021	1%
RB	20.00	0.00	0.00	0.000	0.000	0.000	1.0	19.88	20.00	0.13	0.08	0.033	0.033	0.01	0.000	0%

**Total Flow 2.95**

## Measurement Details:

Start Time (MST):	13:45
End Time (MST):	14:50
Equipment:	ADV
Method:	Wading
River Condition:	high flow, no ice
Quality/Error (see reverse):	excellent
Weather:	clear, light breeze, +20

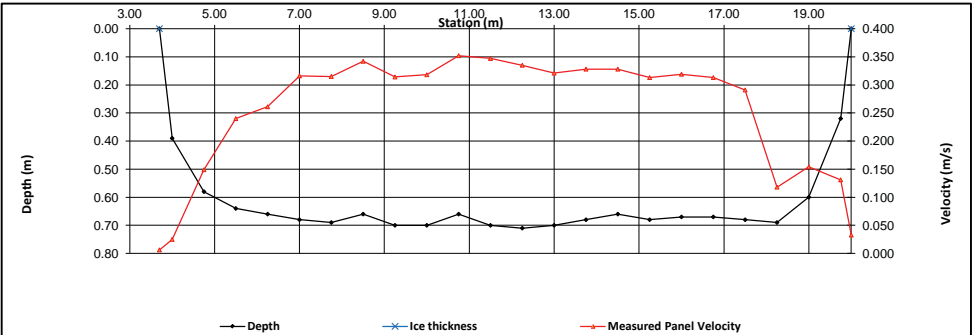
## Flow characteristics:

Total Flow:	2.95	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	10.45	(m <sup>2</sup> )
Wetted Width:	16.30	(m)
Hydraulic Depth:	0.641	(m)
Mean Velocity:	0.282	(m/s)
Froude Number:	0.113	

## Logger Details:

	Before	After
Transducer Reading (m):	0.881	-
Water (°C):	8.2	-
Battery (Main):	14.0	-
Datalogger Clock:	13:56	-
Laptop Clock:	13:58	-
Dessicant:	replaced	-
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.599	275.494	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	0.528	276.093		275.565	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:						
Water Level:			4.075	272.018		
Other:			0.684	275.409	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.586	275.496	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			0.518	275.564	275.565	Nail in tree
Bench Mark 3:						
Ice/PT:						
Water Level:			4.065	272.017		
Other:	0.673	276.082		275.409	275.406	Rebar 2 m SW of data logger
Closing Error	0.001			Average WL	272.018	
WL Check	0.001			Transducer Elevation	271.137	

## General Notes:

<b>Field Personnel:</b>	SM, TR	Trip Date:	7-May-12
Data Entry Personnel:	CJ	Date:	30-May-12
Data Check Personnel:	DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

June 13, 2012



**Flow Measurement:**

Measured Data							Calculated Data									
Bank/ Mnt #	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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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23																
24																
25																
26																
27																
28																
29																
30																
No Flow Measurement Conducted																
<b>Total Flow</b>																

**Measurement Details:**

Start Time (MST):	10:50
End Time (MST):	11:40
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

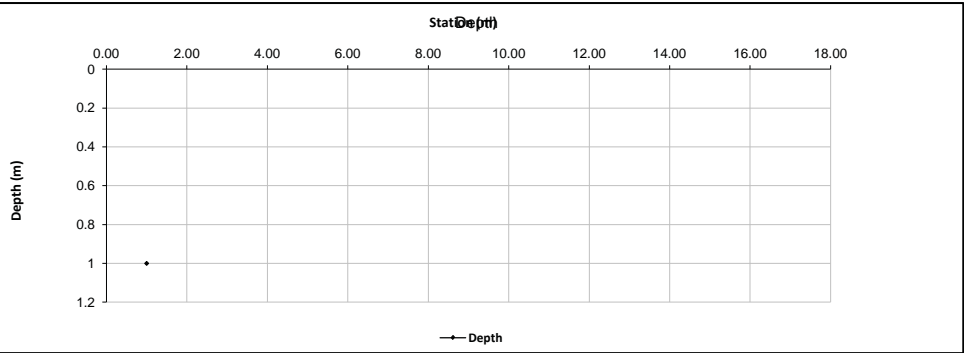
**Flow characteristics:**

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):	0.796	
Water (°C):	15.4	
Battery (Main):	14.2	
Datalogger Clock:	10:50	
Laptop Clock:	10:51	
Dessicant:	replaced	
Logger# (if Δ):	12686	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as	Description
<b>Setup #2</b>						
Bench Mark 1:	0.557	276.055	0.557	275.498	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.230	274.825	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.125	271.930		
Other:			0.643	275.412	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.541	275.498	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.214	274.825	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.109	271.930		
Other:	0.627	276.039		275.412	275.406	Rebar 2 m SW of data logger

Closing Error	0.000	Average WL	271.930
WL Check	0.000	Transducer Elevation	271.134

**General Notes:**

- no flow measurement
- installed 1 BM (short 3/4" pipe)

**Field Personnel:**

	SM, TR	Trip Date:	13-Jun-12
<b>Data Entry Personnel:</b>	CJ	Date:	26-Jun-12
<b>Data Check Personnel:</b>	XP	Date:	28-Jun-12

# Hydrometric Measurement/ Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

August 10, 2012



## 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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
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25																
26																
27																
28																
29																
30																
LB																
No Flow Measurement Conducted																
<b>Total Flow</b>															-	

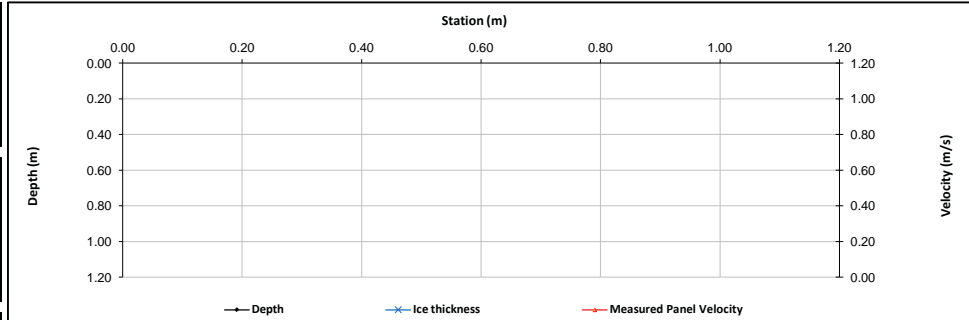
Measurement Details:	
Start Time (MST):	15:45
End Time (MST):	16:30
Equipment:	
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	-
Weather:	sunny, breezy, 25

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):	0.746	0.486
Water (°C):	18.9	
Battery (Main):	13.9	
Datalogger Clock:	2:47	
Laptop Clock:	2:48	
Dessicant:	replaced	
Logger# (if Δ):	12686	
PT# (if Δ):	253472	

**Datalogger / Station Notes:**

-changed PT, stilling well became clogged-couldn't insert new PT into well, attached PT to 3/4" pipe and anchored into bank



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.737	275.490	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.409	274.818	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.358	271.869		
Other:	0.821	276.227			275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:	0.700	276.190		275.490	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.373	274.817	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.324	271.866		
Other:			0.786	275.404	275.406	Rebar 2 m SW of data logger

Closing Error	0.002
WL Check	0.003

Average WL	271.868
Transducer Elevation	271.382

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	10-Aug-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	10-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Aug-12

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay

UTM Location: 465408 E, 6338944 N

Site Visit Date:

September 10, 2012



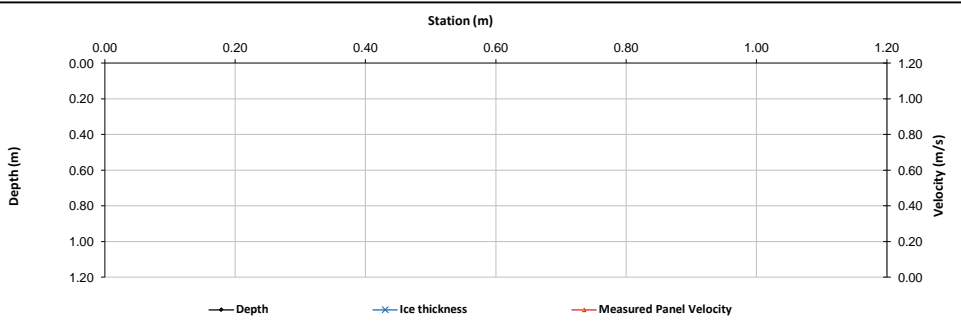
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective 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																
1																
2																
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4																
5																
6																
7																
8																
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25																
26																
27																
28																
29																
30																
LB																
No Flow Measurement Conducted																
<b>Total Flow</b> -																

Measurement Details:	
Start Time (MST):	13:15
End Time (MST):	13:50
Equipment:	-
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	-
Weather:	rain, 15

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):	0.676	
Water (°C):	14.3	
Battery (Main):	13.0	
Datalogger Clock:	13:15	
Laptop Clock:	13:16	
Dessicant:	replaced	
Logger# (if Δ):	12686	
PT# (if Δ):	253472	

Datalogger / Station Notes:	
-PLS s/n: 253472	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.587	276.085		275.498	275.498	3/4" Pipe 8m W of data logger
Bench Mark 2:			1.259	274.826	274.826	3/4" Pipe 10m W of data logger
Bench Mark 3:			0.877	275.208	275.208	3/4" Pipe 2m S of data logger (new)
Ice/PT:						
Water Level:			4.000	272.085		
Other:			0.673	275.412	275.406	Rebar 2m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.575	275.498	275.498	3/4" Pipe 8m W of data logger
Bench Mark 2:	1.247	276.073		274.826	274.826	3/4" Pipe 10m W of data logger
Bench Mark 3:			0.864	275.209	275.208	3/4" Pipe 2m S of data logger (new)
Ice/PT:						
Water Level:			3.989	272.084		
Other:			0.662	275.411	275.406	Rebar 2m SW of data logger

Closing Error	0.000
WL Check	0.001

Average WL	272.085
Transducer Elevation	271.409

General Notes:	
-TSS sampled at LB	

Field Personnel:		SM, TR	Trip Date:	10-Sep-12
Data Entry Personnel:	CJ		Date:	4-Oct-12
Data Check Personnel:	MY		Date:	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S7 - Muskeg River near Fort McKay  
 UTM Location: 465408 E, 6338944 N

Site Visit Date: October 15, 2012



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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
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29																
30																
LB																
No Flow Measurement Conducted																
Total Flow -																

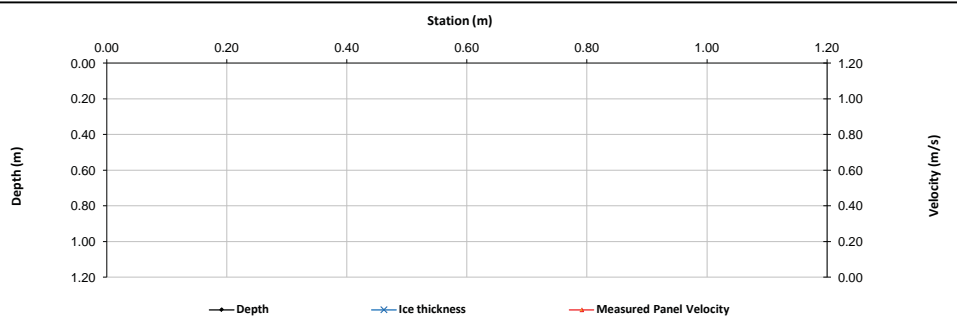
Measurement Details:	
Start Time (MST):	14:59
End Time (MST):	15:21
Equipment:	
Method:	
River Condition:	high flow
Quality/Error (see reverse):	
Weather:	12 deg clear, breezy

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):	0.593	
Water (°C):	4.4	
Battery (Main):	13.1	
Datalogger Clock:	15:03	
Laptop Clock:	15:03	
Dessicant:	replaced	
Logger# (if Δ):	12686	
PT# (if Δ):	-	

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.689	275.500	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	1.363	276.189		274.826	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:			0.977	275.212	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:						
Water Level:			3.995	272.194		
Other:			0.774	275.415	275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:	0.677	276.177		275.500	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.349	274.828	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:			0.966	275.211	275.208	3/4" Pipe 2 m S of data logger (new)
Ice/PT:						
Water Level:			3.983	272.194		
Other:			0.763	275.414	275.406	Rebar 2 m SW of data logger

Closing Error	-0.002
WL Check	0.000

Average WL	272.194
Transducer Elevation	271.601

<u>Field Personnel:</u>	SM, TR	Trip Date:	15-Oct-12
<u>Data Entry Personnel:</u>	TR	Date:	15-Oct-12
<u>Data Check Personnel:</u>	CJ	Date:	7-Nov-12
<u>Entered Digitally in the Field:</u>	<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:

December 2, 2012



### 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	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	0.9	0.30	0.55	0.25	0.19	0.019	0.017	0.05	0.001	0%
1	0.80	1.00	0.26	0.076			0.9	0.55	1.30	0.75	0.74	0.068	0.068	0.56	0.038	2%
2	1.80	1.05	0.33	0.067			0.9	1.30	2.20	0.90	0.72	0.067	0.060	0.65	0.039	2%
3	2.60	0.95	0.34	0.100			0.9	2.20	2.95	0.75	0.61	0.100	0.090	0.46	0.041	2%
4	3.30	0.85	0.30	0.235			0.9	2.95	3.70	0.75	0.55	0.235	0.212	0.41	0.087	4%
5	4.10	0.80	0.35	0.285			0.9	3.70	4.55	0.85	0.45	0.285	0.257	0.38	0.098	4%
6	5.00	0.80	0.35	0.294			0.9	4.55	5.35	0.80	0.45	0.294	0.265	0.36	0.095	4%
7	5.70	0.79	0.27	0.317			0.9	5.35	6.15	0.80	0.52	0.317	0.285	0.42	0.119	5%
8	6.60	0.85	0.23	0.310			0.9	6.15	7.00	0.85	0.62	0.310	0.279	0.53	0.147	7%
9	7.40	0.90	0.24	0.312			0.9	7.00	7.90	0.90	0.66	0.312	0.281	0.59	0.167	7%
10	8.40	0.95	0.20		0.299	0.371	1.0	7.90	8.75	0.85	0.75	0.335	0.335	0.64	0.214	9%
11	9.10	1.00	0.17	0.257	0.359		1.0	8.75	9.55	0.80	0.83	0.308	0.308	0.66	0.205	9%
12	10.00	1.00	0.20	0.320	0.393		1.0	9.55	10.40	0.85	0.80	0.357	0.357	0.68	0.242	11%
13	10.80	0.95	0.15	0.314	0.382		1.0	10.40	11.15	0.75	0.80	0.348	0.348	0.60	0.209	9%
14	11.50	0.90	0.20	0.306			0.9	11.15	11.80	0.65	0.70	0.306	0.275	0.46	0.125	6%
15	12.10	0.80	0.25	0.340			0.9	11.80	12.40	0.60	0.55	0.340	0.306	0.33	0.101	4%
16	12.70	0.70	0.30	0.263			0.9	12.40	13.05	0.65	0.40	0.263	0.237	0.26	0.062	3%
17	13.40	0.60	0.30	0.278			0.9	13.05	13.80	0.75	0.30	0.278	0.250	0.23	0.056	2%
18	14.20	0.65	0.35	0.320			0.9	13.80	14.75	0.95	0.30	0.320	0.288	0.29	0.082	4%
19	15.30	0.70	0.35	0.242			0.9	14.75	15.60	0.85	0.35	0.242	0.218	0.30	0.065	3%
20	15.90	0.75	0.25	0.199			0.9	15.60	16.30	0.70	0.50	0.199	0.179	0.35	0.063	3%
21	16.70	0.70	0.25	0.015			0.9	16.30	17.15	0.85	0.45	0.015	0.014	0.38	0.005	0%
LB	17.60	0.00	0.00	0.00	0.00	0.00	1.0	17.15	17.60	0.45	0.11	0.004	0.004	0.05	0.000	0%
<b>Total Flow</b>														<b>2.26</b>		

### Measurement Details:

Start Time (MST):	13:20
End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm -18

### Flow characteristics:

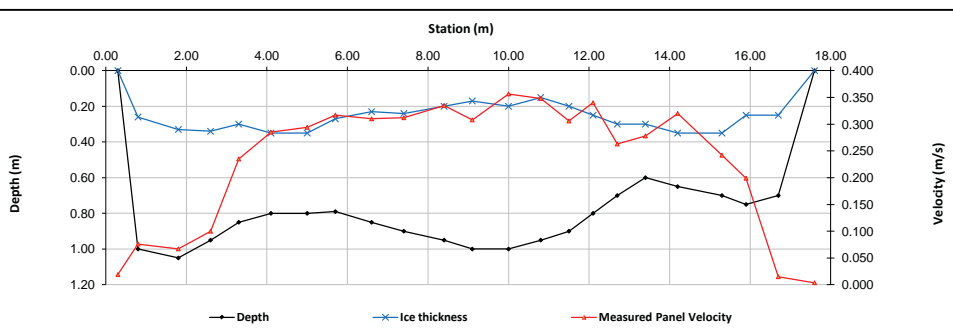
Total Flow:	2.26	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.62	(m <sup>2</sup> )
Wetted Width:	17.30	(m)
Hydraulic Depth:	0.556	(m)
Mean Velocity:	0.235	(m/s)
Froude Number:	0.101	

### Logger Details:

	Before	After
Transducer Reading (m):	0.604	-
Water (°C):	0.2	-
Battery (Main):	12.8	12.59
Datalogger Clock:	13:35	-
Laptop Clock:	13:36	-
Dessicant:	replaced	-
Logger# (if Δ):	12686	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:

replaced battery



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.560	275.499	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:	1.233	276.059		274.826	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:			0.848	275.211	275.208	3/4" Pipe 2m S of data logger (new)
Ice/PT:			3.877	272.182		
Water Level:			3.877	272.182		
Other:					275.406	Rebar 2 m SW of data logger
<b>Setup #2</b>						
Bench Mark 1:			0.553	275.500	275.498	3/4" Pipe 8 m W of data logger
Bench Mark 2:			1.225	274.828	274.826	3/4" Pipe 10 m W of data logger
Bench Mark 3:	0.842	276.053		275.211	275.208	3/4" Pipe 2m S of data logger (new)
Ice/PT:			3.868	272.185		
Water Level:			3.868	272.185		
Other:					275.406	Rebar 2 m SW of data logger
Closing Error	-0.002				Average WL	272.184
WL Check	0.003				Transducer Elevation	271.580

### General Notes:

<b>Field Personnel:</b>	TR, SM	Trip Date:	2-Dec-12
Data Entry Personnel:	TR	Date:	2-Dec-12
Data Check Personnel:	SG	Date:	18-Dec-12
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:

January 10, 2012



## Flow Measurement:

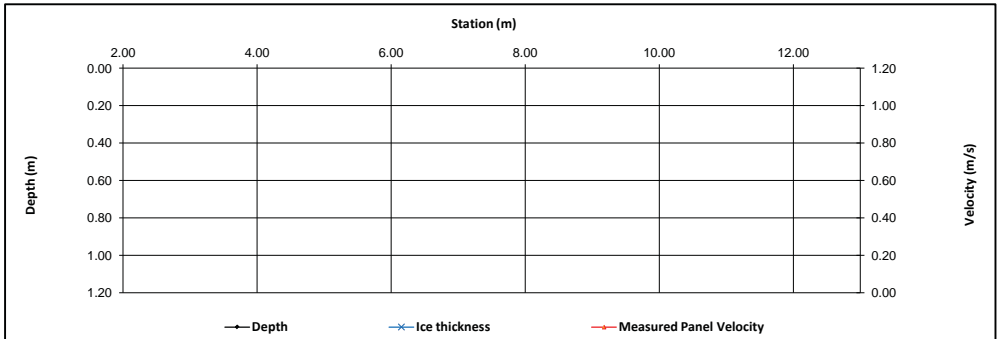
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow</b>																

Measurement Details:	
Start Time (MST):	10:15
End Time (MST):	10:50
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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:	

Datalogger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:					331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					329.796	Nail in birch tree

Closing Error		Average WL	
WL Check		Transducer Elevation	

### General Notes:

-area flooded, see photos  
 -no flow measurement performed, drilled 3 holes, found no flow

<b>Field Personnel:</b>	SM,DW	<b>Trip Date:</b>	10-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	3-Mar-12



# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

February 5, 2012



## 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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow</b>																

## Measurement Details:

Start Time (MST):	9:20
End Time (MST):	9:45
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

## Flow characteristics:

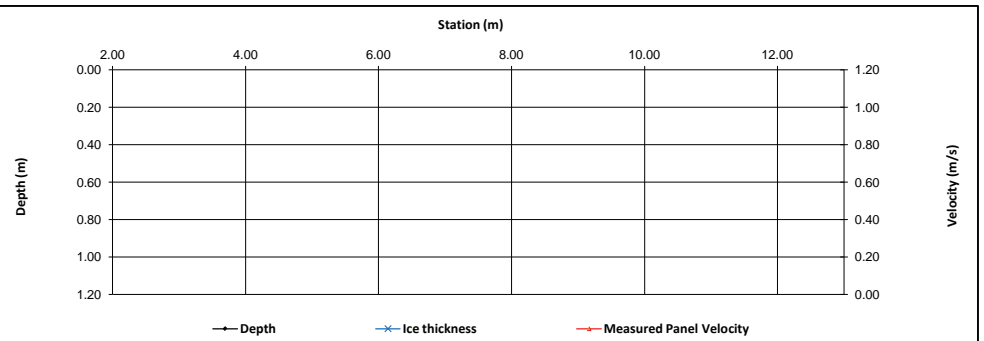
Total Flow:		(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Cross Section Area:		(m <sup>2</sup> )
Wetted Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number:		

## Datalogger Details:

	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

- no logger



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:					331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					329.796	Nail in birch tree

Closing Error		Average WL	
WL Check		Transducer Elevation	

## General Notes:

- augured three holes and found no flow.
- no WL survey, no flow measurement
- see photos.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	5-Feb-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	19-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kears Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

March 7, 2012



### 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)	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	0.10	0.023	0.021	0.02	0.000	0%
1	3.90	0.70	0.30	0.092			0.9	3.75	4.10	0.35	0.40	0.092	0.083	0.14	0.012	10%
2	4.30	0.70	0.30	0.145			0.9	4.10	4.55	0.45	0.40	0.145	0.131	0.18	0.023	20%
3	4.80	0.65	0.35	0.191			0.9	4.55	4.95	0.40	0.30	0.191	0.172	0.12	0.021	18%
4	5.10	0.70	0.35	0.155			0.9	4.95	5.30	0.35	0.35	0.155	0.140	0.12	0.017	15%
5	5.50	0.70	0.35	0.154			0.9	5.30	5.70	0.40	0.35	0.154	0.139	0.14	0.019	17%
6	5.90	0.68	0.33	0.132			0.9	5.70	6.15	0.45	0.35	0.132	0.119	0.16	0.019	16%
7	6.40	0.60	0.35	0.073			0.9	6.15	6.50	0.35	0.25	0.073	0.066	0.09	0.006	5%
RB	6.60	0.00	0.00	0.000	0.000	0.000	1.0	6.50	6.60	0.10	0.06	0.018	0.018	0.01	0.000	0%
<b>Total Flow</b>														<b>0.117</b>		

### Measurement Details:

Start Time (MST):	12:15
End Time (MST):	12:55
Equipment:	ADV
Method:	Ice
River Condition:	Overflow
Quality/Error (see reverse):	Poor
Weather:	Clear, sunny -6 c.

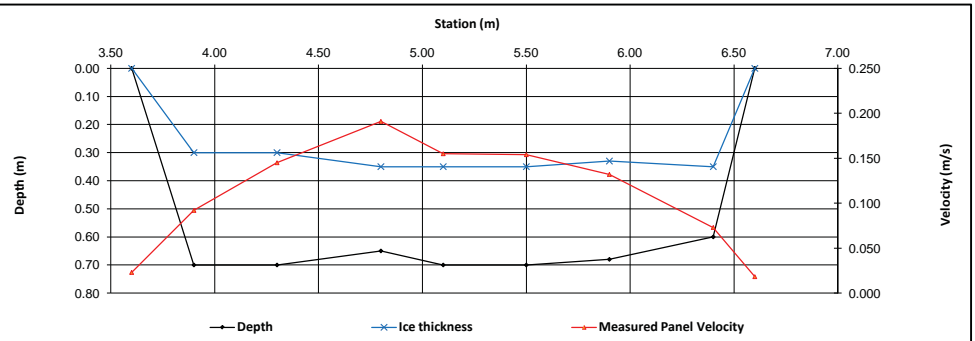
### Flow characteristics:

Total Flow:	0.117	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.97	(m <sup>2</sup> )
Wetted Width:	3.00	(m)
Hydraulic Depth:	0.323	(m)
Mean Velocity:	0.121	(m/s)
Froude Number:	0.068	

### Datalogger Details:

	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.250	331.033	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.660	329.623		
Water Level:			2.076	329.207		
Other:	1.487	331.283		329.796	329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:	0.243	331.276		331.033	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.652	329.624		
Water Level:			2.066	329.210		
Other:			1.480	329.796	329.796	Nail in birch tree

Closing Error	0.000	Average WL	329.209
WL Check	0.003	Transducer Elevation	

### General Notes:

- Culvert full of overflow ice.
- poor flow measurement.
- velocities seemed high.
- slush was cleared from holes.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	7-Mar-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	26-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

March 26, 2012



## Flow Measurement:

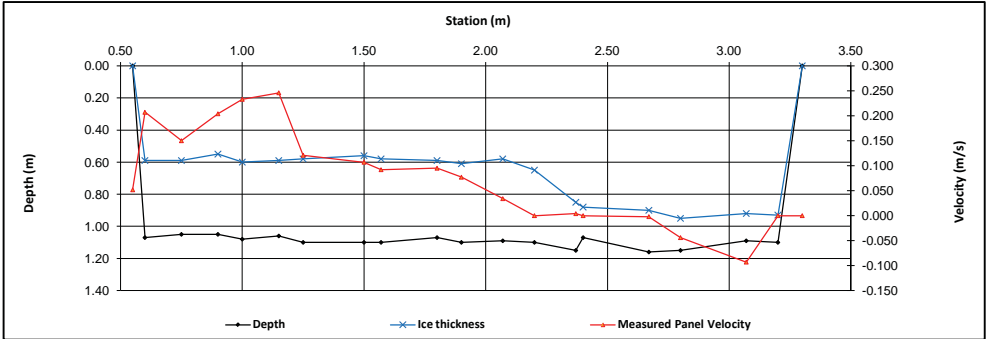
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.55	0.00	0.00	0.000	0.000	0.000	0.9	0.55	0.58	0.02	0.12	0.052	0.047	0.00	0.000	0%
1	0.60	1.07	0.59	0.207			0.9	0.58	0.68	0.10	0.48	0.207	0.186	0.05	0.009	10%
2	0.75	1.05	0.59	0.150			0.9	0.68	0.83	0.15	0.46	0.150	0.135	0.07	0.009	10%
3	0.90	1.05	0.55	0.204			0.9	0.83	0.95	0.13	0.50	0.204	0.184	0.06	0.011	13%
4	1.00	1.08	0.60	0.233			0.9	0.95	1.08	0.13	0.48	0.233	0.210	0.06	0.013	14%
5	1.15	1.06	0.59	0.246			0.9	1.08	1.20	0.13	0.47	0.246	0.221	0.06	0.013	15%
6	1.25	1.10	0.58	0.121			0.9	1.20	1.38	0.18	0.52	0.121	0.109	0.09	0.010	11%
7	1.50	1.10	0.56	0.107			0.9	1.38	1.54	0.16	0.54	0.107	0.096	0.09	0.008	9%
8	1.57	1.10	0.58	0.092			0.9	1.54	1.69	0.15	0.52	0.092	0.083	0.08	0.006	7%
9	1.80	1.07	0.59	0.095			0.9	1.69	1.85	0.17	0.48	0.095	0.086	0.08	0.007	8%
10	1.90	1.10	0.61	0.077			0.9	1.85	1.99	0.14	0.49	0.077	0.069	0.07	0.005	5%
11	2.07	1.09	0.58	0.034			0.9	1.99	2.14	0.15	0.51	0.034	0.031	0.08	0.002	3%
12	2.20	1.10	0.65	0.000			1.0	2.14	2.29	0.15	0.45	0.000	0.000	0.07	0.000	0%
13	2.37	1.15	0.85	0.004			0.9	2.29	2.39	0.10	0.30	0.004	0.004	0.03	0.000	0%
14	2.40	1.07	0.88	0.000			1.0	2.39	2.54	0.15	0.19	0.000	0.000	0.03	0.000	0%
15	2.67	1.16	0.90	-0.002			0.9	2.54	2.74	0.20	0.26	-0.002	-0.002	0.05	0.000	0%
16	2.80	1.15	0.95	-0.044			0.9	2.74	2.94	0.20	0.20	-0.044	-0.040	0.04	-0.002	-2%
17	3.07	1.09	0.92	-0.093			0.9	2.94	3.14	0.20	0.17	-0.093	-0.084	0.03	-0.003	-3%
18	3.20	1.10	0.93	0.000			1.0	3.14	3.25	0.12	0.17	0.000	0.000	0.02	0.000	0%
LB	3.30	0.00	0.00	0.000	0.000	0.000	1.0	3.25	3.30	0.05	0.04	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.089</b>	

Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	12:05
Equipment:	ADV
Method:	Ice
River Condition:	low flow, lots of ice
Quality/Error (see reverse):	good
Weather:	clear, light breeze, +2

Flow characteristics:		
Total Flow:	0.089	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	1.05	(m <sup>2</sup> )
Wetted Width:	2.75	(m)
Hydraulic Depth:	0.383	(m)
Mean Velocity:	0.085	(m/s)
Froude Number:	0.044	

Logger Details:	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS (+m)	HI (m)	FS (-m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>			0.304	331.034	331.024	T-post
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.724	329.614		
Water Level:			2.335	329.003		
Other:	1.542	331.338		329.796	329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:	0.295	331.329		331.034	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.714	329.615		
Water Level:			2.325	329.004		
Other:			1.532	329.797	329.796	Nail in birch tree

Closing Error	-0.001	Average WL	329.004
WL Check	0.001	Transducer Elevation	

**General Notes:**

- air space between surface of water and bottom of ice
- high y values-ADV first 2 measurements

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	26-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

April 23, 2012



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>															-	

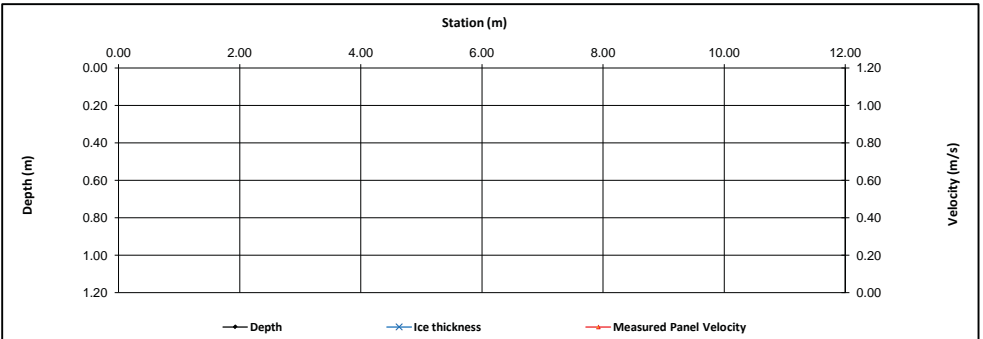
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:20
Equipment:	-
Method:	-
River Condition:	ice cover
Quality/Error (see reverse):	-
Weather:	clear, +10

Flow characteristics:	
Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	0.00 (m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number:	

Logger Details:	Before	After
Transducer Reading (m):	0.145	-
Water (°C):	2.9	-
Battery (Main):	14.5	-
Datalogger Clock:	14:11	-
Laptop Clock:	14:11	-
Dessicant:	replaced	-
Logger# (if Δ):	16567	-
PT# (if Δ):	287962	-

**Datalogger / Station Notes:**

-88 RSSI



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.218	331.026	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.567	328.677		
Other:	1.448	331.244		329.796	329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:	0.191	331.217		331.026	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.539	328.678		
Other:			1.422	329.795	329.796	Nail in birch tree

Closing Error	0.001	Average WL	328.678
WL Check	0.001	Transducer Elevation	328.533

**General Notes:**

-ice cover, managed to install PT.  
-no flow measurement

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	23-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearsal Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

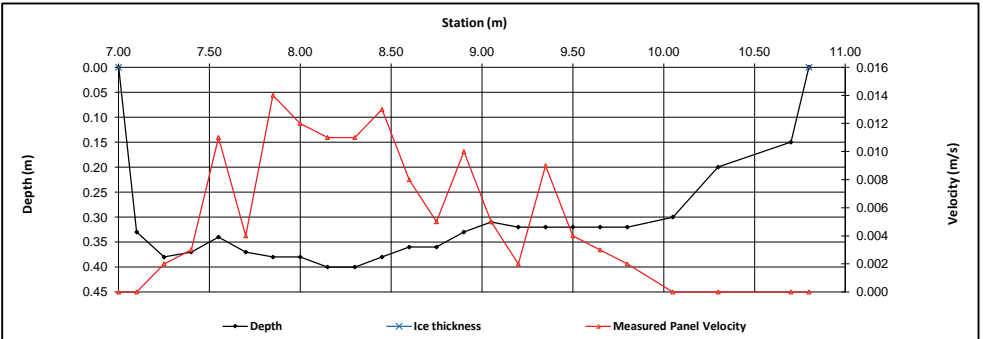
May 12, 2012



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	7.00	0.00	0.00	0.000	0.000	0.000	1.0	7.00	7.05	0.05	0.08	0.000	0.000	0.00	0.000	0%
1	7.10	0.33		0.000			1.0	7.05	7.18	0.13	0.33	0.000	0.000	0.04	0.000	0%
2	7.25	0.38		0.002			1.0	7.18	7.33	0.15	0.38	0.002	0.002	0.06	0.000	2%
3	7.40	0.37		0.003			1.0	7.33	7.48	0.15	0.37	0.003	0.003	0.06	0.000	2%
4	7.55	0.34		0.011			1.0	7.48	7.63	0.15	0.34	0.011	0.011	0.05	0.001	8%
5	7.70	0.37		0.004			1.0	7.63	7.78	0.15	0.37	0.004	0.004	0.06	0.000	3%
6	7.85	0.38		0.014			1.0	7.78	7.93	0.15	0.38	0.014	0.014	0.06	0.001	11%
7	8.00	0.38		0.012			1.0	7.93	8.08	0.15	0.38	0.012	0.012	0.06	0.001	10%
8	8.15	0.40		0.011			1.0	8.08	8.23	0.15	0.40	0.011	0.011	0.06	0.001	9%
9	8.30	0.40		0.011			1.0	8.23	8.38	0.15	0.40	0.011	0.011	0.06	0.001	9%
10	8.45	0.38		0.013			1.0	8.38	8.53	0.15	0.38	0.013	0.013	0.06	0.001	11%
11	8.60	0.36		0.008			1.0	8.53	8.68	0.15	0.36	0.008	0.008	0.05	0.000	6%
12	8.75	0.36		0.005			1.0	8.68	8.83	0.15	0.36	0.005	0.005	0.05	0.000	4%
13	8.90	0.33		0.010			1.0	8.83	8.98	0.15	0.33	0.010	0.010	0.05	0.000	7%
14	9.05	0.31		0.005			1.0	8.98	9.13	0.15	0.31	0.005	0.005	0.05	0.000	3%
15	9.20	0.32		0.002			1.0	9.13	9.28	0.15	0.32	0.002	0.002	0.05	0.000	1%
16	9.35	0.32		0.009			1.0	9.28	9.43	0.15	0.32	0.009	0.009	0.05	0.000	6%
17	9.50	0.32		0.004			1.0	9.43	9.58	0.15	0.32	0.004	0.004	0.05	0.000	3%
18	9.65	0.32		0.003			1.0	9.58	9.73	0.15	0.32	0.003	0.003	0.05	0.000	2%
19	9.80	0.32		0.002			1.0	9.73	9.83	0.20	0.32	0.002	0.002	0.06	0.000	2%
20	10.05	0.30		0.000			1.0	9.93	10.18	0.25	0.30	0.000	0.000	0.08	0.000	0%
21	10.30	0.20		0.000			1.0	10.18	10.50	0.32	0.20	0.000	0.000	0.06	0.000	0%
22	10.70	0.15		0.000			1.0	10.50	10.75	0.25	0.15	0.000	0.000	0.04	0.000	0%
LB	10.80	0.00	0.00	0.000	0.000	0.000	1.0	10.75	10.80	0.05	0.04	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.007</b>	

**Measurement Details:**

Start Time (MST):	9:40
End Time (MST):	10:57
Equipment:	ADV
Method:	Wading
River Condition:	Slow, flow within banks
Quality/Error (see reverse):	good
Weather:	partial cloud, windy, +12



**Flow characteristics:**

Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.314	(m)
Mean Velocity:	0.006	(m/s)
Froude Number:	0.003	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.448	-
Water (°C):	5.4	-
Battery (Main):	14.0	-
Datalogger Clock:	8:49	-
Laptop Clock:	8:51	-
Dessicant:	good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:			0.513	331.028	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.531	329.010		
Other:	1.745	331.541		329.796	329.796	Nail in birch tree
Setup #2						
Bench Mark 1:	0.482	331.510		331.028	331.024	T-post
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.499	329.011		
Other:			1.712	329.798	329.796	Nail in birch tree

Closing Error	-0.002	Average WL	329.011
WL Check	0.001	Transducer Elevation	328.563

**Datalogger / Station Notes:**

**General Notes:**

- fish fence upstream of station
- grass growing in water on both banks (may have affected flow measurement)
- TSS sample taken

**Field Personnel:**

DW, CJ	Trip Date:	12-May-12
CJ	Date:	30-May-12
DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

June 16, 2012



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
LB	5.00	0.00	0.00	0.000	0.000	0.000	1.0	5.00	5.50	0.50	0.11	0.000	0.000	0.06	0.000	0%
1	6.00	0.44					1.0	5.50	6.13	0.63	0.44	0.000	0.000	0.28	0.000	0%
2	6.25	0.40					1.0	6.13	6.38	0.25	0.40	0.001	0.001	0.10	0.000	14%
3	6.50	0.43					1.0	6.38	6.63	0.25	0.43	-0.001	-0.001	0.11	0.000	-15%
4	6.75	0.46					1.0	6.63	6.80	0.18	0.46	0.001	0.001	0.08	0.000	12%
5	6.85	0.48					1.0	6.80	6.93	0.13	0.48	-0.010	-0.010	0.06	-0.001	-86%
6	7.00	0.50					1.0	6.93	7.03	0.10	0.50	0.009	0.009	0.05	0.000	65%
7	7.05	0.49					1.0	7.03	7.08	0.05	0.49	0.007	0.007	0.02	0.000	25%
8	7.10	0.48					1.0	7.08	7.13	0.05	0.48	0.011	0.011	0.02	0.000	38%
9	7.15	0.46					1.0	7.13	7.18	0.05	0.46	0.007	0.007	0.02	0.000	23%
10	7.20	0.46					1.0	7.18	7.28	0.10	0.46	0.009	0.009	0.05	0.000	59%
11	7.35	0.42					1.0	7.28	7.43	0.15	0.42	0.001	0.001	0.06	0.000	9%
12	7.50	0.40					1.0	7.43	7.58	0.15	0.40	0.000	0.000	0.06	0.000	0%
13	7.65	0.40					1.0	7.58	7.73	0.15	0.40	-0.001	-0.001	0.06	0.000	-9%
14	7.80	0.39					1.0	7.73	7.90	0.18	0.39	0.000	0.000	0.07	0.000	0%
15	8.00	0.40					1.0	7.90	8.10	0.20	0.40	0.000	0.000	0.08	0.000	0%
16	8.20	0.40					1.0	8.10	8.30	0.20	0.40	0.001	0.001	0.08	0.000	11%
17	8.40	0.42					1.0	8.30	8.50	0.20	0.42	0.000	0.000	0.08	0.000	0%
18	8.60	0.40					1.0	8.50	8.70	0.20	0.40	0.000	0.000	0.08	0.000	0%
19	8.80	0.40					1.0	8.70	8.90	0.20	0.40	0.001	0.001	0.08	0.000	11%
20	9.00	0.40					1.0	8.90	9.40	0.50	0.40	-0.002	-0.002	0.20	0.000	-57%
RB	9.80	0.00	0.00	0.000	0.000	0.000	1.0	9.40	9.80	0.40	0.10	0.000	0.000	0.04	0.000	0%

**Total Flow 0.001**

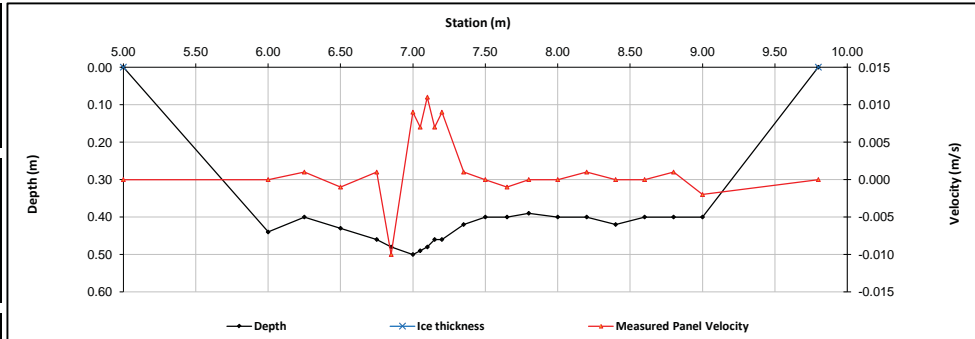
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	15:00
Equipment:	ADV
Method:	WADING
River Condition:	POOR FLOW
Quality/Error (see reverse):	POOR
Weather:	CLOUDY, 17

Flow characteristics:		
Total Flow:	0.001	(m <sup>3</sup> /s)
Perceived Measurement Quality:	POOR	
Cross Section Area:	1.74	(m <sup>2</sup> )
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.363	(m)
Mean Velocity:	0.000	(m/s)
Froude Number:	0.000	

Logger Details:		
	Before	After
Transducer Reading (m):	0.511	
Water (°C):	12.1	
Battery (Main):	13.7	
Datalogger Clock:	12:56	
Laptop Clock:	12:57	
Dessicant:	CHANGED	
Logger# (if Δ):	16567	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-FLOW IS VERY POOR



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.849	330.296	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.509	330.636	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			2.023	329.122		
Other:	1.349	331.145	0.077	329.796	329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.802	330.294	330.293	Pipe 6 m E of Station
Bench Mark 3:	0.460	331.096		330.636	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.974	329.122		
Other:			1.299	329.797	329.796	Nail in birch tree

Closing Error	-0.001	Average WL	329.122
WL Check	0.000	Transducer Elevation	328.611

**General Notes:**

-TSS SAMPLED AT 7.0 m  
-INSTALLED 2BM

<b>Field Personnel:</b>	TR & CJ	Trip Date:	16-Jun-12
Data Entry Personnel:	TR	Date:	22-Jun-12
Data Check Personnel:	CJ	Date:	22-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: S9 - Kearsal Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

August 12, 2012



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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.40	0.40	0.17	0.000	0.000	0.07	0.000	1%
1	3.80	0.66		0.001			1.0	3.40	3.85	0.45	0.66	0.001	0.001	0.30	0.000	13%
2	3.90	0.68		0.008			1.0	3.85	3.95	0.10	0.68	0.008	0.008	0.07	0.001	24%
3	4.00	0.76			0.001	0.001	1.0	3.95	4.05	0.10	0.76	0.001	0.001	0.08	0.000	3%
4	4.10	0.77			-0.001	-0.002	1.0	4.05	4.15	0.10	0.77	-0.002	-0.002	0.08	0.000	-5%
5	4.20	0.77		0.005	0.002		1.0	4.15	4.25	0.10	0.77	0.004	0.004	0.08	0.000	12%
6	4.30	0.82		0.000	-0.002		1.0	4.25	4.35	0.10	0.82	-0.001	-0.001	0.08	0.000	-4%
7	4.40	0.84		-0.001	-0.001		1.0	4.35	4.45	0.10	0.84	-0.001	-0.001	0.08	0.000	-4%
8	4.50	0.86			-0.003	-0.001	1.0	4.45	4.55	0.10	0.86	-0.002	-0.002	0.09	0.000	-8%
9	4.60	0.80			0.004	0.003	1.0	4.55	4.65	0.10	0.80	0.004	0.004	0.08	0.000	12%
10	4.70	0.70		0.005			1.0	4.65	4.75	0.10	0.70	0.005	0.005	0.07	0.000	15%
11	4.80	0.66		0.001			1.0	4.75	4.85	0.10	0.66	0.001	0.001	0.07	0.000	3%
12	4.90	0.62		0.002			1.0	4.85	4.95	0.10	0.62	0.002	0.002	0.06	0.000	5%
13	5.00	0.60		0.001			1.0	4.95	5.05	0.10	0.60	0.001	0.001	0.06	0.000	3%
14	5.10	0.60		0.004			1.0	5.05	5.15	0.10	0.60	0.004	0.004	0.06	0.000	11%
15	5.20	0.60		0.000			1.0	5.15	5.25	0.10	0.60	0.000	0.000	0.06	0.000	0%
16	5.30	0.60		0.001			1.0	5.25	5.35	0.10	0.60	0.001	0.001	0.06	0.000	3%
17	5.40	0.58		-0.001			1.0	5.35	5.50	0.15	0.58	-0.001	-0.001	0.09	0.000	-4%
18	5.60	0.64		0.001			1.0	5.50	5.70	0.20	0.64	0.001	0.001	0.13	0.000	6%
19	5.80	0.62		0.004			1.0	5.70	5.90	0.20	0.62	0.004	0.004	0.12	0.000	22%
20	6.00	0.62		0.002			1.0	5.90	6.20	0.30	0.62	0.002	0.002	0.19	0.000	16%
21	6.40	0.62		0.002			1.0	6.20	6.60	0.40	0.62	0.002	0.002	0.25	0.000	22%
22	6.80	0.64		-0.002			1.0	6.60	7.40	0.80	0.64	-0.002	-0.002	0.51	-0.001	-45%
LB	8.00	0.00	0.00	0.00	0.00	0.00	1.0	7.40	8.00	0.60	0.16	-0.001	-0.001	0.10	0.000	-2%

**Total Flow 0.002**

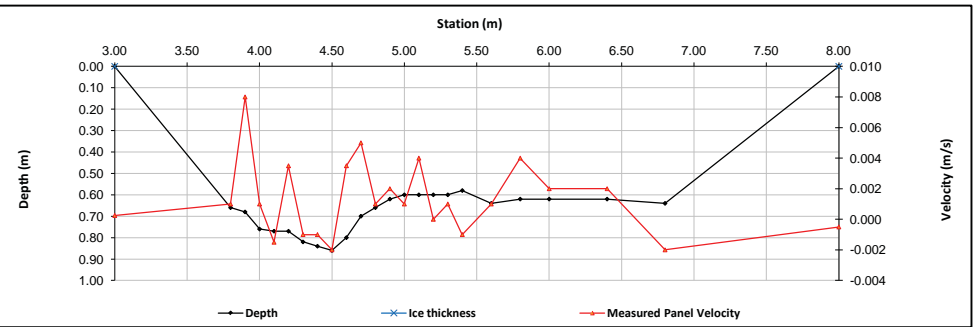
Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	HIGH, BEAVER
Quality/Error (see reverse):	Poor
Weather:	P. CLOUDY, 22 DEGREES

Flow characteristics:	
Total Flow:	0.002 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	2.81 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.562 (m)
Mean Velocity:	0.001 (m/s)
Froude Number:	0.000

Logger Details:		Before	After
Transducer Reading (m):		0.775	
Water (°C):		14.2	
Battery (Main):		13.6	
Datalogger Clock:		13:40	
Laptop Clock:		13:41	
Dessicant:	CHANGED		
Logger# (if Δ):	16567		
PT# (if Δ):	-		

Datalogger / Station Notes:	

**General Notes:**  
 -A lot of beaver activity  
 -TSS taken at 6.4 m  
 -From 6m to bank there was lots of vegetation in stream



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.911	330.293	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.569	330.635	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.882	329.322		
Other:	1.408	331.204		329.796	329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.882	330.292	330.293	Pipe 6 m E of Station
Bench Mark 3:	0.539	331.174		330.635	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.856	329.318		
Other:			1.379	329.795	329.796	Nail in birch tree

Closing Error	0.000	Average WL	329.320
WL Check	0.004	Transducer Elevation	328.545

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	12-Aug-12
<b>Data Entry Personnel:</b>	TR (field)	<b>Date:</b>	12-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	2-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S9 - Kears Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

September 16, 2012



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	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	4.80	0.00	0.00	0.000	0.000	0.000	1.0	4.80	5.40	0.60	0.08	0.007	0.007	0.05	0.000	0%						
1	6.00	0.31		0.028			1.0	5.40	6.25	0.85	0.31	0.028	0.028	0.26	0.007	1%						
2	6.50	0.36		0.033			1.0	6.25	6.75	0.50	0.36	0.033	0.033	0.18	0.006	1%						
3	7.00	0.35		-0.001			1.0	6.75	7.25	0.50	0.35	-0.001	-0.001	0.18	0.000	0%						
4	7.50	0.82			-0.001	0.007	1.0	7.25	7.75	0.50	0.82	0.003	0.003	0.41	0.001	0%						
5	8.00	0.91			0.001	0.186	1.0	7.75	8.13	0.38	0.91	0.094	0.094	0.34	0.032	6%						
6	8.25	1.10			0.182	0.237	1.0	8.13	8.30	0.18	1.10	0.210	0.210	0.19	0.040	8%						
7	8.35	1.13			0.174	0.127	1.0	8.30	8.43	0.13	1.13	0.151	0.151	0.14	0.021	4%						
8	8.50	1.08			0.226	0.196	1.0	8.43	8.58	0.15	1.08	0.211	0.211	0.16	0.034	7%						
9	8.65	1.06			0.218	0.170	1.0	8.58	8.70	0.13	1.06	0.194	0.194	0.13	0.026	5%						
10	8.75	0.98			0.248	0.222	1.0	8.70	8.88	0.18	0.98	0.235	0.235	0.17	0.040	8%						
11	9.00	0.82			0.180	0.223	1.0	8.88	9.13	0.25	0.82	0.202	0.202	0.21	0.041	8%						
12	9.25	0.78			0.071	0.346	1.0	9.13	9.50	0.38	0.78	0.209	0.209	0.29	0.061	12%						
13	9.75	0.75			0.001	0.203	1.0	9.50	10.00	0.50	0.75	0.102	0.102	0.38	0.038	8%						
14	10.25	0.82			0.006	0.160	1.0	10.00	10.50	0.50	0.82	0.083	0.083	0.41	0.034	7%						
15	10.75	0.76			-0.010	0.114	1.0	10.50	11.00	0.50	0.76	0.052	0.052	0.38	0.020	4%						
16	11.25	0.76			0.010	0.079	1.0	11.00	11.50	0.50	0.76	0.045	0.045	0.38	0.017	3%						
17	11.75	0.65		-0.024			1.0	11.50	12.00	0.50	0.65	-0.024	-0.024	0.33	-0.008	-2%						
18	12.25	0.64		-0.002			1.0	12.00	12.50	0.50	0.64	-0.002	-0.002	0.32	-0.001	0%						
19	12.75	0.63		0.000			1.0	12.50	13.00	0.50	0.63	0.000	0.000	0.32	0.000	0%						
20	13.25	0.92			0.052	0.127	1.0	13.00	14.03	1.03	0.92	0.090	0.090	0.94	0.084	17%						
LB	14.80	0.00	0.00	0.00	0.00	0.00	1.0	14.03	14.80	0.78	0.23	0.022	0.022	0.18	0.004	1%						

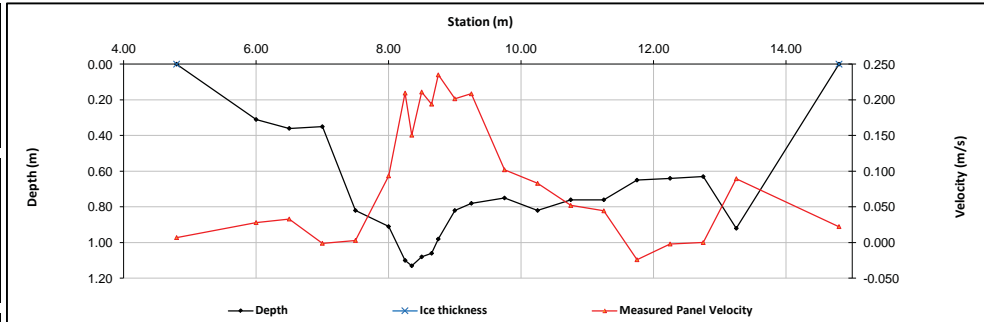
**Total Flow 0.500**

Measurement Details:	
Start Time (MST):	3:45
End Time (MST):	5:50
Equipment:	ADV
Method:	Fishcat
River Condition:	FLOODED BANKS
Quality/Error (see reverse):	Fair
Weather:	SUNNY 12 C

Flow characteristics:		
Total Flow:	0.500	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	6.34	(m <sup>2</sup> )
Wetted Width:	10.00	(m)
Hydraulic Depth:	0.634	(m)
Mean Velocity:	0.079	(m/s)
Froude Number:	0.032	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	11.063	
Battery (Main):	13.9	
Datalogger Clock:	2:57	
Laptop Clock:	2:58	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.996	330.231	330.231	Pipe 15 m E of Station
Bench Mark 2:	0.934	331.227		330.293	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.592	330.635	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.572	329.655		
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:	0.973	331.204		330.231	330.231	Pipe 15 m E of Station
Bench Mark 2:			0.912	330.292	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.569	330.635	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.548	329.656		
Other:					329.796	Nail in birch tree

Closing Error	0.001	Average WL	329.656
WL Check	0.001	Transducer Elevation	328.593

**General Notes:**

- Banks are flooded. There does not appear to be any flow in the grass on the flooded banks.
- The majority of flow is from the culvert on the right, a beaver has recently started to dam the other culvert. The left culvert was cleared out after the flow measurement was conducted.
- Installed new 3/4" Pipe BM.

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	16-Sep-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	16-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12



# Hydrometric Measurement / Site Visit Record

Site: S9 - Kearsal Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

October 23, 2012



## 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	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	4.80	0.00	0.00	0.000	0.000	0.000	1.0	4.80	5.00	0.20	0.18	0.020	0.020	0.03	0.001	0%			
1	5.20	0.70		0.079				5.00	5.35	0.35	0.70	0.079	0.079	0.24	0.019	5%			
2	5.50	0.85			0.046	0.143	1.0	5.35	5.65	0.30	0.85	0.095	0.095	0.26	0.024	6%			
3	5.80	0.90			0.156	0.200	1.0	5.65	5.88	0.23	0.90	0.178	0.178	0.20	0.036	8%			
4	5.95	0.88			0.092	0.181	1.0	5.88	6.03	0.15	0.88	0.137	0.137	0.13	0.018	4%			
5	6.10	1.10			0.190	0.208	1.0	6.03	6.18	0.15	1.10	0.199	0.199	0.16	0.033	8%			
6	6.25	1.07			0.191	0.227	1.0	6.18	6.33	0.15	1.07	0.209	0.209	0.16	0.034	8%			
7	6.40	1.08			0.179	0.216	1.0	6.33	6.48	0.15	1.08	0.198	0.198	0.16	0.032	7%			
8	6.55	1.07			0.187	0.213	1.0	6.48	6.63	0.15	1.07	0.200	0.200	0.16	0.032	7%			
9	6.70	0.97			0.163	0.222	1.0	6.63	6.85	0.23	0.97	0.193	0.193	0.22	0.042	10%			
10	7.00	0.90			0.075	0.199	1.0	6.85	7.15	0.30	0.90	0.137	0.137	0.27	0.037	9%			
11	7.30	0.80				0.041	0.189	1.0	7.15	7.45	0.80	0.115	0.115	0.24	0.028	6%			
12	7.60	0.75		0.064				7.45	7.75	0.30	0.75	0.064	0.064	0.23	0.014	3%			
13	7.90	0.75		0.058				7.75	8.05	0.30	0.75	0.058	0.058	0.23	0.013	3%			
14	8.20	0.85			0.000	0.162	1.0	8.05	8.35	0.30	0.85	0.081	0.081	0.25	0.021	5%			
15	8.50	0.82			0.000	0.176	1.0	8.35	8.65	0.30	0.82	0.088	0.088	0.25	0.022	5%			
16	8.80	0.75		-0.088				8.65	9.10	0.45	0.75	-0.088	-0.088	0.34	-0.030	-7%			
17	9.40	0.69		0.026				9.10	9.65	0.55	0.69	0.026	0.026	0.38	0.010	2%			
18	9.90	0.66		0.001				9.65	10.15	0.50	0.66	0.001	0.001	0.33	0.000	0%			
19	10.40	0.69			0.001	0.089	1.0	10.15	10.55	0.40	0.69	0.045	0.045	0.28	0.012	3%			
20	10.70	0.71			0.013	0.079	1.0	10.55	10.85	0.30	0.71	0.046	0.046	0.21	0.010	2%			
21	11.00	0.83			0.043	0.030	1.0	10.85	11.15	0.30	0.83	0.037	0.037	0.25	0.009	2%			
22	11.30	0.82			0.033	0.029	1.0	11.15	11.65	0.50	0.82	0.031	0.031	0.41	0.013	3%			
RB	12.00	0.00	0.00	0.00	0.00	0.00	1.0	11.65	12.00	0.35	0.21	0.008	0.008	0.07	0.001	0%			
<b>Total Flow</b>															<b>0.430</b>				

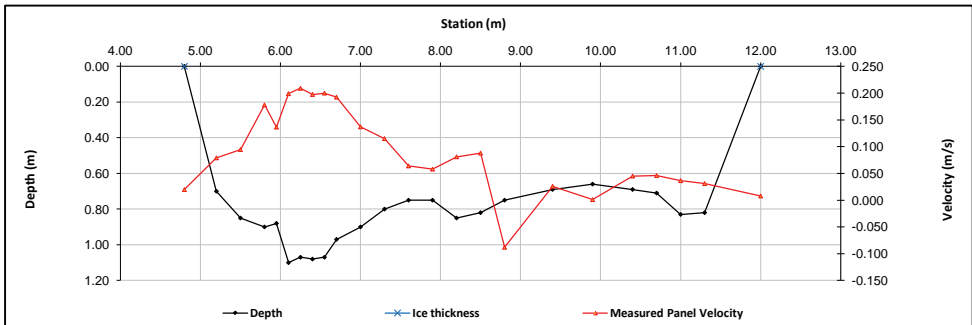
Measurement Details:	
Start Time (MST):	13:10
End Time (MST):	14:10
Equipment:	ADV
Method:	Fishcat
River Condition:	flooded
Quality/Error (see reverse):	Good
Weather:	overcast, 0 deg.

Flow characteristics:		
Total Flow:	0.430	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.46	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.759	(m)
Mean Velocity:	0.079	(m/s)
Froude Number:	0.029	

Logger Details:		
	Before	After
Transducer Reading (m):	1.019	
Water (°C):	1.8	
Battery (Main):	14.3	
Datalogger Clock:	12:42	
Laptop Clock:	12:43	
Dessicant:	CHANGED	
Logger# (if Δ):	16567	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:
-site flooded, both banks not defined.
-water remains very high
-Patchy grass from LB to 7.3 m
-TSS AT 6.3 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.028	330.233	330.231	Pipe 15 m E of Station
Bench Mark 2:	0.968	331.261		330.293	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.624	330.637	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.622	329.639		
Other:					329.796	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:	1.016	331.249		330.233	330.231	Pipe 15 m E of Station
Bench Mark 2:			0.956	330.293	330.293	Pipe 6 m E of Station
Bench Mark 3:			0.612	330.637	330.635	Pipe 10 m E of Station
Ice/PT:						
Water Level:			1.609	329.640		
Other:					329.796	Nail in birch tree

Closing Error	0.000	Average WL	329.640
WL Check	0.001	Transducer Elevation	328.621

Field Personnel:	TR & DW	Trip Date:	23-Oct-12
Data Entry Personnel:	TR	Date:	23-Oct-12
Data Check Personnel:	CJ	Date:	7-Nov-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road

UTM Location: 490350 E, 6355500 N

Site Visit Date:

January 10, 2012



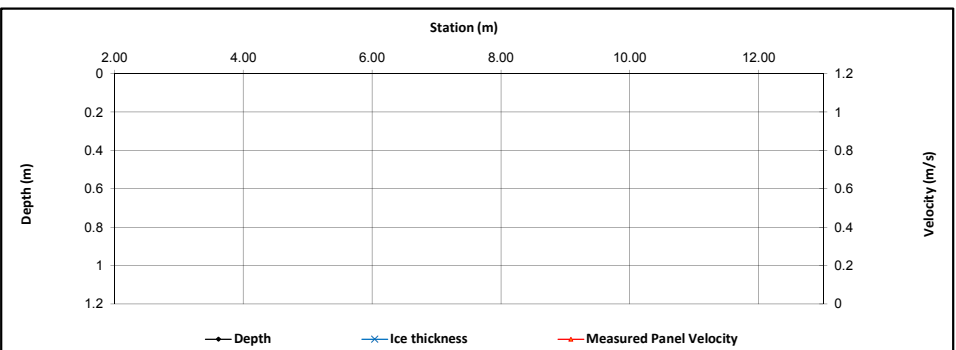
Measured Data							Calculated Data									
Bank/ Mnt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
<b>No Flow Measurement Conducted</b>																
															<b>Total Flow</b>	-

Measurement Details:	
Start Time (MST):	13:05
End Time (MST):	13:40
Equipment:	-
Method:	-
River Condition:	Ice cover
Quality/Error (see reverse):	-
Weather:	overcast, -13

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:	

Datalogger Details:		
	Before	After
Transducer Reading (m):	1.526	
Water (°C):	3.1	-
Battery (Main):	14.7	-
Datalogger Clock:	13:17	-
Laptop Clock:	13:18	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.337	100.644	100.657	Rebar in PVC Pipe
Bench Mark 2:	1.058	101.981		100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.633	100.348		
Water Level:			1.643	100.338		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.318	101.962		100.644	100.657	Rebar in PVC Pipe
Bench Mark 2:			1.092	100.870	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.627	100.335		
Water Level:			1.638	100.324		
Other:						
Closing Error	0.053		Average WL	100.331		
WL Check	0.014		Transducer Elevation	98.805		

**General Notes:**

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	10-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	9-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road  
 UTM Location: 490350 E, 6355500 N

Site Visit Date: February 5, 2012



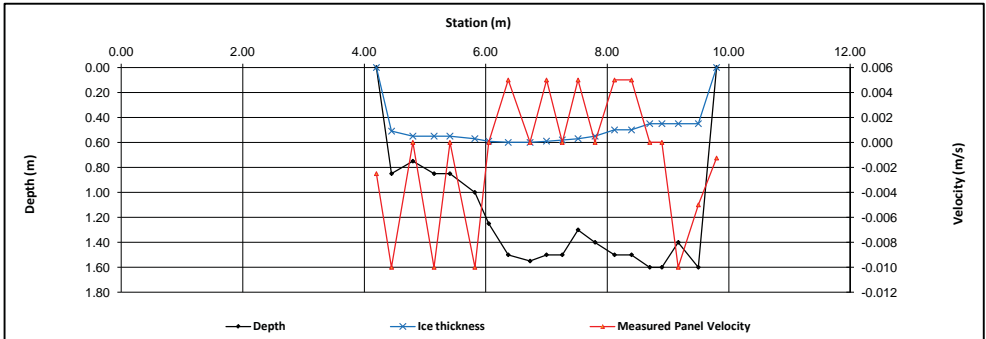
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1	4.20	0.00	0.00	0.000	0.000	0.000	0.9	4.20	4.33	0.13	0.09	-0.003	-0.002	0.01	0.000	2%
2	4.45	0.85	0.51	-0.010			0.9	4.33	4.63	0.30	0.34	-0.010	-0.009	0.10	-0.001	88%
3	4.80	0.75	0.55	0.000			1.0	4.63	4.98	0.35	0.20	0.000	0.000	0.07	0.000	0%
4	5.15	0.85	0.55	-0.010			0.9	4.98	5.28	0.31	0.30	-0.010	-0.009	0.09	-0.001	79%
5	5.41	0.85	0.55	0.000			1.0	5.28	5.62	0.34	0.30	0.000	0.000	0.10	0.000	0%
6	5.82	1.00	0.57	-0.010			0.9	5.62	5.94	0.32	0.43	-0.010	-0.009	0.14	-0.001	118%
7	6.05	1.25	0.59	0.000			1.0	5.94	6.21	0.27	0.66	0.000	0.000	0.18	0.000	0%
8	6.37	1.50	0.60		0.010	0.000	1.0	6.21	6.55	0.34	0.90	0.005	0.005	0.31	0.002	-146%
9	6.73	1.55	0.60		0.000	0.000	1.0	6.55	6.87	0.32	0.95	0.000	0.000	0.30	0.000	0%
10	7.00	1.50	0.59		0.000	0.010	1.0	6.87	7.13	0.27	0.91	0.005	0.005	0.24	0.001	-115%
11	7.26	1.50	0.58		0.000	0.000	1.0	7.13	7.39	0.26	0.92	0.000	0.000	0.24	0.000	0%
12	7.52	1.30	0.57		0.000	0.010	1.0	7.39	7.66	0.27	0.73	0.005	0.005	0.20	0.001	-94%
13	7.80	1.40	0.55		0.000	0.000	1.0	7.66	7.96	0.30	0.85	0.000	0.000	0.25	0.000	0%
14	8.12	1.50	0.50		0.000	0.010	1.0	7.96	8.26	0.30	1.00	0.005	0.005	0.30	0.002	-143%
15	8.40	1.50	0.50		0.000	0.010	1.0	8.26	8.55	0.29	1.00	0.005	0.005	0.29	0.001	-138%
16	8.70	1.60	0.45		0.000	0.000	1.0	8.55	8.80	0.25	1.15	0.000	0.000	0.29	0.000	0%
17	8.90	1.60	0.45		0.000	0.000	1.0	8.80	9.04	0.23	1.15	0.000	0.000	0.27	0.000	0%
18	9.17	1.40	0.45		-0.020	0.000	1.0	9.04	9.34	0.30	0.95	-0.010	-0.010	0.29	-0.003	272%
19	9.50	1.60	0.45		-0.010	0.000	1.0	9.34	9.65	0.32	1.15	-0.005	-0.005	0.36	-0.002	173%
	9.80	0.00	0.00	0.000	0.000	0.000	1.0	9.65	9.80	0.15	0.29	-0.001	-0.001	0.04	0.000	5%
<b>Total Flow</b>															<b>-0.001</b>	

Measurement Details:	
Start Time (MST):	11:35
End Time (MST):	13:05
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Poor
Weather:	overcast, breezy, -5

Flow characteristics:		
Total Flow:	-0.001	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	4.07	(m <sup>2</sup> )
Wetted Width:	5.60	(m)
Hydraulic Depth:	0.727	(m)
Mean Velocity:	0.000	(m/s)
Froude Number:	0.000	

Logger Details:		
	Before	After
Transducer Reading (m):	1.597	
Water (°C):	2.9	-
Battery (Main):	14.3	-
Datalogger Clock:	11:50	-
Laptop Clock:	11:50	-
Dessicant:	good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:			1.360	100.656	100.657	Rebar in PVC Pipe
Bench Mark 2:	1.093	102.016		100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.611	100.405		
Water Level:			1.623	100.393		
Other:						
Setup #2						
Bench Mark 1:	1.348	102.004		100.656	100.657	Rebar in PVC Pipe
Bench Mark 2:			1.082	100.922	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.600	100.404		
Water Level:			1.612	100.392		
Other:						

Closing Error	0.001	Average WL	100.393
WL Check	0.001	Transducer Elevation	98.796

**General Notes:**

Field Personnel:	SM, CJ	Trip Date:	5-Feb-12
Data Entry Personnel:	CJ	Date:	29-Mar-12
Data Check Personnel:	XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road  
 UTM Location: 490350 E, 6355500 N

Site Visit Date:

March 8, 2012



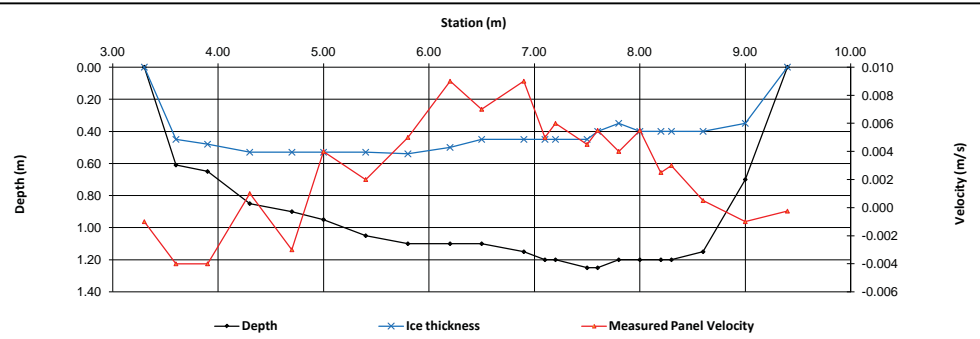
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	0.9	3.30	3.45	0.15	0.04	-0.001	-0.001	0.01	0.000	0%
1	3.60	0.61	0.45	-0.004			0.9	3.45	3.75	0.30	0.16	-0.004	-0.004	0.05	0.000	-2%
2	3.90	0.65	0.48	-0.004			0.9	3.75	4.10	0.35	0.17	-0.004	-0.004	0.06	0.000	-2%
3	4.30	0.85	0.53	0.001			0.9	4.10	4.50	0.40	0.32	0.001	0.001	0.13	0.000	1%
4	4.70	0.90	0.53	-0.003			0.9	4.50	4.85	0.35	0.37	-0.003	-0.003	0.13	0.000	-3%
5	5.00	0.95	0.53	0.004			0.9	4.85	5.20	0.35	0.42	0.004	0.004	0.15	0.001	5%
6	5.40	1.05	0.53	0.002			0.9	5.20	5.60	0.40	0.52	0.002	0.002	0.21	0.000	3%
7	5.80	1.10	0.54	0.005			0.9	5.60	6.00	0.40	0.56	0.005	0.005	0.22	0.001	9%
8	6.20	1.10	0.50	0.009			0.9	6.00	6.35	0.35	0.60	0.009	0.008	0.21	0.002	15%
9	6.50	1.10	0.45	0.007			0.9	6.35	6.70	0.35	0.65	0.007	0.006	0.23	0.001	13%
10	6.90	1.15	0.45	0.009			0.9	6.70	7.00	0.30	0.70	0.009	0.008	0.21	0.002	15%
11	7.10	1.20	0.45		0.001	0.009	1.0	7.00	7.15	0.15	0.75	0.005	0.005	0.11	0.001	5%
12	7.20	1.20	0.45		0.004	0.008	1.0	7.15	7.35	0.20	0.75	0.006	0.006	0.15	0.001	8%
13	7.50	1.25	0.45		0.001	0.008	1.0	7.35	7.55	0.20	0.80	0.005	0.005	0.16	0.001	6%
14	7.60	1.25	0.40		0.007	0.004	1.0	7.55	7.70	0.15	0.85	0.006	0.006	0.13	0.001	6%
15	7.80	1.20	0.35		0.005	0.003	1.0	7.70	7.90	0.20	0.85	0.004	0.004	0.17	0.001	6%
16	8.00	1.20	0.40		0.003	0.008	1.0	7.90	8.10	0.20	0.80	0.006	0.006	0.16	0.001	8%
17	8.20	1.20	0.40		0.002	0.003	1.0	8.10	8.25	0.15	0.80	0.003	0.003	0.12	0.000	3%
18	8.30	1.20	0.40		0.003	0.003	1.0	8.25	8.45	0.20	0.80	0.003	0.003	0.16	0.000	4%
19	8.60	1.15	0.40		0.003	-0.002	1.0	8.45	8.80	0.35	0.75	0.001	0.001	0.26	0.000	1%
20	9.00	0.70	0.35	-0.001			0.9	8.80	9.20	0.40	0.35	-0.001	-0.001	0.14	0.000	-1%
RB	9.40	0.00	0.00	0.000	0.000	0.000	1.0	9.20	9.40	0.20	0.09	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>														<b>0.011</b>		

Measurement Details:	
Start Time (MST):	17:15
End Time (MST):	18:15
Equipment:	ADV
Method:	Ice
River Condition:	beaver dam influence
Quality/Error (see reverse):	Good
Weather:	-2C overcast, breezy

Flow characteristics:	
Total Flow:	0.011 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.18 (m <sup>2</sup> )
Wetted Width:	6.10 (m)
Hydraulic Depth:	0.521 (m)
Mean Velocity:	0.004 (m/s)
Froude Number:	0.002

Datalogger Details:		
	Before	After
Transducer Reading (m):	1.450	
Water (°C):	2.3	-
Battery (Main):	14.3	-
Datalogger Clock:	17:18	-
Laptop Clock:	17:18	-
Dessicant:	good	-
Logger# (if Δ):	17935	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.414	100.657	100.657	Rebar in PVC Pipe
Bench Mark 2:	1.148	102.071		100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.672	100.399		
Water Level:			1.829	100.242		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.403	102.060		100.657	100.657	Rebar in PVC Pipe
Bench Mark 2:			1.137	100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:			1.658	100.402		
Water Level:			1.818	100.242		
Other:						
Closing Error	0.000			Average WL	100.242	
WL Check	0.000			Transducer Elevation	98.792	

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Mar-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	26-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road

UTM Location: 490350 E, 6355500 N

Site Visit Date:

March 31, 2012



## Flow Measurement:

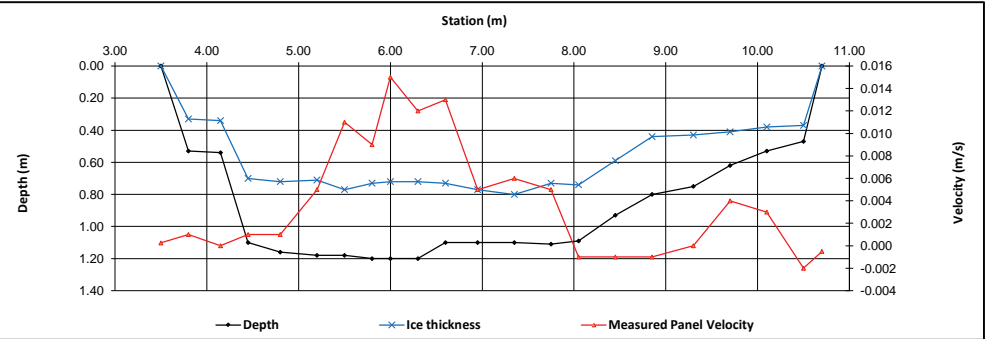
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.0	3.50	3.65	0.15	0.05	0.000	0.000	0.01	0.000	0%
1	3.80	0.53	0.33	0.001			1.0	3.65	3.98	0.33	0.20	0.001	0.001	0.07	0.000	1%
2	4.15	0.54	0.34	0.000			1.0	3.98	4.30	0.33	0.20	0.000	0.000	0.07	0.000	0%
3	4.45	1.10	0.70	0.001			1.0	4.30	4.63	0.32	0.40	0.001	0.001	0.13	0.000	1%
4	4.80	1.16	0.72	0.001			1.0	4.63	5.00	0.38	0.44	0.001	0.001	0.17	0.000	2%
5	5.20	1.18	0.71	0.005			1.0	5.00	5.35	0.35	0.47	0.005	0.005	0.16	0.001	8%
6	5.50	1.18	0.77	0.011			1.0	5.35	5.65	0.30	0.41	0.011	0.011	0.12	0.001	13%
7	5.80	1.20	0.73	0.009			1.0	5.65	5.90	0.25	0.47	0.009	0.009	0.12	0.001	10%
8	6.00	1.20	0.72	0.015			1.0	5.90	6.15	0.25	0.48	0.015	0.015	0.12	0.002	17%
9	6.30	1.20	0.72	0.012			1.0	6.15	6.45	0.30	0.48	0.012	0.012	0.14	0.002	16%
10	6.60	1.10	0.73	0.013			1.0	6.45	6.78	0.33	0.37	0.013	0.013	0.12	0.002	15%
11	6.95	1.10	0.77	0.005			1.0	6.78	7.15	0.38	0.33	0.005	0.005	0.12	0.001	6%
12	7.35	1.10	0.80	0.006			1.0	7.15	7.55	0.40	0.30	0.006	0.006	0.12	0.001	7%
13	7.75	1.11	0.73	0.005			1.0	7.55	7.90	0.35	0.38	0.005	0.005	0.13	0.001	6%
14	8.05	1.09	0.74	-0.001			1.0	7.90	8.25	0.35	0.35	-0.001	-0.001	0.12	0.000	-1%
15	8.45	0.93	0.59	-0.001			1.0	8.25	8.65	0.40	0.34	-0.001	-0.001	0.14	0.000	-1%
16	8.85	0.80	0.44	-0.001			1.0	8.65	9.08	0.43	0.36	-0.001	-0.001	0.15	0.000	-1%
17	9.30	0.75	0.43	0.000			1.0	9.08	9.50	0.43	0.32	0.000	0.000	0.14	0.000	0%
18	9.70	0.62	0.41	0.004			1.0	9.50	9.90	0.40	0.21	0.004	0.004	0.08	0.000	3%
19	10.10	0.53	0.38	0.003			1.0	9.90	10.30	0.40	0.15	0.003	0.003	0.06	0.000	2%
20	10.50	0.47	0.37	-0.002			1.0	10.30	10.60	0.30	0.10	-0.002	-0.002	0.03	0.000	-1%
LB	10.70	0.00	0.00	0.000	0.000	0.000	1.0	10.60	10.70	0.10	0.03	-0.001	-0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.011</b>	

Measurement Details:	
Start Time (MST):	8:55
End Time (MST):	10:25
Equipment:	ADV
Method:	Ice cover
River Condition:	slush under ice
Quality/Error (see reverse):	fair
Weather:	sunny, 0

Flow Characteristics:		
Total Flow:	0.011	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Cross Section Area:	2.32	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.323	(m)
Mean Velocity:	0.005	(m/s)
Froude Number:	0.003	

Datalogger Details:		
	Before	After
Transducer Reading (m):		1.454
Water (°C):	2.2	-
Battery (Main):	14.6	-
Datalogger Clock:	8:04	-
Laptop Clock:	8:05	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.428	100.662	100.657	Rebar in PVC Pipe
Bench Mark 2:	1.167	102.090		100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			1.844	100.246		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.418	102.080		100.662	100.657	Rebar in PVC Pipe
Bench Mark 2:			1.158	100.922	100.923	3/4" Pipe South of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			1.834	100.246		
Other:						

Closing Error	0.001	Average WL	100.246
WL Check	0.000	Transducer Elevation	98.792

**General Notes:**

-slush under ice, especially between offsets 10.70 m and 7.75 m

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	31-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road  
 UTM Location: 490350 E, 6355500 N

Site Visit Date:

May 12, 2012



## 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	5.10	0.00	0.00	0.000	0.000	0.000	1.0	5.10	5.20	0.10	0.03	0.009	0.009	0.00	0.000	0%
1	5.30	0.13		0.034			1.0	5.20	5.45	0.25	0.13	0.034	0.034	0.03	0.001	0%
2	5.60	0.13		0.035			1.0	5.45	5.75	0.30	0.13	0.035	0.035	0.04	0.001	0%
3	5.90	0.30		0.035			1.0	5.75	5.95	0.20	0.30	0.035	0.035	0.06	0.002	1%
4	6.00	0.48		0.044			1.0	5.95	6.15	0.20	0.48	0.044	0.044	0.10	0.004	1%
5	6.30	0.42			0.036	0.049	1.0	6.15	6.45	0.30	0.42	0.043	0.043	0.13	0.005	2%
6	6.60	0.98			0.049	0.043	1.0	6.45	6.75	0.30	0.98	0.046	0.046	0.29	0.014	4%
7	6.90	1.06			0.055	0.056	1.0	6.75	7.05	0.30	1.06	0.056	0.056	0.32	0.018	5%
8	7.20	1.20			0.071	0.068	1.0	7.05	7.35	0.30	1.20	0.070	0.070	0.36	0.025	8%
9	7.50	1.22			0.070	0.062	1.0	7.35	7.65	0.30	1.22	0.066	0.066	0.37	0.024	7%
10	7.80	1.34			0.072	0.068	1.0	7.65	7.95	0.30	1.34	0.070	0.070	0.40	0.028	9%
11	8.10	1.38			0.077	0.060	1.0	7.95	8.25	0.30	1.38	0.069	0.069	0.41	0.028	9%
12	8.40	1.39			0.084	0.063	1.0	8.25	8.55	0.30	1.39	0.074	0.074	0.42	0.031	9%
13	8.70	1.39			0.074	0.061	1.0	8.55	8.85	0.30	1.39	0.068	0.068	0.42	0.028	9%
14	9.00	1.36			0.053	0.062	1.0	8.85	9.15	0.30	1.36	0.058	0.058	0.41	0.023	7%
15	9.30	1.32			0.041	0.060	1.0	9.15	9.45	0.30	1.32	0.051	0.051	0.40	0.020	6%
16	9.60	1.32			0.040	0.054	1.0	9.45	9.75	0.30	1.32	0.047	0.047	0.40	0.019	6%
17	9.90	1.09			0.018	0.060	1.0	9.75	10.05	0.30	1.09	0.039	0.039	0.33	0.013	4%
18	10.20	1.09			0.017	0.052	1.0	10.05	10.35	0.30	1.09	0.035	0.035	0.33	0.011	3%
19	10.50	0.82			0.032	0.052	1.0	10.35	10.65	0.30	0.82	0.042	0.042	0.25	0.010	3%
20	10.80	0.78			0.004	0.049	1.0	10.65	10.95	0.30	0.78	0.027	0.027	0.23	0.006	2%
21	11.10	0.58		0.033			1.0	10.95	11.25	0.30	0.58	0.033	0.033	0.17	0.006	2%
22	11.40	0.46		0.034			1.0	11.25	11.55	0.30	0.46	0.034	0.034	0.14	0.005	1%
23	11.70	0.33		0.016			1.0	11.55	11.85	0.30	0.33	0.016	0.016	0.10	0.002	0%
24	12.00	0.33		0.027			1.0	11.85	12.15	0.30	0.33	0.027	0.027	0.10	0.003	1%
25	12.30	0.14		0.009			1.0	12.15	12.45	0.30	0.14	0.009	0.009	0.04	0.000	0%
26	12.60	0.10		0.003			1.0	12.45	12.65	0.20	0.10	0.003	0.003	0.02	0.000	0%
LB	12.70	0.00	0.00	0.000	0.000	0.000	1.0	12.65	12.70	0.05	0.03	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.328</b>	

## Measurement Details:

Start Time (MST):	13:30
End Time (MST):	15:45
Equipment:	ADV
Method:	Fishcat
River Condition:	open, flooded banks
Quality/Error (see reverse):	excellent
Weather:	cloudy, windy, +18

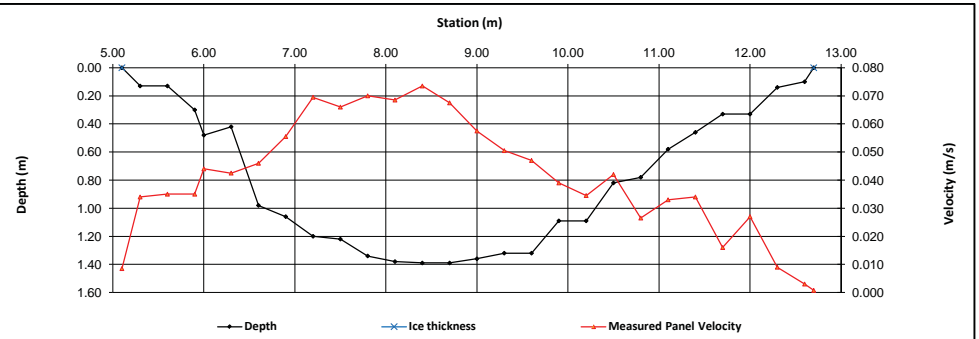
## Flow characteristics:

Total Flow:	0.328	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	6.25	(m <sup>2</sup> )
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.823	(m)
Mean Velocity:	0.052	(m/s)
Froude Number:	0.018	

## Logger Details:

	Before	After
Transducer Reading (m):	1.638	-
Water (°C):	7.5	-
Battery (Main):	14.1	-
Datalogger Clock:	12:35	-
Laptop Clock:	12:35	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #1						
Bench Mark 1:			1.289	100.660	100.657	Rebar in PVC Pipe
Bench Mark 2:	1.026	101.949		100.923	100.923	3/4" Pipe South of Logger
Bench Mark 3:			1.163	100.786		Nail in Log
Ice/PT:						
Water Level:			1.525	100.424		
Other:						
Setup #2						
Bench Mark 1:	1.265	101.925		100.660	100.657	Rebar in PVC Pipe
Bench Mark 2:			1.001	100.924	100.923	3/4" Pipe South of Logger
Bench Mark 3:			1.138	100.787		Nail in Log
Ice/PT:						
Water Level:			1.502	100.423		
Other:						

Closing Error	-0.001	Average WL	100.424
WL Check	0.001	Transducer Elevation	98.786

## General Notes:

- lots of water around station, about 40 cm deep
- banks are not well-defined near station but are good near the bridge where the flow measurement was taken

Field Personnel:	DW, CJ	Trip Date:	12-May-12
Data Entry Personnel:	CJ	Date:	30-May-12
Data Check Personnel:	DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road  
 UTM Location: 490350 E, 6355500 N

Site Visit Date: June 16, 2012



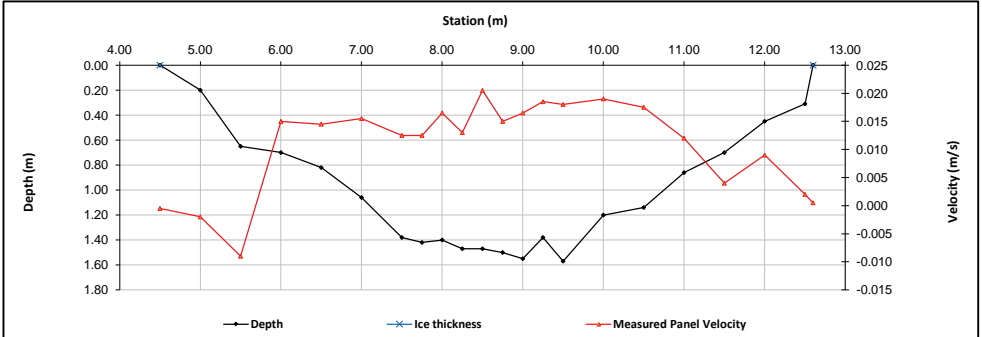
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	4.50	0.00	0.00	0.000	0.000	0.000	1.0	4.50	4.75	0.25	0.05	-0.001	-0.001	0.01	0.000	0%
1	5.00	0.20		-0.002			1.0	4.75	5.25	0.50	0.20	-0.002	-0.002	0.10	0.000	0%
2	5.50	0.65		-0.009			1.0	5.25	5.75	0.50	0.65	-0.009	-0.009	0.33	-0.003	-3%
3	6.00	0.70		0.015			1.0	5.75	6.25	0.50	0.70	0.015	0.015	0.35	0.005	5%
4	6.50	0.82			0.003	0.026	1.0	6.25	6.75	0.50	0.82	0.015	0.015	0.41	0.006	6%
5	7.00	1.06			0.005	0.026	1.0	6.75	7.25	0.50	1.06	0.016	0.016	0.53	0.008	8%
6	7.50	1.38			0.001	0.024	1.0	7.25	7.63	0.38	1.38	0.013	0.013	0.52	0.006	6%
7	7.75	1.42			0.001	0.024	1.0	7.63	7.88	0.25	1.42	0.013	0.013	0.36	0.004	4%
8	8.00	1.40			0.006	0.027	1.0	7.88	8.13	0.25	1.40	0.017	0.017	0.35	0.006	6%
9	8.25	1.47			-0.002	0.028	1.0	8.13	8.38	0.25	1.47	0.013	0.013	0.37	0.005	5%
10	8.50	1.47			0.007	0.034	1.0	8.38	8.63	0.25	1.47	0.021	0.021	0.37	0.008	7%
11	8.75	1.50			0.005	0.025	1.0	8.63	8.88	0.25	1.50	0.015	0.015	0.38	0.006	5%
12	9.00	1.55			0.003	0.030	1.0	8.88	9.13	0.25	1.55	0.017	0.017	0.39	0.006	6%
13	9.25	1.38			0.015	0.022	1.0	9.13	9.38	0.25	1.38	0.019	0.019	0.35	0.006	6%
14	9.50	1.57			0.005	0.031	1.0	9.38	9.75	0.38	1.57	0.018	0.018	0.59	0.011	10%
15	10.00	1.20			0.012	0.026	1.0	9.75	10.25	0.50	1.20	0.019	0.019	0.60	0.011	11%
16	10.50	1.14			0.011	0.024	1.0	10.25	10.75	0.50	1.14	0.018	0.018	0.57	0.010	10%
17	11.00	0.86			0.005	0.019	1.0	10.75	11.25	0.50	0.86	0.012	0.012	0.43	0.005	5%
18	11.50	0.70					1.0	11.25	11.75	0.50	0.70	0.004	0.004	0.35	0.001	1%
19	12.00	0.45			0.009		1.0	11.75	12.25	0.50	0.45	0.009	0.009	0.23	0.002	2%
20	12.50	0.31			0.002		1.0	12.25	12.55	0.30	0.31	0.002	0.002	0.09	0.000	0%
RB	12.60	0.00	0.00	0.000	0.000	0.000	1.0	12.55	12.60	0.05	0.08	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.104</b>	

Measurement Details:	
Start Time (MST):	16:10
End Time (MST):	17:45
Equipment:	ADV
Method:	FISHCAT
River Condition:	NO DEFINED BANKS
Quality/Error (see reverse):	GOOD
Weather:	CLOUDY, BREEZY, 10

Flow characteristics:		
Total Flow:	0.104	(m <sup>3</sup> /s)
Perceived Measurement Quality:	GOOD	
Cross Section Area:	7.65	(m <sup>2</sup> )
Wetted Width:	8.10	(m)
Hydraulic Depth:	0.945	(m)
Mean Velocity:	0.014	(m/s)
Froude Number:	0.004	

Logger Details:		
	Before	After
Transducer Reading (m):	1.712	
Water (°C):	13.5	
Battery (Main):	13.9	
Datalogger Clock:	15:30	
Laptop Clock:	15:31	
Dessicant:	CHANGED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-VENT TUBE CHECKED	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.419	102.076		100.657	100.657	Rebar in PVC Pipe
Bench Mark 2:					100.923	3/4" Pipe South of Logger
Bench Mark 3:			1.347	100.729		Nail in Log
Ice/PT:						
Water Level:			1.576	100.500		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.371	100.657	100.657	Rebar in PVC Pipe
Bench Mark 2:					100.923	3/4" Pipe South of Logger
Bench Mark 3:	1.299	102.028		100.729		Nail in Log
Ice/PT:						
Water Level:			1.527	100.501		
Other:						

Closing Error	0.000	Average WL	100.501
WL Check	0.001	Transducer Elevation	98.789

**General Notes:**  
 -TSS SAMPLED AT 8.5 m  
 -NO DEFINED BANKS (~60CM WATER BESIDE LOGGER)  
 -MEASUREMENT PERFORMED UNDER BRIDGE  
 -SITE HEAVILY FLOODED

<b>Field Personnel:</b>	TR & CJ	<b>Trip Date:</b>	16-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	21-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S10 - Wapasu Creek at Canterra Road  
 UTM Location: 490350 E, 6355500 N

Site Visit Date: August 12, 2012



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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
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21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																

No Flow Measurement Conducted

Total Flow

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	16:45
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

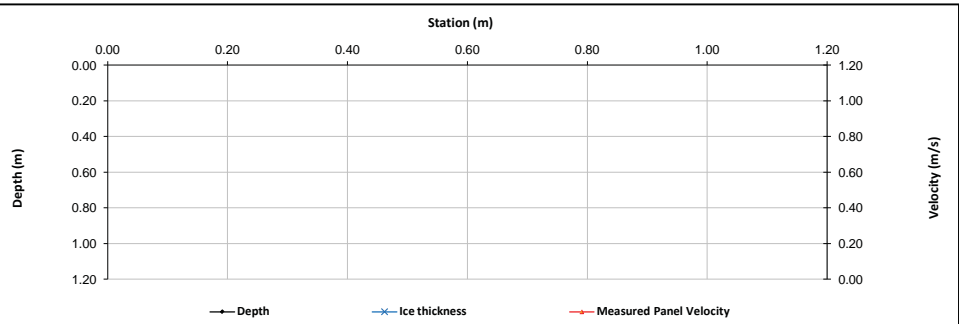
Flow characteristics:	
Total Flow:	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	
Cross Section Area:	(m <sup>2</sup> )
Wetted Width:	(m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number:	

Logger Details:	Before	After
Transducer Reading (m):	1.687	
Water (°C):	15.9	
Battery (Main):	13.9	
Datalogger Clock:	15:05	
Laptop Clock:	15:05	
Dessicant:	-	
Logger# (if Δ):	17935	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-took down station to relocate to new location

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:				100.657		Rebar in PVC Pipe
Bench Mark 2:				100.923		3/4" Pipe South of Logger
Bench Mark 3:						Nail in Log
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:				100.657		Rebar in PVC Pipe
Bench Mark 2:				100.923		3/4" Pipe South of Logger
Bench Mark 3:						Nail in Log
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

Field Personnel:	TR, CJ	Trip Date:	12-Aug-12
Data Entry Personnel:	CJ (Field)	Date:	12-Aug-12
Data Check Personnel:	CJ	Date:	2-Oct-12



# Hydrometric Measurement Field Data Sheet

Site: S10A - Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date:

August 13, 2012



## 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	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	0.85	0.15	0.05	0.036	0.036	0.01	0.000	0%	
1	1.00	0.18		0.142			1.0	0.85	1.10	0.25	0.18	0.142	0.142	0.05	0.006	6%	
2	1.20	0.17		0.166			1.0	1.10	1.30	0.20	0.17	0.166	0.166	0.03	0.006	5%	
3	1.40	0.20		0.173			1.0	1.30	1.50	0.20	0.20	0.173	0.173	0.04	0.007	6%	
4	1.60	0.20		0.163			1.0	1.50	1.70	0.20	0.20	0.163	0.163	0.04	0.007	6%	
5	1.80	0.22		0.157			1.0	1.70	1.90	0.20	0.22	0.157	0.157	0.04	0.007	6%	
6	2.00	0.24		0.166			1.0	1.90	2.10	0.20	0.24	0.166	0.166	0.05	0.008	7%	
7	2.20	0.24		0.163			1.0	2.10	2.30	0.20	0.24	0.163	0.163	0.05	0.008	7%	
8	2.40	0.27		0.172			1.0	2.30	2.50	0.20	0.27	0.172	0.172	0.05	0.009	8%	
9	2.60	0.27		0.162			1.0	2.50	2.70	0.20	0.27	0.162	0.162	0.05	0.009	8%	
10	2.80	0.26		0.156			1.0	2.70	2.90	0.20	0.26	0.156	0.156	0.05	0.008	7%	
11	3.00	0.22		0.176			1.0	2.90	3.10	0.20	0.22	0.176	0.176	0.04	0.008	7%	
12	3.20	0.17		0.155			1.0	3.10	3.30	0.20	0.17	0.155	0.155	0.03	0.005	5%	
13	3.40	0.18		0.175			1.0	3.30	3.50	0.20	0.18	0.175	0.175	0.04	0.006	6%	
14	3.60	0.20		0.157			1.0	3.50	3.70	0.20	0.20	0.157	0.157	0.04	0.006	6%	
15	3.80	0.13		0.161			1.0	3.70	3.90	0.20	0.13	0.161	0.161	0.03	0.004	4%	
16	4.00	0.12		0.138			1.0	3.90	4.10	0.20	0.12	0.138	0.138	0.02	0.003	3%	
17	4.20	0.10		-0.002			1.0	4.10	4.30	0.20	0.10	-0.002	-0.002	0.02	0.000	0%	
18	4.40	0.07		0.179			1.0	4.30	4.50	0.20	0.07	0.179	0.179	0.01	0.003	2%	
19	4.60	0.06		0.179			1.0	4.50	4.75	0.25	0.06	0.179	0.179	0.02	0.003	2%	
LB	4.90	0.00	0.00	0.00	0.00	0.00	1.0	4.75	4.90	0.15	0.02	0.045	0.045	0.00	0.000	0%	
<b>Total Flow</b>														<b>0.113</b>			

## Measurement Details:

Start Time (MST):	9:56
End Time (MST):	13:25
Equipment:	ADV
Method:	Wading
River Condition:	Good flow,
Quality/Error (see reverse):	Excellent
Weather:	20 deg, overcast

## Flow characteristics:

Total Flow:	0.113	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.72	(m <sup>2</sup> )
Wetted Width:	4.20	(m)
Hydraulic Depth:	0.172	(m)
Mean Velocity:	0.157	(m/s)
Froude Number:	0.121	

## Logger Details:

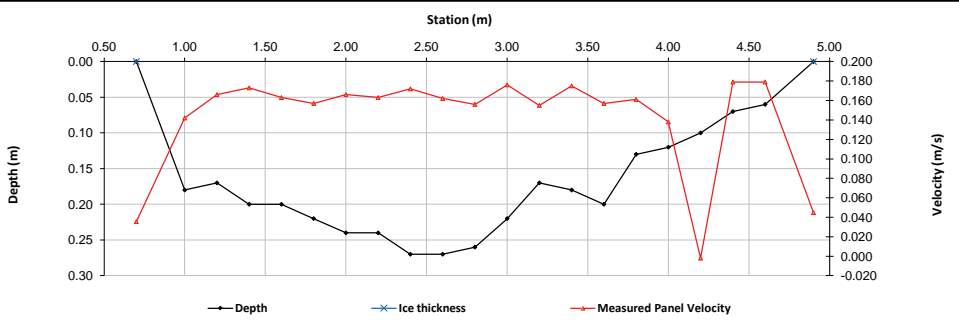
	Before	After
Transducer Reading (m):	0.556	
Water (°C):	15.6	
Battery (Main):	12.6	
Datalogger Clock:	11:48	
Laptop Clock:	11:48	
Dessicant:	New	
Logger# (if Δ):	17935	
PT# (if Δ):	-	

## Datalogger / Station Notes:

Telemetry Installed, Yagi antenna RSSI -84,

## General Notes:

installed station at new location.  
 Prepared heli landing pad



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.962	100.236	100.236	3/4" Pipe NW of logger
Bench Mark 2:	1.198	101.198		100.000	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.061	100.137	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			2.318	98.880		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.948	100.236	100.236	3/4" Pipe NW of logger
Bench Mark 2:			1.183	100.001	100.000	3/4" Pipe W of logger
Bench Mark 3:	1.047	101.184		100.137	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			2.303	98.881		
Other:						

Closing Error	-0.001	Average WL	98.881
WL Check	0.001	Transducer Elevation	98.325

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	13-Aug-12
<b>Data Entry Personnel:</b>	CJ (Field)	<b>Date:</b>	13-Aug-12
<b>Data Check Personnel:</b>	CJ (Field)	<b>Date:</b>	2-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S10A - Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: September 18, 2012



## Flow Measurement:

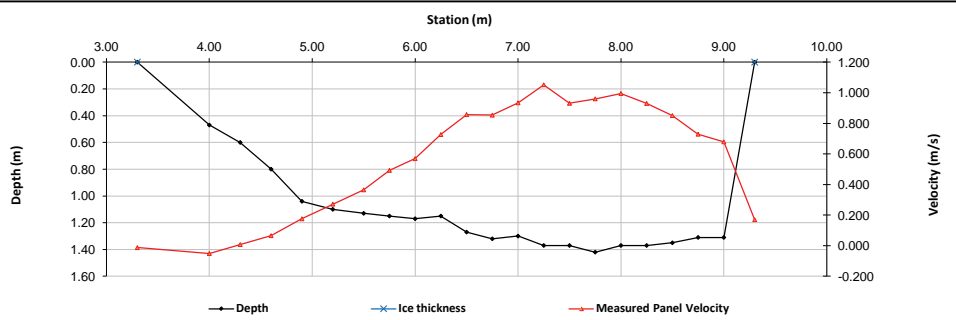
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	3.30	0.00	0.00	0.000	0.000	0.000	1.0	3.30	3.65	0.35	0.12	-0.013	-0.013	0.04	-0.001	0%
1	4.00	0.47		-0.051			1.0	3.65	4.15	0.50	0.47	-0.051	-0.051	0.24	-0.012	0%
2	4.30	0.60		0.007			1.0	4.15	4.45	0.30	0.60	0.007	0.007	0.18	0.001	0%
3	4.60	0.80			0.049	0.082	1.0	4.45	4.75	0.30	0.80	0.066	0.066	0.24	0.016	0%
4	4.90	1.04			0.180	0.171	1.0	4.75	5.05	0.30	1.04	0.176	0.176	0.31	0.055	1%
5	5.20	1.10			0.277	0.266	1.0	5.05	5.35	0.30	1.10	0.272	0.272	0.33	0.090	2%
6	5.50	1.13			0.386	0.344	1.0	5.35	5.63	0.28	1.13	0.365	0.365	0.31	0.113	3%
7	5.75	1.15			0.470	0.515	1.0	5.63	5.88	0.25	1.15	0.493	0.493	0.29	0.142	3%
8	6.00	1.17			0.669	0.469	1.0	5.88	6.13	0.25	1.17	0.569	0.569	0.29	0.166	4%
9	6.25	1.15			0.751	0.702	1.0	6.13	6.38	0.25	1.15	0.727	0.727	0.29	0.209	5%
10	6.50	1.27			0.963	0.752	1.0	6.38	6.63	0.25	1.27	0.858	0.858	0.32	0.272	7%
11	6.75	1.32			1.042	0.665	1.0	6.63	6.88	0.25	1.32	0.854	0.854	0.33	0.282	7%
12	7.00	1.30			0.986	0.882	1.0	6.88	7.13	0.25	1.30	0.934	0.934	0.33	0.304	7%
13	7.25	1.37			1.147	0.957	1.0	7.13	7.38	0.25	1.37	1.052	1.052	0.34	0.360	9%
14	7.50	1.37			0.982	0.880	1.0	7.38	7.63	0.25	1.37	0.931	0.931	0.34	0.319	8%
15	7.75	1.42			1.055	0.865	1.0	7.63	7.88	0.25	1.42	0.960	0.960	0.36	0.341	8%
16	8.00	1.37			1.147	0.843	1.0	7.88	8.13	0.25	1.37	0.995	0.995	0.34	0.341	8%
17	8.25	1.37			0.977	0.883	1.0	8.13	8.38	0.25	1.37	0.930	0.930	0.34	0.319	8%
18	8.50	1.35			0.959	0.742	1.0	8.38	8.63	0.25	1.35	0.851	0.851	0.34	0.287	7%
19	8.75	1.31			0.729	0.729	1.0	8.63	8.88	0.25	1.31	0.729	0.729	0.33	0.239	6%
20	9.00	1.31			0.791	0.567	1.0	8.88	9.15	0.28	1.31	0.679	0.679	0.36	0.245	6%
LB	9.30	0.00	0.00	0.00	0.00	0.00	1.0	9.15	9.30	0.15	0.33	0.170	0.170	0.05	0.008	0%

**Total Flow 4.09**

Measurement Details:	
Start Time (MST):	7:30
End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	High water level
Quality/Error (see reverse):	Excellent
Weather:	rain

Flow characteristics:	
Total Flow:	4.09 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	6.29 (m <sup>2</sup> )
Wetted Width:	6.00 (m)
Hydraulic Depth:	1.048 (m)
Mean Velocity:	0.650 (m/s)
Froude Number:	0.203

Logger Details:		
	Before	After
Transducer Reading (m):	1.306	
Water (°C):	10.0	
Battery (Main):	12.9	
Datalogger Clock:	7:42	
Laptop Clock:	7:41	
Dessicant:	OK	
Logger# (if Δ):	-	
PT# (if Δ):	-	



Datalogger / Station Notes:	

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.067	100.236	100.236	3/4" Pipe NW of logger
Bench Mark 2:	1.303	101.303		100.000	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.167	100.136	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			1.607	99.696		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.042	101.278		100.236	100.236	3/4" Pipe NW of logger
Bench Mark 2:			1.278	100.000	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.140	100.138	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			1.584	99.694		
Other:						

Closing Error	0.000	Average WL	99.695
WL Check	0.002	Transducer Elevation	98.389

General Notes:	

<b>Field Personnel:</b>	DW, SG	Trip Date:	18-Sep-12
Data Entry Personnel:	SG (Field)	Date:	18-Sep-12
Data Check Personnel:	CJ	Date:	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek near the Mouth  
 UTM Location: 490350 E, 6355500 N

Site Visit Date:

October 25, 2012



## 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	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	0.25	0.25	0.08	0.056	0.056	0.02	0.001	0%	
1	0.50	0.30		0.225			1.0	0.25	0.63	0.38	0.30	0.225	0.225	0.11	0.025	2%	
2	0.75	0.28		0.589			1.0	0.63	0.88	0.25	0.28	0.589	0.589	0.07	0.041	4%	
3	1.00	0.30		0.698			1.0	0.88	1.13	0.25	0.30	0.698	0.698	0.08	0.052	5%	
4	1.25	0.30		0.659			1.0	1.13	1.38	0.25	0.30	0.659	0.659	0.08	0.049	5%	
5	1.50	0.30		0.636			1.0	1.38	1.63	0.25	0.30	0.636	0.636	0.08	0.048	5%	
6	1.75	0.35		0.678			1.0	1.63	1.88	0.25	0.35	0.678	0.678	0.09	0.059	6%	
7	2.00	0.35		0.731			1.0	1.88	2.13	0.25	0.35	0.731	0.731	0.09	0.064	6%	
8	2.25	0.36		0.736			1.0	2.13	2.38	0.25	0.36	0.736	0.736	0.09	0.066	6%	
9	2.50	0.40		0.767			1.0	2.38	2.63	0.25	0.40	0.767	0.767	0.10	0.077	7%	
10	2.75	0.40		0.735			1.0	2.63	2.88	0.25	0.40	0.735	0.735	0.10	0.074	7%	
11	3.00	0.41		0.686			1.0	2.88	3.10	0.23	0.41	0.686	0.686	0.09	0.063	6%	
12	3.20	0.42		0.683			1.0	3.10	3.30	0.20	0.42	0.683	0.683	0.08	0.057	5%	
13	3.40	0.45		0.664			1.0	3.30	3.50	0.20	0.45	0.664	0.664	0.09	0.060	6%	
14	3.60	0.38		0.607			1.0	3.50	3.70	0.20	0.38	0.607	0.607	0.08	0.046	4%	
15	3.80	0.40		0.537			1.0	3.70	3.90	0.20	0.40	0.537	0.537	0.08	0.043	4%	
16	4.00	0.36		0.520			1.0	3.90	4.10	0.20	0.36	0.520	0.520	0.07	0.037	4%	
17	4.20	0.35		0.557			1.0	4.10	4.30	0.20	0.35	0.557	0.557	0.07	0.039	4%	
18	4.40	0.36		0.523			1.0	4.30	4.50	0.20	0.36	0.523	0.523	0.07	0.038	4%	
19	4.60	0.38		0.539			1.0	4.50	4.70	0.20	0.38	0.539	0.539	0.08	0.041	4%	
20	4.80	0.36		0.505			1.0	4.70	5.05	0.35	0.36	0.505	0.505	0.13	0.064	6%	
RB	5.30	0.00	0.00	0.00	0.00	0.00	1.0	5.05	5.30	0.25	0.09	0.126	0.126	0.02	0.003	0%	
<b>Total Flow</b>															<b>1.05</b>		

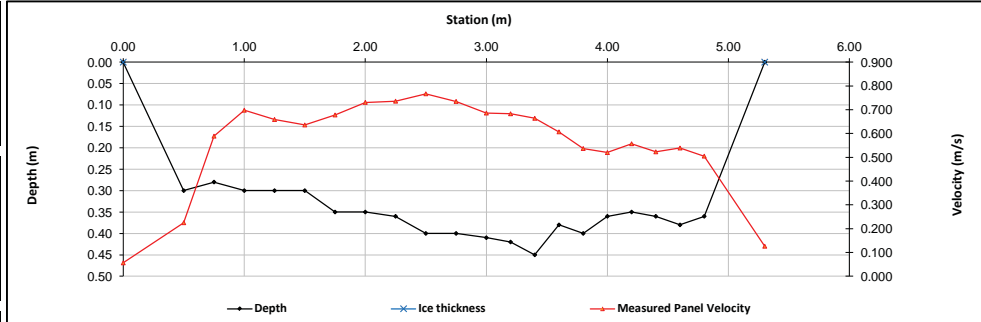
Measurement Details:	
Start Time (MST):	10:20
End Time (MST):	11:40
Equipment:	ADV
Method:	Wading
River Condition:	NORMAL
Quality/Error (see reverse):	Excellent
Weather:	OVERCAST, -3C

Flow characteristics:		
Total Flow:	1.05	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.75	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.331	(m)
Mean Velocity:	0.599	(m/s)
Froude Number:	0.333	

Logger Details:		
	Before	After
Transducer Reading (m):	0.763	
Water (°C):	0.3	
Battery (Main):	14.1	
Datalogger Clock:	10:30	
Laptop Clock:	10:30	
Dessicant:	REPLACED	
Logger# (if Δ):	17935	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:	
ADDED BM TAGS TSS @ 3.156 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.955	100.237	100.236	3/4" Pipe NW of logger
Bench Mark 2:	1.192	101.192		100.000	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.055	100.137	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			2.051	99.141		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.944	100.237	100.236	3/4" Pipe NW of logger
Bench Mark 2:	1.181	101.181		100.000	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.045	100.136	100.136	3/4" Pipe N of logger
Ice/PT:						
Water Level:			2.043	99.138		
Other:						

Closing Error	0.000	Average WL	99.140
WL Check	0.003	Transducer Elevation	98.377

<b>Field Personnel:</b>	DW, TR	Trip Date:	25-Oct-12
<b>Data Entry Personnel:</b>	DW, TR	Date:	25-Oct-12
<b>Data Check Personnel:</b>	CJ	Date:	7-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S10A - Wapasu Creek near the Mouth

UTM Location: 490350 E, 6355500 N

Site Visit Date:

December 14, 2012



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	0.45	0.00	0.00	0.000	0.000	0.000	0.9	0.45	0.68	0.23	0.11	-0.002	-0.002	0.02	0.000	0%			
1	0.90	0.55	0.13	-0.008			0.9	0.68	1.03	0.35	0.42	-0.008	-0.007	0.15	-0.001	-1%			
2	1.15	0.70	0.15	0.017			0.9	1.03	1.28	0.25	0.55	0.017	0.015	0.14	0.002	1%			
3	1.40	0.60	0.15	0.001			0.9	1.28	1.55	0.28	0.45	0.001	0.001	0.12	0.000	0%			
4	1.70	0.75	0.17	0.026			0.9	1.55	1.88	0.33	0.58	0.026	0.023	0.19	0.004	3%			
5	2.05	0.65	0.20	0.015			0.9	1.88	2.18	0.30	0.45	0.015	0.014	0.14	0.002	1%			
6	2.30	0.87	0.25	0.047			0.9	2.18	2.38	0.20	0.62	0.047	0.042	0.12	0.005	3%			
7	2.45	0.85	0.25	0.066			0.9	2.38	2.55	0.18	0.60	0.066	0.059	0.11	0.006	4%			
8	2.65	0.88	0.25	0.048			0.9	2.55	2.73	0.18	0.63	0.048	0.043	0.11	0.005	3%			
9	2.80	0.85	0.25	0.085			0.9	2.73	2.90	0.18	0.60	0.085	0.077	0.11	0.008	5%			
10	3.00	0.90	0.25	0.118			0.9	2.90	3.08	0.18	0.65	0.118	0.106	0.11	0.012	8%			
11	3.15	0.90	0.25	0.133			0.9	3.08	3.25	0.18	0.65	0.133	0.120	0.11	0.014	9%			
12	3.35	0.90	0.25	0.179			0.9	3.25	3.43	0.18	0.65	0.179	0.161	0.11	0.018	12%			
13	3.50	0.90	0.15	0.172			0.9	3.43	3.60	0.18	0.75	0.172	0.155	0.13	0.020	13%			
14	3.70	0.70	0.20	0.171			0.9	3.60	3.75	0.15	0.50	0.171	0.154	0.07	0.012	8%			
15	3.80	0.70	0.25	0.152			0.9	3.75	3.90	0.15	0.45	0.152	0.137	0.07	0.009	6%			
16	4.00	0.70	0.25	0.132			0.9	3.90	4.08	0.18	0.45	0.132	0.119	0.08	0.009	6%			
17	4.15	0.70	0.25	0.102			0.9	4.08	4.25	0.18	0.45	0.102	0.092	0.08	0.007	5%			
18	4.35	0.85	0.25	0.072			0.9	4.25	4.45	0.20	0.60	0.072	0.065	0.12	0.008	5%			
19	4.55	0.80	0.25	0.060			0.9	4.45	4.78	0.33	0.55	0.060	0.054	0.18	0.010	6%			
20	5.00	0.65	0.15	0.003			0.9	4.78	5.18	0.40	0.50	0.003	0.003	0.20	0.001	0%			
LB	5.35	0.00	0.00	0.00	0.00	0.00	1.0	5.18	5.35	0.18	0.13	0.001	0.001	0.02	0.000	0%			

**Total Flow 0.151**

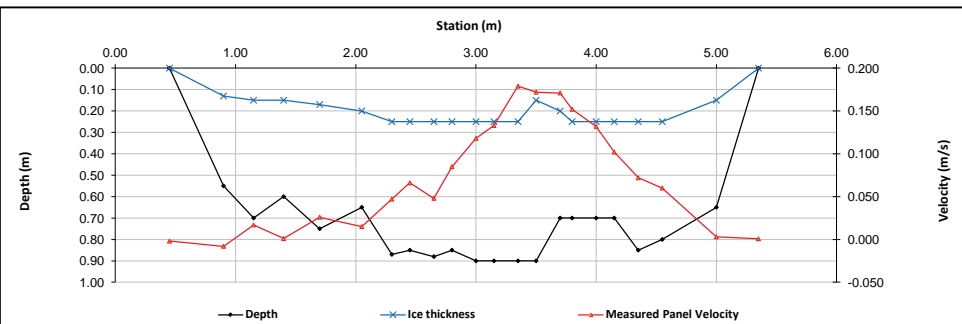
Measurement Details:	
Start Time (MST):	9:10
End Time (MST):	10:25
Equipment:	ADV
Method:	Ice
River Condition:	frozen
Quality/Error (see reverse):	Good
Weather:	scattered clouds, calm, -10

Flow characteristics:		
Total Flow:	0.151	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.49	(m <sup>2</sup> )
Wetted Width:	4.90	(m)
Hydraulic Depth:	0.509	(m)
Mean Velocity:	0.061	(m/s)
Froude Number:	0.027	

Logger Details:		
	Before	After
Transducer Reading (m):	0.514	0.526
Water (°C):	0.0	0
Battery (Main):	12.3	12.9
Datalogger Clock:	9:14	9:26
Laptop Clock:	9:14	9:26
Dessicant:	Good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**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>						
Bench Mark 1:	1.023	101.259		100.236	100.236	3/4" Pipe NW of logger
Bench Mark 2:			1.258	100.001	100.000	3/4" Pipe W of logger
Bench Mark 3:			1.121	100.138	100.136	3/4" Pipe N of logger
Ice/PT:			2.345	98.914		
Water Level:			2.346	98.913		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.007	100.237	100.236	3/4" Pipe NW of logger
Bench Mark 2:			1.243	100.001	100.000	3/4" Pipe W of logger
Bench Mark 3:	1.106	101.244		100.138	100.136	3/4" Pipe N of logger
Ice/PT:			2.329	98.915		
Water Level:			2.333	98.911		
Other:						

Closing Error	-0.001	Average WL	98.912
WL Check	0.002	Transducer Elevation	98.398

**General Notes:**

RAN ADV test, ALL GOOD

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	14-Dec-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	14-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	2-Jan-13
<b>Entered Digitally in the Field:</b>	<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: January 17, 2012



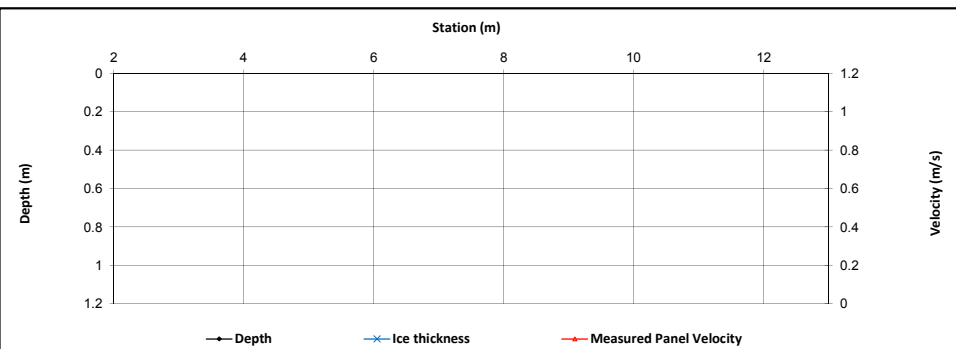
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow</b>																

Measurement Details:	
Start Time (MST):	8:40
End Time (MST):	9:00
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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:	

Datalogger Details:	Before	After
Transducer Reading (m):		
Water (°C):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Drilled 3 holes and found no flow  
 No flow measurement or water level survey performed

Field Personnel:	SM, GB, TR	Trip Date:	17-Jan-12
Data Entry Personnel:	CJ	Date:	9-Feb-12
Data Check Personnel:	CJ	Date:	20-Feb-12

# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: February 7, 2012



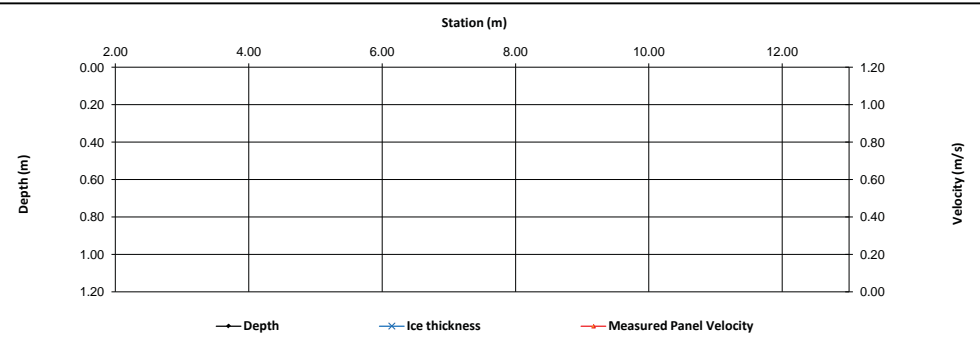
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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																
12																
13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow</b>																

Measurement Details:	
Start Time (MST):	7:55
End Time (MST):	8:15
Equipment:	-
Method:	-
River Condition:	full ice cover
Quality/Error (see reverse):	-
Weather:	clear, calm, -20 deg.

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:	

Datalogger Details:	Before	After
Transducer Reading (m):		
Water (°C):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Drilled 3 holes and found no flow.  
 No flow measurement or water level survey performed.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	7-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	28-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: February 29, 2012



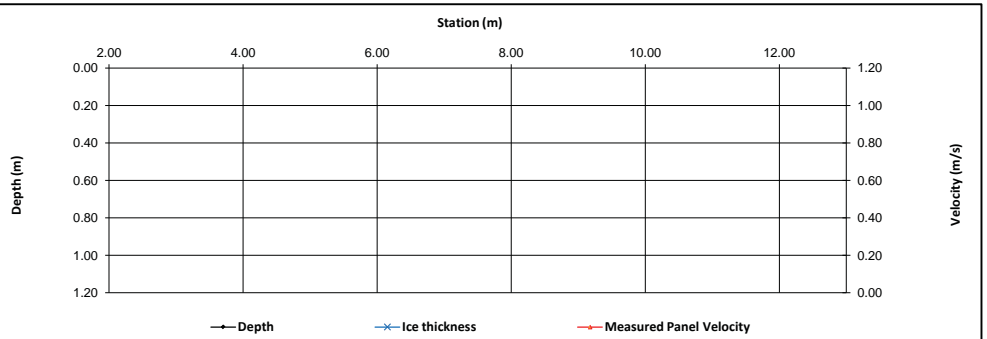
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
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9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

No Flow Measurement Conducted

Total Flow

Measurement Details:	
Start Time (MST):	8:15
End Time (MST):	8:35
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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:	



Datalogger Details:		
	Before	After
Transducer Reading (m):		
Water (°C):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	1.473	243.568		242.095	242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.450	241.118		
Water Level:			2.800	240.768		
Other:			1.232	242.336		Rebar with Orange Flagging
Setup #2						
Bench Mark 1:			1.463	242.095	242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.440	241.118		
Water Level:			2.790	240.768		
Other:	1.222	243.558		242.336		Rebar with Orange Flagging

Closing Error	0.000	Average WL	240.768
WL Check	0.000	Transducer Elevation	

**Datalogger / Station Notes:**

**General Notes:**  
 Drilled 3 holes, found water but no measurable flow.

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	29-Feb-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	26-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: March 27, 2012

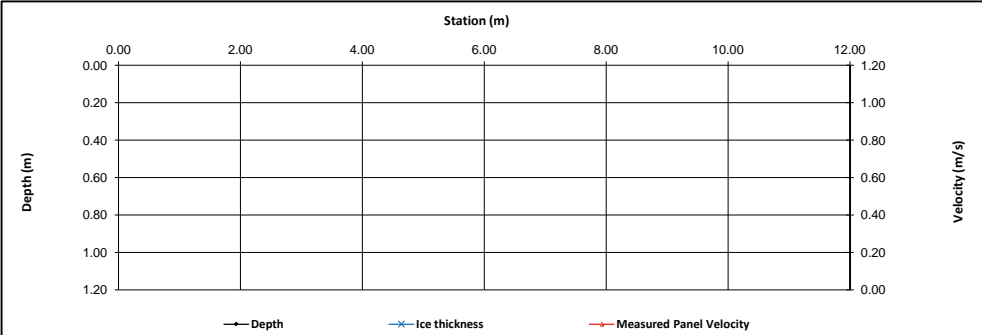


Measured Data				Calculated Data												
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow</b>																

Measurement Details:	
Start Time (MST):	2:30
End Time (MST):	2:55
Equipment:	-
Method:	-
River Condition:	water flowing over ice
Quality/Error (see reverse):	-
Weather:	sunny, calm

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):		
Water (°C):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		



**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						Rebar with Orange Flagging

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**  
 Small amounts of water flowing over the ice  
 3 holes were augered with no water underneath

Field Personnel:	DW, BL	Trip Date:	27-Mar-12
Data Entry Personnel:	CJ	Date:	12-Apr-12
Data Check Personnel:	XP	Date:	1-May-12



# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: April 22, 2012



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	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.63	0.13	0.05	0.029	0.029	0.01	0.000	0%
1	0.75	0.19		0.114			1.0	0.63	1.00	0.38	0.19	0.114	0.114	0.07	0.008	1%
2	1.25	0.34		0.118			1.0	1.00	1.38	0.38	0.34	0.118	0.118	0.13	0.015	2%
3	1.50	0.39		0.401			1.0	1.38	1.63	0.25	0.39	0.401	0.401	0.10	0.039	5%
4	1.75	0.41		0.463			1.0	1.63	1.88	0.25	0.41	0.463	0.463	0.10	0.047	6%
5	2.00	0.41		0.507			1.0	1.88	2.13	0.25	0.41	0.507	0.507	0.10	0.052	7%
6	2.25	0.41		0.399			1.0	2.13	2.38	0.25	0.41	0.389	0.389	0.10	0.040	5%
7	2.50	0.41		0.328			1.0	2.38	2.63	0.25	0.41	0.328	0.328	0.10	0.034	5%
8	2.75	0.40		0.386			1.0	2.63	2.88	0.25	0.40	0.386	0.386	0.10	0.039	5%
9	3.00	0.37		0.450			1.0	2.88	3.13	0.25	0.37	0.450	0.450	0.09	0.042	6%
10	3.25	0.35		0.542			1.0	3.13	3.38	0.25	0.35	0.542	0.542	0.09	0.047	6%
11	3.50	0.36		0.532			1.0	3.38	3.63	0.25	0.36	0.532	0.532	0.09	0.048	7%
12	3.75	0.34		0.625			1.0	3.63	3.88	0.25	0.34	0.625	0.625	0.09	0.053	7%
13	4.00	0.36		0.532			1.0	3.88	4.13	0.25	0.36	0.532	0.532	0.09	0.048	7%
14	4.25	0.24		0.771			1.0	4.13	4.38	0.25	0.24	0.771	0.771	0.06	0.046	6%
15	4.50	0.30		0.804			1.0	4.38	4.63	0.25	0.30	0.804	0.804	0.08	0.060	8%
16	4.75	0.30		0.698			1.0	4.63	4.88	0.25	0.30	0.698	0.698	0.08	0.052	7%
17	5.00	0.34		0.115			1.0	4.88	5.13	0.25	0.34	0.115	0.115	0.09	0.010	1%
18	5.25	0.34		0.185			1.0	5.13	5.38	0.25	0.34	0.185	0.185	0.09	0.016	2%
19	5.50	0.13		0.477			1.0	5.38	5.63	0.25	0.13	0.477	0.477	0.03	0.016	2%
20	5.75	0.22		0.370			1.0	5.63	5.88	0.25	0.22	0.370	0.370	0.06	0.020	3%
LB	6.00	0.00	0.00	0.000	0.000	0.000	1.0	5.88	6.00	0.13	0.06	0.093	0.093	0.01	0.001	0%

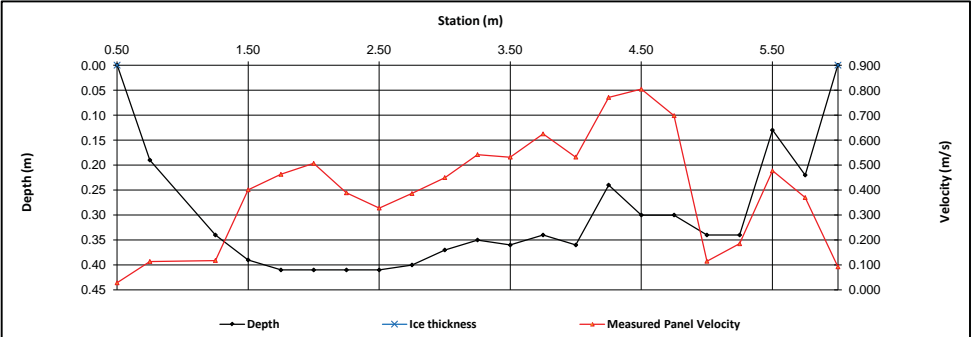
**Total Flow 0.733**

Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	16:15
Equipment:	ADV
Method:	Wading
River Condition:	open, medium
Quality/Error (see reverse):	excellent
Weather:	clear, +15

Flow characteristics:		
Total Flow:	0.733	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	1.73	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.315	(m)
Mean Velocity:	0.423	(m/s)
Froude Number:	0.241	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	replaced	-
Logger# (if Δ):	18260	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 Installed logger but PT could not be installed due to ice conditions in stilling well, 30 m PT is recommended.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.285	243.380		242.095	242.095	ASCN Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.431	240.949		
Other:			1.044	242.336		Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			1.269	242.094	242.095	ASCN Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.416	240.947		
Other:	1.027	243.363		242.336		Rebar with Orange Flagging

Closing Error	0.001	Average WL	240.948
WL Check	0.002	Transducer Elevation	

**General Notes:**  
 Stilling well remains frozen  
 TSS sampled near LB

Field Personnel:	TR, SG	Trip Date:	22-Apr-12
Data Entry Personnel:	CJ	Date:	30-Apr-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: May 22, 2012



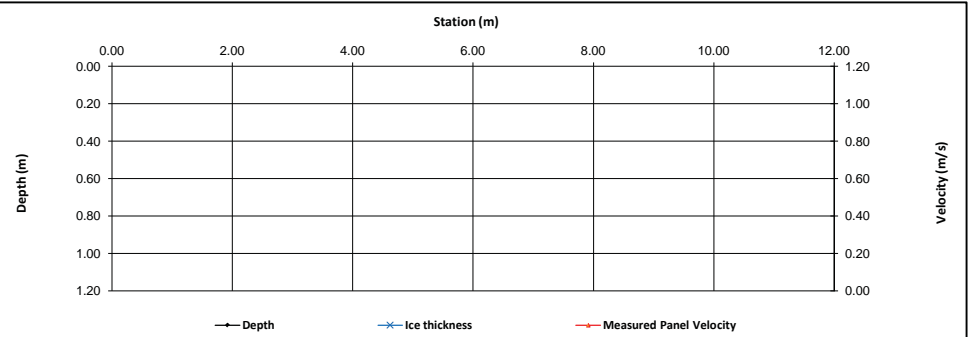
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
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																
No Flow Measurement Conducted																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	9:15
End Time (MST):	10:10
Equipment:	N/A
Method:	
River Condition:	Open
Quality/Error (see reverse):	N/A
Weather:	partly cloudy

Flow characteristics:		
Total Flow:		(m <sup>3</sup> /s)
Perceived Measurement Quality:	N/A	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number:		

Logger Details:		
	Before	After
Transducer Reading (m):	0.544	0.389
Water (°C):	5.1	11.6
Battery (Main):	12.9	12.9
Datalogger Clock:	8:34	8:57
Laptop Clock:	8:34	8:57
Dessicant:	new	-
Logger# (if Δ):	18206	-
PT# (if Δ):	252793	-

**Datalogger / Station Notes:**  
 Installed PLS/station



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.208	243.303		242.095	242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.343	240.960		
Other:			0.956	242.347		Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			1.197	242.093	242.095	ASCM Pin
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.330	240.960		
Other:	0.943	243.290		242.347		Rebar with Orange Flagging

Closing Error	0.002	Average WL	240.960
WL Check	0.000	Transducer Elevation	240.416

**General Notes:**  
 30 m PLS installed, but 15 m should work  
 Previous 30 m PLS replaced due to faulty readings

<b>Field Personnel:</b>	SM, BL	<b>Trip Date:</b>	22-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S11 - Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: June 26, 2012



## 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
LB	0.90	0.00	0.00	0.000	0.000	0.000	1.0	0.90	1.20	0.30	0.07	0.003	0.003	0.02	0.000	0%
1	1.50	0.26		0.013			1.0	1.20	1.63	0.43	0.26	0.013	0.013	0.11	0.001	0%
2	1.75	0.15		0.006			1.0	1.63	1.88	0.25	0.15	0.006	0.006	0.04	0.000	0%
3	2.00	0.13		0.042			1.0	1.88	2.13	0.25	0.13	0.042	0.042	0.03	0.001	0%
4	2.25	0.29		0.225			1.0	2.13	2.38	0.25	0.29	0.225	0.225	0.07	0.016	4%
5	2.50	0.33		0.406			1.0	2.38	2.63	0.25	0.33	0.406	0.406	0.08	0.033	8%
6	2.75	0.28		0.546			1.0	2.63	2.80	0.18	0.28	0.546	0.546	0.05	0.027	7%
7	2.85	0.25		0.579			1.0	2.80	2.93	0.13	0.25	0.579	0.579	0.03	0.018	4%
8	3.00	0.40		0.430			1.0	2.93	3.05	0.13	0.40	0.430	0.430	0.05	0.022	5%
9	3.10	0.38		0.428			1.0	3.05	3.18	0.13	0.38	0.428	0.428	0.05	0.019	5%
10	3.25	0.37		0.440			1.0	3.18	3.38	0.20	0.37	0.440	0.440	0.07	0.033	8%
11	3.50	0.34		0.287			1.0	3.38	3.63	0.25	0.34	0.287	0.287	0.09	0.024	6%
12	3.75	0.38		0.302			1.0	3.63	3.88	0.25	0.38	0.302	0.302	0.10	0.029	7%
13	4.00	0.40		0.289			1.0	3.88	4.13	0.25	0.40	0.289	0.289	0.10	0.029	7%
14	4.25	0.38		0.198			1.0	4.13	4.38	0.25	0.38	0.198	0.198	0.10	0.019	5%
15	4.50	0.40		0.168			1.0	4.38	4.63	0.25	0.40	0.168	0.168	0.10	0.017	4%
16	4.75	0.41		0.338			1.0	4.63	4.88	0.25	0.41	0.338	0.338	0.10	0.035	9%
17	5.00	0.46		0.479			1.0	4.88	5.13	0.25	0.46	0.479	0.479	0.12	0.055	14%
18	5.25	0.38		0.295			1.0	5.13	5.38	0.25	0.38	0.295	0.295	0.10	0.028	7%
19	5.50	0.38		0.063			1.0	5.38	5.63	0.25	0.38	0.063	0.063	0.09	0.006	1%
20	5.75	0.36		-0.045			1.0	5.63	6.13	0.50	0.36	-0.045	-0.045	0.18	-0.008	-2%
RB	6.50	0.00	0.00	0.000	0.000	0.000	1.0	6.13	6.50	0.38	0.09	-0.011	-0.011	0.03	0.000	0%
<b>Total Flow</b>															<b>0.404</b>	

Measurement Details:	
Start Time (MST):	14:25
End Time (MST):	16:15
Equipment:	ADV
Method:	Wading
River Condition:	good flow
Quality/Error (see reverse):	good
Weather:	sunny, 26 deg.

Flow characteristics:	
Total Flow:	0.404 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	1.70 (m <sup>2</sup> )
Wetted Width:	5.60 (m)
Hydraulic Depth:	0.303 (m)
Mean Velocity:	0.238 (m/s)
Froude Number:	0.138

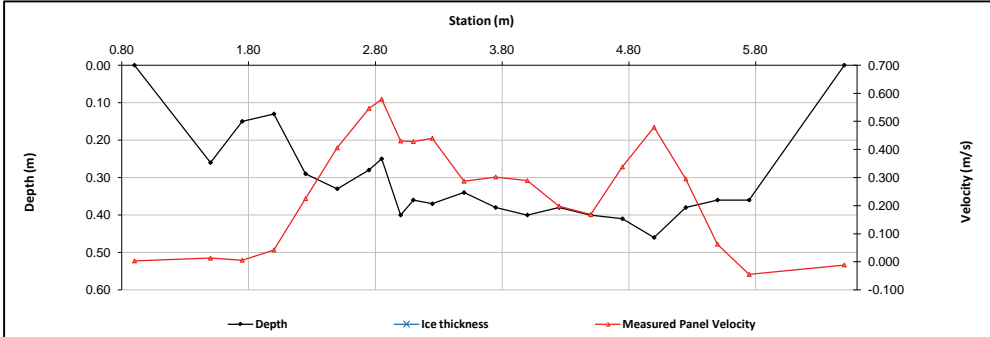
Logger Details:		
	Before	After
Transducer Reading (m):	0.293	
Water (°C):	19.5	
Battery (Main):	12.8	
Datalogger Clock:	13:49	
Laptop Clock:	13:49	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

Changed batteries  
 Installed antenna wiring

**General Notes:**

Heavily weeded from offset 6.5 m- 5.5 m  
 TSS sampled @ 3.5 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCN Pin
Bench Mark 2:			1.041	242.258	242.261	3/4" Pipe near ASCM
Bench Mark 3:						
Ice/PT:						
Water Level:			2.400	240.899		
Other:	0.917	243.299		242.382	242.382	Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:					242.095	ASCN Pin
Bench Mark 2:	1.000	243.258		242.258	242.261	3/4" Pipe near ASCM
Bench Mark 3:						
Ice/PT:						
Water Level:			2.357	240.901		
Other:			0.873	242.385	242.382	Rebar with Orange Flagging

Closing Error	-0.003
WL Check	0.002

Average WL	240.900
Transducer Elevation	240.607

<b>Field Personnel:</b>	TR, RM	<b>Trip Date:</b>	26-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	27-Jun-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	9-Nov-12

# Hydrometric Measurement Field Data Sheet

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: August 12, 2012



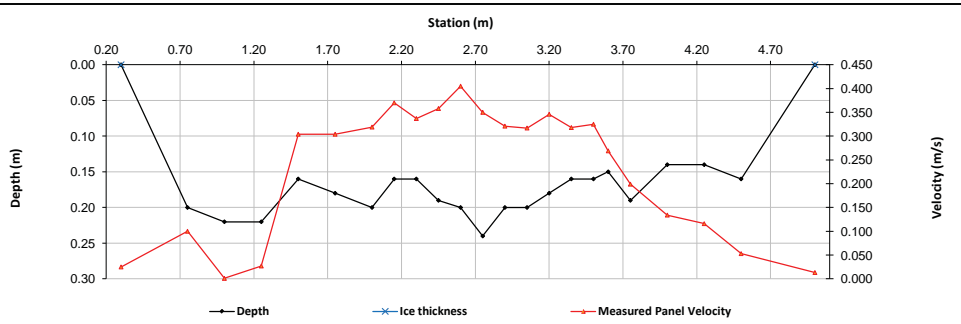
Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	0.53	0.23	0.05	0.025	0.025	0.01	0.000	0%							
1	0.75	0.20		0.100			1.0	0.53	0.88	0.35	0.20	0.100	0.100	0.07	0.007	4%							
2	1.00	0.22		0.001			1.0	0.88	1.13	0.25	0.22	0.001	0.001	0.06	0.000	0%							
3	1.25	0.22		0.027			1.0	1.13	1.38	0.25	0.22	0.027	0.027	0.06	0.001	1%							
4	1.50	0.16		0.304			1.0	1.38	1.63	0.25	0.16	0.304	0.304	0.04	0.012	7%							
5	1.75	0.18		0.304			1.0	1.63	1.88	0.25	0.18	0.304	0.304	0.05	0.014	8%							
6	2.00	0.20		0.319			1.0	1.88	2.08	0.20	0.20	0.319	0.319	0.04	0.013	8%							
7	2.15	0.16		0.370			1.0	2.08	2.23	0.15	0.16	0.370	0.370	0.02	0.009	5%							
8	2.30	0.16		0.337			1.0	2.23	2.38	0.15	0.16	0.337	0.337	0.02	0.008	5%							
9	2.45	0.19		0.358			1.0	2.38	2.53	0.15	0.19	0.358	0.358	0.03	0.010	6%							
10	2.60	0.20		0.405			1.0	2.53	2.68	0.15	0.20	0.405	0.405	0.03	0.012	7%							
11	2.75	0.24		0.350			1.0	2.68	2.83	0.15	0.24	0.350	0.350	0.04	0.013	8%							
12	2.90	0.20		0.321			1.0	2.83	2.98	0.15	0.20	0.321	0.321	0.03	0.010	6%							
13	3.05	0.20		0.317			1.0	2.98	3.13	0.15	0.20	0.317	0.317	0.03	0.010	6%							
14	3.20	0.18		0.346			1.0	3.13	3.28	0.15	0.18	0.346	0.346	0.03	0.009	6%							
15	3.35	0.16		0.318			1.0	3.28	3.43	0.15	0.16	0.318	0.318	0.02	0.008	5%							
16	3.50	0.16		0.325			1.0	3.43	3.55	0.13	0.16	0.325	0.325	0.02	0.007	4%							
17	3.60	0.15		0.269			1.0	3.55	3.68	0.13	0.15	0.269	0.269	0.02	0.005	3%							
18	3.75	0.19		0.199			1.0	3.68	3.88	0.20	0.19	0.199	0.199	0.04	0.008	5%							
19	4.00	0.14		0.134			1.0	3.88	4.13	0.25	0.14	0.134	0.134	0.04	0.005	3%							
20	4.25	0.14		0.116			1.0	4.13	4.38	0.25	0.14	0.116	0.116	0.04	0.004	2%							
21	4.50	0.16		0.053			1.0	4.38	4.75	0.38	0.16	0.053	0.053	0.06	0.003	2%							
LB	5.00	0.00	0.00	0.00	0.00	0.00	1.0	4.75	5.00	0.25	0.04	0.013	0.013	0.01	0.000	0%							
<b>Total Flow</b>														<b>0.167</b>									

Measurement Details:	
Start Time (MST):	18:15
End Time (MST):	19:35
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	clear, 15 deg.

Flow characteristics:	
Total Flow:	0.167 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.79 (m <sup>2</sup> )
Wetted Width:	4.70 (m)
Hydraulic Depth:	0.167 (m)
Mean Velocity:	0.212 (m/s)
Froude Number:	0.166

Logger Details:		
	Before	After
Transducer Reading (m):	0.238	
Water (°C):	18.6	
Battery (Main):	12.7	
Datalogger Clock:	17:34	
Laptop Clock:	17:35	
Dessicant:	Replaced	
Logger# (if Δ):	18206	
PT# (if Δ):	-	

Datalogger / Station Notes:	
1 BM installed	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.303	243.398		242.095	242.095	ASCM Pin
Bench Mark 2:			1.140	242.258	242.261	3/4" Pipe near ASCM
Bench Mark 3:			1.172	242.226	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			2.554	240.844		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			1.275	242.093	242.095	ASCM Pin
Bench Mark 2:			1.110	242.258	242.261	3/4" Pipe near ASCM
Bench Mark 3:	1.142	243.368		242.226	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			2.525	240.843		
Other:						Rebar with Orange Flagging
Closing Error	0.002				Average WL	240.844
WL Check	0.001				Transducer Elevation	240.606

General Notes:	
TSS sampled @ 3 m	

Field Personnel:	TR, CJ	Trip Date:	12-Aug-12
Data Entry Personnel:	TR (Field)	Date:	12-Aug-12
Data Check Personnel:	CJ	Date:	2-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: September 21, 2012



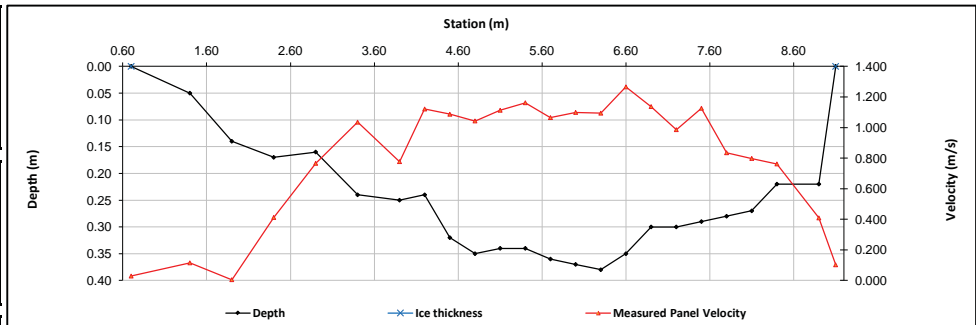
Flow Measurement:							Measured Data										Calculated Data				
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	1.05	0.35	0.01	0.029	0.029	0.00	0.000	0%					
1	1.40	0.05		0.115			1.0	1.05	1.65	0.60	0.05	0.115	0.115	0.03	0.003	0%					
2	1.90	0.14		0.005			1.0	1.65	2.15	0.50	0.14	0.005	0.005	0.07	0.000	0%					
3	2.40	0.17		0.412			1.0	2.15	2.65	0.50	0.17	0.412	0.412	0.09	0.035	2%					
4	2.90	0.16		0.766			1.0	2.65	3.15	0.50	0.16	0.766	0.766	0.08	0.061	3%					
5	3.40	0.24		1.035			1.0	3.15	3.65	0.50	0.24	1.035	1.035	0.12	0.124	7%					
6	3.90	0.25		0.777			1.0	3.65	4.05	0.40	0.25	0.777	0.777	0.10	0.078	4%					
7	4.20	0.24		1.121			1.0	4.05	4.35	0.30	0.24	1.121	1.121	0.07	0.081	4%					
8	4.50	0.32		1.087			1.0	4.35	4.65	0.30	0.32	1.087	1.087	0.10	0.104	6%					
9	4.80	0.35		1.043			1.0	4.65	4.95	0.30	0.35	1.043	1.043	0.11	0.110	6%					
10	5.10	0.34		1.113			1.0	4.95	5.25	0.30	0.34	1.113	1.113	0.10	0.114	6%					
11	5.40	0.34		1.162			1.0	5.25	5.55	0.30	0.34	1.162	1.162	0.10	0.119	6%					
12	5.70	0.36		1.065			1.0	5.55	5.85	0.30	0.36	1.065	1.065	0.11	0.115	6%					
13	6.00	0.37		1.099			1.0	5.85	6.15	0.30	0.37	1.099	1.099	0.11	0.122	7%					
14	6.30	0.38		1.094			1.0	6.15	6.45	0.30	0.38	1.094	1.094	0.11	0.125	7%					
15	6.60	0.35		1.266			1.0	6.45	6.75	0.30	0.35	1.266	1.266	0.11	0.133	7%					
16	6.90	0.30		1.137			1.0	6.75	7.05	0.30	0.30	1.137	1.137	0.09	0.102	6%					
17	7.20	0.30		0.986			1.0	7.05	7.35	0.30	0.30	0.986	0.986	0.09	0.089	5%					
18	7.50	0.29		1.126			1.0	7.35	7.65	0.30	0.29	1.126	1.126	0.09	0.098	5%					
19	7.80	0.28		0.835			1.0	7.65	7.95	0.30	0.28	0.835	0.835	0.08	0.070	4%					
20	8.10	0.27		0.798			1.0	7.95	8.25	0.30	0.27	0.798	0.798	0.08	0.065	3%					
21	8.40	0.22		0.762			1.0	8.25	8.65	0.40	0.22	0.762	0.762	0.09	0.067	4%					
22	8.90	0.22		0.409			1.0	8.65	9.00	0.35	0.22	0.409	0.409	0.08	0.031	2%					
LB	9.10	0.00	0.00	0.00	0.00	0.00	1.0	9.00	9.10	0.10	0.06	0.102	0.102	0.01	0.001	0%					
<b>Total Flow</b>															<b>1.85</b>						

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	17:05
Equipment:	ADV
Method:	Wading
River Condition:	FAST
Quality/Error (see reverse):	Excellent
Weather:	Clear, 20 deg.

Flow Characteristics:	
Total Flow:	1.85 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	2.01 (m <sup>2</sup> )
Wetted Width:	8.40 (m)
Hydraulic Depth:	0.239 (m)
Mean Velocity:	0.922 (m/s)
Froude Number:	0.602

Logger Details:		
	Before	After
Transducer Reading (m):	0.429	0.428
Water (°C):	12.6	12.6
Battery (Main):	12.1	12.47
Datalogger Clock:	15:58	-
Laptop Clock:	15:58	-
Dessicant:	Replaced	-
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 Changed out batteries



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.666	242.761		242.095	242.095	ASCM Pin
Bench Mark 2:			0.500	242.261	242.261	3/4" Pipe near ASCM
Bench Mark 3:			0.533	242.228	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			1.705	241.056		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			0.652	242.097	242.095	ASCM Pin
Bench Mark 2:			0.487	242.262	242.261	3/4" Pipe near ASCM
Bench Mark 3:	0.521	242.749		242.228	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:						
Water Level:			1.693	241.056		
Other:						Rebar with Orange Flagging

Closing Error	-0.002	Average WL	241.056
WL Check	0.000	Transducer Elevation	240.627

**General Notes:**  
 Measurement quality: good; some vegetation in stream bed, substrate is mostly cobble and uneven  
 TSS sampled @ 5 m

<b>Field Personnel:</b>	TR AND SM (Field)	Trip Date:	21-Sep-12
<b>Data Entry Personnel:</b>	TR AND SM (Field)	Date:	21-Sep-12
<b>Data Check Personnel:</b>	CJ	Date:	9-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: November 1, 2012



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	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	1.0	4.00	4.25	0.25	0.06	0.136	0.136	0.02	0.002	0%
1	4.50	0.24		0.545			1.0	4.25	4.75	0.50	0.24	0.545	0.545	0.12	0.065	4%
2	5.00	0.25		0.486			1.0	4.75	5.25	0.50	0.25	0.486	0.486	0.13	0.061	4%
3	5.50	0.22		0.228			1.0	5.25	5.75	0.50	0.22	0.228	0.228	0.11	0.025	2%
4	6.00	0.20		0.594			1.0	5.75	6.25	0.50	0.20	0.594	0.594	0.10	0.059	4%
5	6.50	0.30		0.695			1.0	6.25	6.75	0.50	0.30	0.695	0.695	0.15	0.104	6%
6	7.00	0.32		0.607			1.0	6.75	7.25	0.50	0.32	0.607	0.607	0.16	0.097	6%
7	7.50	0.26		1.047			1.0	7.25	7.63	0.38	0.26	1.047	1.047	0.10	0.102	6%
8	7.75	0.30		0.901			1.0	7.63	7.88	0.25	0.30	0.901	0.901	0.08	0.068	4%
9	8.00	0.28		1.133			1.0	7.88	8.13	0.25	0.28	1.133	1.133	0.07	0.079	5%
10	8.25	0.30		1.097			1.0	8.13	8.38	0.25	0.30	1.097	1.097	0.08	0.082	5%
11	8.50	0.35		0.874			1.0	8.38	8.75	0.38	0.35	0.874	0.874	0.13	0.115	7%
12	9.00	0.30		1.002			1.0	8.75	9.25	0.50	0.30	1.002	1.002	0.15	0.150	9%
13	9.50	0.25		0.805			1.0	9.25	9.75	0.50	0.25	0.805	0.805	0.13	0.101	6%
14	10.00	0.29		0.851			1.0	9.75	10.25	0.50	0.29	0.851	0.851	0.15	0.123	8%
15	10.50	0.29		0.413			1.0	10.25	10.75	0.50	0.29	0.413	0.413	0.15	0.060	4%
16	11.00	0.20		0.859			1.0	10.75	11.25	0.50	0.20	0.859	0.859	0.10	0.086	5%
17	11.50	0.24		0.661			1.0	11.25	11.75	0.50	0.24	0.661	0.661	0.12	0.079	5%
18	12.00	0.22		0.564			1.0	11.75	12.25	0.50	0.22	0.564	0.564	0.11	0.062	4%
19	12.50	0.23		0.208			1.0	12.25	12.75	0.50	0.23	0.208	0.208	0.12	0.024	1%
20	13.00	0.18		0.696			1.0	12.75	13.25	0.50	0.18	0.696	0.696	0.09	0.063	4%
21	13.50	0.13		0.191			1.0	13.25	14.05	0.80	0.13	0.191	0.191	0.10	0.020	1%
22	14.60	0.15		0.066			1.0	14.05	15.45	1.40	0.15	0.066	0.066	0.21	0.014	1%
RB	16.30	0.00	0.00	0.000	0.000	0.000	1.0	15.45	16.30	0.85	0.04	0.017	0.017	0.03	0.001	0%
<b>Total Flow</b>															<b>1.64</b>	

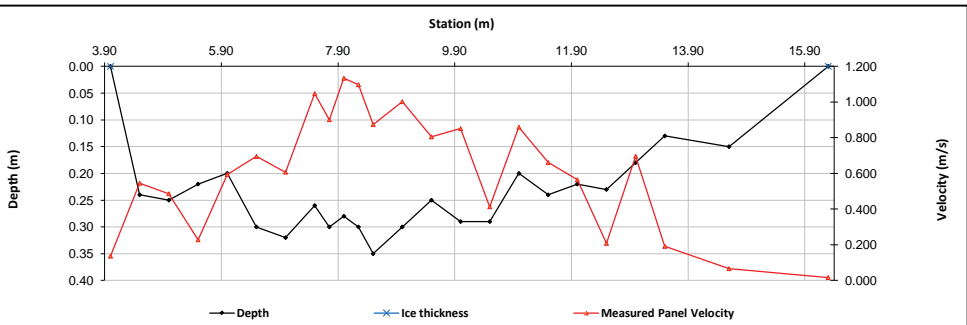
Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	snowing, -9 deg.

Flow characteristics:	
Total Flow:	1.64 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.67 (m <sup>2</sup> )
Wetted Width:	12.30 (m)
Hydraulic Depth:	0.217 (m)
Mean Velocity:	0.613 (m/s)
Froude Number:	0.420

Logger Details:		
	Before	After
Transducer Reading (m):	0.430	-
Water (°C):	0.9	-
Battery (Main):	12.3	12.86
Datalogger Clock:	9:20	-
Laptop Clock:	9:20	-
Dessicant:	good	-
Logger# (if Δ):	18206	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
Replaced batteries	

General Notes:	
Some flow moving through grass along RB TSS sampled @ 8.0 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.075	243.170		242.095	242.095	ASCN Pin
Bench Mark 2:			0.912	242.258	242.261	3/4" Pipe near ASCN
Bench Mark 3:			0.944	242.226	242.228	3/4" Pipe 20 m E of ASCN
Ice/PT:						
Water Level:			2.124	241.046		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			1.064	242.094	242.095	ASCN Pin
Bench Mark 2:			0.900	242.258	242.261	3/4" Pipe near ASCN
Bench Mark 3:	0.932	243.158		242.226	242.228	3/4" Pipe 20 m E of ASCN
Ice/PT:						
Water Level:			2.113	241.045		
Other:						Rebar with Orange Flagging

Closing Error	0.001	Average WL	241.046
WL Check	0.001	Transducer Elevation	240.616

Field Personnel:	SM & TR	Trip Date:	1-Nov-12
Data Entry Personnel:	SM	Date:	1-Nov-12
Data Check Personnel:	TR	Date:	8-Nov-12
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:

November 29, 2012



## 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	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	0.90	0.00	0.00	0.000	0.000	0.000	0.9	0.90	1.95	1.05	0.03	0.106	0.095	0.03	0.002	0%
1	3.00	0.25	0.15	0.423			0.9	1.95	3.30	1.35	0.10	0.423	0.381	0.14	0.051	7%
2	3.60	0.46	0.10	0.449			0.9	3.30	3.95	0.65	0.36	0.449	0.404	0.23	0.095	13%
3	4.30	0.48	0.05	0.434			0.9	3.95	4.65	0.70	0.43	0.434	0.391	0.30	0.118	16%
4	5.00	0.55	0.10	0.340			0.9	4.65	5.35	0.70	0.45	0.340	0.306	0.32	0.096	13%
5	5.70	0.64	0.12	0.319			0.9	5.35	6.10	0.75	0.52	0.319	0.287	0.39	0.112	15%
6	6.50	0.66	0.14	-0.001			0.9	6.10	6.80	0.70	0.52	-0.001	-0.001	0.36	0.000	0%
7	7.10	0.70	0.40	0.000			1.0	6.80	7.40	0.60	0.30	0.000	0.000	0.18	0.000	0%
8	7.70	0.58	0.15	0.003			0.9	7.40	8.00	0.60	0.43	0.003	0.003	0.26	0.001	0%
9	8.30	0.60	0.20	0.001			0.9	8.00	8.65	0.65	0.40	0.001	0.001	0.26	0.000	0%
10	9.00	0.60	0.15	-0.003			0.9	8.65	9.30	0.65	0.45	-0.003	-0.003	0.29	-0.001	0%
11	9.60	0.61	0.15	0.005			0.9	9.30	9.90	0.60	0.46	0.005	0.005	0.28	0.001	0%
12	10.20	0.70	0.14	0.001			0.9	9.90	10.50	0.60	0.56	0.001	0.001	0.34	0.000	0%
13	10.80	0.65	0.15	0.007			0.9	10.50	11.05	0.55	0.50	0.007	0.006	0.28	0.002	0%
14	11.30	0.60	0.16	-0.005			0.9	11.05	11.60	0.55	0.44	-0.005	-0.005	0.24	-0.001	0%
15	11.90	0.65	0.16	-0.003			0.9	11.60	12.15	0.55	0.49	-0.003	-0.003	0.27	-0.001	0%
16	12.40	0.55	0.25	0.000			1.0	12.15	12.95	0.80	0.30	0.000	0.000	0.24	0.000	0%
17	13.50	0.65	0.30	0.345			0.9	12.95	13.80	0.85	0.35	0.345	0.311	0.30	0.092	13%
18	14.10	0.70	0.35	0.267			0.9	13.80	13.50	0.30	0.35	0.267	0.240	0.11	0.025	3%
19	12.90	0.60	0.25	0.189			0.9	13.50	13.80	0.30	0.35	0.189	0.170	0.11	0.018	2%
20	14.70	0.70	0.30	0.211			0.9	13.80	15.00	1.20	0.40	0.211	0.190	0.48	0.091	13%
21	15.30	0.70	0.32	0.043			0.9	15.00	16.55	1.55	0.38	0.043	0.039	0.59	0.023	3%
LB	17.80	0.00	0.00	0.00	0.00	0.00	1.0	16.55	17.80	1.25	0.10	0.011	0.011	0.12	0.001	0%
<b>Total Flow</b>														<b>0.726</b>		

## Measurement Details:

Start Time (MST):	8:27
End Time (MST):	10:16
Equipment:	ADV
Method:	Ice
River Condition:	Ice with leads
Quality/Error (see reverse):	Poor
Weather:	overcast, -27 deg

## Flow characteristics:

Total Flow:	0.726	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	6.09	(m <sup>2</sup> )
Wetted Width:	16.90	(m)
Hydraulic Depth:	0.360	(m)
Mean Velocity:	0.119	(m/s)
Froude Number:	0.063	

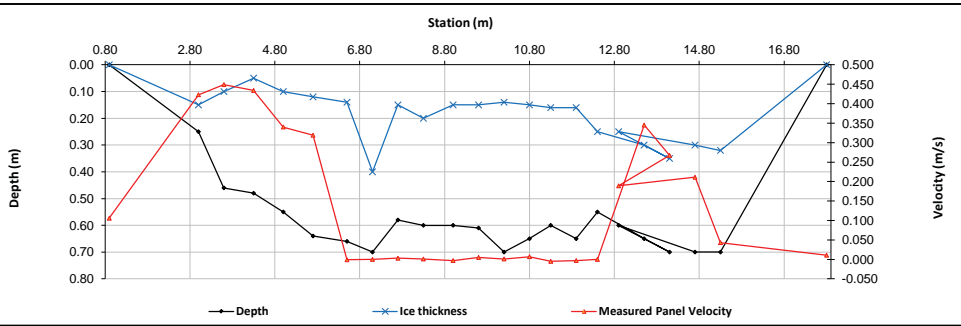
## Logger Details:

	Before	After
Transducer Reading (m):	0.844	
Water (°C):	0.1	
Battery (Main):	12.4	
Datalogger Clock:	8:32	
Laptop Clock:	8:32	
Dessicant:	replaced	
Logger# (if Δ):	18206	
PT# (if Δ):	-	

## Datalogger / Station Notes:

## General Notes:

MMT 6 & 7 are in an eddy  
Two ice layers present



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.199	243.294		242.095	242.095	ASCM Pin
Bench Mark 2:			1.035	242.259	242.261	3/4" Pipe near ASCM
Bench Mark 3:			1.072	242.222	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:			1.815	241.479		
Water Level:			1.826	241.468		
Other:						Rebar with Orange Flagging
<b>Setup #2</b>						
Bench Mark 1:			1.180	242.096	242.095	ASCM Pin
Bench Mark 2:			1.017	242.259	242.261	3/4" Pipe near ASCM
Bench Mark 3:	1.054	243.276		242.222	242.228	3/4" Pipe 20 m E of ASCM
Ice/PT:			1.798	241.478		
Water Level:			1.811	241.465		
Other:						Rebar with Orange Flagging
Closing Error	-0.001				241.467	Average WL
WL Check	0.003				240.623	Transducer Elevation

## Field Personnel:

Data Entry Personnel:	TR AND SM	Trip Date:	29-Nov-12
Data Check Personnel:	TR	Date:	29-Nov-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	18-Dec-12

# Hydrometric Measurement / Site Visit Record

Site: S12 - Fort Creek at Highway 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date:

April 22, 2012



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	0.70	0.00	0.00	0.000	0.000	0.000	1.0	0.70	0.80	0.10	0.02	-0.011	-0.011	0.00	0.000	0%							
1	0.90	0.08		-0.045			1.0	0.80	0.95	0.15	0.08	-0.045	-0.045	0.01	-0.001	-1%							
2	1.00	0.13		0.000			1.0	0.95	1.05	0.10	0.13	0.000	0.000	0.01	0.000	0%							
3	1.10	0.16		0.303			1.0	1.05	1.15	0.10	0.16	0.303	0.303	0.02	0.005	6%							
4	1.20	0.15		0.421			1.0	1.15	1.25	0.10	0.15	0.421	0.421	0.02	0.006	8%							
5	1.30	0.13		0.297			1.0	1.25	1.35	0.10	0.13	0.297	0.297	0.01	0.004	5%							
6	1.40	0.11		0.353			1.0	1.35	1.45	0.10	0.11	0.353	0.353	0.01	0.004	5%							
7	1.50	0.10		0.293			1.0	1.45	1.55	0.10	0.10	0.293	0.293	0.01	0.003	4%							
8	1.60	0.09		0.134			1.0	1.55	1.65	0.10	0.09	0.134	0.134	0.01	0.001	1%							
9	1.70	0.09		0.187			1.0	1.65	1.75	0.10	0.09	0.187	0.187	0.01	0.002	2%							
10	1.80	0.09		0.293			1.0	1.75	1.85	0.10	0.09	0.293	0.293	0.01	0.003	3%							
11	1.90	0.10		0.399			1.0	1.85	1.95	0.10	0.10	0.399	0.399	0.01	0.004	5%							
12	2.00	0.10		0.168			1.0	1.95	2.05	0.10	0.10	0.168	0.168	0.01	0.002	2%							
13	2.10	0.11		0.157			1.0	2.05	2.15	0.10	0.11	0.157	0.157	0.01	0.002	2%							
14	2.20	0.12		0.195			1.0	2.15	2.25	0.10	0.12	0.195	0.195	0.01	0.002	3%							
15	2.30	0.13		0.386			1.0	2.25	2.35	0.10	0.13	0.386	0.386	0.01	0.005	6%							
16	2.40	0.14		0.126			1.0	2.35	2.45	0.10	0.14	0.126	0.126	0.01	0.002	2%							
17	2.50	0.15		0.356			1.0	2.45	2.55	0.10	0.15	0.356	0.356	0.01	0.005	7%							
18	2.60	0.14		0.450			1.0	2.55	2.65	0.10	0.14	0.450	0.450	0.01	0.006	8%							
19	2.70	0.14		0.511			1.0	2.65	2.75	0.10	0.14	0.511	0.511	0.01	0.007	9%							
20	2.80	0.13		0.354			1.0	2.75	2.85	0.10	0.13	0.354	0.354	0.01	0.005	6%							
21	2.90	0.12		0.368			1.0	2.85	2.95	0.10	0.12	0.368	0.368	0.01	0.004	5%							
22	3.00	0.12		0.261			1.0	2.95	3.05	0.10	0.12	0.261	0.261	0.01	0.003	4%							
23	3.10	0.11		0.384			1.0	3.05	3.15	0.10	0.11	0.384	0.384	0.01	0.004	5%							
24	3.20	0.05		0.420			1.0	3.15	3.25	0.10	0.05	0.420	0.420	0.00	0.002	3%							
LB	3.30	0.00	0.00	0.00	0.00	0.00	1.0	3.25	3.30	0.05	0.01	0.105	0.105	0.00	0.000	0%							

**Total Flow 0.081**

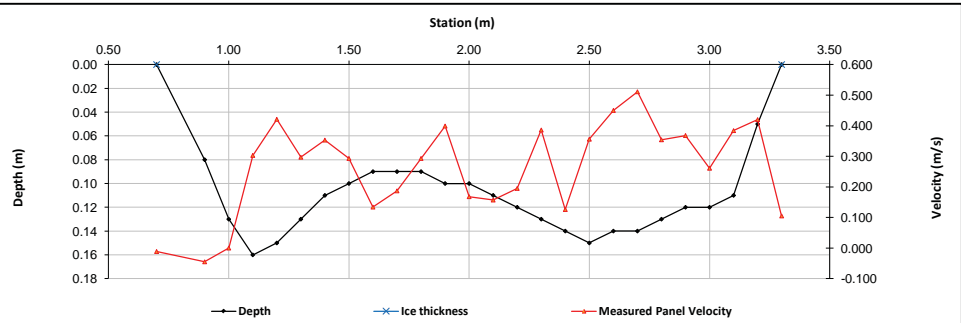
Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	12:45
Equipment:	ADV
Method:	Wading
River Condition:	open, no ice
Quality/Error (see reverse):	excellent
Weather:	sunny, +15

Flow characteristics:		
Total Flow:	0.0807	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	0.29	(m <sup>2</sup> )
Wetted Width:	2.60	(m)
Hydraulic Depth:	0.110	(m)
Mean Velocity:	0.283	(m/s)
Froude Number:	0.272	

Logger Details:		
Transducer Reading (m):	0.167	-
Water (°C):	4.5	-
Battery (Main):	13.3	-
Datalogger Clock:	12:36	-
Laptop Clock:	12:36	-
Dessicant:	replaced	-
Logger# (if Δ):	18201	-
PT# (if Δ):	298680	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.805	99.504		98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:			1.209	98.295		A 517 (Pin)
Ice/PT:						
Water Level:			2.068	97.436		
Other:			0.818	98.686		T-post 2m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.801	98.700	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:	1.206	99.501		98.295		A 517 (Pin)
Ice/PT:						
Water Level:			2.064	97.437		
Other:	0.814			98.686		T-post 2m from logger

Closing Error	-0.001	Average WL	97.437
WL Check	0.001	Transducer Elevation	97.270

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	22-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12



# Hydrometric Measurement / Site Visit Record

Site: S12 - Fort Creek at Highway 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date:

May 11, 2012



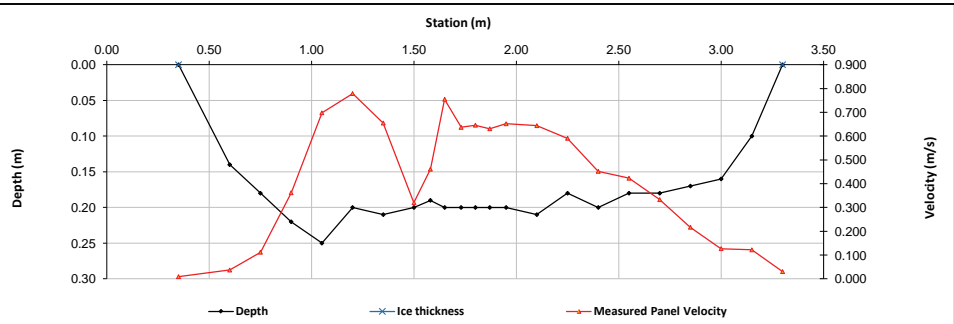
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.35	0.00	0.00	0.000	0.000	0.000	1.0	0.35	0.48	0.13	0.04	0.009	0.009	0.00	0.000	0%
1	0.60	0.14		0.037			1.0	0.48	0.68	0.20	0.14	0.037	0.037	0.03	0.001	0%
2	0.75	0.18		0.112			1.0	0.68	0.83	0.15	0.18	0.112	0.112	0.03	0.003	1%
3	0.90	0.22		0.362			1.0	0.83	0.98	0.15	0.22	0.362	0.362	0.03	0.012	5%
4	1.05	0.25		0.698			1.0	0.98	1.13	0.15	0.25	0.698	0.698	0.04	0.026	11%
5	1.20	0.20		0.779			1.0	1.13	1.28	0.15	0.20	0.779	0.779	0.03	0.023	10%
6	1.35	0.21		0.655			1.0	1.28	1.43	0.15	0.21	0.655	0.655	0.03	0.021	9%
7	1.50	0.20		0.320			1.0	1.43	1.54	0.12	0.20	0.320	0.320	0.02	0.007	3%
8	1.58	0.19		0.461			1.0	1.54	1.62	0.08	0.19	0.461	0.461	0.01	0.007	3%
9	1.65	0.20		0.755			1.0	1.62	1.69	0.08	0.20	0.755	0.755	0.02	0.011	5%
10	1.73	0.20		0.637			1.0	1.69	1.77	0.08	0.20	0.637	0.637	0.02	0.010	4%
11	1.80	0.20		0.646			1.0	1.77	1.84	0.07	0.20	0.646	0.646	0.01	0.009	4%
12	1.87	0.20		0.631			1.0	1.84	1.91	0.08	0.20	0.631	0.631	0.02	0.009	4%
13	1.95	0.20		0.652			1.0	1.91	2.03	0.12	0.20	0.652	0.652	0.02	0.015	6%
14	2.10	0.21		0.644			1.0	2.03	2.18	0.15	0.21	0.644	0.644	0.03	0.020	9%
15	2.25	0.18		0.591			1.0	2.18	2.33	0.15	0.18	0.591	0.591	0.03	0.016	7%
16	2.40	0.20		0.452			1.0	2.33	2.48	0.15	0.20	0.452	0.452	0.03	0.014	6%
17	2.55	0.18		0.423			1.0	2.48	2.63	0.15	0.18	0.423	0.423	0.03	0.011	5%
18	2.70	0.18		0.333			1.0	2.63	2.78	0.15	0.18	0.333	0.333	0.03	0.009	4%
19	2.85	0.17		0.217			1.0	2.78	2.93	0.15	0.17	0.217	0.217	0.03	0.006	2%
20	3.00	0.16		0.127			1.0	2.93	3.08	0.15	0.16	0.127	0.127	0.02	0.003	1%
21	3.15	0.10		0.122			1.0	3.08	3.23	0.15	0.10	0.122	0.122	0.01	0.002	1%
LB	3.30	0.00	0.00	0.00	0.00	0.00	1.0	3.23	3.30	0.08	0.03	0.031	0.031	0.00	0.000	0%
<b>Total Flow</b>														<b>0.235</b>		

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	15:08
Equipment:	ADV
Method:	Wading
River Condition:	high flow, no ice
Quality/Error (see reverse):	good
Weather:	overcast, windy, +10

Flow characteristics:	
Total Flow:	0.235 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	0.52 (m <sup>2</sup> )
Wetted Width:	2.95 (m)
Hydraulic Depth:	0.176 (m)
Mean Velocity:	0.452 (m/s)
Froude Number:	0.344

Logger Details:		
	Before	After
Transducer Reading (m):	0.282	-
Water (°C):	10.7	-
Battery (Main):	14.0	-
Datalogger Clock:	14:15	-
Laptop Clock:	14:15	-
Dessicant:	good	-
Logger# (if Δ):	18201	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.778	99.477		98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:			1.184	98.293		A 517 (Pin)
Ice/PT:						
Water Level:			1.913	97.564		
Other:			0.797	98.680		T-post 2 m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.762	98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:	1.168	99.461		98.293		A 517 (Pin)
Ice/PT:						
Water Level:			1.901	97.560		
Other:			0.775	98.686		T-post 2 m from logger
Closing Error		0.000	Average WL		97.562	
WL Check		0.004	Transducer Elevation		97.280	

General Notes:	
-TSS collected at centre of flow	

Field Personnel:		SM, TR	Trip Date:	11-May-12
Data Entry Personnel:	CJ		Date:	30-May-12
Data Check Personnel:	DW		Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S12 - Fort Creek at Highway 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date:

June 11, 2012



## Flow Measurement:

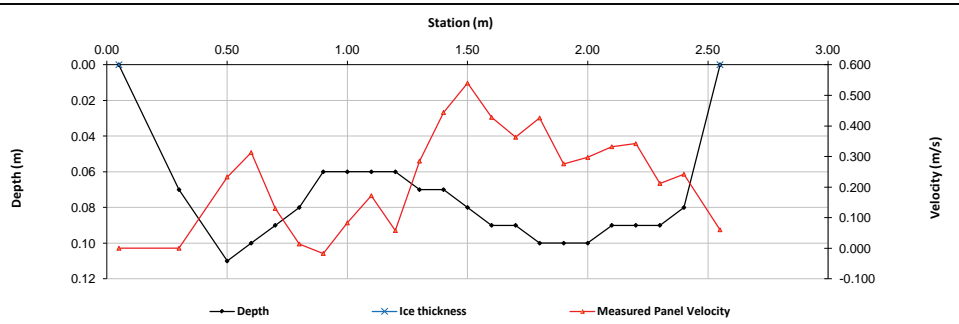
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.05	0.00	0.00	0.000	0.000	0.000	1.0	0.05	0.18	0.13	0.02	0.000	0.000	0.00	0.000	0%
1	0.30	0.07		0.000			1.0	0.18	0.40	0.23	0.07	0.000	0.000	0.02	0.000	0%
2	0.50	0.11		0.233			1.0	0.40	0.55	0.15	0.11	0.233	0.233	0.02	0.004	8%
3	0.60	0.10		0.313			1.0	0.55	0.65	0.10	0.10	0.313	0.313	0.01	0.003	7%
4	0.70	0.09		0.130			1.0	0.65	0.75	0.10	0.09	0.130	0.130	0.01	0.001	2%
5	0.80	0.08		0.014			1.0	0.75	0.85	0.10	0.08	0.014	0.014	0.01	0.000	0%
6	0.90	0.06		-0.017			1.0	0.85	0.95	0.10	0.06	-0.017	-0.017	0.01	0.000	0%
7	1.00	0.06		0.083			1.0	0.95	1.05	0.10	0.06	0.083	0.083	0.01	0.000	1%
8	1.10	0.06		0.172			1.0	1.05	1.15	0.10	0.06	0.172	0.172	0.01	0.001	2%
9	1.20	0.06		0.058			1.0	1.15	1.25	0.10	0.06	0.058	0.058	0.01	0.000	1%
10	1.30	0.07		0.285			1.0	1.25	1.35	0.10	0.07	0.285	0.285	0.01	0.002	4%
11	1.40	0.07		0.444			1.0	1.35	1.45	0.10	0.07	0.444	0.444	0.01	0.003	7%
12	1.50	0.08		0.540			1.0	1.45	1.55	0.10	0.08	0.540	0.540	0.01	0.004	9%
13	1.60	0.09		0.428			1.0	1.55	1.65	0.10	0.09	0.428	0.428	0.01	0.004	8%
14	1.70	0.09		0.363			1.0	1.65	1.75	0.10	0.09	0.363	0.363	0.01	0.003	7%
15	1.80	0.10		0.426			1.0	1.75	1.85	0.10	0.10	0.426	0.426	0.01	0.004	9%
16	1.90	0.10		0.276			1.0	1.85	1.95	0.10	0.10	0.276	0.276	0.01	0.003	6%
17	2.00	0.10		0.297			1.0	1.95	2.05	0.10	0.10	0.297	0.297	0.01	0.003	6%
18	2.10	0.09		0.332			1.0	2.05	2.15	0.10	0.09	0.332	0.332	0.01	0.003	6%
19	2.20	0.09		0.342			1.0	2.15	2.25	0.10	0.09	0.342	0.342	0.01	0.003	7%
20	2.30	0.09		0.212			1.0	2.25	2.35	0.10	0.09	0.212	0.212	0.01	0.002	4%
21	2.40	0.08		0.242			1.0	2.35	2.48	0.13	0.08	0.242	0.242	0.01	0.002	5%
RB	2.55	0.00	0.00	0.00	0.00	0.00	1.0	2.48	2.55	0.08	0.02	0.061	0.061	0.00	0.000	0%
<b>Total Flow</b>															<b>0.047</b>	

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	18:00
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	excellent
Weather:	overcast, breezy, 20

Flow characteristics:	
Total Flow:	0.047 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	0.19 (m <sup>2</sup> )
Wetted Width:	2.50 (m)
Hydraulic Depth:	0.078 (m)
Mean Velocity:	0.242 (m/s)
Froude Number:	0.278

Logger Details:		
	Before	After
Transducer Reading (m):	0.118	
Water (°C):	16.7	
Battery (Main):	13.82	
Datalogger Clock:	16:02	
Laptop Clock:	16:01	
Dessicant:	replaced	
Logger# (if Δ):	18201	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-RSSI: -93	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.685	99.384		98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:			1.082	98.302		A 517 (Pin)
Ice/PT:						
Water Level:			1.982	97.402		
Other:			0.673	98.711		T-post 2 m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.673	98.697	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:	1.068	99.370		98.302		A 517 (Pin)
Ice/PT:						
Water Level:			1.970	97.400		
Other:			0.661	98.709		T-post 2 m from logger
Closing Error		0.002	Average WL		97.401	
WL Check		0.002	Transducer Elevation		97.283	

**General Notes:**

Field Personnel:			
Data Entry Personnel:	SM, CJ	Trip Date:	11-Jun-12
Data Check Personnel:	CJ	Date:	25-Jun-12
	XP	Date:	6-Jul-12

# Hydrometric Measurement Field Data Sheet

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: August 10, 2012



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	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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.23	0.03	0.01	0.002	0.002	0.00	0.000	0%
1	0.25	0.05		0.007				0.23	0.28	0.05	0.05	0.007	0.007	0.00	0.000	0%
2	0.30	0.05		-0.008				0.28	0.33	0.05	0.05	-0.008	-0.008	0.00	0.000	0%
3	0.35	0.05		0.008				0.33	0.38	0.05	0.05	0.008	0.008	0.00	0.000	0%
4	0.40	0.08		0.245				0.38	0.43	0.05	0.08	0.245	0.245	0.00	0.001	7%
5	0.45	0.08		0.267				0.43	0.48	0.05	0.08	0.267	0.267	0.00	0.001	7%
6	0.50	0.07		0.347				0.48	0.53	0.05	0.07	0.347	0.347	0.00	0.001	8%
7	0.55	0.07		0.208				0.53	0.58	0.05	0.07	0.208	0.208	0.00	0.001	5%
8	0.60	0.08		0.401				0.58	0.63	0.05	0.08	0.401	0.401	0.00	0.002	11%
9	0.65	0.08		0.142				0.63	0.68	0.05	0.08	0.142	0.142	0.00	0.001	4%
10	0.70	0.08		0.024				0.68	0.73	0.05	0.08	0.024	0.024	0.00	0.000	1%
11	0.75	0.07		0.277				0.73	0.78	0.05	0.07	0.277	0.277	0.00	0.001	7%
12	0.80	0.07		0.270				0.78	0.83	0.05	0.07	0.270	0.270	0.00	0.001	6%
13	0.85	0.07		0.268				0.83	0.90	0.08	0.07	0.268	0.268	0.01	0.001	10%
14	0.95	0.08		0.232				0.90	1.00	0.10	0.08	0.232	0.232	0.01	0.002	13%
15	1.05	0.07		0.187				1.00	1.10	0.10	0.07	0.187	0.187	0.01	0.001	9%
16	1.15	0.06		0.120				1.10	1.20	0.10	0.06	0.120	0.120	0.01	0.001	5%
17	1.25	0.06		0.096				1.20	1.30	0.10	0.06	0.096	0.096	0.01	0.001	4%
18	1.35	0.05		0.075				1.30	1.40	0.10	0.05	0.075	0.075	0.00	0.000	3%
19	1.45	0.04		0.046				1.40	1.50	0.10	0.04	0.046	0.046	0.00	0.000	1%
20	1.55	0.04		0.019				1.50	1.60	0.10	0.04	0.019	0.019	0.00	0.000	1%
21	1.65	0.02		0.001				1.60	1.73	0.13	0.02	0.001	0.001	0.00	0.000	0%
RB	1.80	0.00	0.00	0.00	0.00	0.00	1.0	1.73	1.80	0.08	0.01	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.015</b>	

Measurement Details:	
Start Time (MST):	17:30
End Time (MST):	18:45
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 20

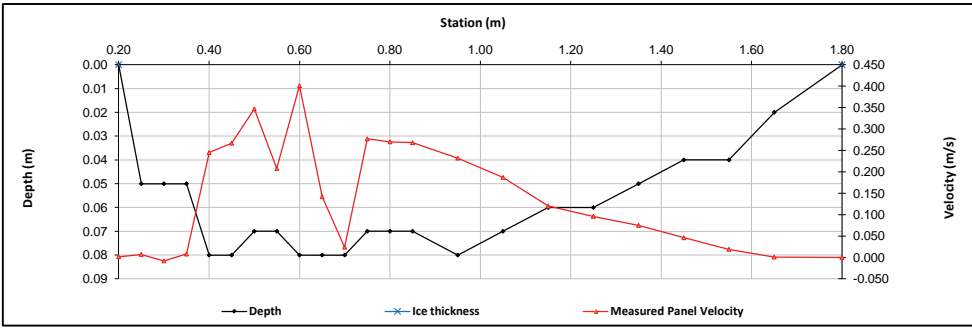
Flow characteristics:	
Total Flow:	0.0147 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.09 (m <sup>2</sup> )
Wetted Width:	1.60 (m)
Hydraulic Depth:	0.056 (m)
Mean Velocity:	0.163 (m/s)
Froude Number:	0.220

Logger Details:		
	Before	After
Transducer Reading (m):	0.093	
Water (°C):	18.3	
Battery (Main):	13.0	
Datalogger Clock:	16:44	
Laptop Clock:	16:43	
Dessicant:	replaced	
Logger# (if Δ):	18201	
PT# (if Δ):	-	

Datalogger / Station Notes:

General Notes:

TSS taken at 0.3 m  
 ADDED 1 BM



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.652	99.351		98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:			0.292	99.059	99.058	3/4" Pipe 8m North of Station
Ice/PT:						
Water Level:			2.055	97.296		
Other:			0.664	98.687		T-post 2m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.641	98.699	98.699	T-post closest to road
Bench Mark 2:						
Bench Mark 3:			0.283	99.057	99.058	3/4" Pipe 8m North of Station
Ice/PT:						
Water Level:			2.043	97.297		
Other:	0.653	99.340		98.687		T-post 2m from logger
Closing Error		0.000		Average WL		97.297
WL Check		0.001		Transducer Elevation		97.204

<u>Field Personnel:</u>	TR, CJ	<u>Trip Date:</u>	10-Aug-12
<u>Data Entry Personnel:</u>	CJ (Field)	<u>Date:</u>	10-Aug-12
<u>Data Check Personnel:</u>	CJ	<u>Date:</u>	2-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S12 Fort Creek at Hwy 63

UTM Location: 462600 E, 6363400 N

Site Visit Date:

September 25, 2012



## 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	0.20	0.10	0.01	0.007	0.007	0.00	0.000	0%
1	0.30	0.04		0.029			1.0	0.20	0.40	0.20	0.04	0.029	0.029	0.01	0.000	0%
2	0.50	0.06		0.337			1.0	0.40	0.55	0.15	0.06	0.337	0.337	0.01	0.003	3%
3	0.60	0.07		0.346			1.0	0.55	0.65	0.10	0.07	0.346	0.346	0.01	0.002	3%
4	0.70	0.08		0.399			1.0	0.65	0.75	0.10	0.08	0.399	0.399	0.01	0.003	4%
5	0.80	0.09		0.382			1.0	0.75	0.85	0.10	0.09	0.382	0.382	0.01	0.003	4%
6	0.90	0.09		0.395			1.0	0.85	0.95	0.10	0.09	0.395	0.395	0.01	0.004	4%
7	1.00	0.11		0.405			1.0	0.95	1.05	0.10	0.11	0.405	0.405	0.01	0.004	5%
8	1.10	0.11		0.368			1.0	1.05	1.15	0.10	0.11	0.368	0.368	0.01	0.004	5%
9	1.20	0.13		0.421			1.0	1.15	1.25	0.10	0.13	0.421	0.421	0.01	0.005	6%
10	1.30	0.13		0.481			1.0	1.25	1.35	0.10	0.13	0.481	0.481	0.01	0.006	7%
11	1.40	0.14		0.515			1.0	1.35	1.45	0.10	0.14	0.515	0.515	0.01	0.007	8%
12	1.50	0.15		0.386			1.0	1.45	1.55	0.10	0.15	0.386	0.386	0.02	0.006	7%
13	1.60	0.16		0.404			1.0	1.55	1.65	0.10	0.16	0.404	0.404	0.02	0.006	7%
14	1.70	0.18		0.372			1.0	1.65	1.75	0.10	0.18	0.372	0.372	0.02	0.007	8%
15	1.80	0.16		0.345			1.0	1.75	1.85	0.10	0.16	0.345	0.345	0.02	0.006	6%
16	1.90	0.18		0.268			1.0	1.85	1.95	0.10	0.18	0.268	0.268	0.02	0.005	5%
17	2.00	0.18		0.550			1.0	1.95	2.03	0.08	0.18	0.550	0.550	0.01	0.007	8%
18	2.05	0.17		0.637			1.0	2.03	2.08	0.05	0.17	0.637	0.637	0.01	0.005	6%
19	2.10	0.16		0.241			1.0	2.08	2.15	0.08	0.16	0.241	0.241	0.01	0.003	3%
20	2.20	0.12		0.001			1.0	2.15	2.30	0.15	0.12	0.001	0.001	0.02	0.000	0%
LB	2.40	0.00	0.00	0.00	0.00	0.00	1.0	2.30	2.40	0.10	0.03	0.000	0.000	0.00	0.000	0%

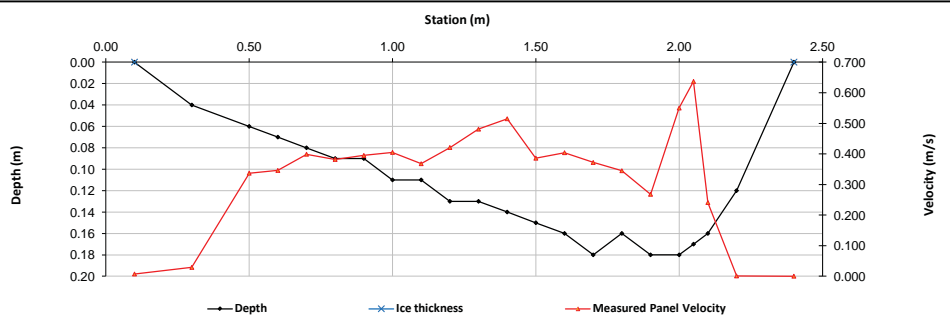
**Total Flow 0.088**

Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	15:00
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	deg. Overcast, light breeze

Flow characteristics:		
Total Flow:	0.0884	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.25	(m <sup>2</sup> )
Wetted Width:	2.30	(m)
Hydraulic Depth:	0.109	(m)
Mean Velocity:	0.352	(m/s)
Froude Number:	0.341	

Logger Details:		
	Before	After
Transducer Reading (m):	0.252	
Water (°C):	10.9	
Battery (Main):	12.5	
Datalogger Clock:	13:47	
Laptop Clock:	13:46	
Dessicant:	replaced	
Logger# (if Δ):	18201	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.720	99.419		98.699	98.699	T-post closest to road
Bench Mark 2:			0.326	99.093	99.093	3/4" Pipe 10 m Northwest of Station
Bench Mark 3:			0.361	99.058	99.058	3/4" Pipe 8 m North of Station
Ice/PT:						
Water Level:			1.957	97.462		
Other:						T-post 2 m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.709	98.700	98.699	T-post closest to road
Bench Mark 2:	0.316	99.409		99.093	99.093	3/4" Pipe 10 m Northwest of Station
Bench Mark 3:			0.350	99.059	99.058	3/4" Pipe 8 m North of Station
Ice/PT:						
Water Level:			1.947	97.462		
Other:						T-post 2 m from logger

Closing Error	-0.001	Average WL	97.462
WL Check	0.000	Transducer Elevation	97.210

General Notes:	
-Tss taken @ 1.8 m	
-Installed 1 3/4" Pipe BM	

Field Personnel:		Trip Date:
Data Entry Personnel:	TR AND SM (Field)	25-Sep-12
Data Check Personnel:	TR AND SM (Field)	25-Sep-12
	CJ	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S12 - Fort Creek at Highway 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: November 1, 2012



## 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	0.30	0.00	0.00	0.000	0.000	0.000	1.0	0.30	0.40	0.10	0.05	-0.005	-0.005	0.01	0.000	0%
1	0.50	0.21		-0.018			1.0	0.40	0.60	0.20	0.21	-0.018	-0.018	0.04	-0.001	-1%
2	0.70	0.21		0.160			1.0	0.60	0.80	0.20	0.21	0.160	0.160	0.04	0.007	11%
3	0.90	0.24		0.054			1.0	0.80	1.00	0.20	0.24	0.054	0.054	0.05	0.003	4%
4	1.10	0.25		-0.029			1.0	1.00	1.20	0.20	0.25	-0.029	-0.029	0.05	-0.001	-2%
5	1.30	0.25		-0.010			1.0	1.20	1.40	0.20	0.25	-0.010	-0.010	0.05	0.000	-1%
6	1.50	0.26		-0.004			1.0	1.40	1.60	0.20	0.26	-0.004	-0.004	0.05	0.000	0%
7	1.70	0.30		0.009			1.0	1.60	1.80	0.20	0.30	0.009	0.009	0.06	0.001	1%
8	1.90	0.33		0.072			1.0	1.80	1.95	0.15	0.33	0.072	0.072	0.05	0.004	6%
9	2.00	0.32		0.221			1.0	1.95	2.05	0.10	0.32	0.221	0.221	0.03	0.007	12%
10	2.10	0.32		0.173			1.0	2.05	2.15	0.10	0.32	0.173	0.173	0.03	0.006	9%
11	2.20	0.33		0.098			1.0	2.15	2.25	0.10	0.33	0.098	0.098	0.03	0.003	5%
12	2.30	0.35		0.046			1.0	2.25	2.35	0.10	0.35	0.046	0.046	0.03	0.002	3%
13	2.40	0.35		0.161			1.0	2.35	2.45	0.10	0.35	0.161	0.161	0.04	0.006	9%
14	2.50	0.35		0.284			1.0	2.45	2.55	0.10	0.35	0.284	0.284	0.03	0.010	16%
15	2.60	0.36		0.381			1.0	2.55	2.65	0.10	0.36	0.381	0.381	0.04	0.014	22%
16	2.70	0.36		0.051			1.0	2.65	2.75	0.10	0.36	0.051	0.051	0.04	0.002	3%
17	2.80	0.34		0.024			1.0	2.75	2.85	0.10	0.34	0.024	0.024	0.03	0.001	1%
18	2.90	0.34		0.050			1.0	2.85	2.95	0.10	0.34	0.050	0.050	0.03	0.002	3%
19	3.00	0.33		-0.013			1.0	2.95	3.05	0.10	0.33	-0.013	-0.013	0.03	0.000	-1%
LB	3.10	0.00	0.00	0.00	0.00	0.00	1.0	3.05	3.10	0.05	0.08	-0.003	-0.003	0.00	0.000	0%

**Total Flow 0.061**

## Measurement Details:

Start Time (MST):	11:20
End Time (MST):	12:30
Equipment:	ADV
Method:	Wading
River Condition:	Ice Covered, Good Flow
Quality/Error (see reverse):	Poor
Weather:	cloudy, light snow, -8 deg.

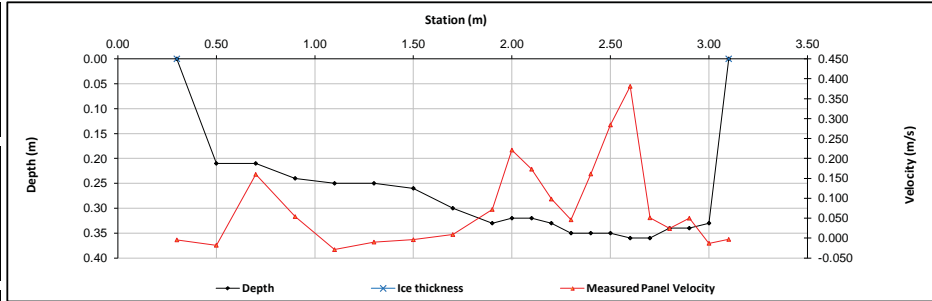
## Flow characteristics:

Total Flow:	0.0611	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.78	(m <sup>2</sup> )
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.278	(m)
Mean Velocity:	0.079	(m/s)
Froude Number:	0.048	

## Logger Details:

	Before	After
Transducer Reading (m):	0.279	
Water (°C):	0.8	
Battery (Main):	12.1	
Datalogger Clock:	11:23	
Laptop Clock:	11:24	
Dessicant:	replaced	
Logger# (if Δ):	18201	
PT# (if Δ):	298680	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.646	99.345		98.699	98.699	T-post closest to road
Bench Mark 2:			0.252	99.093	99.093	3/4" Pipe 10 m Northwest of Station
Bench Mark 3:			0.287	99.058	99.058	3/4" Pipe 8 m North of Station
Ice/PT:						
Water Level:		1.824		97.521		
Other:						T-post 2 m from logger
<b>Setup #2</b>						
Bench Mark 1:			0.635	98.697	98.699	T-post closest to road
Bench Mark 2:	0.239	99.332		99.093	99.093	3/4" Pipe 10 m Northwest of Station
Bench Mark 3:			0.275	99.057	99.058	3/4" Pipe 8 m North of Station
Ice/PT:						
Water Level:		1.812		97.520		
Other:						T-post 2 m from logger
Closing Error	0.002			Average WL	97.521	
WL Check	0.001			Transducer Elevation	97.242	

## General Notes:

Completely ice covered, 5-7 m thick.  
 Pulled PT for winter. Ice jammed 10 m downstream.  
 Anchor cable and weight left on bank marked by stake.

## Field Personnel:

Sm. TR	Trip Date:	1-Nov-12
Data Entry Personnel: TR	Date:	1-Nov-12
Data Check Personnel: CJ	Date:	7-Nov-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

# Hydrometric Measurement / Site Visit Record

Site: S14A - Eils River at the CNRL Bridge

UTM Location: 455748 E, 6344947 N

Site Visit Date:

January 12, 2012



## Flow Measurement:

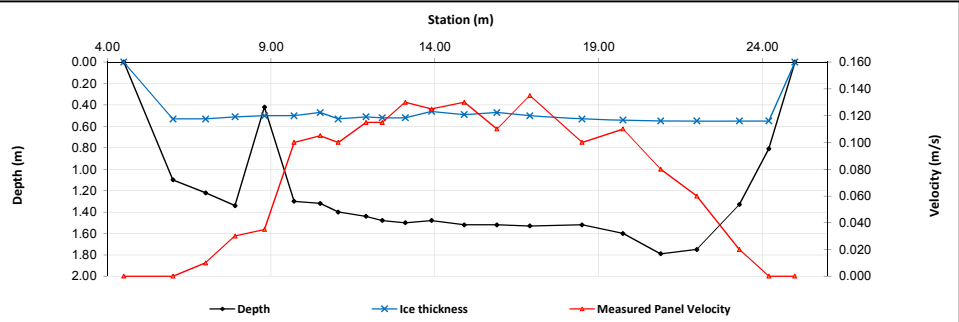
Measured Data										Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	5.25	0.75	0.14	0.000	0.000	0.11	0.000	0%			
1	6.00	1.10	0.53	0.000			1.0	5.25	6.50	1.25	0.57	0.000	0.000	0.71	0.000	0%			
2	7.00	1.22	0.53	0.010			0.9	6.50	7.45	0.95	0.69	0.010	0.009	0.66	0.006	0%			
3	7.90	1.34	0.51		0.020	0.040	1.0	7.45	8.35	0.90	0.83	0.030	0.030	0.75	0.022	2%			
4	8.80	0.42	0.50	0.060	0.010		1.0	8.35	9.25	0.90	-0.08	0.035	0.035	-0.07	-0.003	0%			
5	9.70	1.30	0.50	0.080	0.120		1.0	9.25	10.10	0.85	0.80	0.100	0.100	0.68	0.068	5%			
6	10.50	1.32	0.47	0.090	0.120		1.0	10.10	10.78	0.68	0.85	0.105	0.105	0.57	0.060	4%			
7	11.05	1.40	0.53	0.080	0.120		1.0	10.78	11.48	0.70	0.87	0.100	0.100	0.61	0.061	4%			
8	11.90	1.44	0.51	0.110	0.120		1.0	11.48	12.15	0.67	0.93	0.115	0.115	0.63	0.072	5%			
9	12.40	1.48	0.52	0.100	0.130		1.0	12.15	12.75	0.60	0.96	0.115	0.115	0.58	0.066	4%			
10	13.10	1.50	0.52	0.130	0.130		1.0	12.75	13.50	0.75	0.98	0.130	0.130	0.74	0.096	6%			
11	13.90	1.48	0.46	0.110	0.140		1.0	13.50	14.40	0.90	1.02	0.125	0.125	0.92	0.115	8%			
12	14.90	1.52	0.49	0.120	0.140		1.0	14.40	15.40	1.00	1.03	0.130	0.130	1.03	0.134	9%			
13	15.90	1.52	0.47	0.090	0.130		1.0	15.40	16.40	1.00	1.05	0.110	0.110	1.05	0.116	8%			
14	16.90	1.53	0.50	0.130	0.140		1.0	16.40	17.70	1.30	1.03	0.135	0.135	1.34	0.181	12%			
15	18.50	1.52	0.53	0.090	0.110		1.0	17.70	19.13	1.43	0.99	0.100	0.100	1.41	0.141	9%			
16	19.75	1.60	0.54	0.100	0.120		1.0	19.13	20.33	1.20	1.06	0.110	0.110	1.27	0.140	9%			
17	20.90	1.79	0.55	0.060	0.100		1.0	20.33	21.45	1.13	1.24	0.080	0.080	1.40	0.112	7%			
18	22.00	1.75	0.55	0.060	0.060		1.0	21.45	22.65	1.20	1.20	0.060	0.060	1.44	0.086	6%			
19	23.30	1.33	0.55	0.020	0.020		1.0	22.65	23.75	1.10	0.78	0.020	0.020	0.86	0.017	1%			
20	24.20	0.81	0.55	0.000			1.0	23.75	24.60	0.85	0.26	0.000	0.000	0.22	0.000	0%			
R	25.00	0.00	0.00	0.00	0.00	0.00	1.0	24.60	25.00	0.40	0.07	0.000	0.000	0.03	0.000	0%			
<b>Total Flow</b>															<b>1.49</b>				

Measurement Details:	
Start Time (MST):	10:10
End Time (MST):	12:00
Equipment:	MARSH
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	-

Flow characteristics:		
Total Flow:	1.49	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	16.91	(m <sup>2</sup> )
Wetted Width:	20.50	(m)
Hydraulic Depth:	0.825	(m)
Mean Velocity:	0.088	(m/s)
Froude Number:	0.031	

Logger Details:		
	Before	After
Transducer Reading (m):		1.032
Water (°C):	0.0	0.1
Battery (Main):	12.5	13.1
Datalogger Clock:	10:37	-
Laptop Clock:	10:38	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
-	replaced logger battery



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.267	101.932		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			4.115	98.084		
Water Level:			4.126	98.073		
Other:	2.065	102.199		100.134	100.134	Rebar w/orange flagging
<b>Setup #2</b>						
Bench Mark 1:	0.257	102.189		101.932		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			4.103	98.086		
Water Level:			4.117	98.072		
Other:			2.053	100.136	100.134	Rebar w/orange flagging

Closing Error	-0.002
WL Check	0.001

Average WL	98.073
Transducer Elevation	97.041

General Notes:	

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	12-Jan-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	19-Jan-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	19-Jan-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge

UTM Location: 455748 E, 6344947 N

Site Visit Date:

February 14, 2012



## 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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.53	0.53	0.09	0.000	0.000	0.05	0.000	0%			
1	5.05	0.95	0.60	0.000			1.0	4.53	5.53	1.00	0.35	0.000	0.000	0.35	0.000	0%			
2	6.00	0.85	0.60	0.010			0.9	5.53	6.30	0.77	0.25	0.010	0.009	0.19	0.002	0%			
3	6.60	1.10	0.60	0.020			0.9	6.30	6.95	0.65	0.50	0.020	0.018	0.33	0.006	1%			
4	7.30	1.19	0.60	0.040			0.9	6.95	7.70	0.75	0.59	0.040	0.036	0.44	0.016	2%			
5	8.10	1.30	0.60	0.080			0.9	7.70	8.60	0.90	0.70	0.080	0.072	0.63	0.045	5%			
6	9.10	1.25	0.57	0.110			0.9	8.60	9.55	0.95	0.68	0.110	0.099	0.65	0.064	6%			
7	10.00	1.20	0.60	0.110			0.9	9.55	10.45	0.90	0.60	0.110	0.099	0.54	0.053	5%			
8	10.90	1.25	0.62	0.110			0.9	10.45	11.35	0.90	0.63	0.110	0.099	0.57	0.056	6%			
9	11.80	1.30	0.60	0.110			0.9	11.35	12.25	0.90	0.70	0.110	0.099	0.63	0.062	6%			
10	12.70	1.32	0.60	0.120			0.9	12.25	13.15	0.90	0.72	0.120	0.108	0.65	0.070	7%			
11	13.60	1.33	0.60		0.110	0.130	1.0	13.15	14.05	0.90	0.73	0.120	0.120	0.66	0.079	8%			
12	14.50	1.40	0.60		0.130	0.130	1.0	14.05	14.85	0.80	0.80	0.130	0.130	0.64	0.083	8%			
13	15.20	1.45	0.56		0.080	0.110	1.0	14.85	15.60	0.75	0.89	0.095	0.095	0.67	0.063	6%			
14	16.00	1.44	0.60		0.080	0.130	1.0	15.60	16.50	0.90	0.84	0.105	0.105	0.76	0.079	8%			
15	17.00	1.50	0.55		0.100	0.100	1.0	16.50	17.58	1.08	0.95	0.100	0.100	1.02	0.102	10%			
16	18.15	1.65	0.57		0.040	0.090	1.0	17.58	18.63	1.05	1.08	0.065	0.065	1.13	0.074	7%			
17	19.10	1.65	0.56		0.070	0.070	1.0	18.63	19.50	0.88	1.09	0.070	0.070	0.95	0.067	7%			
18	19.90	1.45	0.55		0.060	0.040	1.0	19.50	20.30	0.80	0.90	0.050	0.050	0.72	0.036	4%			
19	20.70	1.50	0.56		0.020	0.020	1.0	20.30	21.30	1.00	0.94	0.020	0.020	0.94	0.019	2%			
20	21.90	1.50	0.56		0.010	0.010	1.0	21.30	22.45	1.15	0.94	0.010	0.010	1.08	0.011	1%			
21	23.00	1.15	0.55	0.000			1.0	22.45	23.65	1.20	0.60	0.000	0.000	0.72	0.000	0%			
22	24.30	0.65	0.55	0.000			1.0	23.65	24.35	0.70	0.10	0.000	0.000	0.07	0.000	0%			
RB	24.40	0.00	0.00	0.00	0.00	0.00	1.0	24.35	24.40	0.05	0.03	0.000	0.000	0.00	0.000	0%			
<b>Total Flow</b>															<b>0.988</b>				

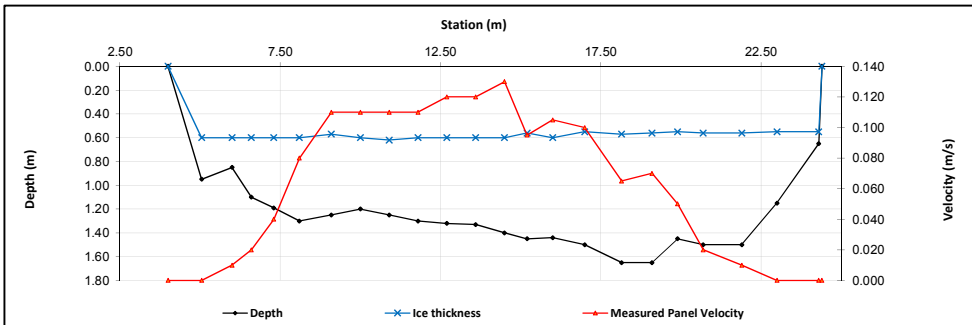
Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	12:40
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	good
Weather:	overcast, calm, -1

Flow Characteristics:		
Total Flow:	0.988	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	14.38	(m <sup>2</sup> )
Wetted Width:	20.40	(m)
Hydraulic Depth:	0.705	(m)
Mean Velocity:	0.069	(m/s)
Froude Number:	0.026	

Logger Details:		
	Before	After
Transducer Reading (m):	0.957	
Water (°C):	0.1	
Battery (Main):	14.8	
Datalogger Clock:	11:16	
Laptop Clock:	11:16	
Dessicant:	good	
Logger# (if Δ):	-	
Pt# (if Δ):	-	

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>						
Bench Mark 1:			0.192	101.923		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			4.078	98.037		
Water Level:			4.127	97.986		
Other:	1.981	102.115		100.134	100.134	Rebar w/orange flagging
<b>Setup #2</b>						
Bench Mark 1:	0.181	102.104		101.923		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			4.067	98.037		
Water Level:			4.118	97.986		
Other:			1.970	100.134	100.134	Rebar w/orange flagging

Closing Error	0.000	Average WL	97.987
WL Check	0.002	Transducer Elevation	97.030

Field Personnel:	SM, DW	Trip Date:	14-Feb-12
Data Entry Personnel:	CJ	Date:	20-Mar-12
Data Check Personnel:	XP	Date:	24-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge

UTM Location: 455748 E, 6344947 N

Site Visit Date:

March 16, 2012



## 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	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.50	0.50	0.05	0.000	0.000	0.03	0.000	0%
1	3.00	0.80	0.60	-0.001			0.9	2.50	3.40	0.90	0.20	-0.001	-0.001	0.18	0.000	0%
2	3.80	0.85	0.60	-0.005			0.9	3.40	4.28	0.88	0.25	-0.005	-0.005	0.22	-0.001	0%
3	4.75	1.05	0.55	0.009			0.9	4.28	5.25	0.98	0.50	0.009	0.008	0.49	0.004	0%
4	5.75	1.10	0.53	0.049			0.9	5.25	6.50	1.25	0.57	0.049	0.044	0.71	0.031	4%
5	7.25	1.15	0.55	0.113			0.9	6.50	7.50	1.00	0.60	0.113	0.102	0.60	0.061	8%
6	7.75	1.15	0.55	0.101			0.9	7.50	7.88	0.38	0.60	0.101	0.091	0.23	0.020	3%
7	8.00	1.15	0.55	0.121			0.9	7.88	8.75	0.88	0.60	0.121	0.109	0.53	0.057	7%
8	9.50	1.10	0.60	0.115			0.9	8.75	9.90	1.15	0.50	0.115	0.104	0.58	0.060	7%
9	10.30	1.20	0.65	0.095			0.9	9.90	10.63	0.73	0.55	0.095	0.086	0.40	0.034	4%
10	10.95	1.40	0.70	0.083			0.9	10.63	11.23	0.60	0.70	0.083	0.075	0.42	0.031	4%
11	11.50	1.40	0.75	0.106			0.9	11.23	11.90	0.68	0.65	0.106	0.095	0.44	0.042	5%
12	12.30	1.40	0.75	0.114			0.9	11.90	12.63	0.73	0.65	0.114	0.103	0.47	0.048	6%
13	12.95	1.40	0.75	0.133			0.9	12.63	13.23	0.60	0.65	0.133	0.120	0.39	0.047	6%
14	13.50	1.40	0.65		0.066	0.132	1.0	13.23	13.90	0.68	0.75	0.099	0.099	0.51	0.050	6%
15	14.30	1.35	0.65	0.120			0.9	13.90	14.55	0.65	0.70	0.120	0.108	0.46	0.049	6%
16	14.80	1.25	0.60	0.125			0.9	14.55	15.25	0.70	0.65	0.125	0.113	0.46	0.051	6%
17	15.70	1.40	0.60		0.128	0.148	1.0	15.25	16.00	0.75	0.80	0.138	0.138	0.60	0.083	10%
18	16.30	1.55	0.60	0.017	0.119		1.0	16.00	16.63	0.63	0.95	0.068	0.068	0.59	0.040	5%
19	16.95	1.70	0.60	0.077	0.131		1.0	16.63	17.25	0.63	1.10	0.104	0.104	0.69	0.072	9%
20	17.55	1.70	0.60	0.109	0.041		1.0	17.25	17.83	0.58	1.10	0.075	0.075	0.63	0.047	6%
21	18.10	1.65	0.60	0.060	0.029		1.0	17.83	18.50	0.67	1.05	0.045	0.045	0.71	0.032	4%
22	18.90	1.60	0.55	0.003	0.006		1.0	18.50	19.40	0.90	1.05	0.005	0.005	0.94	0.004	1%
23	19.90	1.50	0.55		-0.026	-0.029	1.0	19.40	20.45	1.05	0.95	-0.028	-0.028	1.00	-0.027	-3%
24	21.00	1.15	0.55	-0.027			0.9	20.45	21.50	1.05	0.60	-0.027	-0.024	0.63	-0.015	-2%
25	22.00	0.75	0.53	-0.047			0.9	21.50	22.50	1.00	0.22	-0.047	-0.042	0.22	-0.009	-1%
RB	23.00	0.00	0.00	0.00	0.00	0.00	1.0	22.50	23.00	0.50	0.06	-0.012	-0.012	0.03	0.000	0%

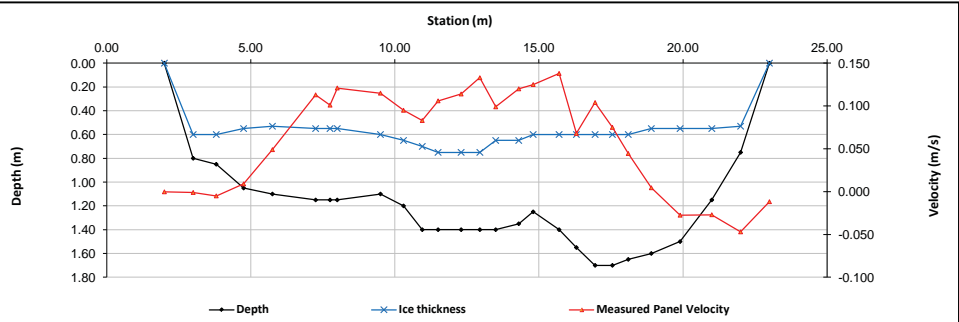
**Total Flow 0.811**

## Measurement Details:

Start Time (MST):	11:50
End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	low flow, full ice cover
Quality/Error (see reverse):	good
Weather:	clear, light breeze, 0

## Flow characteristics:

Total Flow:	0.811	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	13.13	(m <sup>2</sup> )
Wetted Width:	21.00	(m)
Hydraulic Depth:	0.625	(m)
Mean Velocity:	0.062	(m/s)
Froude Number:	0.025	



## Logger Details:

	Before	After
Transducer Reading (m):		0.939
Water (°C):	0.1	
Battery (Main):	14.7	
Datalogger Clock:	10:52	
Laptop Clock:	10:52	
Dessicant:	good	
Logger# (if Δ):	16569	
PT# (if Δ):	-	

## Datalogger / Station Notes:

Level Survey:	
Station	BS + (m)   HI (m)   FS - (m)   Elevation (m)   Elevation as given (m)   Description
<b>Setup #1</b>	
Bench Mark 1:	
Bench Mark 2:	
Bench Mark 3:	
Ice/PT:	4.198   98.021
Water Level:	4.276   97.943
Other:	2.085   102.219   100.134   100.134   Rebar w/orange flagging
<b>Setup #2</b>	
Bench Mark 1:	0.296   102.212     101.916     Top of pipe at bubbler enclosure
Bench Mark 2:	
Bench Mark 3:	
Ice/PT:	4.190   98.022
Water Level:	4.267   97.945
Other:	2.079   100.133   100.134   100.134   Rebar w/orange flagging

Closing Error	0.001
WL Check	0.002

Average WL	97.944
Transducer Elevation	97.005

## General Notes:

- Auger, ice feels rotten

Field Personnel:	SM, GB	Trip Date:	16-Mar-12
Data Entry Personnel:	CJ	Date:	19-Mar-12
Data Check Personnel:	XP	Date:	26-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

April 2, 2012



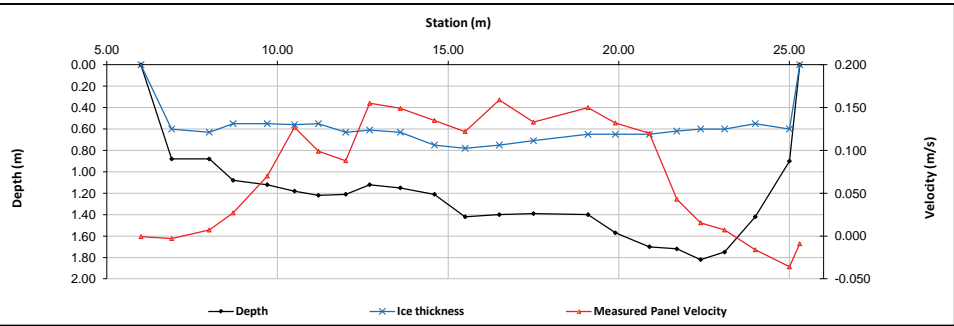
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	6.00	0.00	0.00	0.000	0.000	0.000	0.9	6.00	6.45	0.45	0.07	-0.001	-0.001	0.03	0.000	0%
1	6.90	0.88	0.60	-0.003			0.9	6.45	7.45	1.00	0.28	-0.003	-0.003	0.28	-0.001	0%
2	8.00	0.88	0.63	0.007			0.9	7.45	8.35	0.90	0.25	0.007	0.006	0.23	0.001	0%
3	8.70	1.08	0.55	0.027			0.9	8.35	9.20	0.85	0.53	0.027	0.024	0.45	0.011	1%
4	9.70	1.12	0.55	0.070			0.9	9.20	10.10	0.90	0.57	0.070	0.063	0.51	0.032	3%
5	10.50	1.18	0.56	0.127			0.9	10.10	10.85	0.75	0.62	0.127	0.114	0.47	0.053	5%
6	11.20	1.22	0.55	0.099			0.9	10.85	11.60	0.75	0.67	0.099	0.089	0.50	0.045	4%
7	12.00	1.21	0.63	0.088			0.9	11.60	12.35	0.75	0.58	0.088	0.079	0.44	0.034	3%
8	12.70	1.12	0.61	0.155			0.9	12.35	13.15	0.80	0.51	0.155	0.140	0.41	0.057	6%
9	13.60	1.15	0.63	0.149			0.9	13.15	14.10	0.95	0.52	0.149	0.134	0.49	0.066	7%
10	14.60	1.21	0.75	0.135			0.9	14.10	15.05	0.95	0.46	0.135	0.122	0.44	0.053	5%
11	15.50	1.42	0.78	0.122			0.9	15.05	16.00	0.95	0.64	0.122	0.110	0.61	0.067	7%
12	16.50	1.40	0.75	0.159			0.9	16.00	17.00	1.00	0.65	0.159	0.143	0.65	0.093	9%
13	17.50	1.39	0.71	0.133			0.9	17.00	18.30	1.30	0.68	0.133	0.120	0.88	0.106	10%
14	19.10	1.40	0.65		0.137	0.163	1.0	18.30	19.50	1.20	0.75	0.150	0.150	0.90	0.135	13%
15	19.90	1.57	0.65		0.131	0.133	1.0	19.50	20.40	0.90	0.92	0.132	0.132	0.83	0.109	11%
16	20.90	1.70	0.65		0.145	0.095	1.0	20.40	21.30	0.90	1.05	0.120	0.120	0.94	0.113	11%
17	21.70	1.72	0.62		0.038	0.048	1.0	21.30	22.05	0.75	1.10	0.043	0.043	0.83	0.035	4%
18	22.40	1.82	0.60		0.014	0.017	1.0	22.05	22.75	0.70	1.22	0.016	0.016	0.85	0.013	1%
19	23.10	1.75	0.60		0.005	0.009	1.0	22.75	23.55	0.80	1.15	0.007	0.007	0.92	0.006	1%
20	24.00	1.42	0.55		-0.008	-0.024	1.0	23.55	24.50	0.95	0.87	-0.016	-0.016	0.83	-0.013	-1%
21	25.00	0.90	0.60		-0.036		1.0	24.50	25.15	0.65	0.30	-0.036	-0.032	0.20	-0.006	-1%
RB	25.30	0.00	0.00	0.00	0.00	0.00	1.0	25.15	25.30	0.15	0.08	-0.009	-0.009	0.01	0.000	0%
<b>Total Flow</b>														<b>1.01</b>		

Measurement Details:	
Start Time (MST):	13:40
End Time (MST):	15:25
Equipment:	ADV
Method:	Ice
River Condition:	Ice still ok
Quality/Error (see reverse):	good
Weather:	sunny, calm, +8

Flow characteristics:		
Total Flow:	1.01	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	12.69	(m <sup>2</sup> )
Wetted Width:	19.30	(m)
Hydraulic Depth:	0.657	(m)
Mean Velocity:	0.080	(m/s)
Froude Number:	0.031	

Logger Details:		
	Before	After
Transducer Reading (m):		0.971
Water (°C):	0.2	
Battery (Main):	14.4	
Datalogger Clock:	12:51	
Laptop Clock:	12:51	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.053	101.922		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			3.922	98.053		
Water Level:			3.986	97.989		
Other:	1.841	101.975		100.134	100.134	Rebar w/orange flagging
<b>Setup #2</b>						
Bench Mark 1:	0.047	101.969		101.922		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			3.918	98.051		
Water Level:			3.983	97.986		
Other:			1.833	100.136	100.134	Rebar w/orange flagging
Closing Error	-0.002		Average WL		97.988	
WL Check	0.003		Transducer Elevation		97.017	

General Notes:	
-LB side soft due to more sun exposure	
-ice in decent shape	

<b>Field Personnel:</b>	DW, TR	Trip Date:	2-Apr-12
<b>Data Entry Personnel:</b>	CJ	Date:	11-Apr-12
<b>Data Check Personnel:</b>	XP	Date:	30-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

May 14, 2012



## 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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.25	0.25	0.08	0.020	0.020	0.02	0.000	0%	
1	4.50	0.32		0.078			1.0	4.25	4.75	0.50	0.32	0.078	0.078	0.16	0.012	0%	
2	5.00	0.38		0.118			1.0	4.75	5.50	0.75	0.38	0.118	0.118	0.29	0.034	1%	
3	6.00	0.48		0.111			1.0	5.50	6.50	1.00	0.48	0.111	0.111	0.48	0.053	1%	
4	7.00	0.72		0.153			1.0	6.50	7.50	1.00	0.72	0.153	0.153	0.72	0.110	2%	
5	8.00	0.96			0.134	0.171	1.0	7.50	8.50	1.00	0.96	0.153	0.153	0.96	0.146	2%	
6	9.00	0.98			0.233	0.184	1.0	8.50	9.50	1.00	0.98	0.209	0.209	0.98	0.204	3%	
7	10.00	1.10			0.228	0.222	1.0	9.50	10.50	1.00	1.10	0.225	0.225	1.10	0.248	4%	
8	11.00	1.17			0.241	0.244	1.0	10.50	11.50	1.00	1.17	0.243	0.243	1.17	0.284	5%	
9	12.00	1.20			0.262	0.250	1.0	11.50	12.50	1.00	1.20	0.256	0.256	1.20	0.307	5%	
10	13.00	1.25			0.298	0.276	1.0	12.50	13.50	1.00	1.25	0.287	0.287	1.25	0.359	6%	
11	14.00	1.30			0.283	0.282	1.0	13.50	14.50	1.00	1.30	0.283	0.283	1.30	0.367	6%	
12	15.00	1.30			0.280	0.318	1.0	14.50	15.50	1.00	1.30	0.299	0.299	1.30	0.389	6%	
13	16.00	1.24			0.349	0.384	1.0	15.50	16.50	1.00	1.24	0.367	0.367	1.24	0.454	7%	
14	17.00	1.22			0.364	0.359	1.0	16.50	17.50	1.00	1.22	0.362	0.362	1.22	0.441	7%	
15	18.00	1.15			0.331	0.359	1.0	17.50	18.50	1.00	1.15	0.345	0.345	1.15	0.397	6%	
16	19.00	1.12			0.262	0.364	1.0	18.50	19.50	1.00	1.12	0.313	0.313	1.12	0.351	6%	
17	20.00	1.12			0.319	0.364	1.0	19.50	20.50	1.00	1.12	0.342	0.342	1.12	0.382	6%	
18	21.00	1.09			0.272	0.384	1.0	20.50	21.50	1.00	1.09	0.328	0.328	1.09	0.358	6%	
19	22.00	1.10			0.241	0.349	1.0	21.50	22.50	1.00	1.10	0.295	0.295	1.10	0.325	5%	
20	23.00	0.98			0.232	0.307	1.0	22.50	23.50	1.00	0.98	0.270	0.270	0.98	0.264	4%	
21	24.00	0.86			0.235	0.308	1.0	23.50	24.50	1.00	0.86	0.272	0.272	0.86	0.233	4%	
22	25.00	0.79				0.173	0.280	1.0	24.50	25.50	1.00	0.79	0.227	0.227	0.79	0.179	3%
23	26.00	0.70		0.234			1.0	25.50	26.50	1.00	0.70	0.234	0.234	0.70	0.164	3%	
24	27.00	0.62		0.117			1.0	26.50	27.50	1.00	0.62	0.117	0.117	0.62	0.073	1%	
25	28.00	0.42		0.052			1.0	27.50	28.25	0.75	0.42	0.052	0.052	0.32	0.016	0%	
26	28.50	0.34		-0.004			1.0	28.25	28.75	0.50	0.34	-0.004	-0.004	0.17	-0.001	0%	
LB	29.00	0.00	0.00	0.00	0.00	0.00	1.0	28.75	29.00	0.25	0.09	-0.001	-0.001	0.02	0.000	0%	
<b>Total Flow</b>															<b>6.15</b>		

### Measurement Details:

Start Time (MST):	4:50
End Time (MST):	7:20
Equipment:	ADV
Method:	Fishcat
River Condition:	open, normal
Quality/Error (see reverse):	excellent
Weather:	partly cloudy, +17

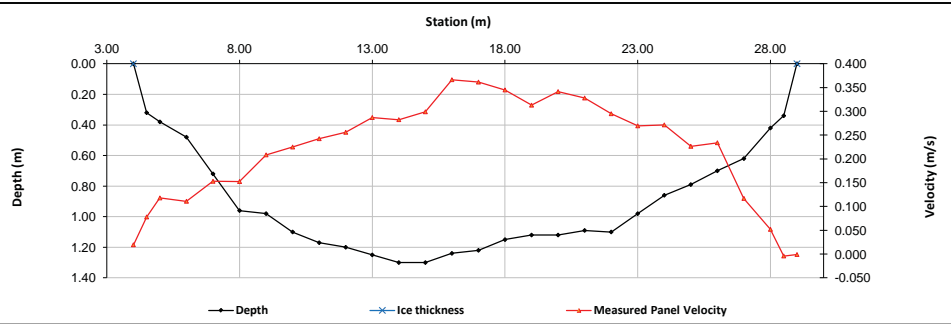
### Flow characteristics:

Total Flow:	6.15	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	23.42	(m <sup>2</sup> )
Wetted Width:	25.00	(m)
Hydraulic Depth:	0.937	(m)
Mean Velocity:	0.263	(m/s)
Froude Number:	0.087	

### Logger Details:

	Before	After
Transducer Reading (m):	1.025	-
Water (°C):	13.4	-
Battery (Main):	14.0	-
Datalogger Clock:	3:57	-
Laptop Clock:	3:56	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:			0.289	101.917		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.163	98.043		
Other:	2.072	102.206		100.134	100.134	Rebar w/orange flagging
Setup #2						
Bench Mark 1:	0.278	102.195		101.917		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.149	98.046		
Other:			2.059	100.136	100.134	Rebar w/orange flagging

Closing Error	-0.002	Average WL	98.045
WL Check	0.003	Transducer Elevation	97.020

### General Notes:

-Fishcat may be causing an already slow flow on the LB to be negative

Field Personnel:	DW, CJ	Trip Date:	14-May-12
Data Entry Personnel:	CJ	Date:	30-May-12
Data Check Personnel:	DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: June 12, 2012



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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	5.00	1.00	0.11	0.003	0.003	0.11	0.000	0%	
1	6.00	0.45		0.013			1.0	5.00	7.00	2.00	0.45	0.013	0.013	0.90	0.012	0%	
2	8.00	0.98			0.129	0.166	1.0	7.00	8.50	1.50	0.98	0.148	0.148	1.47	0.217	4%	
3	9.00	0.96			0.189	0.230	1.0	8.50	9.50	1.00	0.96	0.210	0.210	0.96	0.201	3%	
4	10.00	1.15			0.181	0.253	1.0	9.50	10.50	1.00	1.15	0.217	0.217	1.15	0.250	4%	
5	11.00	1.20			0.239	0.269	1.0	10.50	11.50	1.00	1.20	0.254	0.254	1.20	0.305	5%	
6	12.00	1.00			0.261	0.286	1.0	11.50	12.50	1.00	1.00	0.274	0.274	1.00	0.274	5%	
7	13.00	1.30			0.254	0.326	1.0	12.50	13.50	1.00	1.30	0.290	0.290	1.30	0.377	6%	
8	14.00	1.27			0.295	0.329	1.0	13.50	14.50	1.00	1.27	0.312	0.312	1.27	0.396	7%	
9	15.00	1.27			0.268	0.366	1.0	14.50	15.50	1.00	1.27	0.317	0.317	1.27	0.403	7%	
10	16.00	1.22			0.310	0.373	1.0	15.50	16.50	1.00	1.22	0.342	0.342	1.22	0.417	7%	
11	17.00	1.22			0.283	0.423	1.0	16.50	17.50	1.00	1.22	0.353	0.353	1.22	0.431	7%	
12	18.00	1.17			0.356	0.423	1.0	17.50	18.50	1.00	1.17	0.390	0.390	1.17	0.456	8%	
13	19.00	1.18			0.327	0.397	1.0	18.50	19.50	1.00	1.18	0.362	0.362	1.18	0.427	7%	
14	20.00	1.02			0.274	0.421	1.0	19.50	20.50	1.00	1.02	0.348	0.348	1.02	0.354	6%	
15	21.00	1.16			0.272	0.389	1.0	20.50	21.50	1.00	1.16	0.331	0.331	1.16	0.383	6%	
16	22.00	1.10			0.226	0.376	1.0	21.50	22.50	1.00	1.10	0.301	0.301	1.10	0.331	6%	
17	23.00	0.92			0.197	0.239	1.0	22.50	23.50	1.00	0.92	0.218	0.218	0.92	0.201	3%	
18	24.00	0.85				0.173	0.210	1.0	23.50	24.50	1.00	0.85	0.192	0.192	0.85	0.163	3%
19	25.00	0.74		0.210			1.0	24.50	25.50	1.00	0.74	0.210	0.210	0.74	0.155	3%	
20	26.00	0.70		0.176			1.0	25.50	26.50	1.00	0.70	0.176	0.176	0.70	0.123	2%	
21	27.00	0.56		0.179			1.0	26.50	27.75	1.25	0.56	0.179	0.179	0.70	0.125	2%	
LB	28.50	0.00	0.00	0.00	0.00	0.00	1.0	27.75	28.50	0.75	0.14	0.045	0.045	0.11	0.005	0%	
<b>Total Flow</b>														<b>6.00</b>			

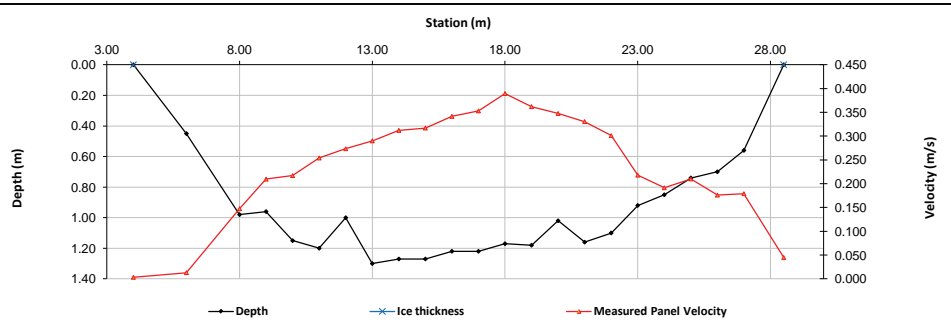
Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	16:50
Equipment:	ADV
Method:	FISHCAT
River Condition:	Open, Moderate flow
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, Breezy, 15C

Flow characteristics:	
Total Flow:	6.00 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	22.72 (m <sup>2</sup> )
Wetted Width:	24.50 (m)
Hydraulic Depth:	0.927 (m)
Mean Velocity:	0.264 (m/s)
Froude Number:	0.088

Logger Details:		
	Before	After
Transducer Reading (m):	0.825	-
Water (°C):	18.5	-
Battery (Main):	14.1	-
Datalogger Clock:	15:38	-
Laptop Clock:	15:38	-
Dessicant:	CHANGED	-
Logger# (if Δ):	16569	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

-Vent tube checked  
 -Logger can be installed in the bubbler enclosure with a 30 m PLS



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.265	101.917		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.132	98.050		
Other:	2.048	102.182		100.134	100.134	Rebar w/orange flagging
<b>Setup #2</b>						
Bench Mark 1:	0.251	102.168		101.917		Top of pipe at bubbler enclosure
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.118	98.050		
Other:			2.034	100.134	100.134	Rebar w/orange flagging
Closing Error	0.000					
WL Check	0.000					
Average WL				98.050		
Transducer Elevation				97.225		

**General Notes:**

- No cell service

Field Personnel:		SM & CJ	Trip Date:	12-Jun-12
Data Entry Personnel:	TR		Date:	21-Jun-12
Data Check Personnel:	CJ		Date:	25-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

August 8, 2012



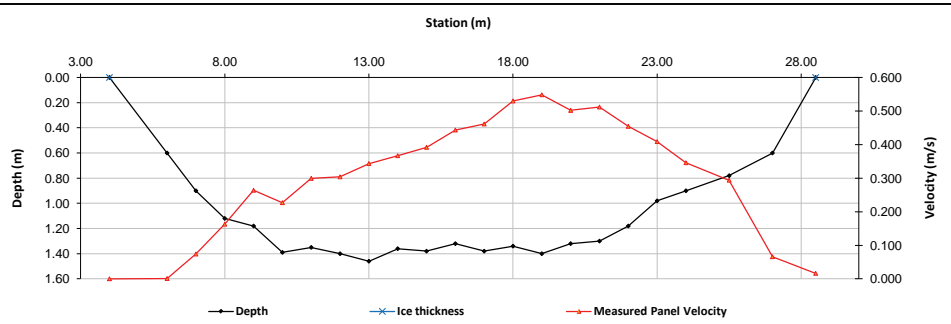
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	5.00	1.00	0.15	0.000	0.000	0.15	0.000	0%
1	6.00	0.60		0.001			1.0	5.00	6.50	1.50	0.60	0.001	0.001	0.90	0.001	0%
2	7.00	0.90			0.012	0.136	1.0	6.50	7.50	1.00	0.90	0.074	0.074	0.90	0.067	1%
3	8.00	1.12			0.066	0.260	1.0	7.50	8.50	1.00	1.12	0.163	0.163	1.12	0.183	2%
4	9.00	1.18			0.234	0.294	1.0	8.50	9.50	1.00	1.18	0.264	0.264	1.18	0.312	3%
5	10.00	1.39			0.164	0.290	1.0	9.50	10.50	1.00	1.39	0.227	0.227	1.39	0.316	4%
6	11.00	1.35			0.284	0.315	1.0	10.50	11.50	1.00	1.35	0.300	0.300	1.35	0.404	4%
7	12.00	1.40			0.266	0.342	1.0	11.50	12.50	1.00	1.40	0.304	0.304	1.40	0.426	5%
8	13.00	1.46			0.330	0.357	1.0	12.50	13.50	1.00	1.46	0.344	0.344	1.46	0.502	6%
9	14.00	1.36			0.350	0.384	1.0	13.50	14.50	1.00	1.36	0.367	0.367	1.36	0.499	6%
10	15.00	1.38			0.408	0.376	1.0	14.50	15.50	1.00	1.38	0.392	0.392	1.38	0.541	6%
11	16.00	1.32			0.468	0.419	1.0	15.50	16.50	1.00	1.32	0.444	0.444	1.32	0.585	6%
12	17.00	1.38			0.452	0.471	1.0	16.50	17.50	1.00	1.38	0.462	0.462	1.38	0.637	7%
13	18.00	1.34			0.542	0.518	1.0	17.50	18.50	1.00	1.34	0.530	0.530	1.34	0.710	8%
14	19.00	1.40			0.506	0.591	1.0	18.50	19.50	1.00	1.40	0.549	0.549	1.40	0.768	9%
15	20.00	1.32			0.576	0.428	1.0	19.50	20.50	1.00	1.32	0.502	0.502	1.32	0.663	7%
16	21.00	1.30			0.468	0.556	1.0	20.50	21.50	1.00	1.30	0.512	0.512	1.30	0.666	7%
17	22.00	1.18			0.400	0.509	1.0	21.50	22.50	1.00	1.18	0.455	0.455	1.18	0.536	6%
18	23.00	0.98			0.378	0.440	1.0	22.50	23.50	1.00	0.98	0.409	0.409	0.98	0.401	4%
19	24.00	0.90			0.287	0.405	1.0	23.50	24.75	1.25	0.90	0.346	0.346	1.13	0.389	4%
20	25.50	0.78			0.246	0.342	1.0	24.75	26.25	1.50	0.78	0.294	0.294	1.17	0.344	4%
21	27.00	0.60		0.066			1.0	26.25	27.75	1.50	0.60	0.066	0.066	0.90	0.059	1%
LB	28.50	0.00	0.00	0.00	0.00	0.00	1.0	27.75	28.50	0.75	0.15	0.017	0.017	0.11	0.002	0%
<b>Total Flow</b>														<b>9.01</b>		

Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	16:30
Equipment:	ADV
Method:	Fishcat
River Condition:	good
Quality/Error (see reverse):	Excellent
Weather:	clear, 27

Flow characteristics:	
Total Flow:	9.01 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	26.12 (m <sup>2</sup> )
Wetted Width:	24.50 (m)
Hydraulic Depth:	1.066 (m)
Mean Velocity:	0.345 (m/s)
Froude Number:	0.107

Logger Details:		
	Before	After
Transducer Reading (m):	0.951	
Water (°C):	21.2	
Battery (Main):	13.9	
Datalogger Clock:	13:26	
Laptop Clock:	13:25	
Dessicant:	replaced	
Logger# (if Δ):	16569	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-modem: RSSI: -94	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			2.194	100.078	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.776	100.496	100.495	Pipe 5 m NE of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.120	98.152		
Other:	2.137	102.272		100.135	100.135	Rebar
<b>Setup #2</b>						
Bench Mark 1:	2.149	102.227		100.078	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.732	100.495	100.495	Pipe 5 m NE of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.079	98.148		
Other:			2.093	100.134	100.135	Rebar
Closing Error	0.001					
WL Check	0.004					
Average WL				98.150		
Transducer Elevation				97.199		

General Notes:	
- TSS sampled at offset 20 m	
- Added 2 BMS	
- Mast was extended	

Field Personnel:		SM, TR	Trip Date:	8-Aug-12
Data Entry Personnel:	CJ		Date:	2-Oct-12
Data Check Personnel:	MY		Date:	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

August 30, 2012



Flow Measurement:										Calculated Data						
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																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b>															-	

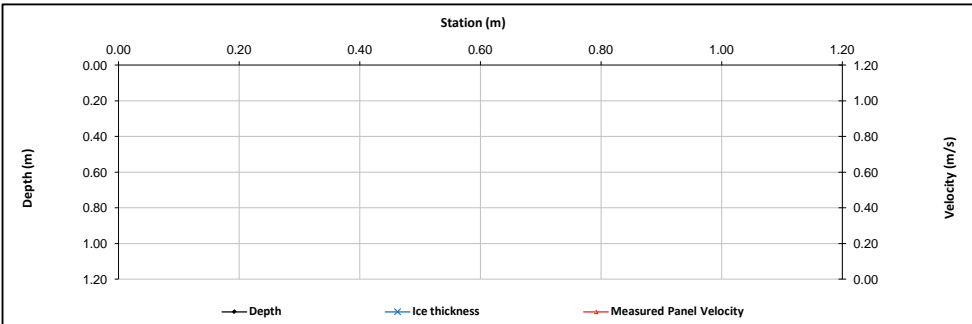
Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	14:50
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

-Modem -RSSI: -93  
 -reoriented antenna NNW



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.077	Pipe 3 m SW of data logger
Bench Mark 2:					100.495	Pipe 5 m NE of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					100.135	Rebar
<b>Setup #2</b>						
Bench Mark 1:					100.077	Pipe 3 m SW of data logger
Bench Mark 2:					100.495	Pipe 5 m NE of data logger
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					100.135	Rebar

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Field Personnel:	SM, TR	Trip Date:	30-Aug-12
Data Entry Personnel:	CJ	Date:	4-Oct-12
Data Check Personnel:	MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S14A - Elys River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: September 24, 2012



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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	5.50	1.50	0.18	0.002	0.002	0.26	0.000	0%
1	7.00	0.70		0.006			1.0	5.50	7.50	2.00	0.70	0.006	0.006	1.40	0.008	0%
2	8.00	0.90			0.003		1.0	7.50	8.50	1.00	0.90	0.002	0.002	0.90	0.001	0%
3	9.00	1.00			0.086		1.0	8.50	9.50	1.00	1.00	0.073	0.073	1.00	0.073	2%
4	10.00	1.16			0.143		1.0	9.50	10.50	1.00	1.16	0.080	0.080	1.16	0.093	3%
5	11.00	1.20			0.152		1.0	10.50	11.50	1.00	1.20	0.143	0.143	1.20	0.172	5%
6	12.00	1.20			0.162		1.0	11.50	12.50	1.00	1.20	0.138	0.138	1.20	0.165	5%
7	13.00	1.24			0.173		1.0	12.50	13.50	1.00	1.24	0.171	0.171	1.24	0.211	6%
8	14.00	1.22			0.139		1.0	13.50	14.50	1.00	1.22	0.167	0.167	1.22	0.203	6%
9	15.00	1.20			0.189		1.0	14.50	15.50	1.00	1.20	0.202	0.202	1.20	0.242	7%
10	16.00	1.20			0.235		1.0	15.50	16.50	1.00	1.20	0.258	0.258	1.20	0.309	8%
11	17.00	1.24			0.276		1.0	16.50	17.50	1.00	1.24	0.266	0.266	1.24	0.329	9%
12	18.00	1.26			0.331		1.0	17.50	18.50	1.00	1.26	0.285	0.285	1.26	0.358	10%
13	19.00	1.18			0.170		1.0	18.50	19.50	1.00	1.18	0.197	0.197	1.18	0.232	6%
14	20.00	1.15			0.366		1.0	19.50	20.50	1.00	1.15	0.298	0.298	1.15	0.343	9%
15	21.00	1.16			0.234		1.0	20.50	21.50	1.00	1.16	0.232	0.232	1.16	0.269	7%
16	22.00	1.06			0.289		1.0	21.50	22.50	1.00	1.06	0.226	0.226	1.06	0.239	7%
17	23.00	0.84			0.235		1.0	22.50	23.50	1.00	0.84	0.188	0.188	0.84	0.158	4%
18	24.00	0.82			0.109	0.229	1.0	23.50	24.50	1.00	0.82	0.169	0.169	0.82	0.139	4%
19	25.00	0.67		0.145			1.0	24.50	25.50	1.00	0.67	0.145	0.145	0.67	0.097	3%
20	26.00	0.65		0.011			1.0	25.50	27.25	1.75	0.65	0.011	0.011	1.14	0.013	0%
LB	28.50	0.00	0.00	0.00	0.00	0.00	1.0	27.25	28.50	1.25	0.16	0.003	0.003	0.20	0.001	0%

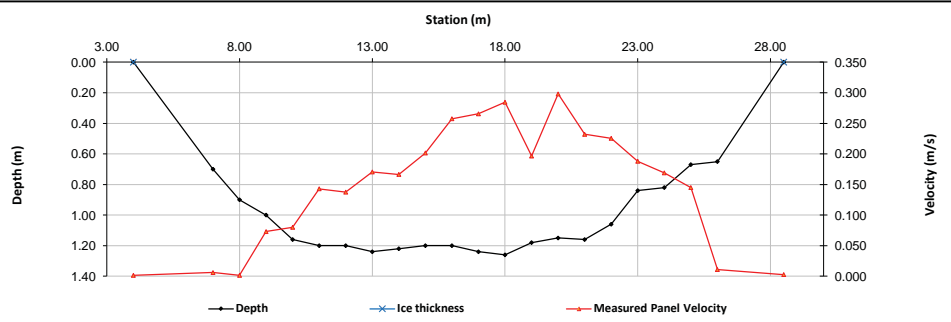
**Total Flow 3.66**

Measurement Details:	
Start Time (MST):	13:10
End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Good
Weather:	15C, clear, calm

Flow characteristics:		
Total Flow:	3.66	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	22.70	(m <sup>2</sup> )
Wetted Width:	24.50	(m)
Hydraulic Depth:	0.927	(m)
Mean Velocity:	0.161	(m/s)
Froude Number:	0.053	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.804	11.5
Battery (Main):	14.1	
Datalogger Clock:	12:29	
Laptop Clock:	12:30	
Dessicant:	replaced	
Logger# (if Δ):	16569	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-	Uploaded new Data logger program to power modem.
-	Modem works: RSSI -95.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	2.265	102.342		100.077	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.847	100.495	100.495	Pipe 5 m NE of data logger
Bench Mark 3:			1.577	100.752	100.752	Pipe 5 m SE of data logger
Ice/PT:						
Water Level:			4.336	98.006		
Other:			2.207	100.135	100.135	Rebar
<b>Setup #2</b>						
Bench Mark 1:	2.252	102.329		100.077	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.834	100.495	100.495	Pipe 5 m NE of data logger
Bench Mark 3:			1.563	100.766	100.752	Pipe 5 m SE of data logger
Ice/PT:						
Water Level:			4.320	98.009		
Other:			2.193	100.136	100.135	Rebar

Closing Error	0.000	Average WL	98.008
WL Check	0.003	Transducer Elevation	97.204

General Notes:	
-	Very weedy between 4 and 7 m offset
-	installed BM # 3 and BM tags
-	rss@16.5 m

Field Personnel:		Trip Date:	24-Sep-12
Data Entry Personnel:	SM, TR (Field)	Date:	24-Sep-12
Data Check Personnel:	CJ	Date:	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date:

October 17, 2012



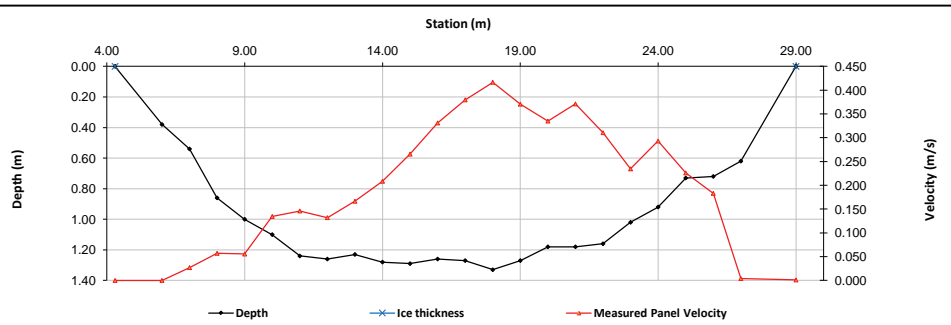
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	4.30	0.00	0.00	0.000	0.000	0.000	1.0	4.30	5.15	0.85	0.10	0.000	0.000	0.08	0.000	0%
1	6.00	0.38		0.000			1.0	5.15	6.50	1.35	0.38	0.000	0.000	0.51	0.000	0%
2	7.00	0.54		0.027			1.0	6.50	7.50	1.00	0.54	0.027	0.027	0.54	0.015	0%
3	8.00	0.86			0.033	0.081	1.0	7.50	8.50	1.00	0.86	0.057	0.057	0.86	0.049	1%
4	9.00	1.00			0.008	0.103	1.0	8.50	9.50	1.00	1.00	0.056	0.056	1.00	0.056	1%
5	10.00	1.10			0.103	0.166	1.0	9.50	10.50	1.00	1.10	0.135	0.135	1.10	0.148	3%
6	11.00	1.24			0.128	0.164	1.0	10.50	11.50	1.00	1.24	0.146	0.146	1.24	0.181	3%
7	12.00	1.26			0.101	0.163	1.0	11.50	12.50	1.00	1.26	0.132	0.132	1.26	0.166	3%
8	13.00	1.23			0.162	0.171	1.0	12.50	13.50	1.00	1.23	0.167	0.167	1.23	0.205	4%
9	14.00	1.28			0.195	0.222	1.0	13.50	14.50	1.00	1.28	0.209	0.209	1.28	0.267	5%
10	15.00	1.29			0.238	0.293	1.0	14.50	15.50	1.00	1.29	0.266	0.266	1.29	0.342	6%
11	16.00	1.26		0.226	0.322	0.340	1.0	15.50	16.50	1.00	1.26	0.331	0.331	1.26	0.417	8%
12	17.00	1.27		0.183	0.335	0.424	1.0	16.50	17.50	1.00	1.27	0.380	0.380	1.27	0.482	9%
13	18.00	1.33		0.004	0.343	0.490	1.0	17.50	18.50	1.00	1.33	0.417	0.417	1.33	0.554	10%
14	19.00	1.27			0.314	0.427	1.0	18.50	19.50	1.00	1.27	0.371	0.371	1.27	0.471	9%
15	20.00	1.18			0.327	0.343	1.0	19.50	20.50	1.00	1.18	0.335	0.335	1.18	0.395	7%
16	21.00	1.18			0.319	0.423	1.0	20.50	21.50	1.00	1.18	0.371	0.371	1.18	0.438	8%
17	22.00	1.16			0.242	0.379	1.0	21.50	22.50	1.00	1.16	0.311	0.311	1.16	0.360	7%
18	23.00	1.02			0.132	0.337	1.0	22.50	23.50	1.00	1.02	0.235	0.235	1.02	0.239	4%
19	24.00	0.92			0.245	0.341	1.0	23.50	24.50	1.00	0.92	0.293	0.293	0.92	0.270	5%
20	25.00	0.73		0.226			1.0	24.50	25.50	1.00	0.73	0.226	0.226	0.73	0.165	3%
21	26.00	0.72		0.183			1.0	25.50	26.50	1.00	0.72	0.183	0.183	0.72	0.132	2%
22	27.00	0.62		0.004			1.0	26.50	28.00	1.50	0.62	0.004	0.004	0.93	0.004	0%
LB	29.00	0.00	0.00	0.00	0.00	0.00	1.0	28.00	29.00	1.00	0.16	0.001	0.001	0.16	0.000	0%

**Total Flow 5.35**

Measurement Details:	
Start Time (MST):	14:15
End Time (MST):	15:40
Equipment:	ADV
Method:	Fishcat
River Condition:	Good Flow
Quality/Error (see reverse):	Excellent
Weather:	Scattered Drizzle, 3C.

Flow characteristics:		
Total Flow:	5.35	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	23.52	(m <sup>2</sup> )
Wetted Width:	24.70	(m)
Hydraulic Depth:	0.952	(m)
Mean Velocity:	0.227	(m/s)
Froude Number:	0.074	

Logger Details:		
	Before	After
Transducer Reading (m):	0.863	
Water (°C):	3.6	
Battery (Main):	13.0	
Datalogger Clock:	14:21	
Laptop Clock:	14:20	
Dessicant:	Replaced	
Logger# (if Δ):	16569	
PT# (if Δ):	-	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.549	100.075	100.077	Pipe 3 m SW of data logger
Bench Mark 2:	1.129	101.624		100.495	100.495	Pipe 5 m SE of data logger
Bench Mark 3:			0.869	100.755	100.752	Pipe 5 m NE of data logger
Ice/PT:						
Water Level:			3.563	98.061		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.537	101.612		100.075	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.118	100.494	100.495	Pipe 5 m SE of data logger
Bench Mark 3:			0.847	100.765	100.752	Pipe 5 m NE of data logger
Ice/PT:						
Water Level:			3.549	98.063		
Other:						

Closing Error	0.001	Average WL	98.062
WL Check	0.002	Transducer Elevation	97.199

**General Notes:**  
 -TSS taken at 18.5 m

<b>Field Personnel:</b>	TR, ACM, SM	Trip Date:	17-Oct-12
<b>Data Entry Personnel:</b>	SM	Date:	19-Oct-12
<b>Data Check Personnel:</b>	CJ	Date:	21-Nov-12
Entered Digitally in the Field:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the CNRL Bridge

UTM Location: 455748 E, 6344947 N

Site Visit Date:

November 30, 2012



## 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	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	31.00	0.00	0.00	0.000	0.000	0.000	0.9	31.00	30.30	0.70	0.09	0.000	0.000	0.06	0.000	0%
1	29.60	0.68	0.34	0.001			0.9	30.30	29.20	1.10	0.34	0.001	0.001	0.37	0.000	0%
2	28.80	0.85	0.33	0.002			0.9	29.20	28.10	1.10	0.52	0.002	0.002	0.57	0.001	0%
3	27.40	0.95	0.35	0.205			0.9	28.10	26.95	1.15	0.60	0.205	0.185	0.69	0.127	3%
4	26.50	1.05	0.32	0.205			0.9	26.95	25.85	1.10	0.73	0.205	0.185	0.80	0.148	3%
5	25.20	1.10	0.32	0.244			0.9	25.85	24.95	0.90	0.78	0.244	0.220	0.70	0.154	3%
6	24.70	1.21	0.33	0.302			0.9	24.95	24.30	0.65	0.88	0.302	0.272	0.57	0.155	3%
7	23.90	1.30	0.34	0.347			0.9	24.30	23.45	0.85	0.96	0.347	0.312	0.82	0.255	6%
8	23.00	1.11	0.35		0.329	0.401	1.0	23.45	22.55	0.90	0.76	0.365	0.365	0.68	0.250	6%
9	22.10	1.11	0.31		0.306	0.418	1.0	22.55	21.60	0.95	0.80	0.362	0.362	0.76	0.275	6%
10	21.10	1.10	0.30		0.334	0.479	1.0	21.60	20.60	1.00	0.80	0.407	0.407	0.80	0.325	7%
11	20.10	1.19	0.29		0.361	0.443	1.0	20.60	19.70	0.90	0.90	0.402	0.402	0.81	0.326	7%
12	19.30	1.29	0.30		0.306	0.434	1.0	19.70	18.80	0.90	0.99	0.370	0.370	0.89	0.330	7%
13	18.30	1.46	0.31		0.318	0.405	1.0	18.80	17.90	0.90	1.15	0.362	0.362	1.04	0.374	8%
14	17.50	1.50	0.30		0.318	0.334	1.0	17.90	16.90	1.00	1.20	0.326	0.326	1.20	0.391	9%
15	16.30	1.49	0.35		0.277	0.235	1.0	16.90	15.75	1.15	1.14	0.256	0.256	1.31	0.336	7%
16	15.20	1.55	0.35		0.184	0.208	1.0	15.75	14.65	1.10	1.20	0.196	0.196	1.32	0.259	6%
17	14.10	1.53	0.33		0.161	0.164	1.0	14.65	13.55	1.10	1.20	0.163	0.163	1.32	0.215	5%
18	13.00	1.51	0.32		0.136	0.151	1.0	13.55	12.45	1.10	1.19	0.144	0.144	1.31	0.188	4%
19	11.90	1.45	0.34		0.121	0.136	1.0	12.45	11.20	1.25	1.11	0.129	0.129	1.39	0.178	4%
20	10.50	1.30	0.32		0.072	0.130	1.0	11.20	9.85	1.35	0.98	0.101	0.101	1.32	0.134	3%
21	9.20	0.97	0.33	0.115			0.9	9.85	8.60	1.25	0.64	0.115	0.104	0.80	0.083	2%
22	8.00	0.70	0.33	0.014			0.9	8.60	7.50	1.10	0.37	0.014	0.013	0.41	0.005	0%
23	7.00	0.59	0.31	0.060			0.9	7.50	6.75	0.75	0.28	0.060	0.054	0.21	0.011	0%
LB	6.50	0.00	0.00	0.00	0.00	0.00	1.0	6.75	6.50	0.25	0.07	0.015	0.015	0.02	0.000	0%

**Total Flow 4.52**

### Measurement Details:

Start Time (MST):	9:50
End Time (MST):	11:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	Light Snow, -17

### Flow characteristics:

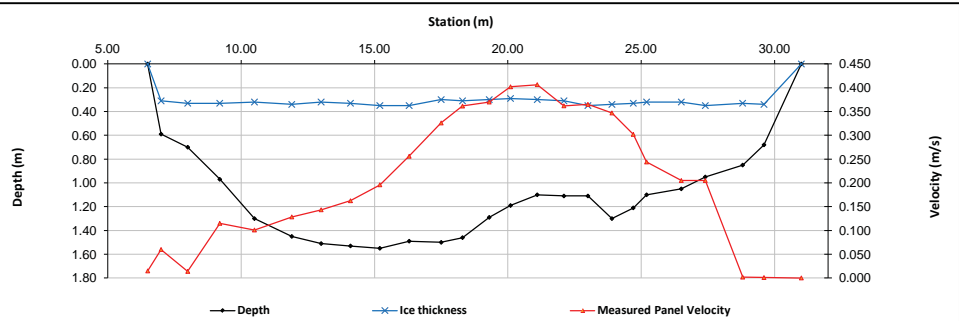
Total Flow:	4.52	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	20.17	(m <sup>2</sup> )
Wetted Width:	23.55	(m)
Hydraulic Depth:	0.857	(m)
Mean Velocity:	0.224	(m/s)
Froude Number:	0.077	

### Logger Details:

	Before	After
Transducer Reading (m):	1.081	
Water (°C):	0.1	
Battery (Main):	12.1	
Datalogger Clock:	9:58	
Laptop Clock:	9:56	
Dessicant:	Good	
Logger# (if Δ):	16569	
PT# (if Δ):	-	

### Datalogger / Station Notes:

replaced battery



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.875	101.952		100.077	100.077	Pipe 3 m SW of data logger
Bench Mark 2:			1.455	100.497	100.495	Pipe 5 m SE of data logger
Bench Mark 3:			1.184	100.768	100.752	Pipe 5 m NE of data logger
Ice/PT:			3.660	98.292		
Water Level:			3.674	98.278		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.864	100.077	100.077	Pipe 3 m SW of data logger
Bench Mark 2:	1.444	101.941		100.497	100.495	Pipe 5 m SE of data logger
Bench Mark 3:			1.173	100.768	100.752	Pipe 5 m NE of data logger
Ice/PT:			3.648	98.293		
Water Level:			3.663	98.278		
Other:						

Closing Error	0.000	Average WL	98.278
WL Check	0.000	Transducer Elevation	97.197

### General Notes:

Field Personnel:	SM, TR	Trip Date:	30-Nov-12
Data Entry Personnel:	SM	Date:	30-Nov-12
Data Check Personnel:	DW	Date:	11-Dec-12
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 4, 2012



## 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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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24																
25																
26																
27																
28																
29																
30																
LB																

No Flow Measurement Conducted

Total Flow

### Measurement Details:

Start Time (MST):	10:45
End Time (MST):	11:52
Equipment:	-
Method:	-
River Condition:	high ice level
Quality/Error (see reverse):	-
Weather:	-

### Flow characteristics:

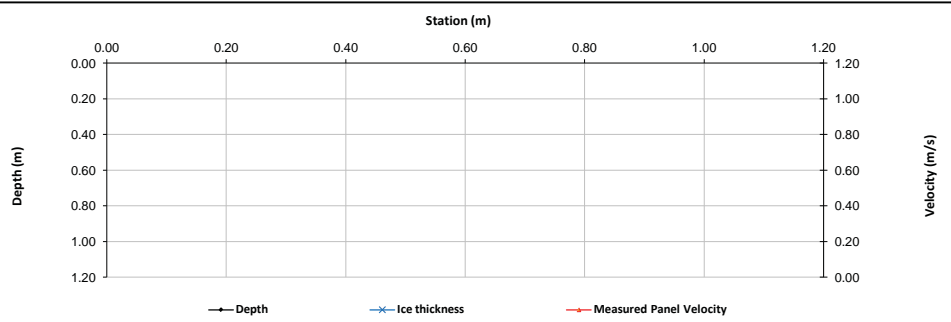
Total Flow:		(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Cross Section Area:		(m <sup>2</sup> )
Wetted Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number:		

### Logger Details:

	Before	After
Transducer Reading (m):	0.459	
Water (°C):	1.5	-
Battery (Main):	14.5	-
Datalogger Clock:	10:32	-
Laptop Clock:	10:32	-
Dessicant:	replaced	-
Logger# (if Δ):	17936	-
PT# (if Δ):		-

### Datalogger / Station Notes:

-logger and PT installed and tested. Deactivated after test.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.182	101.182		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.368	99.814	99.815	3/4" Pipe 2 m E
Bench Mark 3:						
Ice/PT:			3.203	97.979		
Water Level:			3.228	97.954		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.165	100.001		3/4" Pipe 3 m S
Bench Mark 2:	1.352	101.166		99.814		3/4" Pipe 2 m E
Bench Mark 3:						
Ice/PT:			3.187	97.979		
Water Level:			3.21	97.956		
Other:						

Closing Error	-0.001
WL Check	0.002

Average WL	97.955
Transducer Elevation	97.496

### General Notes:

-ice level high. Water present between ice layers. Top layer of ice approx. 15 cm, water between layers at approx. 60 cm depth.  
 -flow measurement not performed due to ice safety concerns, and any measurement performed would have been poor.  
 -WL survey suspected to be poor  
 -Note: next trip bring putty for data logger enclosure.

<b>Field Pers</b> 10:45	SM, DW	Trip Date:	4-Apr-12
<b>Data Entry Personnel:</b>	CJ	Date:	10-Apr-12
<b>Data Check Personnel:</b>	DW	Date:	23-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date:

April 22, 2012



## 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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.45	0.05	0.06	0.022	0.022	0.00	0.000	0%
1	0.50	0.25		0.087			1.0	0.45	0.60	0.15	0.25	0.087	0.087	0.04	0.003	3%
2	0.70	0.26		0.071			1.0	0.60	0.80	0.20	0.26	0.071	0.071	0.05	0.004	3%
3	0.90	0.26		0.087			1.0	0.80	1.00	0.20	0.26	0.087	0.087	0.05	0.005	4%
4	1.10	0.26		0.065			1.0	1.00	1.20	0.20	0.26	0.065	0.065	0.05	0.003	3%
5	1.30	0.26		0.076			1.0	1.20	1.40	0.20	0.26	0.076	0.076	0.05	0.004	3%
6	1.50	0.28		0.112			1.0	1.40	1.60	0.20	0.28	0.112	0.112	0.06	0.006	5%
7	1.70	0.26		0.092			1.0	1.60	1.80	0.20	0.26	0.092	0.092	0.05	0.005	4%
8	1.90	0.27		0.106			1.0	1.80	2.00	0.20	0.27	0.106	0.106	0.05	0.006	5%
9	2.10	0.30		0.077			1.0	2.00	2.20	0.20	0.30	0.077	0.077	0.06	0.005	4%
10	2.30	0.29		0.101			1.0	2.20	2.40	0.20	0.29	0.101	0.101	0.06	0.006	5%
11	2.50	0.28		0.108			1.0	2.40	2.60	0.20	0.28	0.108	0.108	0.06	0.006	5%
12	2.70	0.31		0.081			1.0	2.60	2.80	0.20	0.31	0.081	0.081	0.06	0.005	4%
13	2.90	0.32		0.078			1.0	2.80	3.00	0.20	0.32	0.078	0.078	0.06	0.005	4%
14	3.10	0.30		0.063			1.0	3.00	3.20	0.20	0.30	0.063	0.063	0.06	0.004	3%
15	3.30	0.31		0.108			1.0	3.20	3.40	0.20	0.31	0.108	0.108	0.06	0.007	6%
16	3.50	0.35		0.141			1.0	3.40	3.60	0.20	0.35	0.141	0.141	0.07	0.010	9%
17	3.70	0.39		0.080			1.0	3.60	3.80	0.20	0.39	0.080	0.080	0.08	0.006	5%
18	3.90	0.37		0.075			1.0	3.80	4.00	0.20	0.37	0.075	0.075	0.07	0.006	5%
19	4.10	0.34		0.091			1.0	4.00	4.20	0.20	0.34	0.091	0.091	0.07	0.006	5%
20	4.30	0.34		0.094			1.0	4.20	4.40	0.20	0.34	0.094	0.094	0.07	0.006	6%
21	4.50	0.32		0.081			1.0	4.40	4.60	0.20	0.32	0.081	0.081	0.06	0.005	5%
22	4.70	0.28		0.051			1.0	4.60	4.83	0.23	0.28	0.051	0.051	0.06	0.003	3%
LB	4.95	0.00	0.00	0.00	0.00	0.00	1.0	4.83	4.95	0.13	0.07	0.013	0.013	0.01	0.000	0%
<b>Total Flow</b>															<b>0.115</b>	

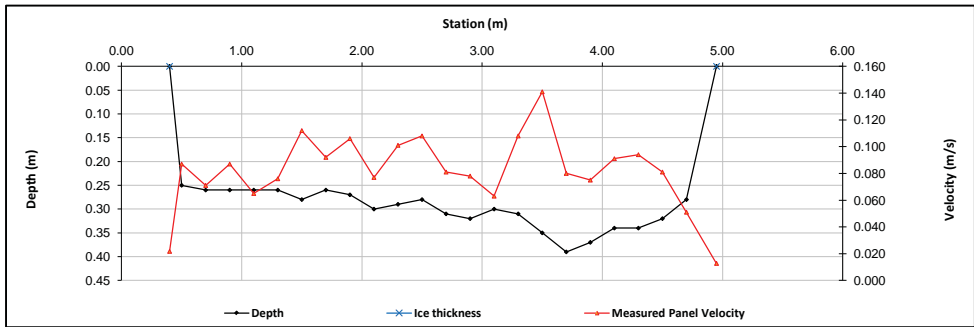
Measurement Details:	
Start Time (MST):	7:30
End Time (MST):	9:00
Equipment:	ADV
Method:	Wading
River Condition:	open, bed ice
Quality/Error (see reverse):	Good
Weather:	sunny, +5

Flow characteristics:		
Total Flow:	0.115	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.33	(m <sup>2</sup> )
Wetted Width:	4.55	(m)
Hydraulic Depth:	0.292	(m)
Mean Velocity:	0.087	(m/s)
Froude Number:	0.051	

Logger Details:	Before	After
Transducer Reading (m):	0.577	-
Water (°C):	0.1	-
Battery (Main):	14.56	-
Datalogger Clock:	9:45	-
Laptop Clock:	9:45	-
Dessicant:	good	-
Logger# (if Δ):	17936	-
PT# (if Δ):	284719	-

Datalogger / Station Notes:	
-modem: (604)-355-7308	
-RSSI (-79)	
-Logger activated, and PT placed in the water	

General Notes:	
-TSS taken at 2.5 offset	
-Lots of bed ice	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.196	101.196		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.382	99.814	99.815	3/4" Pipe 2 m E
Bench Mark 3:						
Ice/PT:						
Water Level:			4.268	96.928		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.181	100.001		3/4" Pipe 3 m S
Bench Mark 2:	1.368	101.182		99.814		3/4" Pipe 2 m E
Bench Mark 3:						
Ice/PT:						
Water Level:			4.258	96.924		
Other:						

Closing Error	-0.001	Average WL	96.926
WL Check	0.004	Transducer Elevation	96.349

Field Personnel:	TR, SG	Trip Date:	22-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date:

May 14, 2012



## 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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.05	0.05	0.09	0.048	0.048	0.00	0.000	0%
1	3.10	0.36		0.193				3.05	3.20	0.15	0.36	0.193	0.193	0.05	0.010	1%
2	3.30	0.46		0.200				3.20	3.40	0.20	0.46	0.200	0.200	0.09	0.018	2%
3	3.50	0.40		0.255				3.40	3.63	0.23	0.40	0.255	0.255	0.09	0.023	2%
4	3.75	0.32		0.303				3.63	3.88	0.25	0.32	0.303	0.303	0.08	0.024	2%
5	4.00	0.27		0.452				3.88	4.25	0.38	0.27	0.452	0.452	0.10	0.046	4%
6	4.50	0.29		0.413				4.25	4.75	0.50	0.29	0.413	0.413	0.15	0.060	5%
7	5.00	0.28		0.467				4.75	5.25	0.50	0.28	0.467	0.467	0.14	0.065	6%
8	5.50	0.30		0.435				5.25	5.75	0.50	0.30	0.435	0.435	0.15	0.065	6%
9	6.00	0.29		0.399				5.75	6.25	0.50	0.29	0.399	0.399	0.15	0.058	5%
10	6.50	0.33		0.325				6.25	6.75	0.50	0.33	0.325	0.325	0.17	0.054	5%
11	7.00	0.40		0.325				6.75	7.25	0.50	0.40	0.325	0.325	0.20	0.065	6%
12	7.50	0.36		0.392				7.25	7.75	0.50	0.36	0.392	0.392	0.18	0.071	6%
13	8.00	0.33		0.381				7.75	8.25	0.50	0.33	0.381	0.381	0.17	0.063	6%
14	8.50	0.35		0.363				8.25	8.75	0.50	0.35	0.363	0.363	0.18	0.064	6%
15	9.00	0.37		0.317				8.75	9.25	0.50	0.37	0.317	0.317	0.19	0.059	5%
16	9.50	0.35		0.415				9.25	9.75	0.50	0.35	0.415	0.415	0.18	0.073	7%
17	10.00	0.30		0.390				9.75	10.25	0.50	0.30	0.390	0.390	0.15	0.059	5%
18	10.50	0.40		0.366				10.25	10.75	0.50	0.40	0.366	0.366	0.20	0.073	7%
19	11.00	0.32		0.225				10.75	11.25	0.50	0.32	0.225	0.225	0.16	0.036	3%
20	11.50	0.26		0.276				11.25	11.75	0.50	0.26	0.276	0.276	0.13	0.036	3%
21	12.00	0.25		0.307				11.75	12.25	0.50	0.25	0.307	0.307	0.13	0.038	4%
22	12.50	0.20		0.248				12.25	12.75	0.50	0.20	0.248	0.248	0.10	0.025	2%
23	13.00	0.23		0.107				12.75	13.18	0.43	0.23	0.107	0.107	0.10	0.010	1%
LB	13.35	0.00	0.00	0.00	0.00	0.00	1.0	13.18	13.35	0.17	0.06	0.027	0.027	0.01	0.000	0%
<b>Total Flow</b>															<b>1.09</b>	

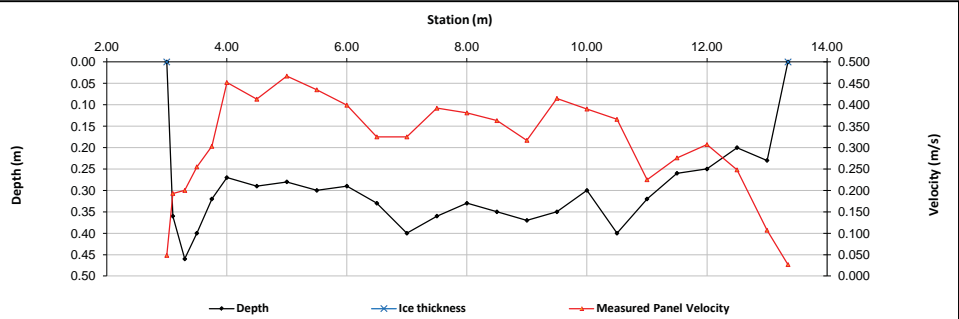
Measurement Details:	
Start Time (MST):	10:11
End Time (MST):	13:20
Equipment:	ADV
Method:	Wading
River Condition:	open, normal flow
Quality/Error (see reverse):	excellent
Weather:	cloudy, +11

Flow characteristics:	
Total Flow:	1.09 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	3.22 (m <sup>2</sup> )
Wetted Width:	10.35 (m)
Hydraulic Depth:	0.311 (m)
Mean Velocity:	0.339 (m/s)
Froude Number:	0.194

Logger Details:		
	Before	After
Transducer Reading (m):	NAN	0.337
Water (°C):	3.8	14.4
Battery (Main):	13.8	14.3
Datalogger Clock:	10:30	11:17
Laptop Clock:	9:30	11:17
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- set time
- PT reading "NAN"
- PT cable severed near PT (likely from ice)
- installed a new PT, install failed (faulty PT), installed a second PT



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.007	101.007		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.194	99.813	99.815	3/4" Pipe 2 m E
Bench Mark 3:			1.079	99.928	99.929	3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.299	96.708		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.991	99.999		3/4" Pipe 3 m S
Bench Mark 2:	1.177	100.99		99.813		3/4" Pipe 2 m E
Bench Mark 3:			1.062	99.928		3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.282	96.708		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	96.708
Transducer Elevation	96.371

**General Notes:**

- large woody debris up/down stream of station- may be affecting flow near middle of reach (offset: 6.7 m)
- BM3 installed (Four 5' sections of 3/4" pipe)

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	14-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	4-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date:

June 12, 2012



## 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
LB	2.80	0.00	0.00	0.000	0.000	0.000	1.0	2.80	2.90	0.10	0.25	-0.001	-0.001	0.03	0.000	0%
1	3.00	1.00			-0.011	0.000	1.0	2.90	3.25	0.35	1.00	-0.006	-0.006	0.35	-0.002	0%
2	3.50	1.30			-0.004	0.016	1.0	3.25	3.75	0.50	1.30	0.006	0.006	0.65	0.004	1%
3	4.00	1.20			-0.006	0.014	1.0	3.75	4.25	0.50	1.20	0.004	0.004	0.60	0.002	1%
4	4.50	1.11			0.011	0.036	1.0	4.25	4.75	0.50	1.11	0.024	0.024	0.56	0.013	3%
5	5.00	1.10			0.008	0.021	1.0	4.75	5.25	0.50	1.10	0.015	0.015	0.55	0.008	2%
6	5.50	1.08			0.020	0.019	1.0	5.25	5.75	0.50	1.08	0.020	0.020	0.54	0.011	2%
7	6.00	1.08			0.020	0.028	1.0	5.75	6.25	0.50	1.08	0.024	0.024	0.54	0.013	3%
8	6.50	1.06			0.027	0.041	1.0	6.25	6.75	0.50	1.06	0.034	0.034	0.53	0.018	4%
9	7.00	1.08			0.012	0.034	1.0	6.75	7.25	0.50	1.08	0.023	0.023	0.54	0.012	3%
10	7.50	1.30			0.011	0.060	1.0	7.25	7.75	0.50	1.30	0.036	0.036	0.65	0.023	5%
11	8.00	1.50			0.006	0.058	1.0	7.75	8.25	0.50	1.50	0.032	0.032	0.75	0.024	6%
12	8.50	1.50			0.013	0.048	1.0	8.25	8.75	0.50	1.50	0.031	0.031	0.75	0.023	5%
13	9.00	1.40			0.016	0.075	1.0	8.75	9.25	0.50	1.40	0.046	0.046	0.70	0.032	7%
14	9.50	1.25			0.012	0.084	1.0	9.25	9.75	0.50	1.25	0.048	0.048	0.63	0.030	7%
15	10.00	1.22			-0.004	0.083	1.0	9.75	10.25	0.50	1.22	0.040	0.040	0.61	0.024	6%
16	10.50	1.25			0.004	0.101	1.0	10.25	10.75	0.50	1.25	0.053	0.053	0.63	0.033	8%
17	11.00	1.15			0.025	0.091	1.0	10.75	11.25	0.50	1.15	0.058	0.058	0.58	0.033	8%
18	11.50	1.18			0.065	0.074	1.0	11.25	12.75	1.50	1.18	0.070	0.070	1.77	0.123	29%
RB	14.00	0.00	0.00	0.00	0.00	0.00	1.0	12.75	14.00	1.25	0.30	0.017	0.017	0.37	0.006	1%

**Total Flow 0.431**

## Measurement Details:

Start Time (MST):	8:30
End Time (MST):	10:45
Equipment:	ADV
Method:	Wading
River Condition:	VERY HIGH
Quality/Error (see reverse):	POOR
Weather:	12, OVERCAST, CALM

## Flow characteristics:

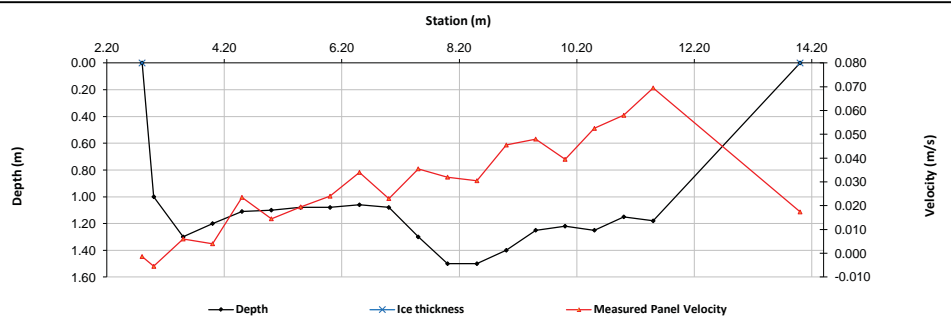
Total Flow:	0.431	(m <sup>3</sup> /s)
Perceived Measurement Quality:	POOR	
Cross Section Area:	12.30	(m <sup>2</sup> )
Wetted Width:	11.20	(m)
Hydraulic Depth:	1.099	(m)
Mean Velocity:	0.035	(m/s)
Froude Number:	0.011	

## Logger Details:

	Before	After
Transducer Reading (m):	1.171	
Water (°C):	16.1	
Battery (Main):	13.3	
Datalogger Clock:	8:45	
Laptop Clock:	8:45	
Dessicant:	Changed	
Logger# (if Δ):	17936	
PT# (if Δ):	-	

## Datalogger / Station Notes:

-Vent tube was checked and is ok



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.092	101.092		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.278	99.814	99.815	3/4" Pipe 2 m E
Bench Mark 3:			1.164	99.928	99.929	3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			3.64	97.452		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.079	100.001		3/4" Pipe 3 m S
Bench Mark 2:	1.266	101.08		99.814		3/4" Pipe 2 m E
Bench Mark 3:			1.152	99.928		3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			3.628	97.452		
Other:						

Closing Error	-0.001	Average WL	97.452
WL Check	0.000	Transducer Elevation	96.281

## General Notes:

-Water level increased by 1m in the past 24 hrs  
 -ikley backwater affected from the Athabasca River  
 -Lots of debris, upstream, downstream and on RB  
 -Flow measurement should quality is poor because of backwater affect

<b>Field Personnel:</b>	SM & CJ	Trip Date:	12-Jun-12
<b>Data Entry Personnel:</b>	TR	Date:	22-Jun-12
<b>Data Check Personnel:</b>	CJ	Date:	25-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date:

August 8, 2012



## Flow Measurement:

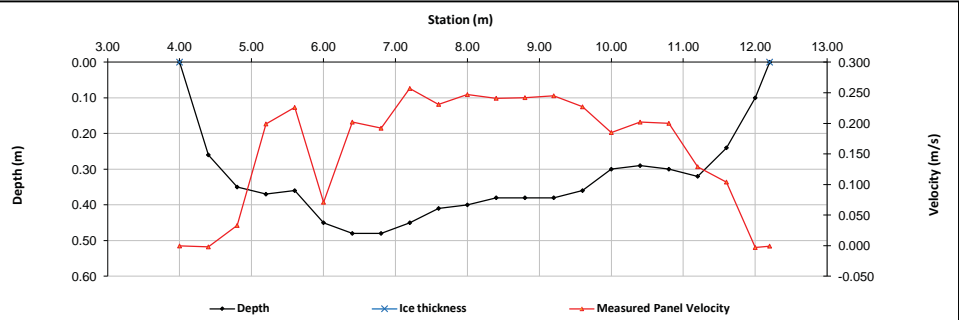
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.0	4.00	4.20	0.20	0.07	-0.001	-0.001	0.01	0.000	0%
1	4.40	0.26		-0.002			1.0	4.20	4.60	0.40	0.26	-0.002	-0.002	0.10	0.000	0%
2	4.80	0.35		0.033			1.0	4.60	5.00	0.40	0.35	0.033	0.033	0.14	0.005	1%
3	5.20	0.37		0.199			1.0	5.00	5.40	0.40	0.37	0.199	0.199	0.15	0.029	6%
4	5.60	0.36		0.226			1.0	5.40	5.80	0.40	0.36	0.226	0.226	0.14	0.033	6%
5	6.00	0.45		0.071			1.0	5.80	6.20	0.40	0.45	0.071	0.071	0.18	0.013	2%
6	6.40	0.48		0.202			1.0	6.20	6.60	0.40	0.48	0.202	0.202	0.19	0.039	7%
7	6.80	0.48		0.192			1.0	6.60	7.00	0.40	0.48	0.192	0.192	0.19	0.037	7%
8	7.20	0.45		0.257			1.0	7.00	7.40	0.40	0.45	0.257	0.257	0.18	0.046	9%
9	7.60	0.41		0.231			1.0	7.40	7.80	0.40	0.41	0.231	0.231	0.16	0.038	7%
10	8.00	0.40		0.247			1.0	7.80	8.20	0.40	0.40	0.247	0.247	0.16	0.040	8%
11	8.40	0.38		0.241			1.0	8.20	8.60	0.40	0.38	0.241	0.241	0.15	0.037	7%
12	8.80	0.38		0.242			1.0	8.60	9.00	0.40	0.38	0.242	0.242	0.15	0.037	7%
13	9.20	0.38		0.245			1.0	9.00	9.40	0.40	0.38	0.245	0.245	0.15	0.037	7%
14	9.60	0.36		0.227			1.0	9.40	9.80	0.40	0.36	0.227	0.227	0.14	0.033	6%
15	10.00	0.30		0.185			1.0	9.80	10.20	0.40	0.30	0.185	0.185	0.12	0.022	4%
16	10.40	0.29		0.202			1.0	10.20	10.60	0.40	0.29	0.202	0.202	0.12	0.023	5%
17	10.80	0.30		0.200			1.0	10.60	11.00	0.40	0.30	0.200	0.200	0.12	0.024	5%
18	11.20	0.32		0.129			1.0	11.00	11.40	0.40	0.32	0.129	0.129	0.13	0.017	3%
19	11.60	0.24		0.104			1.0	11.40	11.80	0.40	0.24	0.104	0.104	0.10	0.010	2%
20	12.00	0.10		-0.003			1.0	11.80	12.10	0.30	0.10	-0.003	-0.003	0.03	0.000	0%
RB	12.20	0.00	0.00	0.00	0.00	0.00	1.0	12.10	12.20	0.10	0.03	-0.001	-0.001	0.00	0.000	0%

**Total Flow 0.518**

Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	12:00
Equipment:	ADV
Method:	Wading
River Condition:	good flow
Quality/Error (see reverse):	excellent
Weather:	Clear, 25

Flow characteristics:		
Total Flow:	0.518	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	2.83	(m <sup>2</sup> )
Wetted Width:	8.20	(m)
Hydraulic Depth:	0.345	(m)
Mean Velocity:	0.183	(m/s)
Froude Number:	0.100	

Logger Details:		
	Before	After
Transducer Reading (m):	0.444	
Water (°C):	17.1	
Battery (Main):	14.0	
Datalogger Clock:	11:40	
Laptop Clock:	11:40	
Dessicant:	replaced	
Logger# (if Δ):	17936	
PT# (if Δ):	-	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.142	101.142		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.327	99.815	99.815	3/4" Pipe 2 m E
Bench Mark 3:			1.213	99.929	99.929	3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.488	96.654		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.131	100.000		3/4" Pipe 3 m S
Bench Mark 2:			1.316	99.815		3/4" Pipe 2 m E
Bench Mark 3:	1.202	101.131		99.929		3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.475	96.656		
Other:						

Closing Error	0.000
WL Check	0.002

Average WL	96.655
Transducer Elevation	96.211

## Datalogger / Station Notes:

## General Notes:

-Athabasca backwater effect appears to be gone  
 -TSS sampled at offset 8.0 m

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	22-Aug-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	23-Aug-12

# Hydrometric Measurement Field Data Sheet

Site:

UTM Location: 458395 E, 6353391 N

Site Visit Date:

September 24, 2012



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	1.35	0.25	0.07	0.057	0.057	0.02	0.001	0%
1	1.60	0.27		0.229			1.0	1.35	1.75	0.40	0.27	0.229	0.229	0.11	0.025	4%
2	1.90	0.31		0.298			1.0	1.75	2.05	0.30	0.31	0.298	0.298	0.09	0.028	4%
3	2.20	0.30		0.427			1.0	2.05	2.35	0.30	0.30	0.427	0.427	0.09	0.038	6%
4	2.50	0.28		0.401			1.0	2.35	2.65	0.30	0.28	0.401	0.401	0.08	0.034	5%
5	2.80	0.24		0.305			1.0	2.65	2.95	0.30	0.24	0.305	0.305	0.07	0.022	4%
6	3.10	0.23		0.276			1.0	2.95	3.25	0.30	0.23	0.276	0.276	0.07	0.019	3%
7	3.40	0.20		0.306			1.0	3.25	3.55	0.30	0.20	0.306	0.306	0.06	0.018	3%
8	3.70	0.21		0.313			1.0	3.55	3.85	0.30	0.21	0.313	0.313	0.06	0.020	3%
9	4.00	0.22		0.316			1.0	3.85	4.15	0.30	0.22	0.316	0.316	0.07	0.021	3%
10	4.30	0.26		0.329			1.0	4.15	4.45	0.30	0.26	0.329	0.329	0.08	0.026	4%
11	4.60	0.30		0.315			1.0	4.45	4.75	0.30	0.30	0.315	0.315	0.09	0.028	5%
12	4.90	0.34		0.281			1.0	4.75	5.05	0.30	0.34	0.281	0.281	0.10	0.029	5%
13	5.20	0.35		0.321			1.0	5.05	5.35	0.30	0.35	0.321	0.321	0.11	0.034	5%
14	5.50	0.33		0.298			1.0	5.35	5.65	0.30	0.33	0.298	0.298	0.10	0.030	5%
15	5.80	0.34		0.262			1.0	5.65	5.95	0.30	0.34	0.262	0.262	0.10	0.027	4%
16	6.10	0.34		0.347			1.0	5.95	6.25	0.30	0.34	0.347	0.347	0.10	0.035	6%
17	6.40	0.34		0.378			1.0	6.25	6.55	0.30	0.34	0.378	0.378	0.10	0.039	6%
18	6.70	0.34		0.334			1.0	6.55	6.85	0.30	0.34	0.334	0.334	0.10	0.034	5%
19	7.00	0.29		0.307			1.0	6.85	7.25	0.40	0.29	0.307	0.307	0.12	0.036	6%
20	7.50	0.28		0.281			1.0	7.25	7.75	0.50	0.28	0.281	0.281	0.14	0.039	6%
21	8.00	0.21		0.243			1.0	7.75	8.25	0.50	0.21	0.243	0.243	0.11	0.026	4%
22	8.50	0.17		0.214			1.0	8.25	8.65	0.40	0.17	0.214	0.214	0.07	0.015	2%
RB	8.80	0.00	0.00	0.00	0.00	0.00	1.0	8.65	8.80	0.15	0.04	0.054	0.054	0.01	0.000	0%

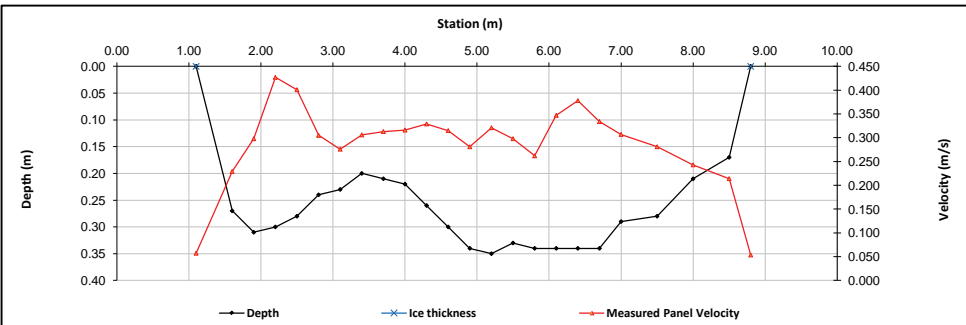
**Total Flow 0.621**

Measurement Details:	
Start Time (MST):	9:27
End Time (MST):	10:15
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	Excellent
Weather:	10C, clear, calm

Flow characteristics:		
Total Flow:	0.621	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.04	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.265	(m)
Mean Velocity:	0.305	(m/s)
Froude Number:	0.189	

Logger Details:		
	Before	After
Transducer Reading (m):	0.302	
Water (°C):	8.9	
Battery (Main):	14.5	
Datalogger Clock:	9:32	
Laptop Clock:	9:32	
Dessicant:	replaced	
Logger# (if Δ):	17936	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.124	101.124		100.000	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.309	99.815	99.815	3/4" Pipe 2 m E
Bench Mark 3:			1.195	99.929	99.929	3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.538	96.586		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.113	100.000		3/4" Pipe 3 m S
Bench Mark 2:			1.298	99.815		3/4" Pipe 2 m E
Bench Mark 3:	1.184	101.113		99.929		3/4" Pipe 3 m NE
Ice/PT:						
Water Level:			4.526	96.587		
Other:						

Closing Error	0.000	Average WL	96.587
WL Check	0.001	Transducer Elevation	96.285

General Notes:	
-TSS sampled at 4.0 m	

Field Personnel:	SM, TR	Trip Date:	24-Sep-12
Data Entry Personnel:	SM, TR	Date:	24-Sep-12
Data Check Personnel:	CJ	Date:	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: October 30, 2012



## 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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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22																
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25																
26																
27																
28																
29																
30																
LB																

No Flow Measurement Conducted

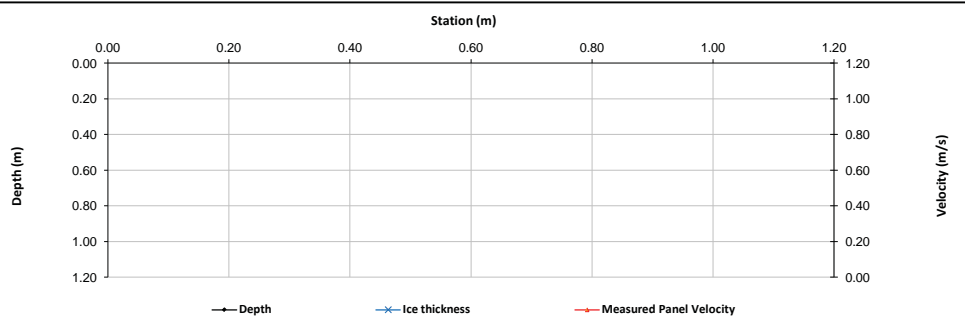
## Total Flow

Measurement Details:	
Start Time (MST):	9:44
End Time (MST):	10:30
Equipment:	-
Method:	-
River Condition:	Full ice cover
Quality/Error (see reverse):	-
Weather:	Snowing, -12C

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):	0.372	
Water (°C):	0.6	
Battery (Main):	12.6	
Datalogger Clock:	9:47	
Laptop Clock:	9:47	
Dessicant:	replaced	
Logger# (if Δ):	17936	
PT# (if Δ):	298684	

**Datalogger / Station Notes:**  
 - removed PLS 298684. Protective cap was missing



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.154	100.001	100.000	3/4" Pipe 3 m S
Bench Mark 2:			1.340	99.815	99.815	3/4" Pipe 2 m E
Bench Mark 3:	1.226	101.155		99.929	99.929	3/4" Pipe 3 m NE
Ice/PT:			4.558	96.597		
Water Level:			4.552	96.603		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.147	100.001		3/4" Pipe 3 m S
Bench Mark 2:	1.333	101.148		99.815		3/4" Pipe 2 m E
Bench Mark 3:			1.217	99.931		3/4" Pipe 3 m NE
Ice/PT:			4.55	96.598		
Water Level:			4.541	96.607		
Other:						

Closing Error	-0.002
WL Check	0.004

Average WL	96.605
Transducer Elevation	96.233

**General Notes:**  
 - No flow meas performed due to full ice cover

<b>Field Personnel:</b>	SM, TR	Trip Date:	30-Oct-12
<b>Data Entry Personnel:</b>	SM	Date:	30-Oct-12
<b>Data Check Personnel:</b>	DW	Date:	21-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary

UTM Location: 458130E, 6362062N

Site Visit Date:

April 25, 2012



## 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	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	0.10	0.10	0.07	0.056	0.056	0.01	0.000	0%
1	0.20	0.26		0.222			1.0	0.10	0.28	0.18	0.26	0.222	0.222	0.05	0.010	5%
2	0.35	0.23		0.279			1.0	0.28	0.43	0.15	0.23	0.279	0.279	0.03	0.010	5%
3	0.50	0.23		0.295			1.0	0.43	0.58	0.15	0.23	0.295	0.295	0.03	0.010	5%
4	0.65	0.30		0.324			1.0	0.58	0.73	0.15	0.30	0.324	0.324	0.05	0.015	8%
5	0.80	0.30		0.308			1.0	0.73	0.88	0.15	0.30	0.308	0.308	0.05	0.014	7%
6	0.95	0.30		0.356			1.0	0.88	1.03	0.15	0.30	0.356	0.356	0.05	0.016	8%
7	1.10	0.29		0.341			1.0	1.03	1.18	0.15	0.29	0.341	0.341	0.04	0.015	8%
8	1.25	0.30		0.280			1.0	1.18	1.33	0.15	0.30	0.280	0.280	0.05	0.013	7%
9	1.40	0.30		0.076			1.0	1.33	1.48	0.15	0.30	0.076	0.076	0.05	0.003	2%
10	1.55	0.28		0.287			1.0	1.48	1.63	0.15	0.28	0.287	0.287	0.04	0.012	6%
11	1.70	0.26		0.318			1.0	1.63	1.78	0.15	0.26	0.318	0.318	0.04	0.012	7%
12	1.85	0.25		0.343			1.0	1.78	1.93	0.15	0.25	0.343	0.343	0.04	0.013	7%
13	2.00	0.27		0.327			1.0	1.93	2.08	0.15	0.27	0.327	0.327	0.04	0.013	7%
14	2.15	0.18		0.239			1.0	2.08	2.28	0.20	0.18	0.239	0.239	0.04	0.009	5%
15	2.40	0.14		0.274			1.0	2.28	2.53	0.25	0.14	0.274	0.274	0.04	0.010	5%
16	2.65	0.08		0.181			1.0	2.53	2.78	0.25	0.08	0.181	0.181	0.02	0.004	2%
17	2.90	0.14		0.093			1.0	2.78	3.03	0.25	0.14	0.093	0.093	0.04	0.003	2%
18	3.15	0.19		0.162			1.0	3.03	3.28	0.25	0.19	0.162	0.162	0.05	0.008	4%
19	3.40	0.08		0.001			1.0	3.28	3.60	0.33	0.08	0.001	0.001	0.03	0.000	0%
LB	3.80	0.00	0.00	0.00	0.00	0.00	1.0	3.60	3.80	0.20	0.02	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.189</b>	

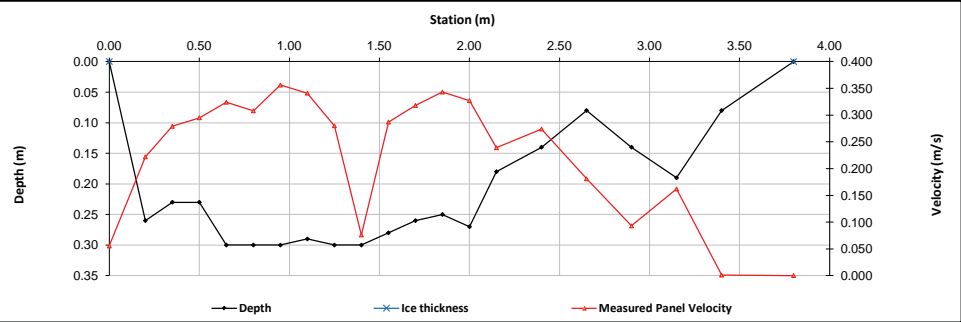
Measurement Details:	
Start Time (MST):	10:50
End Time (MST):	12:30
Equipment:	ADV
Method:	Wading
River Condition:	open, cut into ice
Quality/Error (see reverse):	excellent
Weather:	sunny, +10

Flow characteristics:	
Total Flow:	0.189 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	0.75 (m <sup>2</sup> )
Wetted Width:	3.80 (m)
Hydraulic Depth:	0.198 (m)
Mean Velocity:	0.251 (m/s)
Froude Number:	0.180

Logger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	13.79	-
Datalogger Clock:	11:40	-
Laptop Clock:	11:41	-
Dessicant:	replaced	-
Logger# (if Δ):	18200	-
PT# (if Δ):	284716	-

Datalogger / Station Notes:	
-PLS and logger installed	
-PLS left to melt through ice	

General Notes:	
-Station still too much ice	
-Prepared PT and logger, no WL possible	
-Tree being eaten, consider post/mast	
-Need clothesline for weight	
-No WL survey was conducted	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:					99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:					99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Closing Error						
WL Check						
Average WL						
Transducer Elevation						

Field Personnel:	SM, SG	Trip Date:	25-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12



# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary

UTM Location: 458130E, 6362062N

Site Visit Date:

May 17, 2012



## 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																
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

Total Flow

Measurement Details:	
Start Time (MST):	10:45
End Time (MST):	11:18
Equipment:	-
Method:	-
River Condition:	Open
Quality/Error (see reverse):	-
Weather:	Sunny, calm, 10C

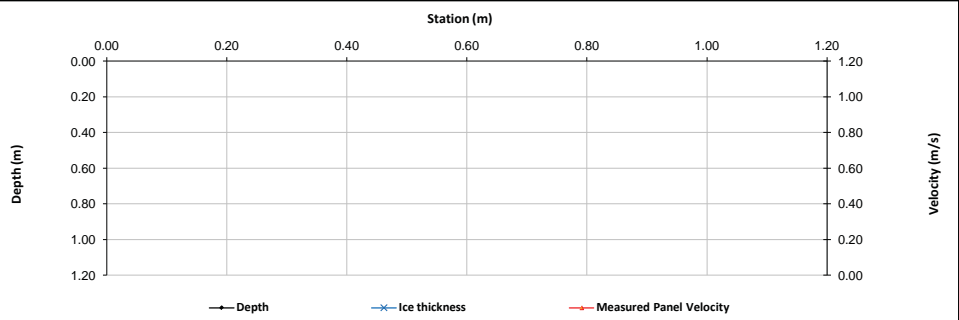
Flow characteristics:	
Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	
Cross Section Area:	(m <sup>2</sup> )
Wetted Width:	(m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number:	

Logger Details:	Before	After
Transducer Reading (m):	0.564	
Water (°C):	12.3	
Battery (Main):	14.5	
Datalogger Clock:	11:06	
Laptop Clock:	11:06	
Dessicant:	good	
Logger# (if Δ):	18200	
PT# (if Δ):	-	

Datalogger / Station Notes:

General Notes:

- Installed PLS
- No telemetry set up



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.382	100.907		99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			0.965	99.942	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.724	98.183		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.369	99.527	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:	0.954	100.896		99.942	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.714	98.182		
Other:						

Closing Error	-0.002
WL Check	0.001

Average WL	98.183
Transducer Elevation	97.619

Field Personnel:		SM, CJ	Trip Date:	17-May-12
Data Entry Personnel:	CJ		Date:	31-May-12
Data Check Personnel:	DW		Date:	4-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date:

June 21, 2012



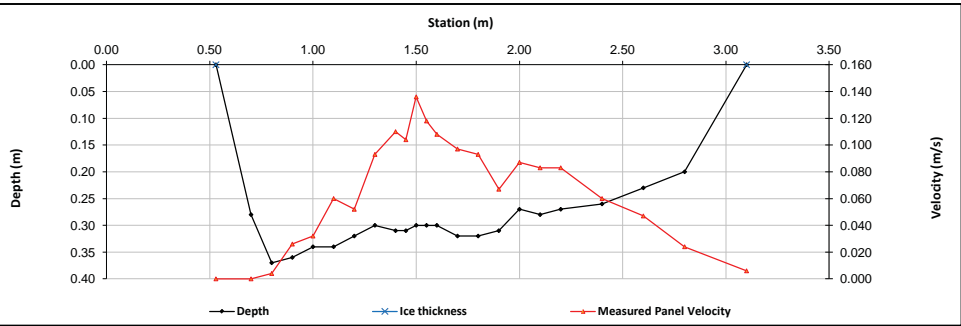
Measured Data											Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	
LB	0.53	0.00	0.00	0.000	0.000	0.000	1.0	0.53	0.62	0.09	0.07	0.000	0.000	0.01	0.000	0%	
1	0.70	0.28		0.000				0.62	0.75	0.14	0.28	0.000	0.000	0.04	0.000	0%	
2	0.80	0.37		0.004				0.75	0.85	0.10	0.37	0.004	0.004	0.04	0.000	0%	
3	0.90	0.36		0.026				0.85	0.95	0.10	0.36	0.026	0.026	0.04	0.001	2%	
4	1.00	0.34		0.032				0.95	1.05	0.10	0.34	0.032	0.032	0.03	0.001	3%	
5	1.10	0.34		0.060				1.05	1.15	0.10	0.34	0.060	0.060	0.03	0.002	5%	
6	1.20	0.32		0.052				1.15	1.25	0.10	0.32	0.052	0.052	0.03	0.002	4%	
7	1.30	0.30		0.093				1.25	1.35	0.10	0.30	0.093	0.093	0.03	0.003	7%	
8	1.40	0.31		0.110				1.35	1.43	0.07	0.31	0.110	0.110	0.02	0.003	6%	
9	1.45	0.31		0.104				1.43	1.48	0.05	0.31	0.104	0.104	0.02	0.002	4%	
10	1.50	0.30		0.136				1.48	1.53	0.05	0.30	0.136	0.136	0.01	0.002	5%	
11	1.55	0.30		0.118				1.53	1.58	0.05	0.30	0.118	0.118	0.02	0.002	4%	
12	1.60	0.30		0.108				1.58	1.65	0.07	0.30	0.108	0.108	0.02	0.002	6%	
13	1.70	0.32		0.097				1.65	1.75	0.10	0.32	0.097	0.097	0.03	0.003	7%	
14	1.80	0.32		0.093				1.75	1.85	0.10	0.32	0.093	0.093	0.03	0.003	7%	
15	1.90	0.31		0.067				1.85	1.95	0.10	0.31	0.067	0.067	0.03	0.002	5%	
16	2.00	0.27		0.087				1.95	2.05	0.10	0.27	0.087	0.087	0.03	0.002	6%	
17	2.10	0.28		0.083				2.05	2.15	0.10	0.28	0.083	0.083	0.03	0.002	6%	
18	2.20	0.27		0.083				2.15	2.30	0.15	0.27	0.083	0.083	0.04	0.003	8%	
19	2.40	0.26		0.060				2.30	2.50	0.20	0.26	0.060	0.060	0.05	0.003	7%	
20	2.60	0.23		0.047				2.50	2.70	0.20	0.23	0.047	0.047	0.05	0.002	5%	
21	2.80	0.20		0.024				2.70	2.95	0.25	0.20	0.024	0.024	0.05	0.001	3%	
RB	3.10	0.00	0.00	0.00	0.00	0.00	1.0	2.95	3.10	0.15	0.05	0.006	0.006	0.01	0.000	0%	
<b>Total Flow</b>														<b>0.042</b>			

Measurement Details:	
Start Time (MST):	15:30
End Time (MST):	16:25
Equipment:	ADV
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	excellent
Weather:	-

Flow characteristics:	
Total Flow:	0.0418 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	0.68 (m <sup>2</sup> )
Wetted Width:	2.57 (m)
Hydraulic Depth:	0.266 (m)
Mean Velocity:	0.061 (m/s)
Froude Number:	0.038

Logger Details:		
	Before	After
Transducer Reading (m):	0.519	
Water (°C):	18.0	
Battery (Main):	13.9	
Datalogger Clock:	15:35	
Laptop Clock:	15:35	
Dessicant:	replaced	
Logger# (if Δ):	18200	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.445	100.970		99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			1.029	99.941	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.825	98.145		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.433	99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:	1.017	100.958		99.941	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.814	98.144		
Other:						
Closing Error	0.000	Average WL		98.145		
WL Check	0.001	Transducer Elevation		97.626		

General Notes:	
-Needs one more BM	
-TSS sampled at offset 2.8 m	

Field Personnel:			
Data Entry Personnel:	SM, GB	Trip Date:	21-Jun-12
Data Check Personnel:	CJ	Date:	4-Jul-12
	MY	Date:	4-Jul-12

# Hydrometric Measurement / Site Visit Record

Site: S16A- Calumet River near the Mouth

UTM Location: 458130E, 6362062N

Site Visit Date:

August 17, 2012



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	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	0.10	0.00	0.00	0.000	0.000	0.000	1.0	0.10	0.30	0.20	0.11	-0.002	-0.002	0.02	0.000	0%
1	0.50	0.42		-0.007			1.0	0.30	0.63	0.33	0.42	-0.007	-0.007	0.14	-0.001	-3%
2	0.75	0.58		-0.001			1.0	0.63	0.88	0.25	0.58	-0.001	-0.001	0.15	0.000	0%
3	1.00	0.56		0.018			1.0	0.88	1.05	0.18	0.56	0.018	0.018	0.10	0.002	5%
4	1.10	0.54		0.025			1.0	1.05	1.18	0.13	0.54	0.025	0.025	0.07	0.002	5%
5	1.25	0.54		0.071			1.0	1.18	1.38	0.20	0.54	0.071	0.071	0.11	0.008	23%
6	1.50	0.60		0.011			1.0	1.38	1.63	0.25	0.60	0.011	0.011	0.15	0.002	5%
7	1.75	0.58		0.040			1.0	1.63	1.88	0.25	0.58	0.040	0.040	0.15	0.006	18%
8	2.00	0.60		0.010			1.0	1.88	2.13	0.25	0.60	0.010	0.010	0.15	0.002	5%
9	2.25	0.48		0.014			1.0	2.13	2.38	0.25	0.48	0.014	0.014	0.12	0.002	5%
10	2.50	0.46		0.006			1.0	2.38	2.63	0.25	0.46	0.006	0.006	0.12	0.001	2%
11	2.75	0.44		0.003			1.0	2.63	2.83	0.20	0.44	0.003	0.003	0.09	0.000	1%
12	2.90	0.46		0.019			1.0	2.83	2.95	0.13	0.46	0.019	0.019	0.06	0.001	3%
13	3.00	0.50		0.032			1.0	2.95	3.13	0.18	0.50	0.032	0.032	0.09	0.003	8%
14	3.25	0.51		0.049			1.0	3.13	3.28	0.15	0.51	0.049	0.049	0.08	0.004	11%
15	3.30	0.50		0.041			1.0	3.28	3.40	0.13	0.50	0.041	0.041	0.06	0.003	8%
16	3.50	0.52		0.008			1.0	3.40	3.63	0.23	0.52	0.008	0.008	0.12	0.001	3%
17	3.75	0.48		0.002			1.0	3.63	3.88	0.25	0.48	0.002	0.002	0.12	0.000	1%
18	4.00	0.40		0.001			1.0	3.88	4.13	0.25	0.40	0.001	0.001	0.10	0.000	0%
19	4.25	0.38		0.000			1.0	4.13	4.43	0.30	0.38	0.000	0.000	0.11	0.000	0%
20	4.60	0.29		0.000			1.0	4.43	4.78	0.35	0.29	0.000	0.000	0.10	0.000	0%
LB	4.95	0.00	0.00	0.000	0.000	0.000	1.0	4.78	4.95	0.18	0.07	0.000	0.000	0.01	0.000	0%

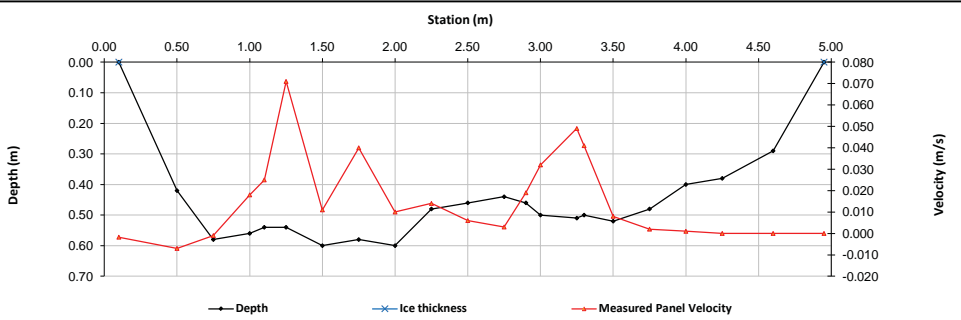
Total Flow **0.033**

Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	12:25
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	poor
Weather:	partial cloud, 20

Flow characteristics:	
Total Flow:	0.033 (m <sup>3</sup> /s)
Perceived Measurement Quality:	poor
Cross Section Area:	2.19 (m <sup>2</sup> )
Wetted Width:	4.85 (m)
Hydraulic Depth:	0.452 (m)
Mean Velocity:	0.015 (m/s)
Froude Number:	0.007

Logger Details:		
	Before	After
Transducer Reading (m):	0.555	
Water (°C):	14.8	
Battery (Main):	14.7	
Datalogger Clock:	10:17	
Laptop Clock:	10:17	
Dessicant:	replaced	
Logger# (if Δ):	18200	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.988	101.513	1.988	99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			1.576	99.937	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:			1.159	100.354	100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:			3.334	98.179		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.121	100.353	99.525	3/4" Pipe 8 m N of logger
Bench Mark 2:	1.537	101.474	1.537	99.937	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:			1.950	99.524	100.356	3/4" Pipe 12 m NE of logger
Ice/PT:						
Water Level:			3.295	98.179		
Other:						

Closing Error	0.001	Average WL	98.179
WL Check	0.000	Transducer Elevation	97.624

General Notes:	
- Lots of weeds in bed of stream, affecting flow measurement (poor quality)	
-TSS sampled at offset 3 m	
-1 3/4" Pipe BM installed	

Field Personnel:		Trip Date:	17-Aug-12
Data Entry Personnel:	CJ	Date:	22-Aug-12
Data Check Personnel:	DW	Date:	23-Aug-12

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary

UTM Location: 458130E, 6362062N

Site Visit Date:

August 24, 2012



## Flow Measurement:

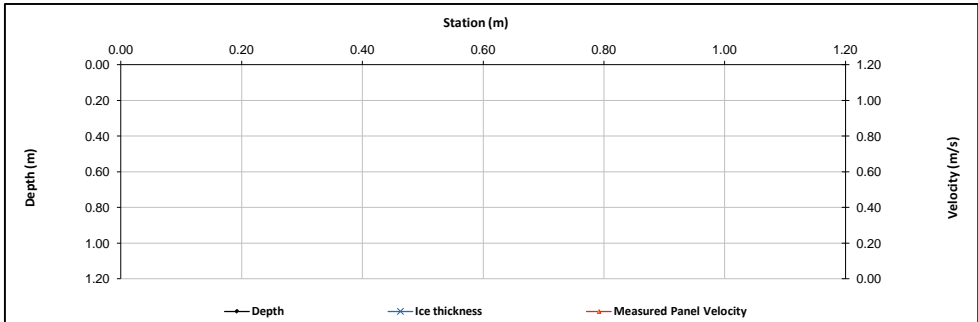
Measured Data							Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel 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																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
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22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
LB																	
<b>No Flow Measurement Conducted</b>																	
															<b>Total Flow</b>		-

Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	11:30
Equipment:	
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	-
Weather:	-

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):	0.559	
Water (°C):	15.1	
Battery (Main):	14.4	
Datalogger Clock:	10:49	
Laptop Clock:	10:50	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
- Raven X Modem and omni antenna installed, RSSI: -94	
- Modem took time to establish network	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:					99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:					100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:					99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:					100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:						
Other:						

Closing Error	
WL Check	

Average WL	
Transducer Elevation	

General Notes:	
- PT showing erratic readings-went to zero several times and is also showing spikes-need to replace	

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, XP	Date:	24-Aug-12
Data Check Personnel:	CJ	Date:	4-Oct-12
	MY	Date:	5-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: September 18, 2012



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	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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.50	0.10	0.03	-0.009	-0.009	0.00	0.000	0%
1	0.60	0.13		-0.035			1.0	0.50	0.70	0.20	0.13	-0.035	-0.035	0.03	-0.001	0%
2	0.80	0.20		-0.014			1.0	0.70	0.90	0.20	0.20	-0.014	-0.014	0.04	-0.001	0%
3	1.00	0.14		0.109			1.0	0.90	1.10	0.20	0.14	0.109	0.109	0.03	0.003	1%
4	1.20	0.17		0.329			1.0	1.10	1.30	0.20	0.17	0.329	0.329	0.03	0.011	3%
5	1.40	0.17		0.821			1.0	1.30	1.50	0.20	0.17	0.821	0.821	0.03	0.028	7%
6	1.60	0.24		0.572			1.0	1.50	1.70	0.20	0.24	0.572	0.572	0.05	0.027	7%
7	1.80	0.23		0.517			1.0	1.70	1.90	0.20	0.23	0.517	0.517	0.05	0.024	6%
8	2.00	0.25		0.663			1.0	1.90	2.10	0.20	0.25	0.663	0.663	0.05	0.033	8%
9	2.20	0.25		0.619			1.0	2.10	2.30	0.20	0.25	0.619	0.619	0.05	0.031	7%
10	2.40	0.25		0.636			1.0	2.30	2.50	0.20	0.25	0.636	0.636	0.05	0.032	8%
11	2.60	0.25		0.920			1.0	2.50	2.70	0.20	0.25	0.920	0.920	0.05	0.046	11%
12	2.80	0.25		0.873			1.0	2.70	2.85	0.15	0.25	0.873	0.873	0.04	0.033	8%
13	2.90	0.26		0.786			1.0	2.85	2.95	0.10	0.26	0.786	0.786	0.03	0.020	5%
14	3.00	0.27		0.721			1.0	2.95	3.10	0.15	0.27	0.721	0.721	0.04	0.029	7%
15	3.20	0.26		0.741			1.0	3.10	3.30	0.20	0.26	0.741	0.741	0.05	0.039	9%
16	3.40	0.27		0.167			1.0	3.30	3.50	0.20	0.27	0.167	0.167	0.05	0.009	2%
17	3.60	0.24		0.359			1.0	3.50	3.70	0.20	0.24	0.359	0.359	0.05	0.017	4%
18	3.80	0.27		0.205			1.0	3.70	3.90	0.20	0.27	0.205	0.205	0.05	0.011	3%
19	4.00	0.20		0.235			1.0	3.90	4.10	0.20	0.20	0.235	0.235	0.04	0.009	2%
20	4.20	0.22		0.150			1.0	4.10	4.30	0.20	0.22	0.150	0.150	0.04	0.007	2%
21	4.40	0.22		0.150			1.0	4.30	4.50	0.20	0.22	0.150	0.150	0.04	0.007	2%
22	4.60	0.20		0.186			1.0	4.50	4.70	0.20	0.20	0.186	0.186	0.04	0.007	2%
RB	4.80	0.00	0.00	0.000	0.000	0.000	1.0	4.70	4.80	0.10	0.05	0.047	0.047	0.01	0.000	0%

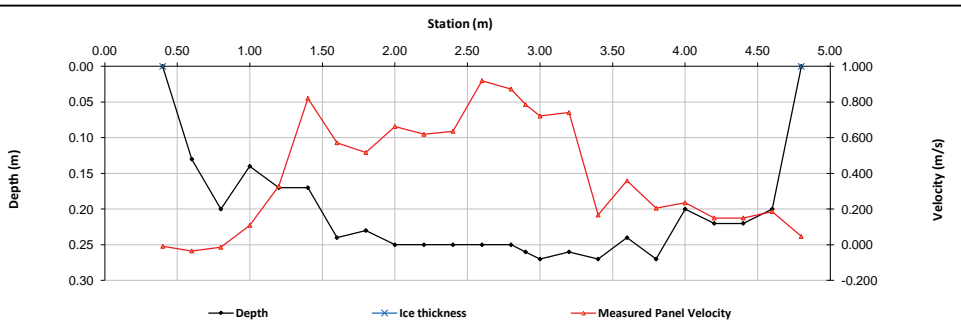
**Total Flow 0.422**

Measurement Details:	
Start Time (MST):	13:30
End Time (MST):	15:15
Equipment:	ADV
Method:	Wading
River Condition:	medium
Quality/Error (see reverse):	Good
Weather:	Sunny, warm, wind

Flow characteristics:	
Total Flow:	0.422 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.94 (m <sup>2</sup> )
Wetted Width:	4.40 (m)
Hydraulic Depth:	0.215 (m)
Mean Velocity:	0.447 (m/s)
Froude Number:	0.308

Logger Details:		
	Before	After
Transducer Reading (m):	0.695	0.716
Water (°C):	10.3	11.3
Battery (Main):	12.8	12.78
Datalogger Clock:	1:38	2:04
Laptop Clock:	1:38	2:04
Dessicant:	REPLACED	-
Logger# (if Δ):	-	-
PT# (if Δ):	284716	304020

**Datalogger / Station Notes:**  
 - Changed PLS and Battery



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	2.141	101.666		99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			1.729	99.937	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:			1.310	100.356	100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:			3.348	98.318		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			2.134	99.526	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			1.721	99.939	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:	1.304	101.660		100.356	100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:			3.343	98.317		
Other:						-0.137

Closing Error	-0.001	Average WL	98.318
WL Check	0.001	Transducer Elevation	97.823

**General Notes:**

<b>Field Personnel:</b>	SG, DW	<b>Trip Date:</b>	18-Sep-12
<b>Data Entry Personnel:</b>	DW (Field)	<b>Date:</b>	18-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date:

November 5, 2012



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
LB	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.58	0.08	0.05	-0.001	-0.001	0.00	0.000	0%
1	0.65	0.18		-0.002				0.58	0.73	0.15	0.18	-0.002	-0.002	0.03	0.000	0%
2	0.80	0.16		0.045				0.73	0.88	0.15	0.16	0.045	0.045	0.02	0.001	1%
3	0.95	0.19		0.244				0.88	1.03	0.15	0.19	0.244	0.244	0.03	0.007	4%
4	1.10	0.18		0.084				1.03	1.18	0.15	0.18	0.084	0.084	0.03	0.002	1%
5	1.25	0.15		0.485				1.18	1.33	0.15	0.15	0.485	0.485	0.02	0.011	7%
6	1.40	0.18		0.607				1.33	1.48	0.15	0.18	0.607	0.607	0.03	0.016	10%
7	1.55	0.26		0.426				1.48	1.59	0.12	0.26	0.426	0.426	0.03	0.013	8%
8	1.63	0.28		0.416				1.59	1.67	0.08	0.28	0.416	0.416	0.02	0.009	5%
9	1.70	0.26		0.461				1.67	1.78	0.11	0.26	0.461	0.461	0.03	0.013	8%
10	1.85	0.21		0.300				1.78	1.93	0.15	0.21	0.300	0.300	0.03	0.009	6%
11	2.00	0.24		0.231				1.93	2.08	0.15	0.24	0.231	0.231	0.04	0.008	5%
12	2.15	0.30		0.261				2.08	2.23	0.15	0.30	0.261	0.261	0.04	0.012	7%
13	2.30	0.32		0.247				2.23	2.38	0.15	0.32	0.247	0.247	0.05	0.012	7%
14	2.45	0.34		0.192				2.38	2.53	0.15	0.34	0.192	0.192	0.05	0.010	6%
15	2.60	0.28		0.146				2.53	2.68	0.15	0.28	0.146	0.146	0.04	0.006	4%
16	2.75	0.30		0.112				2.68	2.83	0.15	0.30	0.112	0.112	0.05	0.005	3%
17	2.90	0.28		0.180				2.83	2.98	0.15	0.28	0.180	0.180	0.04	0.008	5%
18	3.05	0.28		0.220				2.98	3.13	0.15	0.28	0.220	0.220	0.04	0.009	6%
19	3.20	0.28		0.185				3.13	3.28	0.15	0.28	0.185	0.185	0.04	0.008	5%
20	3.35	0.22		0.122				3.28	3.43	0.15	0.22	0.122	0.122	0.03	0.004	2%
RB	3.50	0.00	0.00	0.00	0.00	0.00	1.0	3.43	3.50	0.08	0.06	0.031	0.031	0.00	0.000	0%

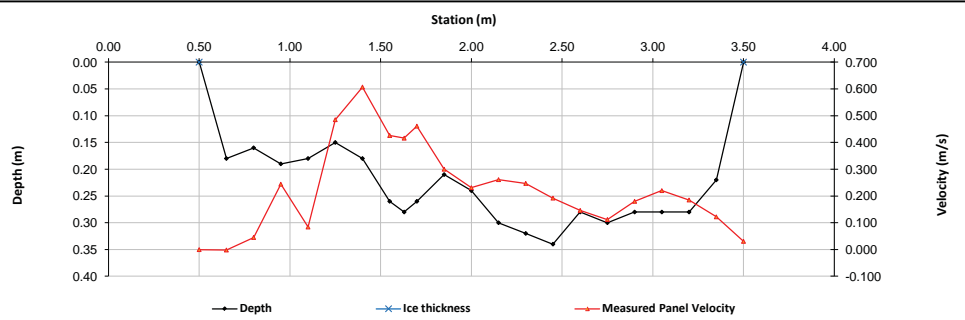
**Total Flow 0.163**

Measurement Details:	
Start Time (MST):	10:20
End Time (MST):	11:15
Equipment:	ADV
Method:	Wading
River Condition:	high, Partial Ice
Quality/Error (see reverse):	Good
Weather:	overcast, breezy, +5 deg

Flow characteristics:	
Total Flow:	0.163 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.70 (m <sup>2</sup> )
Wetted Width:	3.00 (m)
Hydraulic Depth:	0.234 (m)
Mean Velocity:	0.233 (m/s)
Froude Number:	0.154

Logger Details:		
	Before	After
Transducer Reading (m):	0.647	
Water (°C):	0.1	
Battery (Main):	12.9	
Datalogger Clock:	10:27	
Laptop Clock:	10:28	
Dessicant:	replaced	
Logger# (if Δ):	18200	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.243	99.526	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:			0.830	99.939	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:	0.413	100.769		100.356	100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:			2.521	98.248		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.231	99.525	99.525	3/4" Pipe 12 m NE of logger
Bench Mark 2:	0.817	100.756		99.939	99.937	3/4" Pipe 10 m N of logger
Bench Mark 3:			0.400	100.356	100.356	3/4" Pipe 8 m N of logger
Ice/PT:						
Water Level:			2.509	98.247		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	98.248
Transducer Elevation	97.601

**General Notes:**

- PLS left in place for winter

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	5-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	5-Nov-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	16-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date:

April 22, 2012



## 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	0.01	0.00	0.00	0.000	0.000	0.000	1.0	0.01	0.08	0.07	0.03	0.042	0.042	0.00	0.000	0%
1	0.15	0.13		0.168			1.0	0.08	0.18	0.10	0.13	0.168	0.168	0.01	0.002	6%
2	0.20	0.14		0.210			1.0	0.18	0.23	0.05	0.14	0.210	0.210	0.01	0.001	4%
3	0.25	0.13		0.386			1.0	0.23	0.28	0.05	0.13	0.386	0.386	0.01	0.003	8%
4	0.30	0.13		0.407			1.0	0.28	0.33	0.05	0.13	0.407	0.407	0.01	0.003	8%
5	0.35	0.15		0.446			1.0	0.33	0.38	0.05	0.15	0.446	0.446	0.01	0.003	10%
6	0.40	0.16		0.416			1.0	0.38	0.43	0.05	0.16	0.416	0.416	0.01	0.003	10%
7	0.45	0.20		0.360			1.0	0.43	0.48	0.05	0.20	0.360	0.360	0.01	0.004	11%
8	0.50	0.18		0.399			1.0	0.48	0.53	0.05	0.18	0.399	0.399	0.01	0.004	11%
9	0.55	0.18		0.285			1.0	0.53	0.58	0.05	0.18	0.285	0.285	0.01	0.003	8%
10	0.60	0.18		0.222			1.0	0.58	0.63	0.05	0.18	0.222	0.222	0.01	0.002	6%
11	0.65	0.18		0.201			1.0	0.63	0.68	0.05	0.18	0.201	0.201	0.01	0.002	5%
12	0.70	0.17		0.159			1.0	0.68	0.73	0.05	0.17	0.159	0.159	0.01	0.001	4%
13	0.75	0.17		0.000			1.0	0.73	0.80	0.08	0.17	0.000	0.000	0.01	0.000	0%
14	0.85	0.12		0.005			1.0	0.80	0.90	0.10	0.12	0.005	0.005	0.01	0.000	0%
15	0.95	0.09		0.067			1.0	0.90	1.00	0.10	0.09	0.067	0.067	0.01	0.001	2%
16	1.05	0.09		0.158			1.0	1.00	1.15	0.15	0.09	0.158	0.158	0.01	0.002	6%
LB	1.25	0.00	0.00	0.00	0.00	0.00	1.0	1.15	1.25	0.10	0.02	0.040	0.040	0.00	0.000	0%
<b>Total Flow</b>														<b>0.033</b>		

**Measurement Details:**

Start Time (MST):	9:15
End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	open spots
Quality/Error (see reverse):	poor
Weather:	sunny, +10

**Flow characteristics:**

Total Flow:	0.0333	(m <sup>3</sup> /s)
Perceived Measurement Quality:	poor	
Cross Section Area:	0.15	(m <sup>2</sup> )
Wetted Width:	1.24	(m)
Hydraulic Depth:	0.124	(m)
Mean Velocity:	0.216	(m/s)
Froude Number:	0.196	

**Logger Details:**

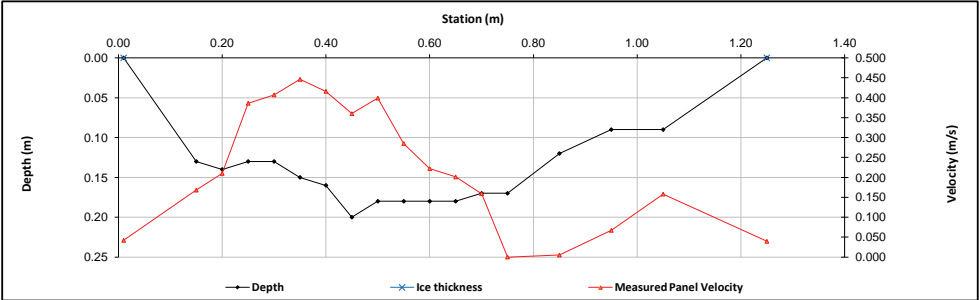
	Before	After
Transducer Reading (m):	0.231	-
Water (°C):	0.7	-
Battery (Main):	12.9	-
Datalogger Clock:	10:16	-
Laptop Clock:	10:16	-
Dessicant:	replaced	-
Logger# (if Δ):	18167	-
PT# (if Δ):	298679	-

**Datalogger / Station Notes:**

- Some ice still on bank

**General Notes:**

- Moved station  
 - Station was frozen but below the road was open. Will need to drive post and mount equipment next visit.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:					103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:					103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.332	101.238		
Other:	0.944	104.57		103.626	103.626	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:					103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:					103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:					103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.312	101.241		
Other:	0.927	104.553		103.626	103.626	Nail in tree
Closing Error	0.000			Average WL	101.240	
WL Check	0.003			Transducer Elevation	101.009	

**Field Personnel:**

TR, SG	Trip Date:	22-Apr-12
Data Entry Personnel: CJ	Date:	30-Apr-12
Data Check Personnel: XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date:

May 14, 2012



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	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Depth (m)	Measured 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	1.0	3.20	3.25	0.05	0.03	0.029	0.029	0.00	0.000	0%							
1	3.30	0.10		0.117			1.0	3.25	3.35	0.10	0.10	0.117	0.117	0.01	0.001	3%							
2	3.40	0.12		0.158			1.0	3.35	3.45	0.10	0.12	0.158	0.158	0.01	0.002	5%							
3	3.50	0.14		0.164			1.0	3.45	3.55	0.10	0.14	0.164	0.164	0.01	0.002	6%							
4	3.60	0.14		0.238			1.0	3.55	3.65	0.10	0.14	0.238	0.238	0.01	0.003	9%							
5	3.70	0.16		0.302			1.0	3.65	3.73	0.07	0.16	0.302	0.302	0.01	0.004	10%							
6	3.75	0.22		0.248			1.0	3.73	3.78	0.05	0.22	0.248	0.248	0.01	0.003	7%							
7	3.80	0.22		0.150			1.0	3.78	3.83	0.05	0.22	0.150	0.150	0.01	0.002	4%							
8	3.85	0.22		0.243			1.0	3.83	3.88	0.05	0.22	0.243	0.243	0.01	0.003	7%							
9	3.90	0.24		0.281			1.0	3.88	3.93	0.05	0.24	0.281	0.281	0.01	0.003	9%							
10	3.95	0.19		0.286			1.0	3.93	3.98	0.05	0.19	0.286	0.286	0.01	0.003	7%							
11	4.00	0.17		0.232			1.0	3.98	4.03	0.05	0.17	0.232	0.232	0.01	0.002	5%							
12	4.05	0.17		0.182			1.0	4.03	4.08	0.05	0.17	0.182	0.182	0.01	0.002	4%							
13	4.10	0.18		0.131			1.0	4.08	4.13	0.05	0.18	0.131	0.131	0.01	0.001	3%							
14	4.15	0.15		0.145			1.0	4.13	4.18	0.05	0.15	0.145	0.145	0.01	0.001	3%							
15	4.20	0.18		0.180			1.0	4.18	4.23	0.05	0.18	0.180	0.180	0.01	0.002	4%							
16	4.25	0.18		0.170			1.0	4.23	4.28	0.05	0.18	0.170	0.170	0.01	0.002	4%							
17	4.30	0.14		0.150			1.0	4.28	4.33	0.05	0.14	0.150	0.150	0.01	0.001	3%							
18	4.35	0.13		0.112			1.0	4.33	4.38	0.05	0.13	0.112	0.112	0.01	0.001	2%							
19	4.40	0.12		0.094			1.0	4.38	4.45	0.08	0.12	0.094	0.094	0.01	0.001	2%							
20	4.50	0.12		0.040			1.0	4.45	4.55	0.10	0.12	0.040	0.040	0.01	0.000	1%							
21	4.60	0.10		-0.001			1.0	4.55	4.65	0.10	0.10	-0.001	-0.001	0.01	0.000	0%							
LB	4.70	0.00	0.00	0.00	0.00	0.00	1.0	4.65	4.70	0.05	0.03	0.000	0.000	0.00	0.000	0%							
<b>Total Flow</b>														<b>0.038</b>									

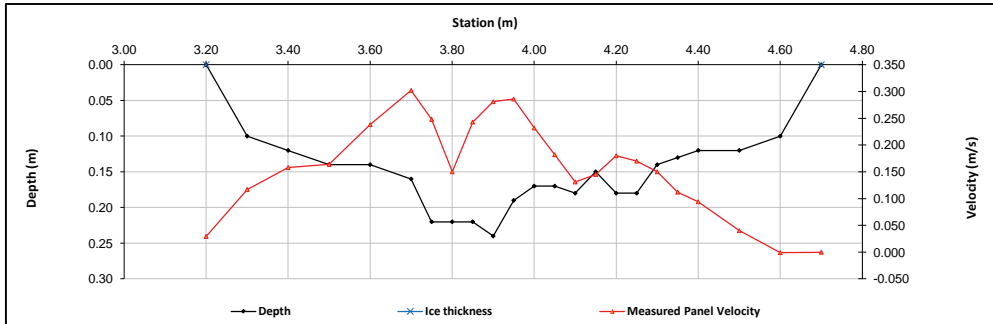
Measurement Details:	
Start Time (MST):	13:37
End Time (MST):	15:41
Equipment:	ADV
Method:	Wading
River Condition:	Open, Moderate Flow
Quality/Error (see reverse):	good
Weather:	Partly cloudy, 21C

Flow characteristics:		
Total Flow:	0.0375	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.22	(m <sup>2</sup> )
Wetted Width:	1.50	(m)
Hydraulic Depth:	0.143	(m)
Mean Velocity:	0.174	(m/s)
Froude Number:	0.147	

Logger Details:		
	Before	After
Transducer Reading (m):	0.202	0.204
Water (°C):	8.6	8.8
Battery (Main):	12.8	12.9
Datalogger Clock:	12:49	13:52
Laptop Clock:	12:49	13:52
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

-battery was replaced because the solar panel is not operating yet



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:					103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:					103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:						
Other:						Nail in tree
<b>Setup #2</b>						
Bench Mark 1:					103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:					103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:					103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:						
Other:						Nail in tree

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

-2" Pipe threads were warped and station could not be mounted on mast, left it as it was. Station still needs logger, mast, benchmarks, antenna and modem.

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	14-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	31-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	4-Jun-12



# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date:

June 12, 2012



## 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	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	0.23	0.13	0.04	0.037	0.037	0.00	0.000	1%
1	0.35	0.15		0.148			1.0	0.23	0.38	0.15	0.15	0.148	0.148	0.02	0.003	18%
2	0.40	0.16		0.234			1.0	0.38	0.43	0.05	0.16	0.234	0.234	0.01	0.002	10%
3	0.45	0.16		0.223			1.0	0.43	0.48	0.05	0.16	0.223	0.223	0.01	0.002	10%
4	0.50	0.18		0.203			1.0	0.48	0.53	0.05	0.18	0.203	0.203	0.01	0.002	10%
5	0.55	0.18		0.194			1.0	0.53	0.58	0.05	0.18	0.194	0.194	0.01	0.002	10%
6	0.60	0.18		0.147			1.0	0.58	0.63	0.05	0.18	0.147	0.147	0.01	0.001	7%
7	0.65	0.14		0.134			1.0	0.63	0.68	0.05	0.14	0.134	0.134	0.01	0.001	5%
8	0.70	0.14		0.144			1.0	0.68	0.73	0.05	0.14	0.144	0.144	0.01	0.001	6%
9	0.75	0.14		0.111			1.0	0.73	0.78	0.05	0.14	0.111	0.111	0.01	0.001	4%
10	0.80	0.14		0.086			1.0	0.78	0.83	0.05	0.14	0.086	0.086	0.01	0.001	3%
11	0.85	0.12		0.081			1.0	0.83	0.88	0.05	0.12	0.081	0.081	0.01	0.000	3%
12	0.90	0.12		0.105			1.0	0.88	0.93	0.05	0.12	0.105	0.105	0.01	0.001	3%
13	0.95	0.10		0.072			1.0	0.93	0.98	0.05	0.10	0.072	0.072	0.00	0.000	2%
14	1.00	0.10		0.136			1.0	0.98	1.03	0.05	0.10	0.136	0.136	0.00	0.001	4%
15	1.05	0.10		0.113			1.0	1.03	1.08	0.05	0.10	0.113	0.113	0.01	0.001	3%
16	1.10	0.10		0.050			1.0	1.08	1.13	0.05	0.10	0.050	0.050	0.00	0.000	1%
17	1.15	0.10		0.015			1.0	1.13	1.18	0.05	0.10	0.015	0.015	0.00	0.000	0%
18	1.20	0.10		-0.026			1.0	1.18	1.25	0.08	0.10	-0.026	-0.026	0.01	0.000	-1%
19	1.30	0.10		-0.004			1.0	1.25	1.35	0.10	0.10	-0.004	-0.004	0.01	0.000	0%
20	1.40	0.06		0.000			1.0	1.35	1.48	0.13	0.06	0.000	0.000	0.01	0.000	0%
LB	1.55	0.00	0.00	0.00	0.00	0.00	1.0	1.48	1.55	0.08	0.02	0.000	0.000	0.00	0.000	0%

**Total Flow 0.018**

Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	13:45
Equipment:	ADV
Method:	WADING
River Condition:	Open, Moderate Flow
Quality/Error (see reverse):	Fair
Weather:	Cloudy, Breezy, 10C

Flow characteristics:	
Total Flow:	0.0182 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.16 (m <sup>2</sup> )
Wetted Width:	1.45 (m)
Hydraulic Depth:	0.111 (m)
Mean Velocity:	0.113 (m/s)
Froude Number:	0.108

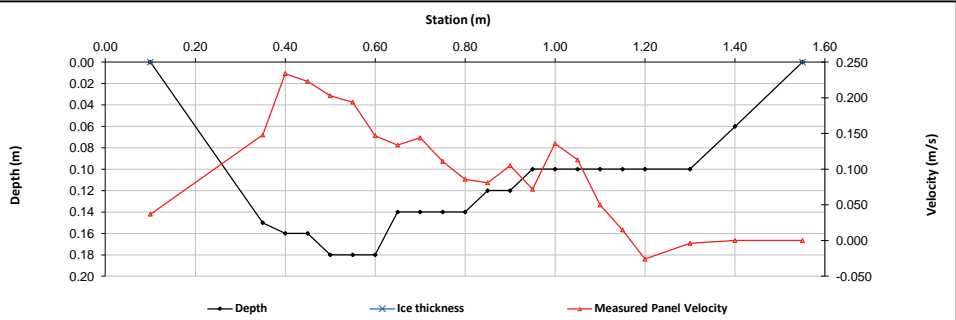
Logger Details:		
	Before	After
Transducer Reading (m):	0.157	
Water (°C):	14.8	
Battery (Main):	12.8	
Datalogger Clock:	13:08	
Laptop Clock:	13:08	
Dessicant:	CHANGED	
Logger# (if Δ):	18167	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Modem that previously was at L2 was installed, Check for phone #
- RSSI# -92 (New Raven Moddem)
- Vent tube checked
- Need to install a precip gauge next trip

**General Notes:**

- 3 BM's were installed



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.995	104.329		103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			0.729	103.600	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.799	103.530	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.153	101.176		
Other:						Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.982	103.335	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:	0.717	104.317		103.600	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.785	103.532	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.141	101.176		
Other:						Nail in tree

Closing Error	-0.001	Average WL	101.176
WL Check	0.000	Transducer Elevation	101.019

<b>Field Personnel:</b>	SM & CJ	<b>Trip Date:</b>	12-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	22-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date:

August 8, 2012



## 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	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	0.25	0.05	0.01	0.061	0.061	0.00	0.000	1%
1	0.30	0.03		0.242			1.0	0.25	0.31	0.06	0.03	0.242	0.242	0.00	0.000	12%
2	0.33	0.04		0.235			1.0	0.31	0.34	0.03	0.04	0.235	0.235	0.00	0.000	6%
3	0.35	0.04		0.226			1.0	0.34	0.36	0.03	0.04	0.226	0.226	0.00	0.000	6%
4	0.38	0.04		0.208			1.0	0.36	0.39	0.03	0.04	0.208	0.208	0.00	0.000	6%
5	0.40	0.04		0.222			1.0	0.39	0.41	0.03	0.04	0.222	0.222	0.00	0.000	6%
6	0.43	0.06		0.221			1.0	0.41	0.44	0.03	0.06	0.221	0.221	0.00	0.000	9%
7	0.45	0.07		0.274			1.0	0.44	0.46	0.03	0.07	0.274	0.274	0.00	0.000	13%
8	0.48	0.06		0.284			1.0	0.46	0.49	0.03	0.06	0.284	0.284	0.00	0.000	12%
9	0.50	0.07		0.220			1.0	0.49	0.51	0.03	0.07	0.220	0.220	0.00	0.000	10%
10	0.53	0.08		0.135			1.0	0.51	0.54	0.03	0.08	0.135	0.135	0.00	0.000	7%
11	0.55	0.08		0.077			1.0	0.54	0.56	0.02	0.08	0.077	0.077	0.00	0.000	4%
12	0.58	0.10		0.094			1.0	0.56	0.59	0.02	0.10	0.094	0.094	0.00	0.000	6%
13	0.60	0.10		0.015			1.0	0.59	0.63	0.04	0.10	0.015	0.015	0.00	0.000	2%
14	0.65	0.07		-0.001			1.0	0.63	0.68	0.05	0.07	-0.001	-0.001	0.00	0.000	0%
15	0.70	0.07		0.001			1.0	0.68	0.73	0.05	0.07	0.001	0.001	0.00	0.000	0%
16	0.75	0.06		-0.002			1.0	0.73	0.78	0.05	0.06	-0.002	-0.002	0.00	0.000	0%
17	0.80	0.06		0.000			1.0	0.78	0.83	0.05	0.06	0.000	0.000	0.00	0.000	0%
18	0.85	0.06		0.001			1.0	0.83	0.93	0.10	0.06	0.001	0.001	0.01	0.000	0%
LB	1.00	0.00	0.00	0.00	0.00	0.00	1.0	0.93	1.00	0.08	0.02	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.004</b>	

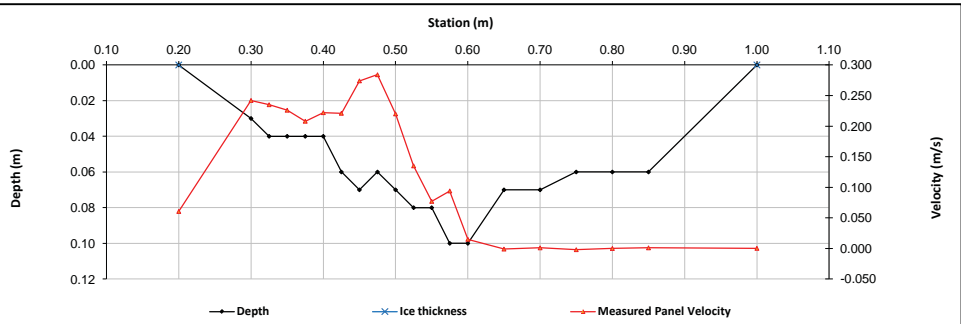
Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	good
Weather:	clear, calm, 20

Flow characteristics:	
Total Flow:	0.0037 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	0.04 (m <sup>2</sup> )
Wetted Width:	0.80 (m)
Hydraulic Depth:	0.054 (m)
Mean Velocity:	0.086 (m/s)
Froude Number:	0.118

Logger Details:		
	Before	After
Transducer Reading (m):	0.090	
Water (°C):	16.9	
Battery (Main):	14.3	
Datalogger Clock:	9:06	
Laptop Clock:	9:06	
Dessicant:	replaced	
Logger# (if Δ):	18167	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-installed tipping bucket and tested. Tested with 4 tips	
-ok	

General Notes:	
-TSS sampled at centre of flow	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.243	104.577		103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			1.047	103.530	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.977	103.600	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.466	101.111		
Other:			0.951	103.626	103.626	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.233	103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:	1.037	104.567		103.530	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.967	103.600	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.456	101.111		
Other:			0.942	103.625		Nail in tree

Closing Error	0.000	Average WL	101.111
WL Check	0.000	Transducer Elevation	101.021

Field Personnel:	SM, TR	Trip Date:	8-Aug-12
Data Entry Personnel:	CJ	Date:	2-Oct-12
Data Check Personnel:	MY	Date:	5-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: September 24, 2012



## 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	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	0.000	0.000	0.00	0.000	0%
1	0.20	0.06		0.000			1.0	0.15	0.23	0.08	0.06	0.000	0.000	0.00	0.000	0%
2	0.25	0.10		0.191			1.0	0.23	0.28	0.05	0.10	0.191	0.191	0.01	0.001	5%
3	0.30	0.12		0.161			1.0	0.28	0.33	0.05	0.12	0.161	0.161	0.01	0.001	5%
4	0.35	0.14		0.256			1.0	0.33	0.38	0.05	0.14	0.256	0.256	0.01	0.002	9%
5	0.40	0.15		0.304			1.0	0.38	0.41	0.04	0.15	0.304	0.304	0.01	0.002	8%
6	0.42	0.17		0.325			1.0	0.41	0.44	0.03	0.17	0.325	0.325	0.00	0.001	7%
7	0.45	0.17		0.334			1.0	0.44	0.46	0.03	0.17	0.334	0.334	0.00	0.001	7%
8	0.47	0.18		0.331			1.0	0.46	0.49	0.03	0.18	0.331	0.331	0.00	0.001	8%
9	0.50	0.18		0.354			1.0	0.49	0.51	0.03	0.18	0.354	0.354	0.00	0.002	8%
10	0.52	0.18		0.367			1.0	0.51	0.54	0.03	0.18	0.367	0.367	0.00	0.002	9%
11	0.55	0.17		0.349			1.0	0.54	0.58	0.04	0.17	0.349	0.349	0.01	0.002	12%
12	0.60	0.16		0.321			1.0	0.58	0.63	0.05	0.16	0.321	0.321	0.01	0.003	13%
13	0.65	0.14		0.024			1.0	0.63	0.68	0.05	0.14	0.024	0.024	0.01	0.000	1%
14	0.70	0.13		0.174			1.0	0.68	0.73	0.05	0.13	0.174	0.174	0.01	0.001	6%
15	0.75	0.13		0.001			1.0	0.73	0.78	0.05	0.13	0.001	0.001	0.01	0.000	0%
16	0.80	0.13		0.000			1.0	0.78	0.83	0.05	0.13	0.000	0.000	0.01	0.000	0%
17	0.85	0.12		0.002			1.0	0.83	0.88	0.05	0.12	0.002	0.002	0.01	0.000	0%
18	0.90	0.11		0.000			1.0	0.88	0.93	0.05	0.11	0.000	0.000	0.01	0.000	0%
19	0.95	0.10		0.013			1.0	0.93	0.98	0.05	0.10	0.013	0.013	0.00	0.000	0%
20	1.00	0.08		0.000			1.0	0.98	1.15	0.18	0.08	0.000	0.000	0.01	0.000	0%
LB	1.30	0.00	0.00	0.00	0.00	0.00	1.0	1.15	1.30	0.15	0.02	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>0.019</b>	

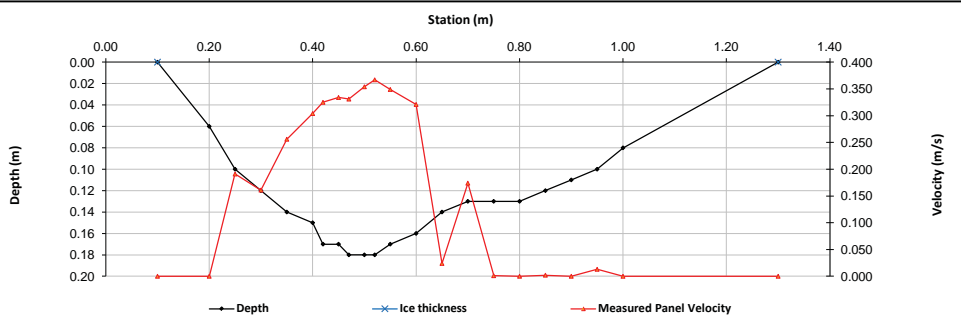
Measurement Details:	
Start Time (MST):	10:38
End Time (MST):	11:24
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	Good
Weather:	12 deg, clear, calm

Flow characteristics:	
Total Flow:	0.0192 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.13 (m <sup>2</sup> )
Wetted Width:	1.20 (m)
Hydraulic Depth:	0.104 (m)
Mean Velocity:	0.153 (m/s)
Froude Number:	0.151

Logger Details:		
	Before	After
Transducer Reading (m):	0.129	
Water (°C):	9.4	
Battery (Main):	14.4	
Datalogger Clock:	10:40	
Laptop Clock:	10:40	
Dessicant:	replaced	
Logger# (if Δ):	18167	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-	Tested precip gauge: 0.2 mm

General Notes:	
-	TSS collected at 0.5 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.156	104.49		103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			0.960	103.530	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.892	103.598	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.314	101.176		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.146	104.48		103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			0.949	103.531	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			0.882	103.598	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.303	101.177		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	101.177
Transducer Elevation	101.048

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	24-Sep-12
<b>Data Entry Personnel:</b>	SM (Field)	<b>Date:</b>	24-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: October 30, 2012



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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.25	0.05	0.02	0.060	0.060	0.00	0.000	0%
1	0.30	0.08		0.241			1.0	0.25	0.33	0.08	0.08	0.241	0.241	0.01	0.001	8%
2	0.35	0.10		0.275			1.0	0.33	0.38	0.05	0.10	0.275	0.275	0.01	0.001	8%
3	0.40	0.12		0.255			1.0	0.38	0.41	0.04	0.12	0.255	0.255	0.00	0.001	6%
4	0.43	0.12		0.084			1.0	0.41	0.44	0.03	0.12	0.084	0.084	0.00	0.000	1%
5	0.45	0.14		0.338			1.0	0.44	0.46	0.03	0.14	0.338	0.338	0.00	0.001	7%
6	0.48	0.14		0.369			1.0	0.46	0.49	0.03	0.14	0.369	0.369	0.00	0.001	7%
7	0.50	0.12		0.391			1.0	0.49	0.51	0.03	0.12	0.391	0.391	0.00	0.001	7%
8	0.53	0.13		0.377			1.0	0.51	0.54	0.03	0.13	0.377	0.377	0.00	0.001	7%
9	0.55	0.12		0.354			1.0	0.54	0.56	0.02	0.12	0.354	0.354	0.00	0.001	6%
10	0.58	0.14		0.226			1.0	0.56	0.59	0.02	0.14	0.226	0.226	0.00	0.001	4%
11	0.60	0.15		0.199			1.0	0.59	0.61	0.03	0.15	0.199	0.199	0.00	0.001	4%
12	0.63	0.16		0.206			1.0	0.61	0.64	0.02	0.16	0.206	0.206	0.00	0.001	5%
13	0.65	0.15		0.191			1.0	0.64	0.66	0.03	0.15	0.191	0.191	0.00	0.001	4%
14	0.68	0.14		0.238			1.0	0.66	0.69	0.02	0.14	0.238	0.238	0.00	0.001	5%
15	0.70	0.14		0.192			1.0	0.69	0.71	0.02	0.14	0.192	0.192	0.00	0.001	4%
16	0.73	0.14		0.182			1.0	0.71	0.74	0.03	0.14	0.182	0.182	0.00	0.001	4%
17	0.75	0.12		0.082			1.0	0.74	0.76	0.02	0.12	0.082	0.082	0.00	0.000	1%
18	0.78	0.12		0.138			1.0	0.76	0.81	0.05	0.12	0.138	0.138	0.01	0.001	5%
19	0.85	0.10		0.158			1.0	0.81	0.90	0.09	0.10	0.158	0.158	0.01	0.001	8%
20	0.95	0.07		0.002			1.0	0.90	1.03	0.13	0.07	0.002	0.002	0.01	0.000	0%
LB	1.10	0.00	0.00	0.00	0.00	0.00	1.0	1.03	1.10	0.08	0.02	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>														<b>0.018</b>		

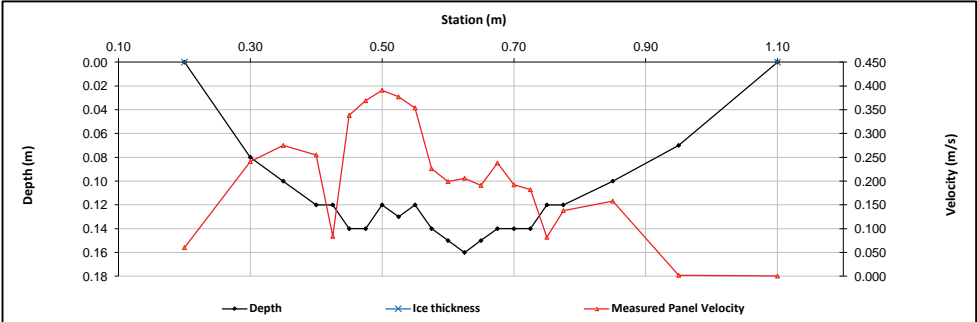
Measurement Details:	
Start Time (MST):	11:10
End Time (MST):	12:25
Equipment:	ADV
Method:	Wading
River Condition:	Open, high flow
Quality/Error (see reverse):	Excellent
Weather:	Snowing, -12C

Flow characteristics:	
Total Flow:	0.0179 (m <sup>3</sup> /s)
Perceived Measurement Quality:	0.0179
Cross Section Area:	0.09 (m <sup>2</sup> )
Wetted Width:	0.90 (m)
Hydraulic Depth:	0.099 (m)
Mean Velocity:	
Froude Number:	

Logger Details:		
	Before	After
Transducer Reading (m):	0.117	
Water (°C):	0.8	
Battery (Main):	14.9	
Datalogger Clock:	11:26	
Laptop Clock:		
Dessicant:	Replaced	
Logger# (if Δ):	18167	
PT# (if Δ):	298679	

Datalogger / Station Notes:	
-	Winterized precip gauge
-	removed PLS from water. SIN: 298679

General Notes:	
-	Anchor and cable weight were left at the stake by the waters edge



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.217	104.551		103.334	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			0.953	103.598	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:			1.023	103.528	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.418	101.133		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.208	103.333	103.334	3/4" Pipe 5 m N of logger
Bench Mark 2:			0.944	103.597	103.599	3/4" Pipe 3 m S of logger
Bench Mark 3:	1.013	104.541		103.528	103.530	3/4" Pipe 3 m SE of logger
Ice/PT:						
Water Level:			3.408	101.133		
Other:						

Closing Error	0.001
WL Check	0.000

Average WL	101.133
Transducer Elevation Before	101.016
Transducer Elevation After	

<b>Field Personnel:</b>	TR, SM	<b>Trip Date:</b>	30-Oct-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	15-Nov-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	21-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date: March 8, 2012



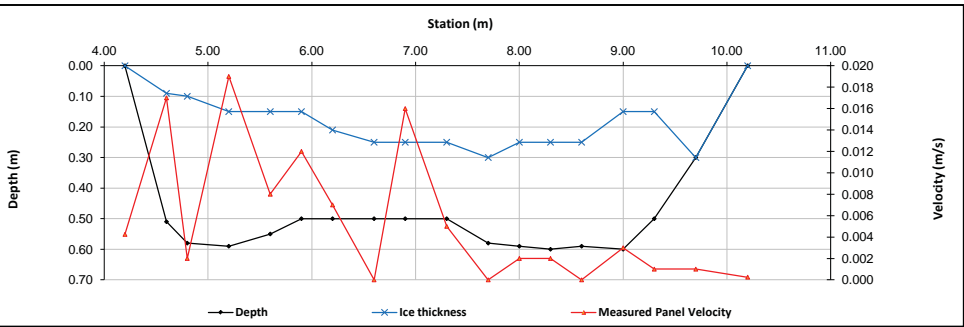
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel 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	4.40	0.20	0.11	0.004	0.004	0.02	0.000	1%
1	4.60	0.51	0.09	0.017			0.9	4.40	4.70	0.30	0.42	0.017	0.015	0.13	0.002	18%
2	4.80	0.58	0.10	0.002			0.9	4.70	5.00	0.30	0.48	0.002	0.002	0.14	0.000	2%
3	5.20	0.59	0.15	0.019			0.9	5.00	5.40	0.40	0.44	0.019	0.017	0.18	0.003	28%
4	5.60	0.55	0.15	0.008			0.9	5.40	5.75	0.35	0.40	0.008	0.007	0.14	0.001	9%
5	5.90	0.50	0.15	0.012			0.9	5.75	6.05	0.30	0.35	0.012	0.011	0.11	0.001	11%
6	6.20	0.50	0.21	0.007			0.9	6.05	6.40	0.35	0.29	0.007	0.006	0.10	0.001	6%
7	6.60	0.50	0.25	0.000			1.0	6.40	6.75	0.35	0.25	0.000	0.000	0.09	0.000	0%
8	6.90	0.50	0.25	0.016			0.9	6.75	7.10	0.35	0.25	0.016	0.014	0.09	0.001	12%
9	7.30	0.50	0.25	0.005			0.9	7.10	7.50	0.40	0.25	0.005	0.005	0.10	0.000	4%
10	7.70	0.58	0.30	0.000			1.0	7.50	7.85	0.35	0.28	0.000	0.000	0.10	0.000	0%
11	8.00	0.59	0.25	0.002			0.9	7.85	8.15	0.30	0.34	0.002	0.002	0.10	0.000	2%
12	8.30	0.60	0.25	0.002			0.9	8.15	8.45	0.30	0.35	0.002	0.002	0.11	0.000	2%
13	8.60	0.59	0.25	0.000			1.0	8.45	8.80	0.35	0.34	0.000	0.000	0.12	0.000	0%
14	9.00	0.60	0.15	0.003			0.9	8.80	9.15	0.35	0.45	0.003	0.003	0.16	0.000	4%
15	9.30	0.50	0.15	0.001			0.9	9.15	9.50	0.35	0.35	0.001	0.001	0.12	0.000	1%
16	9.70	0.30	0.30	0.001			0.9	9.50	9.95	0.45	0.00	0.001	0.001	0.00	0.000	0%
LB	10.20	0.00	0.00	0.00	0.00	0.00	1.0	9.95	10.20	0.25	0.00	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.011</b>		

Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	11:30
Equipment:	ADV
Method:	Ice
River Condition:	Ice, still good.
Quality/Error (see reverse):	Poor
Weather:	Sunny, clear -11°C

Flow characteristics:	
Total Flow:	0.0107 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	1.79 (m <sup>2</sup> )
Wetted Width:	6.00 (m)
Hydraulic Depth:	0.299 (m)
Mean Velocity:	0.006 (m/s)
Froude Number:	0.003

Logger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 Datalogger not installed in Winter



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.406	329.382		328.976	328.976	T-Post near Station
Bench Mark 2:			1.529	327.853		Rebar near River
Bench Mark 3:						
Ice/PT:			3.118	326.264		
Water Level:			3.320	326.062		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.398	328.977	328.976	T-Post near Station
Bench Mark 2:	1.522	329.375		327.853		Rebar near River
Bench Mark 3:						
Ice/PT:			3.111	326.264		
Water Level:			3.310	326.065		
Other:						

Closing Error	-0.001	Average WL	326.064
WL Check	0.003	Transducer Elevation	-

**General Notes:**  
 Lots of slush in water. Snowmobile traffic over centre of channel.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	8-Mar-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	19-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date:

April 23, 2012



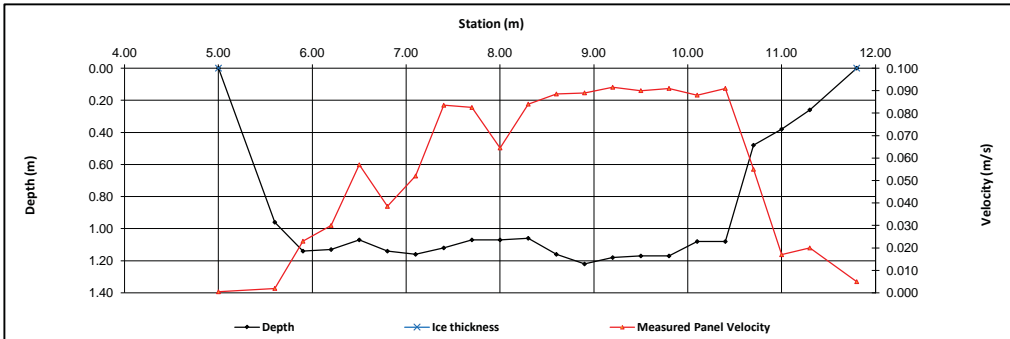
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	5.00	0.00	0.00	0.000	0.000	0.000	1.0	5.00	5.30	0.30	0.24	0.001	0.001	0.07	0.000	0%
1	5.60	0.96		0.004	0.000		1.0	5.30	5.75	0.45	0.96	0.002	0.002	0.43	0.001	0%
2	5.90	1.14		0.039	0.007		1.0	5.75	6.05	0.30	1.14	0.023	0.023	0.34	0.008	2%
3	6.20	1.13		0.028	0.032		1.0	6.05	6.35	0.30	1.13	0.030	0.030	0.34	0.010	3%
4	6.50	1.07		0.065	0.049		1.0	6.35	6.65	0.30	1.07	0.057	0.057	0.32	0.018	5%
5	6.80	1.14		0.062	0.015		1.0	6.65	6.95	0.30	1.14	0.039	0.039	0.34	0.013	3%
6	7.10	1.16		0.062	0.042		1.0	6.95	7.25	0.30	1.16	0.052	0.052	0.35	0.018	5%
7	7.40	1.12		0.081	0.086		1.0	7.25	7.55	0.30	1.12	0.084	0.084	0.34	0.028	7%
8	7.70	1.07		0.078	0.087		1.0	7.55	7.85	0.30	1.07	0.083	0.083	0.32	0.026	7%
9	8.00	1.07		0.042	0.087		1.0	7.85	8.15	0.30	1.07	0.065	0.065	0.32	0.021	5%
10	8.30	1.06		0.079	0.089		1.0	8.15	8.45	0.30	1.06	0.084	0.084	0.32	0.027	7%
11	8.60	1.16		0.083	0.094		1.0	8.45	8.75	0.30	1.16	0.089	0.089	0.35	0.031	8%
12	8.90	1.22		0.077	0.101		1.0	8.75	9.05	0.30	1.22	0.089	0.089	0.37	0.033	8%
13	9.20	1.18		0.080	0.103		1.0	9.05	9.35	0.30	1.18	0.092	0.092	0.35	0.032	8%
14	9.50	1.17		0.087	0.093		1.0	9.35	9.65	0.30	1.17	0.090	0.090	0.35	0.032	8%
15	9.80	1.17		0.079	0.103		1.0	9.65	9.95	0.30	1.17	0.091	0.091	0.35	0.032	8%
16	10.10	1.08		0.090	0.086		1.0	9.95	10.25	0.30	1.08	0.088	0.088	0.32	0.029	7%
17	10.40	1.08			0.101	0.081	1.0	10.25	10.55	0.30	1.08	0.091	0.091	0.32	0.029	7%
18	10.70	0.48		0.055			1.0	10.55	10.85	0.30	0.48	0.055	0.055	0.14	0.008	2%
19	11.00	0.38		0.017			1.0	10.85	11.15	0.30	0.38	0.017	0.017	0.11	0.002	0%
20	11.30	0.26		0.020			1.0	11.15	11.55	0.40	0.26	0.020	0.020	0.10	0.002	1%
RB	11.80	0.00	0.00	0.000	0.000	0.000	1.0	11.55	11.80	0.25	0.07	0.005	0.005	0.02	0.000	0%
<b>Total Flow</b>															<b>0.400</b>	

Measurement Details:	
Start Time (MST):	8:30
End Time (MST):	10:45
Equipment:	ADV
Method:	Fishcat
River Condition:	surface ice 2"
Quality/Error (see reverse):	good
Weather:	sunny, +10

Flow characteristics:		
Total Flow:	0.400	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	6.29	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.925	(m)
Mean Velocity:	0.064	(m/s)
Froude Number:	0.021	

Logger Details:		
Transducer Reading (m):	0.856	-
Water (°C):	0.7	-
Battery (Main):	14.5	-
Datalogger Clock:	10:15	-
Laptop Clock:	10:15	-
Dessicant:	replaced	-
Logger# (if Δ):	18205	-
PT# (if Δ):	250998	-

Datalogger / Station Notes:	
-modem RSSI -74	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.317	329.293		328.976	328.976	T-Post near Station
Bench Mark 2:			1.433	327.860		Rebar near River
Bench Mark 3:						
Ice/PT:						
Water Level:			2.622	326.671		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.301	328.975	328.976	T-Post near Station
Bench Mark 2:	1.416	329.276		327.860		Rebar near River
Bench Mark 3:						
Ice/PT:						
Water Level:			2.604	326.672		
Other:						

Closing Error	0.001	Average WL	326.672
WL Check	0.001	Transducer Elevation Before	325.8155
		Transducer Elevation After	-

Field Personnel:			
TR, SG	Trip Date:	23-Apr-12	
CJ	Date:	30-Apr-12	
XP	Date:	28-May-12	

**General Notes:**  
 -some surface ice.  
 -installed station and telemetry

# Hydrometric Measurement / Site Visit Record

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date: June 16, 2012



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	4.50	0.00	0.00	0.000	0.000	0.000	1.0	4.50	4.75	0.25	0.24	0.000	0.000	0.06	0.000	0%
1	5.00	0.94		0.008	-0.008		1.0	4.75	5.15	0.40	0.94	0.000	0.000	0.38	0.000	0%
2	5.30	0.94		0.008	-0.001		1.0	5.15	5.45	0.30	0.94	0.004	0.004	0.28	0.001	2%
3	5.60	1.28		0.014	0.008		1.0	5.45	5.75	0.30	1.28	0.011	0.011	0.38	0.004	6%
4	5.90	1.24		0.017	0.007		1.0	5.75	6.05	0.30	1.24	0.012	0.012	0.37	0.004	7%
5	6.20	1.32		0.018	0.012		1.0	6.05	6.35	0.30	1.32	0.015	0.015	0.40	0.006	9%
6	6.50	1.28		0.019	0.013		1.0	6.35	6.65	0.30	1.28	0.016	0.016	0.38	0.006	9%
7	6.80	1.26		0.024	0.005		1.0	6.65	6.95	0.30	1.26	0.015	0.015	0.38	0.005	8%
8	7.10	1.26		0.023	0.014		1.0	6.95	7.25	0.30	1.26	0.019	0.019	0.38	0.007	11%
9	7.40	1.28		0.019	0.009		1.0	7.25	7.55	0.30	1.28	0.014	0.014	0.38	0.005	8%
10	7.70	1.28		0.013	0.017		1.0	7.55	7.85	0.30	1.28	0.015	0.015	0.38	0.006	9%
11	8.00	1.03		0.014	0.011		1.0	7.85	8.15	0.30	1.03	0.013	0.013	0.31	0.004	6%
12	8.30	0.96		0.017	0.008		1.0	8.15	8.45	0.30	0.96	0.013	0.013	0.29	0.004	5%
13	8.60	1.36		0.007	0.012		1.0	8.45	8.75	0.30	1.36	0.010	0.010	0.41	0.004	6%
14	8.90	1.30		0.008	0.001		1.0	8.75	9.05	0.30	1.30	0.005	0.005	0.39	0.002	3%
15	9.20	1.26		0.008	0.002		1.0	9.05	9.35	0.30	1.26	0.005	0.005	0.38	0.002	3%
16	9.50	1.26		0.006	0.000		1.0	9.35	9.65	0.30	1.26	0.003	0.003	0.38	0.001	2%
17	9.80	1.12		0.004	0.007		1.0	9.65	9.95	0.30	1.12	0.006	0.006	0.34	0.002	3%
18	10.10	1.20		0.004	-0.009		1.0	9.95	10.25	0.30	1.20	-0.003	-0.003	0.36	-0.001	-1%
19	10.40	1.21		0.001	0.005		1.0	10.25	10.55	0.30	1.21	0.003	0.003	0.36	0.001	2%
20	10.70	1.25		0.005	-0.002		1.0	10.55	10.85	0.30	1.25	0.002	0.002	0.37	0.001	1%
21	11.00	1.26		0.005	0.001		1.0	10.85	11.25	0.40	1.26	0.003	0.003	0.50	0.002	2%
LB	11.50	0.00	0.00	0.000	0.000	0.000	1.0	11.25	11.50	0.25	0.32	0.001	0.001	0.08	0.000	0%
<b>Total Flow</b>														<b>0.066</b>		

**Measurement Details:**

Start Time (MST):	10:10
End Time (MST):	12:00
Equipment:	ADV
Method:	Fishcat
River Condition:	SLOW FLOW
Quality/Error (see reverse):	GOOD
Weather:	PARTLY CLOUDY, 15

**Flow characteristics:**

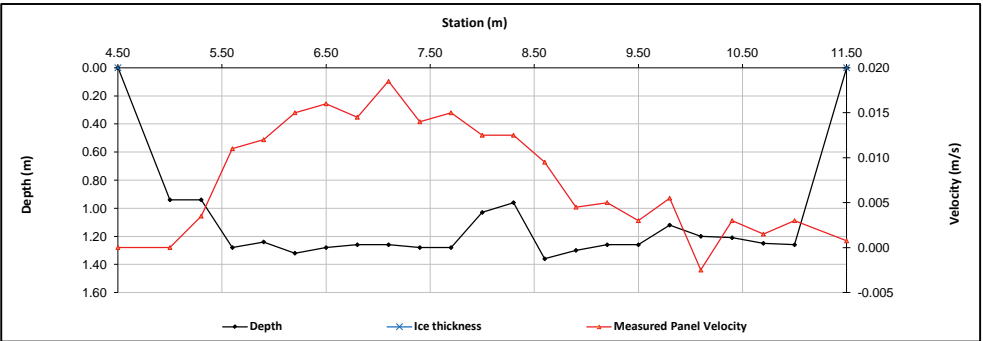
Total Flow:	0.066	(m <sup>3</sup> /s)
Perceived Measurement Quality:	GOOD	
Cross Section Area:	7.94	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	1.135	(m)
Mean Velocity:	0.008	(m/s)
Froude Number:	0.002	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.069	
Water (°C):	13.7	
Battery (Main):	14.3	
Datalogger Clock:	9:14	
Laptop Clock:	9:14	
Dessicant:	CHANGED	
Logger# (if Δ):	18205	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-INSTALLED 1BM, CAN USE A FEW MORE HITS



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	
<b>Setup #1</b>						
Bench Mark 1:	0.186	329.162		328.976	328.976	T-Post near Station
Bench Mark 2:			1.299	327.863		Rebar near River
Bench Mark 3:						
Ice/PT:						
Water Level:			2.368	326.794		
Other:						
<b>Setup #2</b>						
Bench Mark 3:					328.976	T-Post near Station
Water Level:			2.330	326.793		Rebar near River
Ice/PT:						
Bench Mark 2:	1.260	329.123		327.863		
Bench Mark 1:			0.148	328.975		
Other:						
Closing Error	0.001					
WL Check	0.001					
Average WL				326.794		
Transducer Depth				325.7245		

**General Notes:**

-TSS SAMPLED AT 8.0 m  
 -FISHCAT MAY HAVE HAD A BACKWATER EFFECT ON 0.2 MEASUREMENTS  
 -BEAVER DAM ~20M DS, BACKWATER EFFECT AND GREATLY SLOWS FLOW

**Field Personnel:**

TR & CJ	Trip Date:	16-Jun-12
Data Entry Personnel:	Date:	22-Jun-12
Data Check Personnel:	Date:	25-Jun-12

# Hydrometric Measurement Field Data Sheets

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date: August 12, 2012



## Flow Measurement:

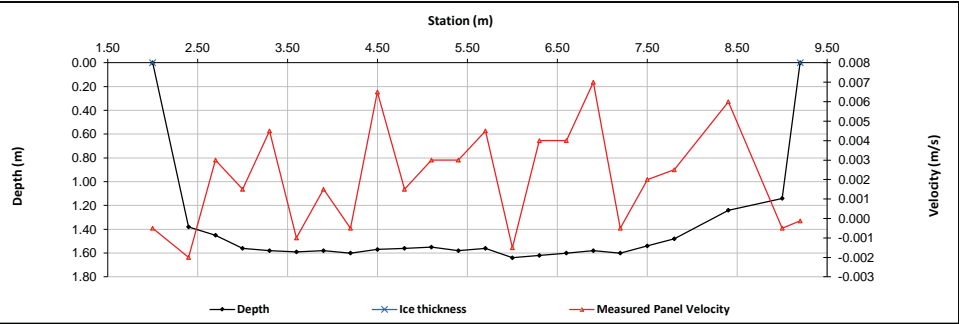
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.20	0.20	0.35	-0.001	-0.001	0.07	0.000	0%
1	2.40	1.38		0.001	-0.005		1.0	2.20	2.55	0.35	1.38	-0.002	-0.002	0.48	-0.001	-4%
2	2.70	1.45		0.009	-0.003		1.0	2.55	2.85	0.30	1.45	0.003	0.003	0.44	0.001	5%
3	3.00	1.56		0.005	-0.002		1.0	2.85	3.15	0.30	1.56	0.002	0.002	0.47	0.001	3%
4	3.30	1.58		0.005	0.004		1.0	3.15	3.45	0.30	1.58	0.005	0.005	0.47	0.002	9%
5	3.60	1.59		0.005	-0.007		1.0	3.45	3.75	0.30	1.59	-0.001	-0.001	0.48	0.000	-2%
6	3.90	1.58		0.005	-0.002		1.0	3.75	4.05	0.30	1.58	0.002	0.002	0.47	0.001	3%
7	4.20	1.60		0.004	-0.005		1.0	4.05	4.35	0.30	1.60	-0.001	-0.001	0.48	0.000	-1%
8	4.50	1.57		0.007	0.006		1.0	4.35	4.65	0.30	1.57	0.007	0.007	0.47	0.003	12%
9	4.80	1.56		0.005	-0.002		1.0	4.65	4.95	0.30	1.56	0.002	0.002	0.47	0.001	3%
10	5.10	1.55		0.003	0.003		1.0	4.95	5.25	0.30	1.55	0.003	0.003	0.47	0.001	6%
11	5.40	1.58		0.006	0.000		1.0	5.25	5.55	0.30	1.58	0.003	0.003	0.47	0.001	6%
12	5.70	1.56		0.009	0.000		1.0	5.55	5.85	0.30	1.56	0.005	0.005	0.47	0.002	8%
13	6.00	1.64		0.004	-0.007		1.0	5.85	6.15	0.30	1.64	-0.002	-0.002	0.49	-0.001	-3%
14	6.30	1.62		0.003	0.005		1.0	6.15	6.45	0.30	1.62	0.004	0.004	0.49	0.002	8%
15	6.60	1.60		0.007	0.001		1.0	6.45	6.75	0.30	1.60	0.004	0.004	0.48	0.002	8%
16	6.90	1.58		0.007	0.007		1.0	6.75	7.05	0.30	1.58	0.007	0.007	0.47	0.003	13%
17	7.20	1.60		0.004	-0.005		1.0	7.05	7.35	0.30	1.60	-0.001	-0.001	0.48	0.000	-1%
18	7.50	1.54		0.009	-0.005		1.0	7.35	7.65	0.30	1.54	0.002	0.002	0.46	0.001	4%
19	7.80	1.48		0.006	-0.001		1.0	7.65	8.10	0.45	1.48	0.003	0.003	0.67	0.002	7%
20	8.40	1.24		0.009	0.003		1.0	8.10	8.70	0.60	1.24	0.006	0.006	0.74	0.004	18%
21	9.00	1.14		-0.001	0.000		1.0	8.70	9.10	0.40	1.14	-0.001	-0.001	0.46	0.000	-1%
RB	9.20	0.00	0.00	0.00	0.00	0.00	1.0	9.10	9.20	0.10	0.29	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>														<b>0.0248</b>		

Measurement Details:	
Start Time (MST):	9:15
End Time (MST):	11:20
Equipment:	ADV
Method:	Wading
River Condition:	HIGH, BEAVERS
Quality/Error (see reverse):	Fair
Weather:	CLEAR, 22 DEGREES

Flow characteristics:	
Total Flow:	0.0248 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	10.47 (m <sup>2</sup> )
Wetted Width:	7.20 (m)
Hydraulic Depth:	1.455 (m)
Mean Velocity:	0.002 (m/s)
Froude Number:	0.001

Logger Details:		
	Before	After
Transducer Reading (m):	1.377	
Water (°C):	16.0	
Battery (Main):	14.4	
Datalogger Clock:	8:40	
Laptop Clock:	8:40	
Dessicant:	CHANGED	
Logger# (if Δ):	18205	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 FAR REBAR BM Moving/sinking



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.356	329.332		328.976	328.976	T-Post near Station
Bench Mark 2:			0.853	328.479		Rebar near River
Bench Mark 3:						
Ice/PT:						
Water Level:			2.213	327.119		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.322	328.977	328.976	T-Post near Station
Bench Mark 2:	0.820	329.299		328.479		Rebar near River
Bench Mark 3:						
Ice/PT:						
Water Level:			2.184	327.115		
Other:						
Closing Error	-0.001					
WL Check	0.004					
Average WL				327.117		
Transducer Elevation				325.740		

**General Notes:**  
 -RECENT BEAVER DAM UPGRADES, WL HIGH, TEMP LOW  
 -TSS TAKEN AT 6 m

Field Personnel:		Trip Date:	12-Aug-12
Data Entry Personnel:	TR (Field)	Date:	12-Aug-12
Data Check Personnel:	CJ	Date:	3-Oct-12



# Hydrometric Measurement Field Data Sheets

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date: September 16, 2012



## Flow Measurement:

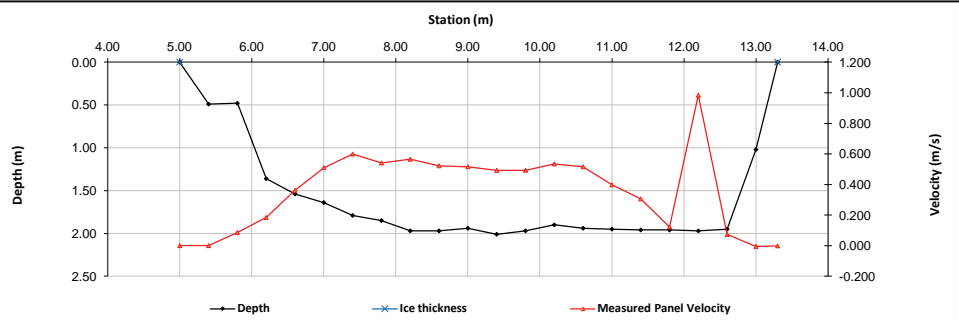
Measured Data						Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.0	5.00	5.20	0.20	0.12	0.000	0.000	0.02	0.000	0%
1	5.40	0.49		0.000			1.0	5.20	5.60	0.40	0.49	0.000	0.000	0.20	0.000	0%
2	5.80	0.48		0.086			1.0	5.60	6.00	0.40	0.48	0.086	0.086	0.19	0.017	0%
3	6.20	1.36			0.061	0.307	1.0	6.00	6.40	0.40	1.36	0.184	0.184	0.54	0.100	2%
4	6.60	1.54			0.336	0.388	1.0	6.40	6.80	0.40	1.54	0.362	0.362	0.62	0.223	4%
5	7.00	1.64			0.478	0.542	1.0	6.80	7.20	0.40	1.64	0.510	0.510	0.66	0.335	6%
6	7.40	1.79			0.556	0.642	1.0	7.20	7.60	0.40	1.79	0.599	0.599	0.72	0.429	7%
7	7.80	1.85			0.549	0.533	1.0	7.60	8.00	0.40	1.85	0.541	0.541	0.74	0.400	7%
8	8.20	1.97			0.503	0.627	1.0	8.00	8.40	0.40	1.97	0.565	0.565	0.79	0.445	8%
9	8.60	1.97			0.479	0.565	1.0	8.40	8.80	0.40	1.97	0.522	0.522	0.79	0.411	7%
10	9.00	1.94			0.499	0.533	1.0	8.80	9.20	0.40	1.94	0.516	0.516	0.78	0.400	7%
11	9.40	2.01			0.433	0.552	1.0	9.20	9.60	0.40	2.01	0.493	0.493	0.80	0.396	7%
12	9.80	1.97			0.484	0.501	1.0	9.60	10.00	0.40	1.97	0.493	0.493	0.79	0.388	7%
13	10.20	1.90			0.561	0.508	1.0	10.00	10.40	0.40	1.90	0.535	0.535	0.76	0.406	7%
14	10.60	1.94			0.515	0.516	1.0	10.40	10.80	0.40	1.94	0.516	0.516	0.78	0.400	7%
15	11.00	1.95			0.445	0.351	1.0	10.80	11.20	0.40	1.95	0.398	0.398	0.78	0.310	5%
16	11.40	1.96			0.297	0.314	1.0	11.20	11.60	0.40	1.96	0.306	0.306	0.78	0.240	4%
17	11.80	1.96			0.149	0.095	1.0	11.60	12.00	0.40	1.96	0.122	0.122	0.78	0.096	2%
18	12.20	1.97			1.880	0.089	1.0	12.00	12.40	0.40	1.97	0.985	0.985	0.79	0.776	13%
19	12.60	1.95			0.150	-0.003	1.0	12.40	12.80	0.40	1.95	0.074	0.074	0.78	0.057	1%
20	13.00	1.02			-0.007	-0.004	1.0	12.80	13.15	0.35	1.02	-0.006	-0.006	0.36	-0.002	0%
LB	13.30	0.00	0.00	0.00	0.00	0.00	1.0	13.15	13.30	0.15	0.26	-0.001	-0.001	0.04	0.000	0%
<b>Total Flow</b>														<b>5.83</b>		

Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	12:50
Equipment:	ADV
Method:	Fishcat
River Condition:	Flooded banks
Quality/Error (see reverse):	Good
Weather:	Sunny, 10C

Flow characteristics:		
Total Flow:	5.83	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.48	(m <sup>2</sup> )
Wetted Width:	8.30	(m)
Hydraulic Depth:	1.624	(m)
Mean Velocity:	0.433	(m/s)
Froude Number:	0.108	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.724	8.8
Battery (Main):	14.5	
Datalogger Clock:	9:25	
Laptop Clock:	9:24	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.083	329.059		328.976	328.976	T-Post near Station
Bench Mark 2:						Rebar near River
Bench Mark 3:			0.591	328.468	328.468	New 3/4" Pipe
Ice/PT:						
Water Level:			1.600	327.459		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.062	328.975	328.976	T-Post near Station
Bench Mark 2:						Rebar near River
Bench Mark 3:	0.569	329.037		328.468	328.468	New 3/4" Pipe
Ice/PT:						
Water Level:			1.580	327.457		
Other:						

Closing Error	0.001	Average WL	327.458
WL Check	0.002	Transducer Elevation	325.734

**General Notes:**

- 5 m to 6.5 m is flooded grass but the water is flowing overtop. At 5.4 m, at 20% depth, there was a flow of 0.229. At 3.5 m with a depth of 0.26 m the flow was 0.032.
- water flowing over and around beaver dam downstream
- water is flowing slowly around the trees on the banks
- LB is flooded to 15.9 m
- At 14.3 m the flow was 1.033 at a depth of 0.66 m

<b>Field Personnel:</b>	DW,TR	<b>Trip Date:</b>	16-Sep-12
<b>Data Entry Personnel:</b>	DW (IN FIELD)	<b>Date:</b>	16-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S20 - Muskeg River Upland  
 UTM Location: 49178 E, 6354787 N

Site Visit Date: October 23, 2012



## 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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.25	0.25	0.39	0.023	0.023	0.10	0.002	0%
1	3.50	1.55		0.102	0.079		1.0	3.25	3.65	0.40	1.55	0.091	0.091	0.62	0.056	5%
2	3.80	1.68		0.151	0.148		1.0	3.65	3.95	0.30	1.68	0.150	0.150	0.50	0.075	6%
3	4.10	1.72		0.169	0.169		1.0	3.95	4.25	0.30	1.72	0.169	0.169	0.52	0.087	7%
4	4.40	1.80		0.152	0.160		1.0	4.25	4.55	0.30	1.80	0.156	0.156	0.54	0.084	7%
5	4.70	1.80		0.168	0.174		1.0	4.55	4.85	0.30	1.80	0.171	0.171	0.54	0.092	8%
6	5.00	1.86		0.153	0.168		1.0	4.85	5.15	0.30	1.86	0.161	0.161	0.56	0.090	7%
7	5.30	1.76		0.153	0.149		1.0	5.15	5.45	0.30	1.76	0.151	0.151	0.53	0.080	7%
8	5.60	1.85		0.161	0.178		1.0	5.45	5.75	0.30	1.85	0.170	0.170	0.56	0.094	8%
9	5.90	1.91		0.151	0.183		1.0	5.75	6.05	0.30	1.91	0.167	0.167	0.57	0.096	8%
10	6.20	1.77		0.091	0.185		1.0	6.05	6.35	0.30	1.77	0.138	0.138	0.53	0.073	6%
11	6.50	1.84		0.064	0.163		1.0	6.35	6.65	0.30	1.84	0.114	0.114	0.55	0.063	5%
12	6.80	1.61		0.047	0.178		1.0	6.65	6.95	0.30	1.61	0.113	0.113	0.48	0.054	4%
13	7.10	1.81		0.062	0.168		1.0	6.95	7.25	0.30	1.81	0.115	0.115	0.54	0.062	5%
14	7.40	1.82		0.078	0.081		1.0	7.25	7.55	0.30	1.82	0.080	0.080	0.55	0.043	4%
15	7.70	1.81		0.056	0.069		1.0	7.55	7.85	0.30	1.81	0.063	0.063	0.54	0.034	3%
16	8.00	1.85		0.063	0.099		1.0	7.85	8.15	0.30	1.85	0.081	0.081	0.56	0.045	4%
17	8.30	1.86		0.016	0.087		1.0	8.15	8.45	0.30	1.86	0.052	0.052	0.56	0.029	2%
18	8.60	1.87		0.003	0.090		1.0	8.45	8.75	0.30	1.87	0.047	0.047	0.56	0.026	2%
19	8.90	1.82		-0.007	0.097		1.0	8.75	9.05	0.30	1.82	0.045	0.045	0.55	0.025	2%
20	9.20	1.82		-0.008	0.017		1.0	9.05	9.50	0.45	1.82	0.005	0.005	0.82	0.004	0%
21	9.80	1.76		-0.007	0.000		1.0	9.50	10.15	0.65	1.76	-0.004	-0.004	1.14	-0.004	0%
LB	10.50	0.00	0.00	0.00	0.00	0.00	1.0	10.15	10.50	0.35	0.44	-0.001	-0.001	0.15	0.000	0%
<b>Total Flow</b>														<b>1.21</b>		

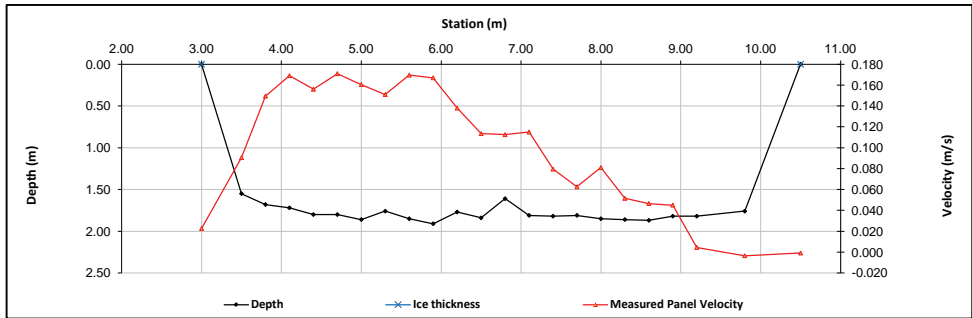
Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	12:50
Equipment:	ADV
Method:	Fishcat
River Condition:	HIGH
Quality/Error (see reverse):	Poor
Weather:	OVERCAST, OC

Flow characteristics:	
Total Flow:	1.21 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	12.57 (m <sup>2</sup> )
Wetted Width:	7.50 (m)
Hydraulic Depth:	1.675 (m)
Mean Velocity:	0.096 (m/s)
Froude Number:	0.024

Logger Details:		
	Before	After
Transducer Reading (m):	1.622	1.623
Water (°C):	0.2	0.3
Battery (Main):	11.1	13.18
Datalogger Clock:	9:10	10:32
Laptop Clock:	9:10	10:32
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Logger Notes:	
-replaced batteries	

General Notes:	
-RB is flooded	
-Slush is on the surface near the banks	
-TSS at 7.5 m	
-added new bm and mast for new site beside bridge	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.254	328.977	328.976	T-Post near Station
Bench Mark 2:						Rebar near River
Bench Mark 3:	0.763	329.231		328.468	328.468	New 3/4" Pipe
Ice/PT:						
Water Level:			1.867	327.364		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.238	329.215		328.977	328.976	T-Post near Station
Bench Mark 2:						Rebar near River
Bench Mark 3:			0.746	328.469	328.468	New 3/4" Pipe
Ice/PT:						
Water Level:			1.849	327.366		
Other:						

Closing Error	-0.001	Average WL	327.365
WL Check	0.002	Transducer Elevation	325.743

<b>Field Personnel:</b>	DW, TR	Trip Date:	23-Oct-12
<b>Data Entry Personnel:</b>	DW	Date:	23-Oct-12
<b>Data Check Personnel:</b>	CJ	Date:	8-Nov-12
<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: February 13, 2012



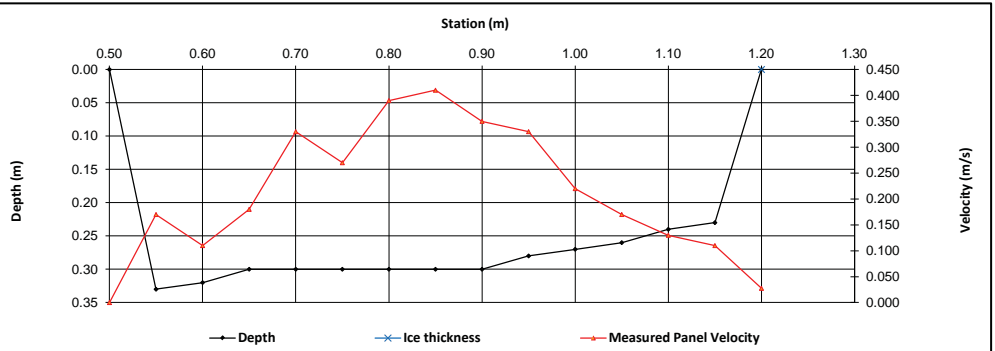
Measured Data							Calculated Data										
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.00	0.000	0.000	0.000	1.0	0.00	0.03	0.03	0.05	0.070	0.070	0.00	0.000	0%	
1	0.05	0.18		0.280			1.0	0.03	0.08	0.05	0.18	0.280	0.280	0.01	0.003	4%	
2	0.10	0.21		0.350			1.0	0.08	0.13	0.05	0.21	0.350	0.350	0.01	0.004	5%	
3	0.15	0.24		0.350			1.0	0.13	0.18	0.05	0.24	0.350	0.350	0.01	0.004	6%	
4	0.20	0.24		0.260			1.0	0.18	0.23	0.05	0.24	0.260	0.260	0.01	0.003	5%	
5	0.25	0.25		0.170			1.0	0.23	0.28	0.05	0.25	0.170	0.170	0.01	0.002	3%	
6	0.30	0.26		0.120			1.0	0.28	0.33	0.05	0.26	0.120	0.120	0.01	0.002	2%	
7	0.35	0.28		0.160			1.0	0.33	0.38	0.05	0.28	0.160	0.160	0.01	0.002	3%	
8	0.40	0.29		0.170			1.0	0.38	0.43	0.05	0.29	0.170	0.170	0.01	0.002	4%	
9	0.45	0.00		0.000			1.0	0.43	0.48	0.05	0.07	0.000	0.000	0.00	0.000	0%	
10	0.50	0.00		0.000			1.0	0.48	0.53	0.05	0.00	0.000	0.000	0.00	0.000	0%	
11	0.55	0.33		0.170			1.0	0.53	0.58	0.05	0.33	0.170	0.170	0.02	0.003	4%	
12	0.60	0.32		0.110			1.0	0.58	0.63	0.05	0.32	0.110	0.110	0.02	0.002	3%	
13	0.65	0.30		0.180			1.0	0.63	0.68	0.05	0.30	0.180	0.180	0.02	0.003	4%	
14	0.70	0.30		0.330			1.0	0.68	0.73	0.05	0.30	0.330	0.330	0.02	0.005	7%	
15	0.75	0.30		0.270			1.0	0.73	0.78	0.05	0.30	0.270	0.270	0.02	0.004	6%	
16	0.80	0.30		0.390			1.0	0.78	0.83	0.05	0.30	0.390	0.390	0.02	0.006	9%	
17	0.85	0.30		0.410			1.0	0.83	0.88	0.05	0.30	0.410	0.410	0.02	0.006	9%	
18	0.90	0.30		0.350			1.0	0.88	0.93	0.05	0.30	0.350	0.350	0.02	0.005	8%	
19	0.95	0.28		0.330			1.0	0.93	0.98	0.05	0.28	0.330	0.330	0.01	0.005	7%	
20	1.00	0.27		0.220			1.0	0.98	1.03	0.05	0.27	0.220	0.220	0.01	0.003	4%	
21	1.05	0.26		0.170			1.0	1.03	1.08	0.05	0.26	0.170	0.170	0.01	0.002	3%	
22	1.10	0.24		0.130			1.0	1.08	1.13	0.05	0.24	0.130	0.130	0.01	0.002	2%	
23	1.15	0.23		0.110			1.0	1.13	1.18	0.05	0.23	0.110	0.110	0.01	0.001	2%	
LB	1.20	0.00	0.00	0.000	0.000	0.000	1.0	1.15	1.20	0.05	0.06	0.028	0.028	0.00	0.000	5%	
<b>Total Flow</b>														<b>0.068</b>			

Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	11:35
Equipment:	Marsh
Method:	Wading
River Condition:	Partly Frozen
Quality/Error (see reverse):	Good
Weather:	Sunny -10°

Flow characteristics:	
Total Flow:	0.068 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.29 (m <sup>2</sup> )
Wetted Width:	1.20 (m)
Hydraulic Depth:	0.243 (m)
Mean Velocity:	0.234 (m/s)
Froude Number:	0.151

Datalogger Details:		
	Before	After
Transducer Reading (m):		
Water (°C):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.340	306.474		T-Post near Station
Bench Mark 3:						
Ice/PT:						
Water Level:			3.488	303.326		
Other:	1.600	306.814		305.214	305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.341	306.815		306.474		T-Post near Station
Bench Mark 3:						
Ice/PT:						
Water Level:			3.485	303.330		
Other:			1.598	305.217	305.214	Nail in Tree
<b>Closing Error</b>						
Closing Error	-0.003					
<b>Average WL</b>						
WL Check	0.004			303.328		
				Transducer Elevation	-	

**General Notes:**

Two independent channels measured.  
 Grounded Ice was blocking the middle at measurement point.

Field Personnel:		Trip Date:	13-Feb-12
Data Entry Personnel:	SG	Date:	16-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek near the mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: April 23, 2012



## 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	1.10	0.00	0.00	0.000	0.000	0.000	1.0	1.10	1.15	0.05	0.07	0.147	0.147	0.00	0.001	0%
1	1.20	0.29		0.588			1.0	1.15	1.25	0.10	0.29	0.588	0.588	0.03	0.017	11%
2	1.30	0.28		0.553			1.0	1.25	1.35	0.10	0.28	0.553	0.553	0.03	0.015	10%
3	1.40	0.32		0.552			1.0	1.35	1.45	0.10	0.32	0.552	0.552	0.03	0.018	11%
4	1.50	0.31		0.681			1.0	1.45	1.55	0.10	0.31	0.681	0.681	0.03	0.021	14%
5	1.60	0.25		0.663			1.0	1.55	1.65	0.10	0.25	0.663	0.663	0.03	0.017	11%
6	1.70	0.22		0.702			1.0	1.65	1.75	0.10	0.22	0.702	0.702	0.02	0.015	10%
7	1.80	0.19		0.675			1.0	1.75	1.85	0.10	0.19	0.675	0.675	0.02	0.013	8%
8	1.90	0.16		0.595			1.0	1.85	1.95	0.10	0.16	0.595	0.595	0.02	0.010	6%
9	2.00	0.12		0.571			1.0	1.95	2.05	0.10	0.12	0.571	0.571	0.01	0.007	4%
10	2.10	0.13		0.467			1.0	2.05	2.15	0.10	0.13	0.467	0.467	0.01	0.006	4%
11	2.20	0.12		0.434			1.0	2.15	2.25	0.10	0.12	0.434	0.434	0.01	0.005	3%
12	2.30	0.13		0.361			1.0	2.25	2.35	0.10	0.13	0.361	0.361	0.01	0.005	3%
13	2.40	0.14		0.288			1.0	2.35	2.45	0.10	0.14	0.288	0.288	0.01	0.004	3%
14	2.50	0.14		0.189			1.0	2.45	2.55	0.10	0.14	0.189	0.189	0.01	0.003	2%
15	2.60	0.14		-0.015			1.0	2.55	2.65	0.10	0.14	-0.015	-0.015	0.01	0.000	0%
16	2.70	0.15		-0.011			1.0	2.65	2.75	0.10	0.15	-0.011	-0.011	0.01	0.000	0%
17	2.80	0.14		0.013			1.0	2.75	2.88	0.13	0.14	0.013	0.013	0.02	0.000	0%
LB	2.95	0.00	0.00	0.000	0.000	0.000	1.0	2.88	2.95	0.08	0.04	0.003	0.003	0.00	0.000	0%
<b>Total Flow</b>															<b>0.156</b>	

## Measurement Details:

Start Time (MST):	11:15
End Time (MST):	13:30
Equipment:	ADV
Method:	Wading
River Condition:	partial ice
Quality/Error (see reverse):	good
Weather:	clear, +10

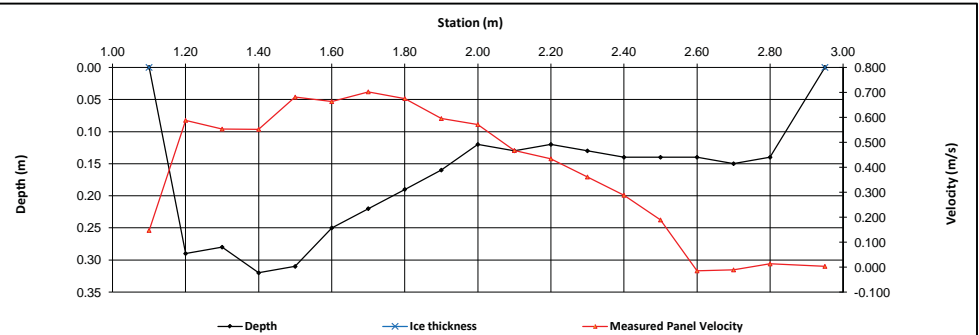
## Flow characteristics:

Total Flow:	0.156	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.33	(m <sup>2</sup> )
Wetted Width:	1.85	(m)
Hydraulic Depth:	0.180	(m)
Mean Velocity:	0.468	(m/s)
Froude Number:	0.352	

## Logger Details:

	Before	After
Transducer Reading (m):	0.863	-
Water (°C):	1.3	-
Battery (Main):	12:76	-
Datalogger Clock:	13:21	-
Laptop Clock:	13:21	-
Dessicant:	replaced	-
Logger# (if Δ):	18166	-
PT# (if Δ):	298682	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:						
Bench Mark 2:			0.372	306.469		T-Post near Station
Bench Mark 3:						
Ice/PT:						
Water Level:			3.484	303.357		
Other:	1.627	306.841		305.214	305.214	Nail in Tree
Setup #2						
Bench Mark 1:						
Bench Mark 2:	0.354	306.823		306.469		T-Post near Station
Bench Mark 3:						
Ice/PT:						
Water Level:			3.464	303.359		
Other:			1.609	305.214	305.214	Nail in Tree

Closing Error	0.000	Average WL	303.358
WL Check	0.002	Transducer Elevation	302.495

## General Notes:

Field Personnel:	TR, SG	Trip Date:	23-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek near the mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date:

June 16, 2012



## Flow Measurement:

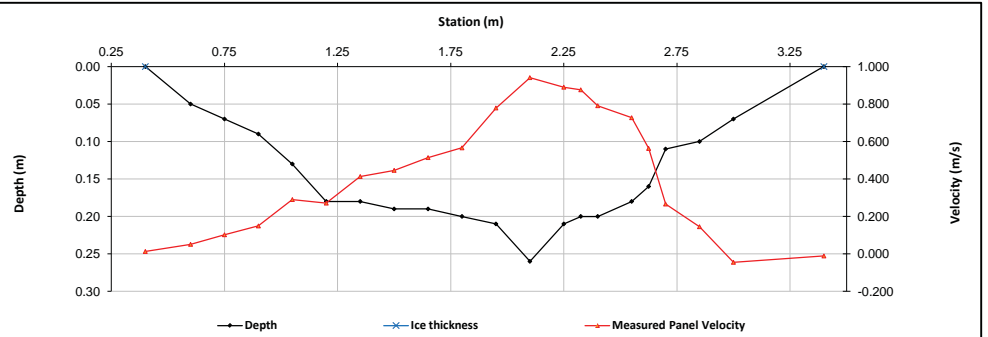
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.50	0.10	0.01	0.013	0.013	0.00	0.000	0%
1	0.60	0.05		0.051			1.0	0.50	0.68	0.18	0.05	0.051	0.051	0.01	0.000	0%
2	0.75	0.07		0.102			1.0	0.68	0.83	0.15	0.07	0.102	0.102	0.01	0.001	1%
3	0.90	0.09		0.149			1.0	0.83	0.98	0.15	0.09	0.149	0.149	0.01	0.002	1%
4	1.05	0.13		0.290			1.0	0.98	1.13	0.15	0.13	0.290	0.290	0.02	0.006	3%
5	1.20	0.18		0.271			1.0	1.13	1.28	0.15	0.18	0.271	0.271	0.03	0.007	3%
6	1.35	0.18		0.413			1.0	1.28	1.43	0.15	0.18	0.413	0.413	0.03	0.011	5%
7	1.50	0.19		0.446			1.0	1.43	1.58	0.15	0.19	0.446	0.446	0.03	0.013	6%
8	1.65	0.19		0.514			1.0	1.58	1.73	0.15	0.19	0.514	0.514	0.03	0.015	7%
9	1.80	0.20		0.566			1.0	1.73	1.88	0.15	0.20	0.566	0.566	0.03	0.017	8%
10	1.95	0.21		0.779			1.0	1.88	2.03	0.15	0.21	0.779	0.779	0.03	0.025	12%
11	2.10	0.26		0.941			1.0	2.03	2.18	0.15	0.26	0.941	0.941	0.04	0.037	17%
12	2.25	0.21		0.890			1.0	2.18	2.29	0.11	0.21	0.890	0.890	0.02	0.021	10%
13	2.33	0.20		0.876			1.0	2.29	2.36	0.07	0.20	0.876	0.876	0.01	0.013	6%
14	2.40	0.20		0.791			1.0	2.36	2.48	0.11	0.20	0.791	0.791	0.02	0.018	8%
15	2.55	0.18		0.727			1.0	2.48	2.59	0.11	0.18	0.727	0.727	0.02	0.015	7%
16	2.63	0.16		0.563			1.0	2.59	2.66	0.08	0.16	0.563	0.563	0.01	0.007	3%
17	2.70	0.11		0.266			1.0	2.66	2.78	0.11	0.11	0.266	0.266	0.01	0.003	2%
18	2.85	0.10		0.145			1.0	2.78	2.93	0.15	0.10	0.145	0.145	0.01	0.002	1%
19	3.00	0.07		-0.045			1.0	2.93	3.20	0.28	0.07	-0.045	-0.045	0.02	-0.001	0%
LB	3.40	0.00	0.00	0.000	0.000	0.000	1.0	3.20	3.40	0.20	0.02	-0.011	-0.011	0.00	0.000	0%
<b>Total Flow</b>															<b>0.211</b>	

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	13:30
Equipment:	ADV
Method:	Wading
River Condition:	GOOD FLOW
Quality/Error (see reverse):	FAIR
Weather:	PARTLY CLOUDY, 17

Flow characteristics:	
Total Flow:	0.211 (m <sup>3</sup> /s)
Perceived Measurement Quality:	FAIR
Cross Section Area:	0.41 (m <sup>2</sup> )
Wetted Width:	3.00 (m)
Hydraulic Depth:	0.136 (m)
Mean Velocity:	0.517 (m/s)
Froude Number:	0.448

Logger Details:		
	Before	After
Transducer Reading (m):	0.824	
Water (°C):	14.8	
Battery (Main):	14:15	
Datalogger Clock:	11:28	
Laptop Clock:	11:29	
Dessicant:	CHANGED	
Logger# (if Δ):	18166	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-2BM INSTALLED	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.578	305.591	305.596	Pipe 3 m W of Logger
Bench Mark 2:			0.484	305.685	305.689	Pipe 5 m SW of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.834	303.335		
Other:	0.955	306.169		305.214	305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:	0.488	306.079		305.591	305.596	Pipe 3 m W of Logger
Bench Mark 2:			0.395	305.684	305.689	Pipe 5 m SW of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.745	303.334		
Other:			0.866	305.213	305.214	Nail in Tree
<b>Closing Error</b>						
	0.001				303.335	
<b>WL Check</b>						
	0.001				302.511	

General Notes:	
-TSS SAMPLED AT 2.0 m	
-VENT TUBE CHECKED	

Field Personnel:	TR & CJ	Trip Date:	16-Jun-12
Data Entry Personnel:	TR	Date:	22-Jun-12
Data Check Personnel:	CJ	Date:	25-Jun-12

# Hydrometric Measurement/Site Visit Record

Site: S22 - Muskeg Creek near the Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

August 12, 2012



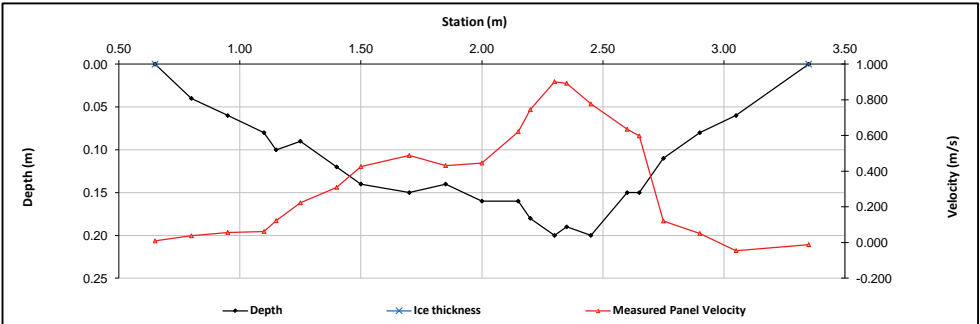
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.65	0.00	0.00	0.000	0.000	0.000	1.0	0.65	0.73	0.08	0.01	0.010	0.010	0.00	0.000	0%
1	0.80	0.04		0.038			1.0	0.73	0.88	0.15	0.04	0.038	0.038	0.01	0.000	0%
2	0.95	0.06		0.057			1.0	0.88	1.03	0.15	0.06	0.057	0.057	0.01	0.001	0%
3	1.10	0.08		0.062			1.0	1.03	1.13	0.10	0.08	0.062	0.062	0.01	0.000	0%
4	1.15	0.10		0.123			1.0	1.13	1.20	0.08	0.10	0.123	0.123	0.01	0.001	1%
5	1.25	0.09		0.223			1.0	1.20	1.33	0.13	0.09	0.223	0.223	0.01	0.003	2%
6	1.40	0.12		0.310			1.0	1.33	1.45	0.13	0.12	0.310	0.310	0.02	0.005	3%
7	1.50	0.14		0.426			1.0	1.45	1.60	0.15	0.14	0.426	0.426	0.02	0.009	7%
8	1.70	0.15		0.488			1.0	1.60	1.78	0.18	0.15	0.488	0.488	0.03	0.013	10%
9	1.85	0.14		0.432			1.0	1.78	1.93	0.15	0.14	0.432	0.432	0.02	0.009	7%
10	2.00	0.16		0.446			1.0	1.93	2.08	0.15	0.16	0.446	0.446	0.02	0.011	8%
11	2.15	0.16		0.622			1.0	2.08	2.18	0.10	0.16	0.622	0.622	0.02	0.010	7%
12	2.20	0.18		0.745			1.0	2.18	2.25	0.08	0.18	0.745	0.745	0.01	0.010	8%
13	2.30	0.20		0.902			1.0	2.25	2.33	0.08	0.20	0.902	0.902	0.02	0.014	10%
14	2.35	0.19		0.893			1.0	2.33	2.40	0.08	0.19	0.893	0.893	0.01	0.013	9%
15	2.45	0.20		0.777			1.0	2.40	2.53	0.13	0.20	0.777	0.777	0.03	0.019	14%
16	2.60	0.15		0.635			1.0	2.53	2.63	0.10	0.15	0.635	0.635	0.01	0.010	7%
17	2.65	0.15		0.598			1.0	2.63	2.70	0.08	0.15	0.598	0.598	0.01	0.007	5%
18	2.75	0.11		0.121			1.0	2.70	2.83	0.13	0.11	0.121	0.121	0.01	0.002	1%
19	2.90	0.08		0.051			1.0	2.83	2.98	0.15	0.08	0.051	0.051	0.01	0.001	0%
20	3.05	0.06		-0.045			1.0	2.98	3.20	0.23	0.06	-0.045	-0.045	0.01	-0.001	0%
LB	3.35	0.00	0.00	0.00	0.00	0.00	1.0	3.20	3.35	0.15	0.02	-0.011	-0.011	0.00	0.000	0%

**Total Flow 0.134**

Measurement Details:	
Start Time (MST):	13:05
End Time (MST):	14:20
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	P. CLOUDY, 20 DEGREES

Flow characteristics:		
Total Flow:	0.134	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.30	(m <sup>2</sup> )
Wetted Width:	2.70	(m)
Hydraulic Depth:	0.112	(m)
Mean Velocity:	0.445	(m/s)
Froude Number:	0.425	

Logger Details:		
	Before	After
Transducer Reading (m):	0.761	
Water (°C):	16.2	
Battery (Main):	14.1	
Datalogger Clock:	12:25	
Laptop Clock:	12:25	
Dessicant:	CHANGED	
Logger# (if Δ):	-	
PT# (if Δ):	-	



**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.158	305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:			1.066	305.688	305.689	Pipe 5 m SW of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.518	303.236		
Other:	1.540	306.754		305.214	305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:	1.168	306.764		305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:			1.085	305.679	305.689	Pipe 5 m SW of Logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.525	303.239		
Other:			1.549	305.215	305.214	Nail in Tree

Closing Error	-0.001	Average WL	303.238
WL Check	0.003	Transducer Elevation	302.477

**General Notes:**

TSS taken at offset 2 m

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	12-Aug-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	12-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Aug-12

# Hydrometric Measurement Field Data Sheet

Site: S22 - Muskeg Creek near the Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

September 16, 2012



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	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	7.65	0.00	0.00	0.000	0.000	0.000	1.0	7.65	8.15	0.50	0.13	0.088	0.088	0.06	0.005	0%
1	8.65	0.50		0.350			1.0	8.15	9.08	0.92	0.50	0.350	0.350	0.46	0.162	2%
2	9.50	0.67		0.556			1.0	9.08	10.00	0.93	0.67	0.556	0.556	0.62	0.345	4%
3	10.50	0.70		0.653			1.0	10.00	10.75	0.75	0.70	0.653	0.653	0.53	0.343	4%
4	11.00	1.05			0.528	0.779	1.0	10.75	11.25	0.50	1.05	0.654	0.654	0.53	0.343	4%
5	11.50	1.40			0.917	0.932	1.0	11.25	11.75	0.50	1.40	0.925	0.925	0.70	0.647	8%
6	12.00	1.40			0.576	0.948	1.0	11.75	12.25	0.50	1.40	0.762	0.762	0.70	0.533	7%
7	12.50	1.40			1.038	1.010	1.0	12.25	12.75	0.50	1.40	1.024	1.024	0.70	0.717	9%
8	13.00	1.40			0.988	1.187	1.0	12.75	13.25	0.50	1.40	1.088	1.088	0.70	0.761	10%
9	13.50	1.20			0.742	1.231	1.0	13.25	14.75	1.50	1.20	0.987	0.987	1.80	1.776	22%
10	16.00	1.15			0.423	1.040	1.0	14.75	16.25	1.50	1.15	0.732	0.732	1.73	1.262	16%
11	16.50	1.05			0.460	1.312	1.0	16.25	16.75	0.50	1.05	0.886	0.886	0.53	0.465	6%
12	17.00	0.96			0.315	1.297	1.0	16.75	17.40	0.65	0.96	0.806	0.806	0.62	0.503	6%
13	17.80	0.30		0.785			1.0	17.40	17.90	0.50	0.30	0.785	0.785	0.15	0.118	1%
LB	18.00	0.00	0.00	0.00	0.00	0.00	1.0	17.90	18.00	0.10	0.08	0.196	0.196	0.01	0.001	0%
<b>Total Flow</b>															<b>7.98</b>	

Measurement Details:	
Start Time (MST):	1:30
End Time (MST):	3:30
Equipment:	ADV
Method:	Fishcat
River Condition:	HIGH AND FAST
Quality/Error (see reverse):	Poor
Weather:	CLEAR, 13.2 DEGREES

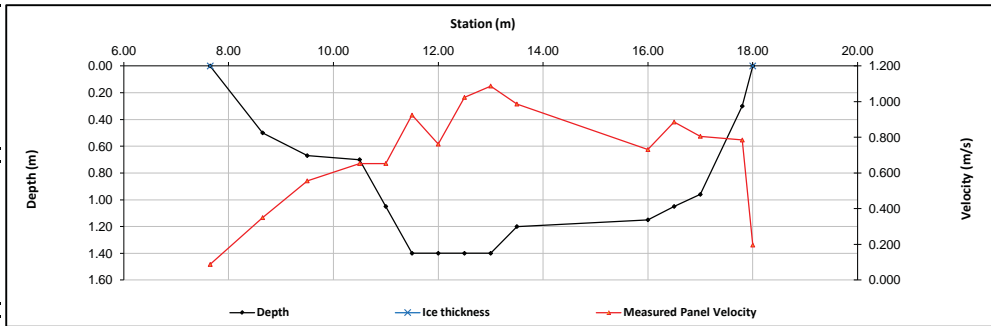
Flow characteristics:	
Total Flow:	7.98 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	9.83 (m <sup>2</sup> )
Wetted Width:	10.35 (m)
Hydraulic Depth:	0.949 (m)
Mean Velocity:	0.812 (m/s)
Froude Number:	0.266

Logger Details:		
	Before	After
Transducer Reading (m):	2.253	
Water (°C):	9.5	
Battery (Main):	14.3	
Datalogger Clock:	12:31	
Laptop Clock:	12:30	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	

**General Notes:**

- Was unable to measure from 14.0 m to 16.0 m due to high flow
- Banks above and below the bridge are flooded
- Flow measurement done under the bridge
- Installed new 3/4" Pipe BM



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.344	306.940		305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:			1.251	305.689	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.862	306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:						
Water Level:			2.267	304.673		
Other:			1.725	305.215	305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:			1.326	305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:	1.233	306.922		305.689	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.844	306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:						
Water Level:			2.250	304.672		
Other:			1.708	305.214	305.214	Nail in Tree

Closing Error	0.000	Average WL	304.673
WL Check	0.001	Transducer Elevation	302.420

Field Personnel:		DW, TR	Trip Date:	16-Sep-12
Data Entry Personnel:	TR, DW (Field)	Date:	16-Sep-12	
Data Check Personnel:	CJ	Date:	9-Oct-12	

# Hydrometric Measurement / Site Visit Record

Site: S22 - Muskeg Creek Near The Mouth

UTM Location: 481036 E, 6348856 N

Site Visit Date:

October 23, 2012



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	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	3.90	0.00	0.00	0.000	0.000	0.000	1.0	3.90	4.25	0.35	0.13	0.023	0.023	0.05	0.001	0%							
1	4.60	0.52		0.093			1.0	4.25	4.80	0.55	0.52	0.093	0.023	0.29	0.027	1%							
2	5.00	0.71		0.422			1.0	4.80	5.20	0.40	0.71	0.422	0.422	0.28	0.120	4%							
3	5.40	1.00			0.281	0.515	1.0	5.20	5.60	0.40	1.00	0.398	0.398	0.40	0.159	5%							
4	5.80	1.13			0.772	0.431	1.0	5.60	6.00	0.40	1.13	0.602	0.602	0.45	0.272	9%							
5	6.20	1.16			0.496	0.581	1.0	6.00	6.40	0.40	1.16	0.539	0.539	0.46	0.250	8%							
6	6.60	1.14			0.486	0.561	1.0	6.40	6.80	0.40	1.14	0.524	0.524	0.46	0.239	8%							
7	7.00	1.14			0.598	0.533	1.0	6.80	7.20	0.40	1.14	0.566	0.566	0.46	0.258	8%							
8	7.40	0.89			0.457	0.622	1.0	7.20	7.60	0.40	0.89	0.540	0.540	0.36	0.192	6%							
9	7.80	1.00			0.395	0.647	1.0	7.60	8.00	0.40	1.00	0.521	0.521	0.40	0.208	7%							
10	8.20	0.94			0.487	0.655	1.0	8.00	8.40	0.40	0.94	0.571	0.571	0.38	0.215	7%							
11	8.60	0.87			0.613	0.717	1.0	8.40	8.80	0.40	0.87	0.665	0.665	0.35	0.231	7%							
12	9.00	0.79			0.716	0.729	1.0	8.80	9.20	0.40	0.79	0.723	0.723	0.32	0.228	7%							
13	9.40	0.73		0.754			1.0	9.20	9.50	0.30	0.73	0.754	0.754	0.22	0.165	5%							
14	9.60	0.66		0.735			1.0	9.50	9.70	0.20	0.66	0.735	0.735	0.13	0.097	3%							
15	9.80	0.70		0.734			1.0	9.70	10.00	0.30	0.70	0.734	0.734	0.21	0.154	5%							
16	10.20	0.63		0.585			1.0	10.00	10.40	0.40	0.63	0.585	0.585	0.25	0.147	5%							
17	10.60	0.36		0.478			1.0	10.40	10.80	0.40	0.36	0.478	0.478	0.14	0.069	2%							
18	11.00	0.48		0.378			1.0	10.80	11.20	0.40	0.48	0.378	0.378	0.19	0.073	2%							
19	11.40	0.33		0.384			1.0	11.20	11.70	0.50	0.33	0.384	0.384	0.17	0.063	2%							
20	12.00	0.20		0.158			1.0	11.70	12.10	0.40	0.20	0.158	0.158	0.08	0.013	0%							
LB	12.20	0.00	0.00	0.00	0.00	0.00	1.0	12.10	12.20	0.10	0.05	0.040	0.040	0.00	0.000	0%							

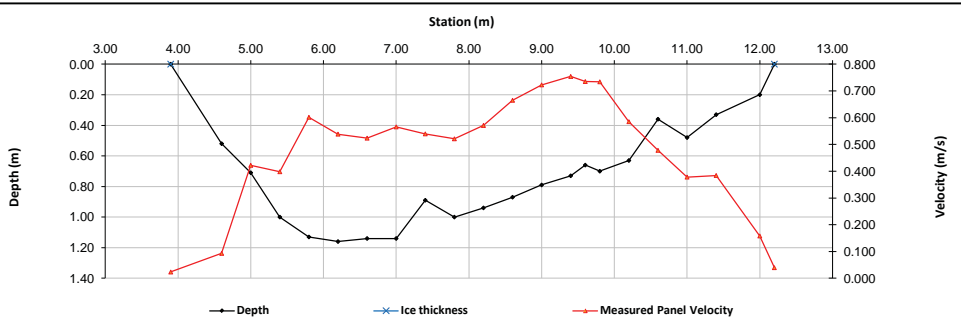
**Total Flow 3.18**

Measurement Details:	
Start Time (MST):	2:30
End Time (MST):	4:15
Equipment:	ADV
Method:	Wading
River Condition:	NORMAL
Quality/Error (see reverse):	Excellent
Weather:	OVERCAST, -1C

Flow characteristics:	
Total Flow:	3.18 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	6.04 (m <sup>2</sup> )
Wetted Width:	8.30 (m)
Hydraulic Depth:	0.728 (m)
Mean Velocity:	0.527 (m/s)
Froude Number:	0.197

Logger Details:		
	Before	After
Transducer Reading (m):	1.610	
Water (°C):	1.3	
Battery (Main):	12.9	
Datalogger Clock:	2:35	
Laptop Clock:	2:35	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.170	306.766		305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:			1.078	305.688	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.688	306.078	306.078	Pipe 1 m SE of Logger
Ice/PT:						
Water Level:			2.755	304.011		
Other:					305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:			1.156	305.595	305.596	Pipe 3 m W of Logger
Bench Mark 2:	1.063	306.751		305.688	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.674	306.077	306.078	Pipe 1 m SE of Logger
Ice/PT:						
Water Level:			2.740	304.011		
Other:					305.214	Nail in Tree

Closing Error	0.001
WL Check	0.000

Average WL	304.011
Transducer Elevation	302.401

**General Notes:**

MARKED TRAIL AND LOCATION FOR WINTER MEASUREMENT DOWN STREAM OF STATION

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	23-Oct-12
<b>Data Entry Personnel:</b>	DW, TR	<b>Date:</b>	23-Oct-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Nov-12
<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:

December 11, 2012



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	0.30	0.30	0.02	-0.003	-0.002	0.00	0.000	0%
1	0.60	0.21	0.15	-0.011			0.9	0.30	0.85	0.55	0.06	-0.011	-0.010	0.03	0.000	0%
2	1.10	0.23	0.15	-0.008			0.9	0.85	1.25	0.40	0.08	-0.008	-0.007	0.03	0.000	0%
3	1.40	1.03	0.12		0.168	0.137	1.0	1.25	1.65	0.40	0.91	0.153	0.153	0.36	0.056	13%
4	1.90	1.05	0.35	0.171			0.9	1.65	1.95	0.30	0.70	0.171	0.154	0.21	0.032	7%
5	2.00	1.04	0.34	0.124			0.9	1.95	2.15	0.20	0.70	0.124	0.112	0.14	0.016	4%
6	2.30	0.95	0.35	0.295			0.9	2.15	2.38	0.23	0.60	0.295	0.266	0.14	0.036	8%
7	2.45	0.83	0.35	0.363			0.9	2.38	2.60	0.23	0.48	0.363	0.327	0.11	0.035	8%
8	2.75	0.90	0.33	0.366			0.9	2.60	2.83	0.23	0.57	0.366	0.329	0.13	0.042	10%
9	2.90	0.90	0.32	0.340			0.9	2.83	3.00	0.18	0.58	0.340	0.306	0.10	0.031	7%
10	3.10	0.84	0.32	0.450			0.9	3.00	3.18	0.18	0.52	0.450	0.405	0.09	0.037	8%
11	3.25	0.87	0.31	0.411			0.9	3.18	3.40	0.23	0.56	0.411	0.370	0.13	0.047	11%
12	3.55	0.84	0.30	0.291			0.9	3.40	3.63	0.23	0.54	0.291	0.262	0.12	0.032	7%
13	3.70	0.82	0.27	0.245			0.9	3.63	3.84	0.21	0.55	0.245	0.221	0.12	0.025	6%
14	3.97	0.78	0.24	0.132			0.9	3.84	4.04	0.20	0.54	0.132	0.119	0.11	0.013	3%
15	4.10	0.77	0.22	0.183			0.9	4.04	4.22	0.18	0.55	0.183	0.165	0.10	0.016	4%
16	4.33	0.64	0.20	0.158			0.9	4.22	4.42	0.20	0.44	0.158	0.142	0.09	0.013	3%
17	4.50	0.62	0.20	0.111			0.9	4.42	4.63	0.21	0.42	0.111	0.100	0.09	0.009	2%
18	4.75	0.51	0.19	0.056			0.9	4.63	4.90	0.28	0.32	0.056	0.050	0.09	0.004	1%
19	5.05	0.43	0.20	0.002			0.9	4.90	5.23	0.32	0.23	0.002	0.002	0.07	0.000	0%
20	5.40	0.39	0.23	0.001			0.9	5.23	5.65	0.43	0.16	0.001	0.001	0.07	0.000	0%
21	5.90	0.30	0.17	-0.007			0.9	5.65	6.05	0.40	0.13	-0.007	-0.006	0.05	0.000	0%
LB	6.20	0.00	0.00	0.00	0.00	0.00	1.0	6.05	6.20	0.15	0.03	-0.002	-0.002	0.00	0.000	0%
<b>Total Flow</b>														<b>0.443</b>		

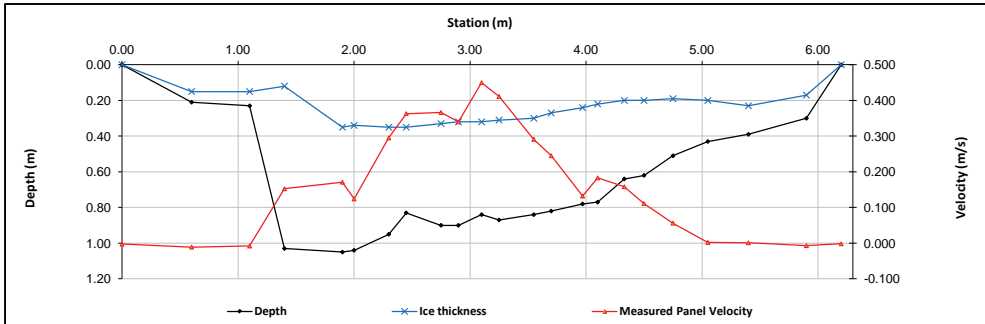
Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	11:10
Equipment:	ADV
Method:	Ice
River Condition:	Ice and snow covered
Quality/Error (see reverse):	Good
Weather:	overcast, -20

Flow characteristics:	
Total Flow:	0.443 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.38 (m <sup>2</sup> )
Wetted Width:	6.20 (m)
Hydraulic Depth:	0.384 (m)
Mean Velocity:	0.186 (m/s)
Froude Number:	0.096

Logger Details:		
	Before	After
Transducer Reading (m):	1.154	-
Water (°C):	0.4	-
Battery (Main):	12.2	12.3
Datalogger Clock:	9:46	-
Laptop Clock:	9:46	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**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>						
Bench Mark 1:	1.036	306.632		305.596	305.596	Pipe 3 m W of Logger
Bench Mark 2:			0.946	305.686	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.556	306.076	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.027	303.605		
Water Level:			3.071	303.561		
Other:					305.214	Nail in Tree
<b>Setup #2</b>						
Bench Mark 1:			1.027	305.595	305.596	Pipe 3 m W of Logger
Bench Mark 2:	0.936	306.622		305.686	305.689	Pipe 5 m SW of Logger
Bench Mark 3:			0.546	306.076	306.078	Pipe 1 m SE of Logger
Ice/PT:			3.017	303.605		
Water Level:			3.065	303.557		
Other:					305.214	Nail in Tree
Closing Error	0.001	Average WL		303.559		
WL Check	0.004	Transducer Elevation		302.405		

**General Notes:**

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	11-Dec-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	17-Dec-12
<b>Data Check Personnel:</b>	SG	<b>Date:</b>	18-Dec-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

January 21, 2012

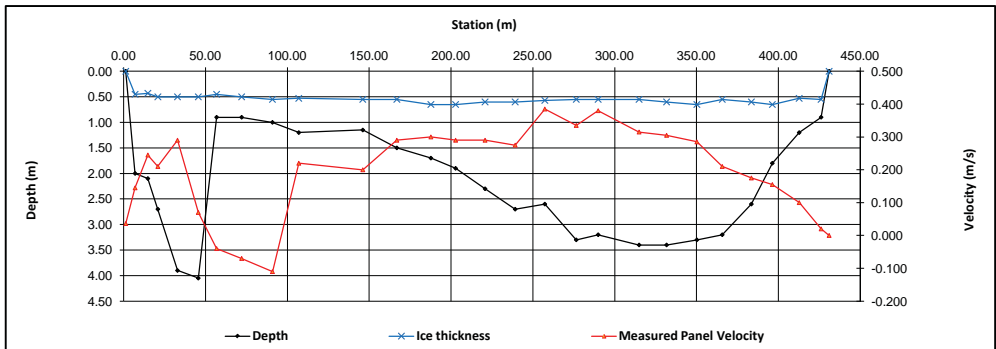


Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
LB	1.30	0.00	0.00	0.000	0.000	0.000	1.0	1.30	4.15	2.85	0.39	0.036	0.036	1.10	0.040	0%
1	7.00	2.00	0.45		0.080	0.210	1.0	4.15	10.90	6.75	1.55	0.145	0.145	10.46	1.517	1%
2	14.80	2.10	0.43		0.200	0.290	1.0	10.90	17.85	6.95	1.67	0.245	0.245	11.61	2.844	2%
3	20.90	2.70	0.50		0.210	0.210	1.0	17.85	26.90	9.05	2.20	0.210	0.210	19.91	4.181	2%
4	32.90	3.90	0.50		0.280	0.300	1.0	26.90	39.25	12.35	3.40	0.290	0.290	41.99	12.177	7%
5	45.60	4.05	0.50		0.100	0.040	1.0	39.25	51.20	11.95	3.55	0.070	0.070	42.42	2.970	2%
6	56.80	0.90	0.45	-0.040			0.9	51.20	64.45	13.25	0.45	-0.040	-0.036	5.96	-0.215	0%
7	72.10	0.90	0.50	-0.070			0.9	64.45	81.50	17.05	0.40	-0.070	-0.063	6.82	-0.430	0%
8	90.90	1.00	0.55	-0.110			0.9	81.50	98.95	17.45	0.45	-0.110	-0.099	7.85	-0.777	0%
9	107.00	1.20	0.53	0.220			0.9	98.95	126.55	27.60	0.67	0.220	0.198	18.49	3.661	2%
10	146.10	1.15	0.55	0.200			0.9	126.55	156.50	29.95	0.60	0.200	0.180	17.97	3.235	2%
11	166.90	1.50	0.55	0.290			0.9	156.50	177.30	20.80	0.95	0.290	0.261	19.76	5.157	3%
12	187.70	1.70	0.65		0.310	0.290	1.0	177.30	195.25	17.95	1.05	0.300	0.300	18.85	5.654	3%
13	202.80	1.90	0.65		0.300	0.280	1.0	195.25	211.80	16.55	1.25	0.290	0.290	20.69	5.999	3%
14	220.80	2.30	0.60		0.270	0.310	1.0	211.80	230.00	18.20	1.70	0.290	0.290	30.94	8.973	5%
15	239.20	2.70	0.60		0.220	0.330	1.0	230.00	248.25	18.25	2.10	0.275	0.275	38.33	10.539	6%
16	257.30	2.60	0.57		0.360	0.410	1.0	248.25	266.90	18.65	2.03	0.385	0.385	37.86	14.576	8%
17	276.50	3.30	0.55		0.300	0.370	1.0	266.90	283.20	16.30	2.75	0.335	0.335	44.83	15.016	8%
18	289.90	3.20	0.55		0.370	0.390	1.0	283.20	302.40	19.20	2.65	0.380	0.380	50.88	19.334	11%
19	314.90	3.40	0.55		0.250	0.380	1.0	302.40	323.30	20.90	2.85	0.315	0.315	59.56	18.763	10%
20	331.70	3.40	0.60		0.250	0.360	1.0	323.30	340.95	17.65	2.80	0.305	0.305	49.42	15.073	8%
21	350.20	3.30	0.65		0.250	0.320	1.0	340.95	357.95	17.00	2.65	0.285	0.285	45.05	12.839	7%
22	365.70	3.20	0.55		0.180	0.240	1.0	357.95	374.60	16.65	2.65	0.210	0.210	44.12	9.266	5%
23	383.50	2.60	0.60		0.150	0.200	1.0	374.60	389.90	15.30	2.00	0.175	0.175	30.60	5.355	3%
24	396.30	1.80	0.65		0.140	0.170	1.0	389.90	404.50	14.60	1.15	0.155	0.155	16.79	2.602	1%
25	412.70	1.20	0.53	0.100			0.9	404.50	419.40	14.90	0.67	0.100	0.090	9.98	0.898	1%
26	426.10	0.90	0.55	0.020			0.9	419.40	428.55	9.15	0.35	0.020	0.018	3.20	0.058	0%
RB	431.00	0.00	0.00	0.000	0.000	0.000	1.0	428.55	431.00	2.45	0.09	0.000	0.000	0.21	0.000	0%
<b>Total Flow</b>															<b>179</b>	

Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	12:55
Equipment:	Marsh
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Good
Weather:	Clear, Calm -28

Flow characteristics:	
Total Flow:	179 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	705.66 (m <sup>2</sup> )
Wetted Width:	429.70 (m)
Hydraulic Depth:	1.642 (m)
Mean Velocity:	0.254 (m/s)
Froude Number:	0.063



Datalogger Details:		
WL PLS_1 (m):	Before	1.772
WL PLS_2 (m):	After	-
Water (°C):		0.1
Battery (Main):		15.4
Datalogger Clock:		12:20
Laptop Clock:		12:20
Dessicant:		replaced
Logger# (if Δ):		-
PT# (if Δ):		-

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.476	231.823		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.660	226.163		
Water Level:			5.665	226.158		
Other:			0.745	231.078	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.464	231.349	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.648	226.165		
Water Level:			5.654	226.159		
Other:	0.735	231.813		231.078	231.081	Nail in birch tree

Closing Error	-0.002	Average WL	226.159
WL Check	0.001	Transducer Elevation	224.387

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	21-Jan-12
Data Entry Personnel:	CJ	Date:	9-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date:

February 10, 2012



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
1	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	2.70	2.50	0.36	0.078	0.078	0.91	0.070	0%
2	5.20	1.90	0.45	0.290	0.330	0.270	1.0	2.70	8.60	5.90	1.45	0.310	0.310	8.56	2.652	2%
3	12.00	2.10	0.57	0.270	0.270	0.270	1.0	8.60	15.10	6.50	1.53	0.270	0.270	9.95	2.685	2%
4	18.20	2.60	0.55	0.270	0.240	0.240	1.0	15.10	24.35	9.25	2.05	0.255	0.255	18.96	4.835	3%
5	30.50	3.77	0.55	0.250	0.310	0.310	1.0	24.35	36.50	12.15	3.22	0.280	0.280	39.12	10.954	7%
6	42.50	3.80	0.56	0.110	0.020	0.020	1.0	36.50	50.05	13.55	3.24	0.065	0.065	43.90	2.854	2%
7	57.60	0.90	0.50	0.020	-0.180	-0.180	0.9	50.05	65.05	15.00	0.40	0.020	0.018	6.00	0.108	0%
8	72.50	1.05	0.52	-0.070	-0.070	-0.070	0.9	65.05	81.85	16.80	0.53	-0.180	-0.162	8.90	-1.442	-1%
9	91.20	0.93	0.56	-0.100	-0.100	-0.100	0.9	81.85	101.60	19.75	0.37	-0.070	-0.063	7.31	-0.460	0%
10	112.00	0.89	0.56	0.070	0.070	0.070	0.9	101.60	120.15	18.55	0.33	-0.100	-0.090	6.12	-0.551	0%
11	128.30	1.29	0.64	0.230	0.260	0.260	0.9	120.15	137.65	17.50	0.65	0.070	0.063	11.38	0.717	0%
12	147.00	1.32	0.65	0.270	0.280	0.280	0.9	137.65	158.25	20.60	0.67	0.090	0.081	13.80	1.118	1%
13	169.50	1.48	0.70	0.250	0.270	0.270	1.0	158.25	179.75	21.50	0.78	0.245	0.245	16.77	4.109	2%
14	190.00	1.74	0.71	0.320	0.350	0.350	1.0	179.75	196.50	16.75	1.03	0.275	0.275	17.25	4.744	3%
15	203.00	1.89	0.77	0.340	0.330	0.330	1.0	196.50	212.55	16.05	1.12	0.260	0.260	17.98	4.674	3%
16	222.10	2.29	0.66	0.240	0.290	0.290	1.0	212.55	231.05	18.50	1.63	0.335	0.335	30.16	10.102	6%
17	240.00	2.76	0.67	0.320	0.380	0.380	1.0	231.05	249.25	18.20	2.09	0.285	0.285	38.04	10.841	6%
18	258.50	2.79	0.64	0.330	0.390	0.390	1.0	249.25	268.40	19.15	2.15	0.290	0.290	41.17	11.940	7%
19	278.30	2.95	0.61	0.330	0.410	0.410	1.0	268.40	289.40	21.00	2.34	0.350	0.350	49.14	17.199	10%
20	300.50	3.39	0.66	0.310	0.370	0.370	1.0	289.40	308.50	19.10	2.73	0.370	0.370	52.14	19.293	11%
21	316.50	3.48	0.73	0.260	0.280	0.280	1.0	308.50	324.75	16.25	2.75	0.350	0.350	44.69	15.641	9%
22	333.00	3.55	0.75	0.160	0.260	0.260	1.0	324.75	342.50	17.75	2.80	0.315	0.315	49.70	15.656	9%
23	352.00	3.33	0.71	0.190	0.220	0.220	1.0	342.50	359.50	17.00	2.62	0.270	0.270	44.54	12.026	7%
24	367.00	3.03	0.73	0.240	0.220	0.220	1.0	359.50	376.00	16.50	2.30	0.210	0.210	37.95	7.970	5%
25	385.00	2.58	0.72	0.140	0.170	0.170	1.0	376.00	391.50	15.50	1.86	0.230	0.230	28.83	6.631	4%
26	398.00	1.89	0.72	0.080	0.080	0.080	0.9	391.50	406.30	14.80	1.17	0.155	0.155	17.32	2.684	2%
27	414.60	1.19	0.62	0.010	0.010	0.010	0.9	406.30	421.30	15.00	0.57	0.080	0.072	8.55	0.616	0%
28	428.00	0.85	0.67	0.000	0.000	0.000	0.9	421.30	433.50	12.20	0.18	0.010	0.009	2.20	0.020	0%
Total	439.00	0.00	0.00	0.000	0.000	0.000	1.0	433.50	439.00	5.50	0.05	0.003	0.003	0.25	0.001	0%

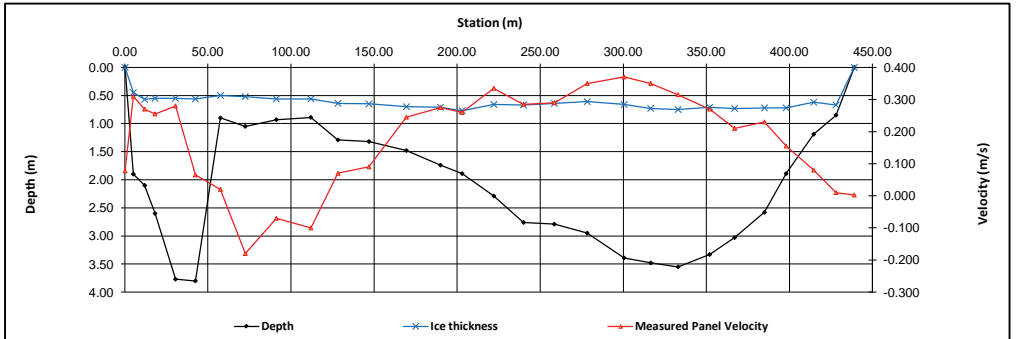
**Total Flow 168**

Measurement Details:	
Start Time (MST):	10:25
End Time (MST):	13:30
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	good
Weather:	clear, breezy, -28

Flow characteristics:	
Total Flow:	168 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	671.57 (m <sup>2</sup> )
Wetted Width:	438.80 (m)
Hydraulic Depth:	1.530 (m)
Mean Velocity:	0.250 (m/s)
Froude Number:	0.065

Logger Details:		Before	After
WL PLS 1 (m):		1.789	-
WL PLS 2 (m):		-	-
Water (°C) 1:		-	-
Water (°C) 2:		0.1	-
Battery (Main):		15.2	-
Datalogger Clock:		12:07	-
Laptop Clock:		12:07	-
Dessicant:		good	-
Logger# (if Δ):		-	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.453	231.800		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.660	226.140		
Water Level:			5.624	226.176		
Other:			0.724	231.076	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.445	231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.650	226.142		
Water Level:			5.616	226.176		
Other:	0.716	231.792		231.076	231.081	Nail in birch tree

Closing Error	0.000	Average WL	226.176
WL Check	0.000	Transducer Elevation	224.387

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	10-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	20-Feb-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	24-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

February 28, 2012



## 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)	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	1.63	1.63	0.38	0.055	0.055	0.61	0.034	0%
1	3.25	2.00	0.50		0.190	0.250	1.0	1.63	6.88	5.25	1.50	0.220	0.220	7.88	1.733	1%
2	10.50	2.05	0.60		0.160	0.240	1.0	6.88	13.40	6.53	1.45	0.200	0.200	9.46	1.892	1%
3	16.30	2.60	0.63		0.190	0.170	1.0	13.40	18.30	4.90	1.97	0.180	0.180	9.65	1.738	1%
4	20.30	3.60	0.65		0.230	0.290	1.0	18.30	30.40	12.10	2.95	0.260	0.260	35.70	9.281	6%
5	40.50	3.60	0.63		0.090	0.110	1.0	30.40	47.75	17.35	2.97	0.100	0.100	51.53	5.153	3%
6	55.00	0.95	0.53	-0.160			0.9	47.75	62.50	14.75	0.42	-0.160	-0.144	6.20	-0.892	-1%
7	70.00	1.20	0.57	-0.140			0.9	62.50	79.25	16.75	0.63	-0.140	-0.126	10.55	-1.330	-1%
8	88.50	0.95	0.63	-0.070			0.9	79.25	98.75	19.50	0.32	-0.070	-0.063	6.24	-0.393	0%
9	109.00	1.00	0.60	0.170			0.9	98.75	117.50	18.75	0.40	0.170	0.153	7.50	1.148	1%
10	126.00	1.30	0.70	0.050			0.9	117.50	135.40	17.90	0.60	0.050	0.045	10.74	0.483	0%
11	144.80	1.30	0.70	0.130			0.9	135.40	155.75	20.35	0.60	0.130	0.117	12.21	1.429	1%
12	166.70	1.30	0.75	0.180			0.9	155.75	177.00	21.25	0.55	0.180	0.162	11.69	1.893	1%
13	187.30	1.68	0.75		0.300	0.210	1.0	177.00	193.68	16.68	0.93	0.255	0.255	15.51	3.966	3%
14	200.06	1.95	0.75		0.220	0.250	1.0	193.68	209.83	16.15	1.20	0.235	0.235	19.38	4.554	3%
15	219.60	2.30	0.75		0.210	0.270	1.0	209.83	228.50	18.67	1.55	0.240	0.240	28.94	6.945	5%
16	237.40	2.70	0.75		0.240	0.330	1.0	228.50	246.25	17.75	1.95	0.285	0.285	34.61	9.865	7%
17	255.10	2.90	0.75		0.270	0.300	1.0	246.25	264.90	18.65	2.15	0.285	0.285	40.10	11.428	8%
18	274.70	3.00	0.70		0.370	0.390	1.0	264.90	285.55	20.65	2.30	0.380	0.380	47.49	18.048	12%
19	296.40	3.45	0.75		0.320	0.370	1.0	285.55	303.55	18.00	2.70	0.345	0.345	48.60	16.767	11%
20	310.70	3.50	0.77		0.310	0.400	1.0	303.55	318.95	15.40	2.73	0.355	0.355	42.04	14.925	10%
21	327.20	3.40	0.80		0.330	0.360	1.0	318.95	336.50	17.55	2.60	0.345	0.345	45.63	15.742	10%
22	345.80	3.10	0.75		0.270	0.200	1.0	336.50	352.50	16.00	2.35	0.235	0.235	37.60	8.836	6%
23	359.20	3.10	0.80		0.210	0.290	1.0	352.50	367.85	15.35	2.30	0.250	0.250	35.31	8.826	6%
24	376.50	2.55	0.75		0.200	0.210	1.0	367.85	382.95	15.10	1.80	0.205	0.205	27.18	5.572	4%
25	389.40	1.90	0.70		0.120	0.170	1.0	382.95	394.70	11.75	1.20	0.145	0.145	14.10	2.045	1%
26	400.00	1.45	0.65		0.120	0.130	1.0	394.70	404.50	9.80	0.80	0.125	0.125	7.84	0.980	1%
27	409.00	1.05	0.65	0.080			0.9	404.50	412.75	8.25	0.40	0.080	0.072	3.30	0.238	0%
28	416.50	0.85	0.70	0.000			1.0	412.75	418.25	5.50	0.15	0.000	0.000	0.83	0.000	0%
RB	420.00	0.00	0.00	0.000	0.000	0.000	1.0	418.25	420.00	1.75	0.04	0.000	0.000	0.07	0.000	0%
<b>Total Flow</b>															<b>151</b>	

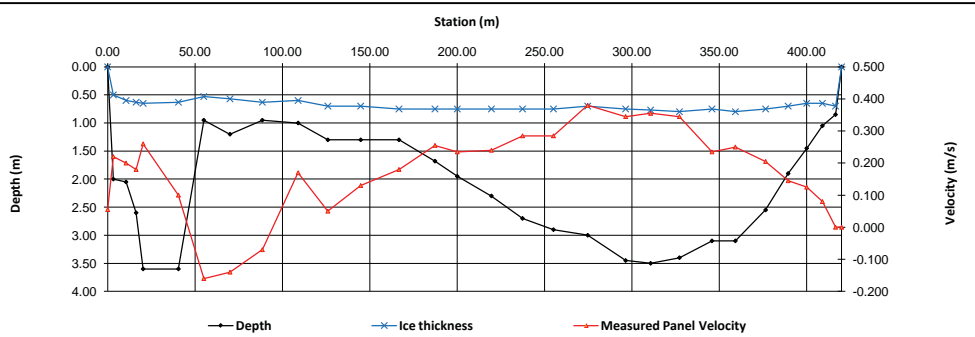
Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	14:30
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	partial cloud, calm, -2

Flow characteristics:	
Total Flow:	151 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	628.47 (m <sup>2</sup> )
Wetted Width:	420.00 (m)
Hydraulic Depth:	1.496 (m)
Mean Velocity:	0.240 (m/s)
Froude Number:	0.063

Datalogger Details:		
WL PLS 1 (m):	1.766	-
WL PLS 2 (m):	-	-
Water (°C) 1:	0.1	-
Water (°C) 2:	-	-
Battery (Main):	15.0	-
Datalogger Clock:	11:16	-
Laptop Clock:	11:16	-
Dessicant:	good	-
Logger# (if Δ):	0.00	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:

BM1: 1.09 m



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.382	231.729		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.565	226.164		
Water Level:			5.577	226.152		
Other:			0.649	231.080	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.371	231.348	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.553	226.166		
Water Level:			5.564	226.155		
Other:	0.639	231.719		231.080	231.081	Nail in birch tree

Closing Error	-0.001	Average WL	226.154
WL Check	0.003	Transducer Elevation	224.388

### General Notes:

Overflow on east bank, opposite to data logger station side.

Field Personnel:	SM, GB	Trip Date:	28-Feb-12
Data Entry Personnel:	CJ	Date:	19-Mar-12
Data Check Personnel:	SG	Date:	20-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

March 29, 2012



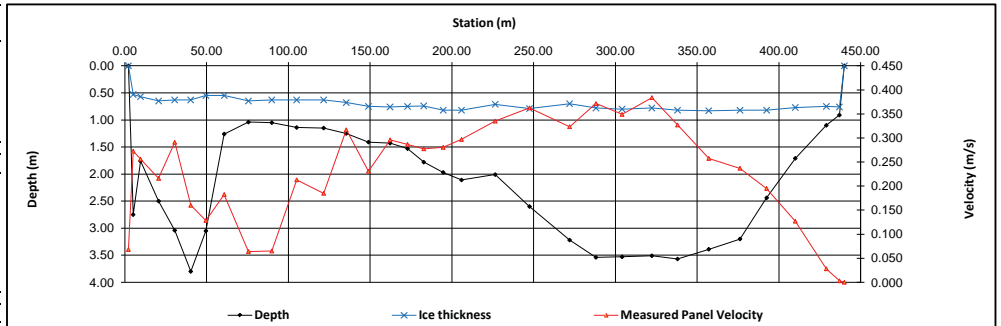
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	2.20	0.00	0.00	0.000	0.000	0.000	1.0	2.20	2.55	0.35	0.56	0.068	0.068	0.19	0.013	0%
1	5.10	2.75	0.53		0.284	0.261	1.0	3.65	7.35	3.70	2.22	0.273	0.273	8.21	2.238	1%
2	9.60	1.76	0.57		0.220	0.292	1.0	7.35	15.15	7.80	1.19	0.256	0.256	9.28	2.376	1%
3	20.70	2.50	0.65		0.134	0.298	1.0	15.15	25.60	10.45	1.85	0.216	0.216	19.33	4.176	2%
4	30.50	3.04	0.63		0.305	0.277	1.0	25.60	35.40	9.80	2.41	0.291	0.291	23.62	6.873	4%
5	40.30	3.80	0.63		0.056	0.264	1.0	35.40	44.95	9.55	3.17	0.160	0.160	30.27	4.844	3%
6	49.60	3.05	0.55		0.076	0.181	1.0	44.95	55.20	10.25	2.50	0.129	0.129	25.63	3.293	2%
7	60.80	1.26	0.55		0.217	0.148	1.0	55.20	68.20	13.00	0.71	0.183	0.183	9.23	1.684	1%
8	75.60	1.04	0.65	0.064			0.9	68.20	82.75	14.55	0.39	0.064	0.058	5.67	0.327	0%
9	89.90	1.05	0.63	0.065			0.9	82.75	97.50	14.75	0.42	0.065	0.059	6.20	0.362	0%
10	105.10	1.14	0.63	0.213			0.9	97.50	113.35	15.85	0.51	0.213	0.192	8.08	1.550	1%
11	121.60	1.15	0.63	0.185			0.9	113.35	128.50	15.15	0.52	0.185	0.167	7.88	1.312	1%
12	135.40	1.25	0.68	0.317			0.9	128.50	142.20	13.70	0.57	0.317	0.285	7.81	2.228	1%
13	149.00	1.41	0.75	0.231			0.9	142.20	155.60	13.40	0.66	0.231	0.208	8.84	1.839	1%
14	162.20	1.43	0.76	0.296			0.9	155.60	167.55	11.95	0.67	0.296	0.266	8.01	2.133	1%
15	172.90	1.53	0.75		0.277	0.296	1.0	167.55	177.85	10.30	0.78	0.287	0.287	8.03	2.302	1%
16	182.80	1.78	0.74		0.273	0.282	1.0	177.85	188.75	10.90	1.04	0.278	0.278	11.34	3.146	2%
17	194.70	1.97	0.82		0.226	0.335	1.0	188.75	200.30	11.55	1.15	0.281	0.281	13.28	3.726	2%
18	205.90	2.11	0.82		0.262	0.332	1.0	200.30	216.20	15.90	1.29	0.297	0.297	20.51	6.092	3%
19	226.50	2.01	0.71		0.289	0.381	1.0	216.20	237.00	20.80	1.30	0.335	0.335	27.04	9.058	5%
20	247.50	2.60	0.79		0.334	0.391	1.0	237.00	259.75	22.75	1.81	0.363	0.363	41.18	14.927	8%
21	272.00	3.22	0.70		0.281	0.366	1.0	259.75	280.05	20.30	2.52	0.324	0.324	51.16	16.549	9%
22	288.10	3.54	0.78		0.318	0.425	1.0	280.05	296.10	16.05	2.76	0.372	0.372	44.30	16.457	9%
23	304.10	3.53	0.80		0.291	0.407	1.0	296.10	313.20	17.10	2.73	0.349	0.349	46.68	16.292	9%
24	322.30	3.51	0.78		0.383	0.385	1.0	313.20	330.15	16.95	2.73	0.384	0.384	46.27	17.769	10%
25	338.00	3.57	0.82		0.275	0.379	1.0	330.15	347.55	17.40	2.75	0.327	0.327	47.85	15.647	8%
26	357.10	3.39	0.83		0.225	0.290	1.0	347.55	366.65	19.10	2.56	0.258	0.258	48.90	12.591	7%
27	376.20	3.20	0.82		0.235	0.239	1.0	366.65	384.35	17.00	2.38	0.237	0.237	42.13	9.984	5%
28	392.50	2.44	0.82		0.171	0.219	1.0	384.35	401.25	16.90	1.62	0.195	0.195	27.38	5.339	3%
29	410.00	1.71	0.77		0.126	0.128	1.0	401.25	419.50	18.25	0.94	0.127	0.127	17.16	2.179	1%
30	429.00	1.10	0.75	0.028			0.9	419.50	433.00	13.50	0.35	0.028	0.025	4.73	0.119	0%
31	437.00	0.91	0.76	0.003			0.9	433.00	438.50	5.50	0.15	0.003	0.003	0.83	0.002	0%
RB	440.00	0.00	0.00	0.000	0.000	0.000	1.0	438.50	440.00	1.50	0.04	0.000	0.000	0.06	0.000	0%
<b>Total Flow</b>															<b>187</b>	

Measurement Details:	
Start Time (MST):	
End Time (MST):	8:15
Equipment:	ADV
Method:	ICE
River Condition:	Ice is good
Quality/Error (see reverse):	Good
Weather:	Cloudy, 1C

Flow characteristics:		
Total Flow:	187	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	677.06	(m <sup>2</sup> )
Wetted Width:	437.80	(m)
Hydraulic Depth:	1.547	(m)
Mean Velocity:	0.276	(m/s)
Froude Number:	0.071	

Datalogger Details:		
WL PLS 1 (m):	1.858	-
WL PLS 2 (m):	-	-
Water (°C) 1:	0.1	-
Water (°C) 2:	-	-
Battery (Main):	14.0	-
Datalogger Clock:	10:26	-
Laptop Clock:	10:26	-
Dessicant:	Changed	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.089	231.436		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.240	226.196		
Water Level:			5.187	226.249		
Other:			0.357	231.079	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.083	231.345	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			5.232	226.196		
Water Level:			5.180	226.248		
Other:	0.349	231.428		231.079	231.081	Nail in birch tree
Closing Error	0.002				226.249	Average WL
WL Check	0.001				224.391	Transducer Elevation

### General Notes:

-Dirty Ice

Field Personnel:	DW,TR	Trip Date:	29-Mar-12
Data Entry Personnel:	DW	Date:	5-Apr-12
Data Check Personnel:	CJ	Date:	10-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

May 19, 2012



## 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
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	7.50	7.50	0.79	0.151	0.151	5.93	0.896	0%
1	15.00	3.16		0.510	0.700		1.0	7.50	21.00	13.50	3.16	0.605	0.605	42.66	25.809	3%
2	27.00	3.45		0.670	0.740		1.0	21.00	35.50	14.50	3.45	0.705	0.705	50.03	35.268	4%
3	44.00	3.48		0.660	0.750		1.0	35.50	51.00	15.50	3.48	0.705	0.705	53.94	38.028	5%
4	58.00	2.36		0.420	0.530		1.0	51.00	67.00	16.00	2.36	0.475	0.475	37.76	17.936	2%
5	76.00	1.26		0.590	0.400		1.0	67.00	87.00	20.00	1.26	0.495	0.495	25.20	12.474	1%
6	98.00	1.30		0.430	0.660		1.0	87.00	109.50	22.50	1.30	0.545	0.545	29.25	15.941	2%
7	121.00	1.30		0.480	0.800		1.0	109.50	130.00	20.50	1.25	0.640	0.640	25.63	16.400	2%
8	139.00	1.25		0.680	0.820		1.0	130.00	152.00	22.00	1.46	0.750	0.750	32.12	24.090	3%
9	165.00	1.46		0.660	0.920		1.0	152.00	171.50	19.50	1.57	0.790	0.790	30.62	24.186	3%
10	178.00	1.57		0.670	0.860		1.0	171.50	187.00	15.50	1.68	0.765	0.765	26.04	19.921	2%
11	196.00	1.68		0.770	0.950		1.0	187.00	213.50	26.50	2.18	0.860	0.860	57.77	49.682	6%
12	231.00	2.18		0.740	0.950		1.0	213.50	236.00	22.50	2.44	0.845	0.845	54.90	46.391	6%
13	241.00	2.44		0.690	0.950		1.0	236.00	254.00	18.00	3.00	0.820	0.820	54.00	44.280	5%
14	267.00	3.00		0.770	1.020		1.0	254.00	272.50	18.50	3.01	0.895	0.895	55.69	49.838	6%
15	278.00	3.01		0.390	0.950		1.0	272.50	287.50	15.00	3.55	0.670	0.670	53.25	35.678	4%
16	297.00	3.55		0.890	0.670		1.0	287.50	311.00	23.50	3.72	0.780	0.780	87.42	68.188	8%
17	325.00	3.72		0.940	1.000		1.0	311.00	334.50	23.50	3.68	0.970	0.970	86.48	83.886	10%
18	344.00	3.68		0.600	0.800		1.0	334.50	353.00	18.50	3.46	0.700	0.700	64.01	44.807	5%
19	362.00	3.46		0.700	0.980		1.0	353.00	378.50	25.50	3.28	0.840	0.840	83.64	70.258	8%
20	395.00	3.28		0.540	0.870		1.0	378.50	398.50	20.00	3.36	0.705	0.705	67.20	47.376	6%
21	402.00	3.36		0.570	0.670		1.0	398.50	415.00	16.50	3.22	0.620	0.620	53.13	32.941	4%
22	428.00	3.22		0.120	0.720		1.0	415.00	448.00	33.00	1.59	0.420	0.420	52.47	22.037	3%
23	468.00	1.59		0.130	-0.010		1.0	448.00	480.50	32.50	2.57	0.060	0.060	83.53	5.012	1%
24	493.00	2.57		0.420	0.620		1.0	480.50	493.50	13.00	0.64	0.520	0.520	8.35	4.343	1%
RB	494.00	0.00	0.00	0.000	0.000	0.000	1.0	493.50	494.00	0.50	0.64	0.130	0.130	0.32	0.042	0%
<b>Total Flow</b>															<b>836</b>	

## Measurement Details:

Start Time (MST):	9:25
End Time (MST):	13:25
Equipment:	ADC
Method:	Boat
River Condition:	med flow
Quality/Error (see reverse):	good
Weather:	-

## Flow characteristics:

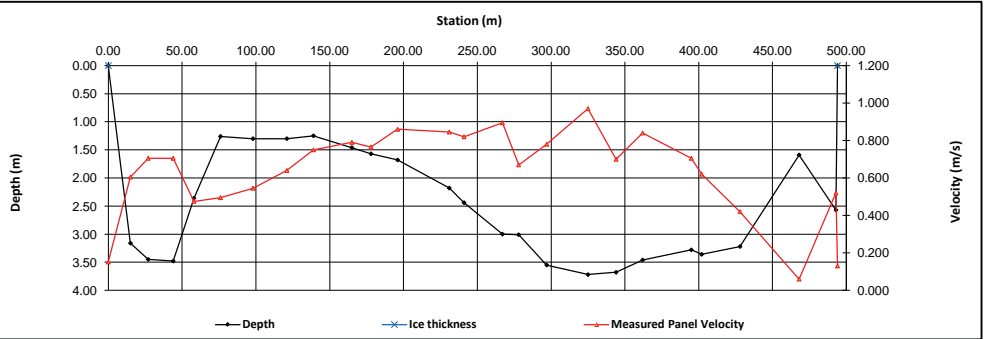
Total Flow:	836	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	1221.31	(m <sup>2</sup> )
Wetted Width:	494.00	(m)
Hydraulic Depth:	2.472	(m)
Mean Velocity:	0.685	(m/s)
Froude Number:	0.139	

## Logger Details:

	Before	After
WL PLS_1 (m):	2.398	-
WL PLS_2 (m):	-	-
Water (°C)_1	12.8	-
Water (°C)_2	-	-
Battery (Main):	14.3	-
Datalogger Clock:	9:30	-
Laptop Clock:	9:30	-
Dessicant:	replaced	-
Logger# (if Δ):	16570	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

-limited cell reception



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	0.133	231.480		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.490	226.990		
Other:			0.399	231.081	231.081	Nail in birch tree
Setup #2						
Bench Mark 1:			0.119	231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			4.477	226.989		
Other:	0.385	231.466		231.081	231.081	Nail in birch tree

Closing Error	0.000	Average WL	226.990
WL Check	0.001	Transducer Elevation	224.592

## General Notes:

- 4 sets of pipe left at station for future benchmark installation
- BM pipe stopped at frost line ~70 cm

Field Personnel:	SM, GB, TR	Trip Date:	19-May-12
Data Entry Personnel:	CJ	Date:	31-May-12
Data Check Personnel:	DW	Date:	4-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

June 18, 2012



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	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	10.00	10.00	1.38	0.256	0.256	13.82	3.543	0%
1	20.00	5.53		0.970	1.080	0.970	1.0	10.00	28.00	18.00	5.53	1.025	1.025	99.54	102.028	6%
2	36.00	6.38		1.000	1.190	1.000	1.0	28.00	50.50	22.50	6.38	1.095	1.095	143.55	157.187	9%
3	65.00	3.67		0.920	1.230	0.920	1.0	50.50	71.50	21.00	3.67	1.075	1.075	77.07	82.850	5%
4	78.00	3.18		1.100	1.210	1.100	1.0	71.50	89.00	17.50	3.18	1.155	1.155	55.65	64.276	4%
5	100.00	2.79		0.630	1.060	0.630	1.0	89.00	111.00	22.00	2.79	0.845	0.845	61.38	51.866	3%
6	122.00	3.27		0.960	1.070	0.960	1.0	111.00	129.50	18.50	3.27	1.015	1.015	60.50	61.402	4%
7	137.00	3.11		0.920	0.980	0.920	1.0	129.50	148.50	19.00	3.11	0.950	0.950	59.09	56.136	3%
8	160.00	3.56		0.910	1.050	0.910	1.0	148.50	171.50	23.00	3.56	0.980	0.980	81.88	80.242	5%
9	183.00	4.09		0.870	1.130	0.870	1.0	171.50	193.00	21.50	4.09	1.000	1.000	87.94	87.935	5%
10	203.00	4.28		1.140	1.200	1.140	1.0	193.00	210.00	17.00	4.28	1.170	1.170	72.76	85.129	5%
11	217.00	4.34		0.970	1.240	0.970	1.0	210.00	228.50	18.50	4.34	1.105	1.105	80.29	88.720	5%
12	240.00	4.53		0.930	1.120	0.930	1.0	228.50	246.50	18.00	4.53	1.025	1.025	81.54	83.579	5%
13	253.00	4.78		0.840	1.430	0.840	1.0	246.50	265.50	19.00	4.78	1.135	1.135	90.82	103.081	6%
14	278.00	5.01		0.450	1.230	0.450	1.0	265.50	292.50	27.00	5.01	0.840	0.840	135.27	113.627	7%
15	307.00	4.84		0.810	1.010	0.810	1.0	292.50	316.00	23.50	4.84	0.910	0.910	113.74	103.503	6%
16	325.00	4.55		1.090	0.950	1.090	1.0	316.00	334.50	18.50	4.55	1.020	1.020	84.18	85.859	5%
17	344.00	4.14		0.920	1.280	0.920	1.0	334.50	350.00	15.50	4.14	1.100	1.100	64.17	70.587	4%
18	356.00	3.34		0.690	1.190	0.690	1.0	350.00	370.00	20.00	3.34	0.940	0.940	66.80	62.792	4%
19	384.00	3.25		0.900	0.990	0.900	1.0	370.00	392.00	22.00	3.25	0.945	0.945	71.50	67.568	4%
20	400.00	3.38		1.020	1.190	1.020	1.0	392.00	410.00	18.00	3.38	1.105	1.105	60.84	67.228	4%
21	420.00	2.51		0.610	0.840	0.610	1.0	410.00	427.50	17.50	2.51	0.725	0.725	43.93	31.846	2%
RB	435.00	0.00	0.00	0.000	0.000	0.000	1.0	427.50	435.00	7.50	0.63	0.181	0.181	4.71	0.853	0%
<b>Total Flow</b>															<b>1710</b>	

**Measurement Details:**

Start Time (MST):	9:45
End Time (MST):	13:20
Equipment:	ADC
Method:	BOAT
River Condition:	HIGH WATER
Quality/Error (see reverse):	EXCELLENT
Weather:	RAIN, 13

**Flow characteristics:**

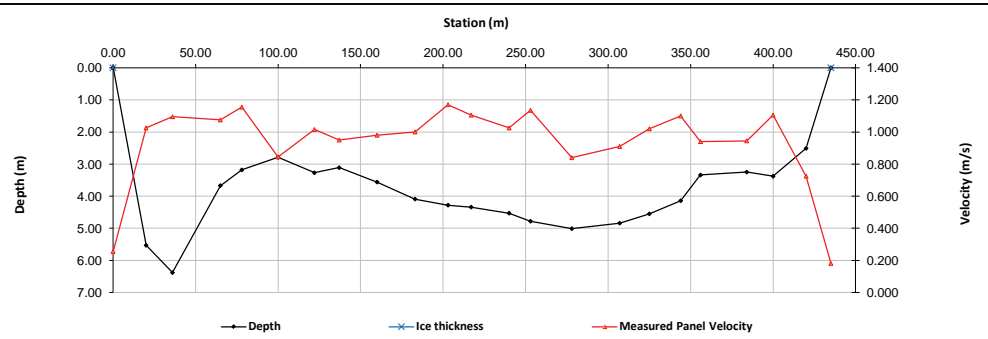
Total Flow:	1710	(m <sup>3</sup> /s)
Perceived Measurement Quality:	EXCELLENT	
Cross Section Area:	1710.95	(m <sup>2</sup> )
Wetted Width:	435.00	(m)
Hydraulic Depth:	3.933	(m)
Mean Velocity:	0.999	(m/s)
Froude Number:	0.161	

**Logger Details:**

	Before	After
Transducer Reading (m):	4.118	4.115
Water (°C):	15.2	15.2
Battery (Main):	14.6	13.86
Datalogger Clock:	9:51	-
Laptop Clock:	9:51	-
Dessicant:	CHANGED	-
Logger# (if Δ):	16570	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

UPLOADED NEW PROGRAM



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.337	231.684		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:			1.319	230.365	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			2.978	228.706		
Other:			0.603	231.081	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.301	231.345	231.347	T. Post 2 m N of data logger
Bench Mark 2:						
Bench Mark 3:	1.281	231.646		230.365	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			2.939	228.707		
Other:			0.566	231.080	231.081	Nail in birch tree
Closing Error	0.002					
WL Check	0.001					
Average WL				228.707		
Transducer Elevation				224.589		

**General Notes:**

RSSI -87  
TSS TAKEN AT 217 m  
INSTALLED 2BM

<b>Field Personnel:</b>	SM, TR, GB & CJ	<b>Trip Date:</b>	18-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	21-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date:

August 3, 2012



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	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	9.00	9.00	1.66	0.269	0.269	14.90	4.003	0%					
1	18.00	6.62		0.970	1.180		1.0	9.00	28.00	19.00	6.62	1.075	1.075	125.78	135.214	7%					
2	38.00	7.10		1.060	1.360		1.0	28.00	52.00	24.00	7.10	1.210	1.210	170.40	206.184	10%					
3	66.00	6.95		0.840	1.280		1.0	52.00	70.50	18.50	6.95	1.060	1.060	128.58	136.290	7%					
4	75.00	5.69		0.960	1.310		1.0	70.50	84.50	14.00	5.69	1.135	1.135	79.66	90.414	4%					
5	94.00	4.39		0.990	1.280		1.0	84.50	109.00	24.50	4.39	1.135	1.135	107.56	122.075	6%					
6	124.00	4.30		0.960	1.280		1.0	109.00	131.00	22.00	4.30	1.120	1.120	94.60	105.952	5%					
7	138.00	4.16		0.890	1.170		1.0	131.00	149.00	18.00	4.16	1.030	1.030	74.88	77.126	4%					
8	160.00	3.82		0.930	1.330		1.0	149.00	171.00	22.00	3.82	1.130	1.130	84.04	94.965	5%					
9	182.00	3.77		0.880	1.200		1.0	171.00	190.50	19.50	3.77	1.040	1.040	73.52	76.456	4%					
10	199.00	3.72		0.750	1.050		1.0	190.50	212.00	21.50	3.72	0.900	0.900	79.98	71.982	3%					
11	225.00	4.51		0.960	1.310		1.0	212.00	233.00	21.00	4.51	1.135	1.135	94.71	107.496	5%					
12	241.00	4.78		0.840	1.280		1.0	233.00	253.00	20.00	4.78	1.060	1.060	95.60	101.336	5%					
13	265.00	4.96		0.890	1.250		1.0	253.00	275.00	22.00	4.96	1.070	1.070	109.12	116.758	6%					
14	285.00	4.95		0.930	1.140		1.0	275.00	294.50	19.50	4.95	1.035	1.035	96.53	99.903	5%					
15	304.00	4.72		0.840	0.900		1.0	294.50	310.50	16.00	4.72	0.870	0.870	75.52	65.702	3%					
16	317.00	4.18		0.930	1.100		1.0	310.50	328.00	17.50	4.18	1.015	1.015	73.15	74.247	4%					
17	339.00	3.77		1.010	1.210		1.0	328.00	348.00	20.00	3.77	1.110	1.110	75.40	83.694	4%					
18	357.00	3.41		1.050	1.180		1.0	348.00	369.50	21.50	3.41	1.115	1.115	73.32	81.746	4%					
19	382.00	3.52		0.820	1.020		1.0	369.50	391.50	22.00	3.52	0.920	0.920	77.44	71.245	3%					
20	401.00	3.40		0.880	1.090		1.0	391.50	412.00	20.50	3.40	0.985	0.985	69.70	68.655	3%					
21	423.00	3.44		0.940	1.080		1.0	412.00	435.50	23.50	3.44	1.010	1.010	80.84	81.648	4%					
RB	448.00	0.00	0.00	0.00	0.00	0.00	1.0	435.50	448.00	12.50	0.86	0.253	0.253	10.75	2.714	0%					
<b>Total Flow</b>														<b>2080</b>							

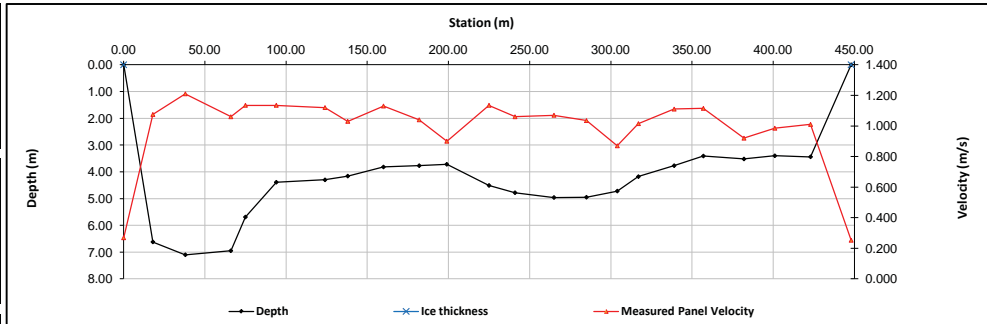
Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	14:10
Equipment:	ADC
Method:	Boat
River Condition:	high flow
Quality/Error (see reverse):	good
Weather:	clear, windy, 20

Flow characteristics:		
Total Flow:	2080	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	1965.95	(m <sup>2</sup> )
Wetted Width:	448.00	(m)
Hydraulic Depth:	4.388	(m)
Mean Velocity:	1.058	(m/s)
Froude Number:	0.161	

Logger Details:		
	Before	After
Transducer Reading (m):	4.267	6.402
Water (°C):	19.0	20.4
Battery (Main):	14.0	13.9
Datalogger Clock:	9:56	10:38
Laptop Clock:	9:56	10:38
Dessicant:	replaced	-
Logger# (if Δ):	16570	-
PT# (if Δ):	-	262389

**Datalogger / Station Notes:**  
 -PT replaced with 30 m PLS, s/n: 262389

**General Notes:**  
 -TSS sampled at offset 94 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.243	231.590		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.767	230.823	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:			1.224	230.366	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			2.725	228.865		
Other:			0.510	231.080	231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.233	231.348	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.758	230.823	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:	1.215	231.581		230.366	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			2.714	228.867		
Other:			0.501	231.080	231.081	Nail in birch tree
Closing Error	-0.001					
WL Check	0.002					
Average WL				228.866		
Transducer Elevation				224.599		

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	3-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	3-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	4-Oct-12



# Hydrometric Measurement Field Data Sheet

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date:

September 15, 2012



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	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	0.84	0.068	0.068	4.19	0.285	0%							
1	10.00	3.35		0.139	0.406	0.139	1.0	5.00	15.00	10.00	3.35	0.273	0.273	33.50	9.129	1%							
2	20.00	4.40		0.199	0.665	0.199	1.0	15.00	29.50	14.50	4.40	0.432	0.432	63.80	27.562	3%							
3	39.00	5.50		0.748	0.931	0.748	1.0	29.50	48.50	19.00	5.50	0.840	0.840	104.50	87.728	11%							
4	58.00	4.10		0.727	0.908	0.727	1.0	48.50	71.00	22.50	4.10	0.818	0.818	92.25	75.414	9%							
5	84.00	3.30		0.749	0.980	0.749	1.0	71.00	91.00	20.00	3.30	0.865	0.865	66.00	57.057	7%							
6	98.00	2.60		0.859	1.021	0.859	1.0	91.00	108.00	17.00	2.60	0.940	0.940	44.20	41.548	5%							
7	118.00	2.50		0.814	0.906	0.814	1.0	108.00	126.00	18.00	2.50	0.860	0.860	45.00	38.700	5%							
8	134.00	2.30		0.829	0.927	0.829	1.0	126.00	143.50	17.50	2.30	0.878	0.878	40.25	35.340	4%							
9	153.00	2.10		0.837	0.934	0.837	1.0	143.50	163.50	20.00	2.10	0.886	0.886	42.00	37.191	4%							
10	174.00	2.10		0.761	0.941	0.761	1.0	163.50	184.50	21.00	2.10	0.851	0.851	44.10	37.529	5%							
11	195.00	2.00		0.785	0.895	0.785	1.0	184.50	206.50	22.00	2.00	0.840	0.840	44.00	36.960	4%							
12	218.00	2.40		0.671	0.891	0.671	1.0	206.50	227.00	20.50	2.40	0.781	0.781	49.20	38.425	5%							
13	236.00	2.50		0.703	0.866	0.703	1.0	227.00	247.00	20.00	2.50	0.785	0.785	50.00	39.225	5%							
14	258.00	2.60		0.759	0.877	0.759	1.0	247.00	268.50	21.50	2.60	0.818	0.818	55.90	45.726	5%							
15	279.00	3.00		0.732	0.849	0.732	1.0	268.50	289.50	21.00	3.00	0.791	0.791	63.00	49.802	6%							
16	300.00	2.80		0.607	0.762	0.607	1.0	289.50	309.00	19.50	2.80	0.685	0.685	54.60	37.374	4%							
17	318.00	2.60		0.558	0.749	0.558	1.0	309.00	328.00	19.00	2.60	0.654	0.654	49.40	32.283	4%							
18	338.00	2.20		0.660	0.741	0.660	1.0	328.00	349.00	21.00	2.20	0.701	0.701	46.20	32.363	4%							
19	360.00	2.10		0.580	0.627	0.580	1.0	349.00	370.50	21.50	2.10	0.604	0.604	45.15	27.248	3%							
20	381.00	1.60		0.476	0.633	0.476	1.0	370.50	390.50	20.00	1.60	0.555	0.555	32.00	17.744	2%							
21	400.00	1.50		0.450	0.594	0.450	1.0	390.50	411.00	20.50	1.50	0.522	0.522	30.75	16.052	2%							
22	422.00	1.30		0.433	0.532	0.433	1.0	411.00	429.50	18.50	1.30	0.483	0.483	24.05	11.604	1%							
RB	437.00	0.00	0.00	0.00	0.00	0.00	1.0	429.50	437.00	7.50	0.33	0.121	0.121	2.44	0.294	0%							

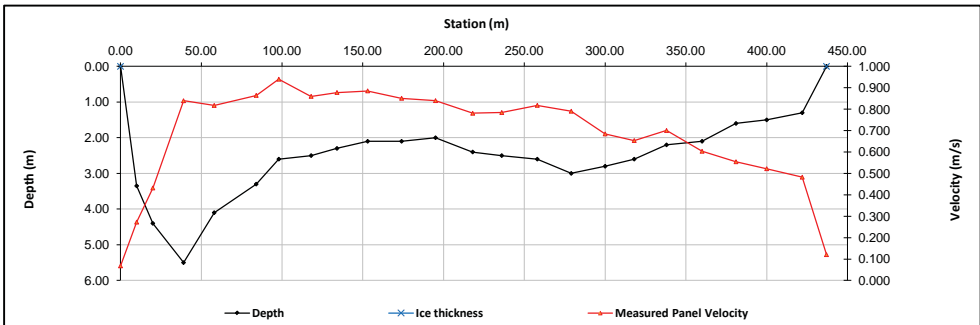
**Total Flow 833**

Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	12:40
Equipment:	ADV
Method:	Boat
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	10, partial cloud, breezy

Flow characteristics:	
Total Flow:	833 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1126.48 (m <sup>2</sup> )
Wetted Width:	437.00 (m)
Hydraulic Depth:	2.578 (m)
Mean Velocity:	0.739 (m/s)
Froude Number:	0.147

Logger Details:		
	Before	After
Transducer Reading (m):	3.827	
Water (°C):	12.3	
Battery (Main):	14.4	
Datalogger Clock:	9:07	
Laptop Clock:	9:08	
Dessicant:	replaced	
Logger# (if Δ):	16570	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.205	231.552		231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.731	230.821	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:			1.187	230.365	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			4.482	227.070		
Other:					231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:			0.187	231.347	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.714	230.820	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:	1.169	231.534		230.365	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			4.465	227.069		
Other:					231.081	Nail in birch tree

Closing Error	0.000	Average WL	227.070
WL Check	0.001	Transducer Elevation	223.243

General Notes:	
-TSS sampled at 120 m	

Field Personnel:	SM, DW (Field)	Trip Date:	15-Sep-12
Data Entry Personnel:	SM	Date:	15-Sep-12
Data Check Personnel:	CJ	Date:	9-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

October 16, 2012



## 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
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	6.50	6.50	0.73	0.114	0.114	4.71	0.539	0%
1	13.00	2.90		0.409	0.506		1.0	6.50	16.50	10.00	2.90	0.458	0.458	29.00	13.268	3%
2	20.00	3.90		0.429	0.632		1.0	16.50	29.00	12.50	3.90	0.531	0.531	48.75	25.862	5%
3	38.00	3.25		0.590	0.699		1.0	29.00	49.50	20.50	3.25	0.645	0.645	66.63	42.940	9%
4	61.00	3.20		0.586	0.738		1.0	49.50	72.00	22.50	3.20	0.662	0.662	72.00	47.664	10%
5	83.00	2.60		0.695	0.769		1.0	72.00	90.50	18.50	2.60	0.732	0.732	48.10	35.209	7%
6	98.00	2.25		0.677	0.787		1.0	90.50	112.50	22.00	2.25	0.732	0.732	49.50	36.234	8%
7	127.00	1.80		0.683	0.741		1.0	112.50	132.50	20.00	1.80	0.712	0.712	36.00	25.632	5%
8	138.00	1.90		0.488	0.671		1.0	132.50	150.50	18.00	1.90	0.580	0.580	34.20	19.819	4%
9	163.00	1.80		0.518	0.562		1.0	150.50	173.50	23.00	1.80	0.540	0.540	41.40	22.356	5%
10	184.00	1.50		0.512	0.688		1.0	173.50	195.50	22.00	1.50	0.600	0.600	33.00	19.800	4%
11	207.00	1.50		0.545	0.645		1.0	195.50	216.00	20.50	1.50	0.595	0.595	30.75	18.296	4%
12	225.00	1.95		0.507	0.646		1.0	216.00	235.00	19.00	1.95	0.577	0.577	37.05	21.359	4%
13	245.00	2.05		0.563	0.657		1.0	235.00	255.50	20.50	2.05	0.610	0.610	42.03	25.635	5%
14	266.00	2.50		0.489	0.671		1.0	255.50	273.00	17.50	2.50	0.580	0.580	43.75	25.375	5%
15	280.00	2.25		0.570	0.589		1.0	273.00	293.50	20.50	2.25	0.580	0.580	46.13	26.729	6%
16	307.00	2.05		0.438	0.544		1.0	293.50	313.50	20.00	2.05	0.491	0.491	41.00	20.131	4%
17	320.00	2.00		0.331	0.554		1.0	313.50	330.00	16.50	2.00	0.443	0.443	33.00	14.603	3%
18	340.00	1.50		0.398	0.510		1.0	330.00	350.50	20.50	1.50	0.454	0.454	30.75	13.961	3%
19	361.00	1.10		0.372	0.488		1.0	350.50	372.00	21.50	1.10	0.430	0.430	23.65	10.170	2%
20	383.00	0.75		0.397			1.0	372.00	391.00	19.00	0.75	0.397	0.397	14.25	5.657	1%
21	399.00	0.55		0.455			1.0	391.00	409.50	18.50	0.55	0.455	0.455	10.18	4.630	1%
22	420.00	0.95		0.274	0.374		1.0	409.50	427.00	17.50	0.95	0.324	0.324	16.63	5.387	1%
RB	434.00	0.00	0.00	0.00	0.00	0.00	1.0	427.00	434.00	7.00	0.24	0.081	0.081	1.66	0.135	0%

**Total Flow 481**

### Measurement Details:

Start Time (MST):	8:18
End Time (MST):	12:30
Equipment:	ADV
Method:	Boat
River Condition:	Good, Lower flow
Quality/Error (see reverse):	Excellent
Weather:	Overcast, BREEZY, 6 deg

### Flow characteristics:

Total Flow:	481	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	834.10	(m <sup>2</sup> )
Wetted Width:	434.00	(m)
Hydraulic Depth:	1.922	(m)
Mean Velocity:	0.577	(m/s)
Froude Number:	0.133	

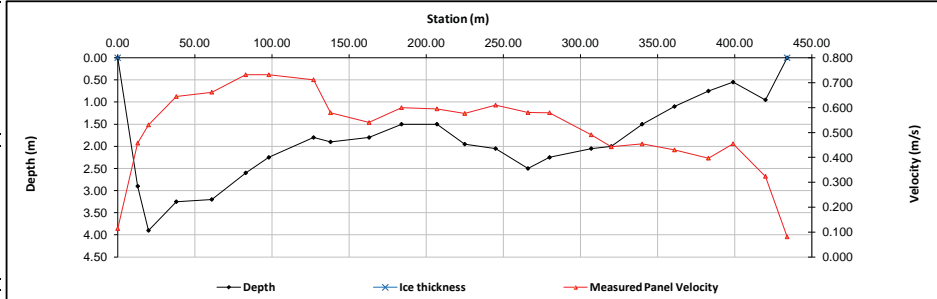
### Logger Details:

	Before	After
Transducer Reading (m):	2.672	
Water (°C):	4.9	
Battery (Main):	12.7	
Datalogger Clock:	9:26	
Laptop Clock:	9:26	
Dessicant:	replaced	
Logger# (if Δ):	16570	
PT# (if Δ):	-	

### Datalogger / Station Notes:

### General Notes:

ADV test run - good.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:			0.118	231.351	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.647	230.822	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:	1.103	231.469		230.366	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			5.222	226.247		
Other:					231.081	Nail in birch tree
Setup #2						
Bench Mark 1:	0.079	231.430		231.351	231.347	T. Post 2 m N of data logger
Bench Mark 2:			0.606	230.824	230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:			1.063	230.367	230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:			5.181	226.249		
Other:					231.081	Nail in birch tree

Closing Error	-0.001	Average WL	226.248
WL Check	0.002	Transducer Elevation	223.576

Field Personnel:	SM, TR, ACM	Trip Date:	16-Oct-12
Data Entry Personnel:	SM	Date:	16-Oct-12
Data Check Personnel:	SM	Date:	16-Nov-12
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:

December 8, 2012



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																
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 Measurement Conducted

### Total Flow

**Measurement Details:**

Start Time (MST):	-
End Time (MST):	-
Equipment:	
Method:	
River Condition:	-
Quality/Error (see reverse):	
Weather:	-

**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:		

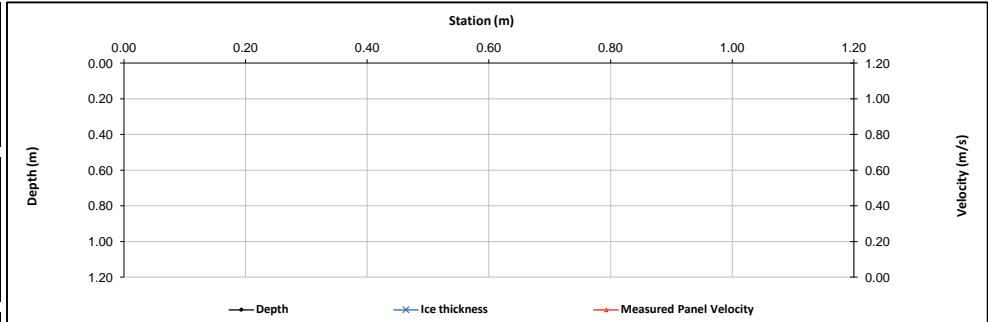
**Logger Details:**

	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Enclosure Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant:	-	-
Vent Tube Checked:	-	-

**Datalogger / Station Notes:**

**General Notes:**

A station visit was not performed in December due to poor ice conditions. Crew flew over station in a helicopter to check for visible damage or problems.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					231.347	T. Post 2 m N of data logger
Bench Mark 2:					230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:					230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:						
Other:					231.081	Nail in birch tree
<b>Setup #2</b>						
Bench Mark 1:					231.347	T. Post 2 m N of data logger
Bench Mark 2:					230.823	3/4" Pipe 5 m N of data logger
Bench Mark 3:					230.366	3/4" Pipe 8 m S of data logger
Ice/PT:						
Water Level:						
Other:					231.081	Nail in birch tree

Closing Error	
WL Check	
Average WL	
Transducer Elevation Before	
Transducer Elevation After	

**Field Personnel:**

Data Entry Personnel:	SM, CJ	Trip Date:	8-Dec-12
Data Check Personnel:	SM	Date:	8-Dec-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	8-Dec-12

# Hydrometric Measurement / Site Visit Record

Site: S25 - Susan Lake Outlet

UTM Location: 464513 E, 6368477 N

Site Visit Date:

May 19, 2012



## 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	0.12	0.00	0.00	0.000	0.000	0.000	1.0	0.12	0.16	0.04	0.04	0.057	0.057	0.00	0.000	0%
1	0.20	0.15		0.229			1.0	0.16	0.23	0.07	0.15	0.229	0.229	0.01	0.002	3%
2	0.25	0.16		0.395			1.0	0.23	0.28	0.05	0.16	0.395	0.395	0.01	0.003	5%
3	0.30	0.17		0.356			1.0	0.28	0.33	0.05	0.17	0.356	0.356	0.01	0.003	5%
4	0.35	0.17		0.237			1.0	0.33	0.38	0.05	0.17	0.237	0.237	0.01	0.002	3%
5	0.40	0.16		0.116			1.0	0.38	0.43	0.05	0.16	0.116	0.116	0.01	0.001	1%
6	0.45	0.18		0.247			1.0	0.43	0.48	0.05	0.18	0.247	0.247	0.01	0.002	3%
7	0.50	0.18		0.243			1.0	0.48	0.53	0.05	0.18	0.243	0.243	0.01	0.002	3%
8	0.55	0.19		0.300			1.0	0.53	0.58	0.05	0.19	0.300	0.300	0.01	0.003	4%
9	0.60	0.19		0.279			1.0	0.58	0.63	0.05	0.19	0.279	0.279	0.01	0.003	4%
10	0.65	0.20		0.139			1.0	0.63	0.68	0.05	0.20	0.139	0.139	0.01	0.001	2%
11	0.70	0.20		0.176			1.0	0.68	0.73	0.05	0.20	0.176	0.176	0.01	0.002	3%
12	0.75	0.18		0.342			1.0	0.73	0.78	0.05	0.18	0.342	0.342	0.01	0.003	5%
13	0.80	0.18		0.284			1.0	0.78	0.83	0.05	0.18	0.284	0.284	0.01	0.003	4%
14	0.85	0.20		0.363			1.0	0.83	0.88	0.05	0.20	0.363	0.363	0.01	0.004	5%
15	0.90	0.20		0.375			1.0	0.88	0.93	0.05	0.20	0.375	0.375	0.01	0.004	6%
16	0.95	0.21		0.313			1.0	0.93	0.98	0.05	0.21	0.313	0.313	0.01	0.003	5%
17	1.00	0.22		0.307			1.0	0.98	1.03	0.05	0.22	0.307	0.307	0.01	0.003	5%
18	1.05	0.22		0.400			1.0	1.03	1.08	0.05	0.22	0.400	0.400	0.01	0.004	7%
19	1.10	0.22		0.399			1.0	1.08	1.13	0.05	0.22	0.399	0.399	0.01	0.004	7%
20	1.15	0.21		0.537			1.0	1.13	1.18	0.05	0.21	0.537	0.537	0.01	0.006	8%
21	1.20	0.20		0.466			1.0	1.18	1.23	0.05	0.20	0.466	0.466	0.01	0.005	7%
22	1.25	0.11		0.315			1.0	1.23	1.28	0.05	0.11	0.315	0.315	0.01	0.002	3%
23	1.30	0.11		0.267			1.0	1.28	1.33	0.06	0.11	0.267	0.267	0.01	0.002	2%
LB	1.36	0.00	0.00	0.000	0.000	0.000	1.0	1.33	1.36	0.03	0.03	0.067	0.067	0.00	0.000	0%
<b>Total Flow</b>															<b>0.067</b>	

## Measurement Details:

Start Time (MST):	14:00
End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	Open
Quality/Error (see reverse):	Excellent
Weather:	cloudy, Rainy, + 10

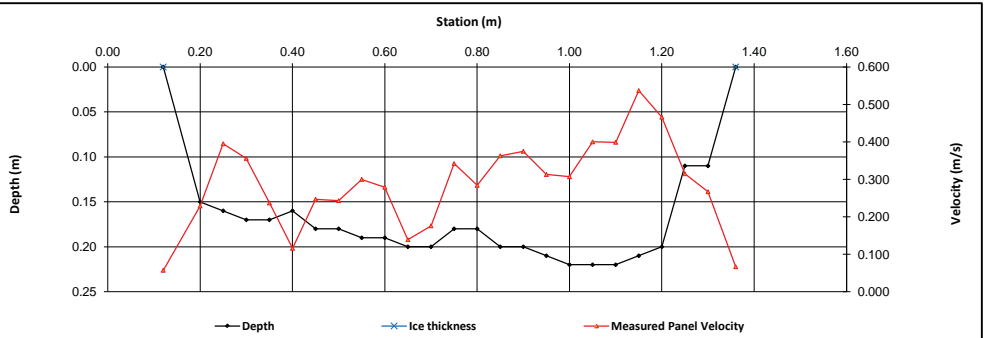
## Flow characteristics:

Total Flow:	0.067	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.22	(m <sup>2</sup> )
Wetted Width:	1.24	(m)
Hydraulic Depth:	0.174	(m)
Mean Velocity:	0.309	(m/s)
Froude Number:	0.237	

## Logger Details:

	Before	After
Transducer Reading (m):	0.191	
Water (°C):	8.2	
Battery (Main):	14.5	
Datalogger Clock:	14:30	
Laptop Clock:	14:30	
Dessicant:	new	
Logger# (if Δ):	20960	
PT# (if Δ):	287963	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.158	101.158		100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			1.148	100.010		
Bench Mark 3:			0.887	100.271		
Ice/PT:						
Water Level:			2.216	98.942		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.148	100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			1.139	100.009		
Bench Mark 3:	0.877	101.148		100.271		
Ice/PT:						
Water Level:			2.205	98.943		
Other:						
Closing Error	0.000				Average WL	98.943
WL Check	0.001				Transducer Elevation	98.752

## General Notes:

- installed CR800, no telemetry

<b>Field Personnel:</b>	SM, TR, GB	<b>Trip Date:</b>	19-May-12
Data Entry Personnel:	XP	Date:	30-May-12
Data Check Personnel:	DW	Date:	1-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S25 - Susan Lake Outlet

UTM Location: 464513 E, 6368477 N

Site Visit Date:

June 18, 2012



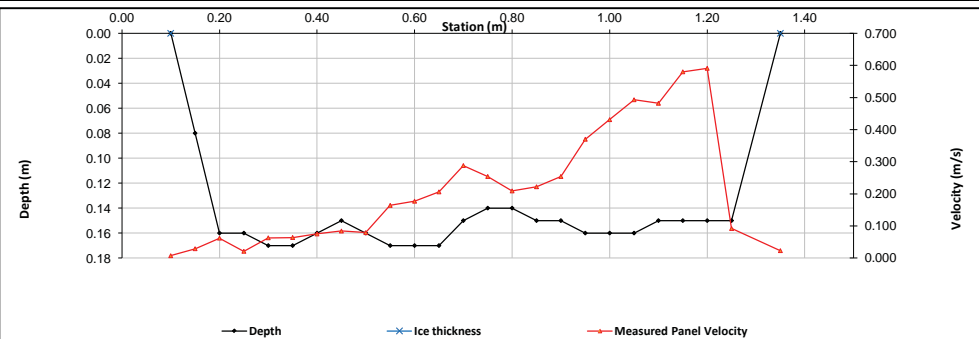
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.13	0.03	0.02	0.007	0.007	0.00	0.000	0%
1	0.15	0.08		0.029			1.0	0.13	0.18	0.05	0.08	0.029	0.029	0.00	0.000	0%
2	0.20	0.16		0.062			1.0	0.18	0.23	0.05	0.16	0.062	0.062	0.01	0.000	1%
3	0.25	0.16		0.021			1.0	0.23	0.28	0.05	0.16	0.021	0.021	0.01	0.000	0%
4	0.30	0.17		0.063			1.0	0.28	0.33	0.05	0.17	0.063	0.063	0.01	0.001	1%
5	0.35	0.17		0.064			1.0	0.33	0.38	0.05	0.17	0.064	0.064	0.01	0.001	1%
6	0.40	0.16		0.075			1.0	0.38	0.43	0.05	0.16	0.075	0.075	0.01	0.001	1%
7	0.45	0.15		0.084			1.0	0.43	0.48	0.05	0.15	0.084	0.084	0.01	0.001	2%
8	0.50	0.16		0.079			1.0	0.48	0.53	0.05	0.16	0.079	0.079	0.01	0.001	2%
9	0.55	0.17		0.164			1.0	0.53	0.58	0.05	0.17	0.164	0.164	0.01	0.001	3%
10	0.60	0.17		0.177			1.0	0.58	0.63	0.05	0.17	0.177	0.177	0.01	0.002	4%
11	0.65	0.17		0.206			1.0	0.63	0.68	0.05	0.17	0.206	0.206	0.01	0.002	4%
12	0.70	0.15		0.288			1.0	0.68	0.73	0.05	0.15	0.288	0.288	0.01	0.002	5%
13	0.75	0.14		0.254			1.0	0.73	0.78	0.05	0.14	0.254	0.254	0.01	0.002	4%
14	0.80	0.14		0.209			1.0	0.78	0.83	0.05	0.14	0.209	0.209	0.01	0.001	4%
15	0.85	0.15		0.222			1.0	0.83	0.88	0.05	0.15	0.222	0.222	0.01	0.002	4%
16	0.90	0.15		0.254			1.0	0.88	0.93	0.05	0.15	0.254	0.254	0.01	0.002	5%
17	0.95	0.16		0.370			1.0	0.93	0.98	0.05	0.16	0.370	0.370	0.01	0.003	7%
18	1.00	0.16		0.431			1.0	0.98	1.03	0.05	0.16	0.431	0.431	0.01	0.003	8%
19	1.05	0.16		0.493			1.0	1.03	1.08	0.05	0.16	0.493	0.493	0.01	0.004	10%
20	1.10	0.15		0.482			1.0	1.08	1.13	0.05	0.15	0.482	0.482	0.01	0.004	9%
21	1.15	0.15		0.580			1.0	1.13	1.18	0.05	0.15	0.580	0.580	0.01	0.004	11%
22	1.20	0.15		0.591			1.0	1.18	1.23	0.05	0.15	0.591	0.591	0.01	0.004	11%
23	1.25	0.15		0.092			1.0	1.23	1.30	0.08	0.15	0.092	0.092	0.01	0.001	3%
LB	1.35	0.00	0.00	0.000	0.000	0.000	1.0	1.30	1.35	0.05	0.04	0.023	0.023	0.00	0.000	0%
<b>Total Flow</b>															<b>0.041</b>	

Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	GOOD FLOW
Quality/Error (see reverse):	Good
Weather:	CLOUDY, 15

Flow characteristics:	
Total Flow:	0.041 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.18 (m <sup>2</sup> )
Wetted Width:	1.25 (m)
Hydraulic Depth:	0.146 (m)
Mean Velocity:	0.226 (m/s)
Froude Number:	0.189

Logger Details:		Before	After
Transducer Reading (m):		0.125	
Water (°C):		15.5	
Battery (Main):		14.18	
Datalogger Clock:		13:54	
Laptop Clock:		13:54	
Dessicant:		CHANGED	
Logger# (if Δ):		20960	
PT# (if Δ):		-	

**Datalogger / Station Notes:**  
-GOS 227 MAY WORK



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.919	100.919		100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.799	100.120	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:			0.658	100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.048	98.871		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.899	99.998	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.777	100.120	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:	0.636	100.897		100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.028	98.869		
Other:						

Closing Error	0.002	Average WL	98.870
WL Check	0.002	Transducer Elevation	98.745

**General Notes:**  
-LARGE INCREASE IN DEPTH ON ATHABASCA R.  
-installed BM, left pipe for a second BM

<b>Field Personnel:</b>	TR, CJ, SM & GB	<b>Trip Date:</b>	18-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	22-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	26-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S25 - Susan Lake Outlet

UTM Location: 464513 E, 6368477 N

Site Visit Date:

August 3, 2012



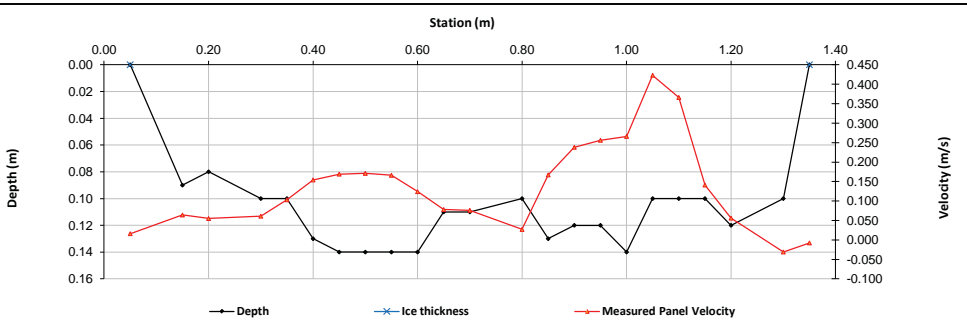
Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (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	0.05	0.00	0.00	0.000	0.000	0.000	1.0	0.05	0.10	0.05	0.02	0.016	0.016	0.00	0.000	0%							
1	0.15	0.09		0.064			1.0	0.10	0.18	0.08	0.09	0.064	0.064	0.01	0.000	2%							
2	0.20	0.08		0.055			1.0	0.18	0.25	0.08	0.08	0.055	0.055	0.01	0.000	2%							
3	0.30	0.10		0.061			1.0	0.25	0.33	0.08	0.10	0.061	0.061	0.01	0.000	2%							
4	0.35	0.10		0.103			1.0	0.33	0.38	0.05	0.10	0.103	0.103	0.01	0.001	3%							
5	0.40	0.13		0.154			1.0	0.38	0.43	0.05	0.13	0.154	0.154	0.01	0.001	5%							
6	0.45	0.14		0.169			1.0	0.43	0.48	0.05	0.14	0.169	0.169	0.01	0.001	6%							
7	0.50	0.14		0.171			1.0	0.48	0.53	0.05	0.14	0.171	0.171	0.01	0.001	6%							
8	0.55	0.14		0.166			1.0	0.53	0.58	0.05	0.14	0.166	0.166	0.01	0.001	6%							
9	0.60	0.14		0.124			1.0	0.58	0.63	0.05	0.14	0.124	0.124	0.01	0.001	4%							
10	0.65	0.11		0.078			1.0	0.63	0.68	0.05	0.11	0.078	0.078	0.01	0.000	2%							
11	0.70	0.11		0.076			1.0	0.68	0.75	0.08	0.11	0.076	0.076	0.01	0.001	3%							
12	0.80	0.10		0.027			1.0	0.75	0.83	0.08	0.10	0.027	0.027	0.01	0.000	1%							
13	0.85	0.13		0.167			1.0	0.83	0.88	0.05	0.13	0.167	0.167	0.01	0.001	6%							
14	0.90	0.12		0.238			1.0	0.88	0.93	0.05	0.12	0.238	0.238	0.01	0.001	7%							
15	0.95	0.12		0.256			1.0	0.93	0.98	0.05	0.12	0.256	0.256	0.01	0.002	8%							
16	1.00	0.14		0.266			1.0	0.98	1.03	0.05	0.14	0.266	0.266	0.01	0.002	10%							
17	1.05	0.10		0.423			1.0	1.03	1.08	0.05	0.10	0.423	0.423	0.01	0.002	11%							
18	1.10	0.10		0.366			1.0	1.08	1.13	0.05	0.10	0.366	0.366	0.00	0.002	9%							
19	1.15	0.10		0.141			1.0	1.13	1.18	0.05	0.10	0.141	0.141	0.00	0.001	4%							
20	1.20	0.12		0.056			1.0	1.18	1.25	0.08	0.12	0.056	0.056	0.01	0.001	3%							
21	1.30	0.10		-0.031			1.0	1.25	1.33	0.08	0.10	-0.031	-0.031	0.01	0.000	-1%							
LB	1.35	0.00	0.00	0.00	0.00	0.00	1.0	1.33	1.35	0.02	0.03	-0.008	-0.008	0.00	0.000	0%							
<b>Total Flow</b>														<b>0.019</b>									

Measurement Details:	
Start Time (MST):	14:45
End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	medium flow
Quality/Error (see reverse):	good
Weather:	overcast, calm, 20

Flow characteristics:		
Total Flow:	0.0193	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	0.14	(m <sup>2</sup> )
Wetted Width:	1.30	(m)
Hydraulic Depth:	0.108	(m)
Mean Velocity:	0.138	(m/s)
Froude Number:	0.135	

Logger Details:		
	Before	After
Transducer Reading (m):	0.051	0.123
Water (°C):	20.4	-
Battery (Main):	13.7	-
Datalogger Clock:	2:49	-
Laptop Clock:	2:49	-
Dessicant:	replaced	-
Logger# (if Δ):	20960	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
-PLS moved into deeper water-0.123 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.105	101.105		100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.984	100.121	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:			0.844	100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.274	98.831		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.096	100.001	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:	0.976	101.097		100.121	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:			0.834	100.263	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.266	98.831		
Other:						
Closing Error	-0.001					Average WL
WL Check	0.000					Transducer Elevation
						98.831
						98.780

**General Notes:**  
-potential repeater location 40 m N of station

Field Personnel:		SM, TR	Trip Date:	3-Aug-12
Data Entry Personnel:	CJ		Date:	3-Oct-12
Data Check Personnel:	MY		Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S25 - Susan Lake Outlet

UTM Location: 464513 E, 6368477 N

Site Visit Date:

September 15, 2012



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	0.06	0.00	0.00	0.000	0.000	0.000	1.0	0.06	0.11	0.05	0.04	0.001	0.001	0.00	0.000	0%
1	0.15	0.16		0.002			1.0	0.11	0.18	0.07	0.16	0.002	0.002	0.01	0.000	0%
2	0.20	0.16		0.251			1.0	0.18	0.23	0.05	0.16	0.251	0.251	0.01	0.002	5%
3	0.25	0.18		0.393			1.0	0.23	0.28	0.05	0.18	0.393	0.393	0.01	0.004	9%
4	0.30	0.18		0.438			1.0	0.28	0.33	0.05	0.18	0.438	0.438	0.01	0.004	10%
5	0.35	0.18		0.195			1.0	0.33	0.38	0.05	0.18	0.195	0.195	0.01	0.002	4%
6	0.40	0.18		0.328			1.0	0.38	0.43	0.05	0.18	0.328	0.328	0.01	0.003	7%
7	0.45	0.16		0.282			1.0	0.43	0.48	0.05	0.16	0.282	0.282	0.01	0.002	6%
8	0.50	0.16		0.217			1.0	0.48	0.53	0.05	0.16	0.217	0.217	0.01	0.002	4%
9	0.55	0.15		0.103			1.0	0.53	0.58	0.05	0.15	0.103	0.103	0.01	0.001	2%
10	0.60	0.16		0.032			1.0	0.58	0.63	0.05	0.16	0.032	0.032	0.01	0.000	1%
11	0.65	0.15		0.222			1.0	0.63	0.68	0.05	0.15	0.222	0.222	0.01	0.002	4%
12	0.70	0.16		0.427			1.0	0.68	0.73	0.05	0.16	0.427	0.427	0.01	0.003	8%
13	0.75	0.16		0.405			1.0	0.73	0.78	0.05	0.16	0.405	0.405	0.01	0.003	8%
14	0.80	0.16		0.276			1.0	0.78	0.83	0.05	0.16	0.276	0.276	0.01	0.002	5%
15	0.85	0.16		0.209			1.0	0.83	0.88	0.05	0.16	0.209	0.209	0.01	0.002	4%
16	0.90	0.16		0.332			1.0	0.88	0.93	0.05	0.16	0.332	0.332	0.01	0.003	7%
17	0.95	0.14		0.404			1.0	0.93	0.98	0.05	0.14	0.404	0.404	0.01	0.003	7%
18	1.00	0.14		0.306			1.0	0.98	1.03	0.05	0.14	0.306	0.306	0.01	0.002	5%
19	1.05	0.14		0.068			1.0	1.03	1.08	0.05	0.14	0.068	0.068	0.01	0.000	1%
20	1.10	0.13		0.096			1.0	1.08	1.18	0.10	0.13	0.096	0.096	0.01	0.001	3%
RB	1.25	0.00	0.00	0.00	0.00	0.00	1.0	1.18	1.25	0.08	0.03	0.024	0.024	0.00	0.000	0%
<b>Total Flow</b>															<b>0.041</b>	

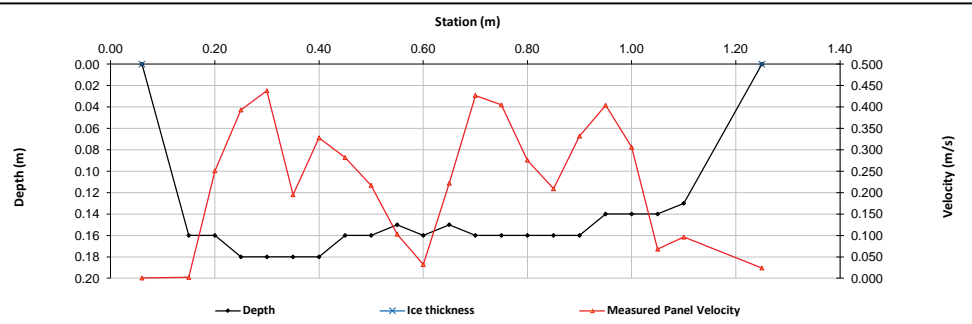
Measurement Details:	
Start Time (MST):	13:25
End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	Good
Weather:	12 deg, overcast, calm

Flow characteristics:		
Total Flow:	0.0408	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	1.17	(m <sup>2</sup> )
Wetted Width:	1.19	(m)
Hydraulic Depth:	0.145	(m)
Mean Velocity:	0.237	(m/s)
Froude Number:	0.199	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	11.5	
Battery (Main):	14.5	
Datalogger Clock:	13:29	
Laptop Clock:	13:29	
Dessicant:	replaced	
Logger# (if Δ):	20960	
PT# (if Δ):	-	

**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>						
Bench Mark 1:	0.958	100.958		100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.837	100.121	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:			0.697	100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.074	98.884		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.942	100.000	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.822	100.120	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:	0.681	100.942		100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			2.060	98.882		
Other:						

Closing Error	0.000	Average WL	98.883
WL Check	0.002	Transducer Elevation	98.694

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	15-Sep-12
<b>Data Entry Personnel:</b>	Sm, DW (Field)	<b>Date:</b>	15-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S25 - Susan Lake Outlet

UTM Location: 464513 E, 6368477 N

Site Visit Date:

October 16, 2012



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	0.01	0.00	0.00	0.000	0.000	0.000	1.0	0.01	0.10	0.10	0.04	0.019	0.019	0.00	0.000	0%					
1	0.20	0.17		0.074			1.0	0.10	0.23	0.12	0.17	0.074	0.074	0.02	0.002	2%					
2	0.25	0.18		0.103			1.0	0.23	0.28	0.05	0.18	0.103	0.103	0.01	0.001	1%					
3	0.30	0.19		0.148			1.0	0.28	0.33	0.05	0.19	0.148	0.148	0.01	0.001	2%					
4	0.35	0.19		0.176			1.0	0.33	0.38	0.05	0.19	0.176	0.176	0.01	0.002	3%					
5	0.40	0.20		0.436			1.0	0.38	0.43	0.05	0.20	0.436	0.436	0.01	0.004	7%					
6	0.45	0.20		0.380			1.0	0.43	0.48	0.05	0.20	0.380	0.380	0.01	0.004	6%					
7	0.50	0.20		0.281			1.0	0.48	0.53	0.05	0.20	0.281	0.281	0.01	0.003	5%					
8	0.55	0.20		0.289			1.0	0.53	0.58	0.05	0.20	0.289	0.289	0.01	0.003	5%					
9	0.60	0.20		0.371			1.0	0.58	0.63	0.05	0.20	0.371	0.371	0.01	0.004	6%					
10	0.65	0.19		0.454			1.0	0.63	0.68	0.05	0.19	0.454	0.454	0.01	0.004	7%					
11	0.70	0.19		0.473			1.0	0.68	0.73	0.05	0.19	0.473	0.473	0.01	0.004	7%					
12	0.75	0.18		0.158			1.0	0.73	0.78	0.05	0.18	0.158	0.158	0.01	0.001	2%					
13	0.80	0.17		0.113			1.0	0.78	0.83	0.05	0.17	0.113	0.113	0.01	0.001	2%					
14	0.85	0.17		0.081			1.0	0.83	0.88	0.05	0.17	0.081	0.081	0.01	0.001	1%					
15	0.90	0.18		0.251			1.0	0.88	0.93	0.05	0.18	0.251	0.251	0.01	0.002	4%					
16	0.95	0.18		0.321			1.0	0.93	0.98	0.05	0.18	0.321	0.321	0.01	0.003	5%					
17	1.00	0.18		0.407			1.0	0.98	1.03	0.05	0.18	0.407	0.407	0.01	0.004	6%					
18	1.05	0.20		0.458			1.0	1.03	1.08	0.05	0.20	0.458	0.458	0.01	0.005	7%					
19	1.10	0.20		0.468			1.0	1.08	1.13	0.05	0.20	0.468	0.468	0.01	0.005	8%					
20	1.15	0.16		0.450			1.0	1.13	1.18	0.05	0.16	0.450	0.450	0.01	0.004	6%					
21	1.20	0.16		0.329			1.0	1.18	1.28	0.10	0.16	0.329	0.329	0.02	0.005	8%					
LB	1.35	0.00	0.00	0.00	0.00	0.00	1.0	1.28	1.35	0.08	0.04	0.082	0.082	0.00	0.000	0%					
<b>Total Flow</b>														<b>0.062</b>							

**Measurement Details:**

Start Time (MST):	12:57
End Time (MST):	13:55
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	6 deg. rain

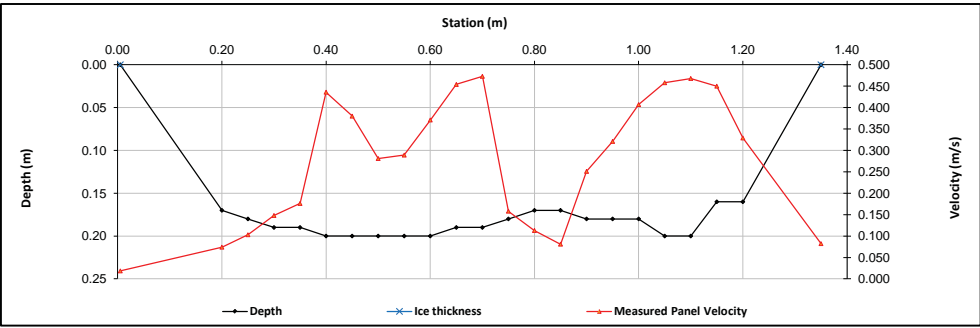
**Flow characteristics:**

Total Flow:	0.0623	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.22	(m <sup>2</sup> )
Wetted Width:	1.35	(m)
Hydraulic Depth:	0.165	(m)
Mean Velocity:	0.281	(m/s)
Froude Number:	0.221	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.222	
Water (°C):	4.4	
Battery (Main):	12.7	
Datalogger Clock:	13:01	
Laptop Clock:	13:01	
Dessicant:	replaced	
Logger# (if Δ):	20960	
PT# (if Δ):	287963	

**Datalogger / Station Notes:**  
removed PLS



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.892	99.999	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.772	100.119	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:	0.630	100.891		100.261	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			1.967	98.924		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.883	100.882		99.999	100.000	T-Post in PVC 2 m N of data logger
Bench Mark 2:			0.763	100.119	100.121	3/4" Pipe 2 m E of data logger
Bench Mark 3:			0.622	100.260	100.261	3/4" Pipe 4 m E of data logger
Ice/PT:						
Water Level:			1.960	98.922		
Other:						
Closing Error	0.001				98.923	Average WL
WL Check	0.002				98.701	Transducer Elevation

**General Notes:**

**Field Personnel:**

SM, TR, ACM	Trip Date:	16-Oct-12
SM	Date:	16-Oct-12
CJ	Date:	8-Nov-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO



# Hydrometric Measurement / Site Visit Record

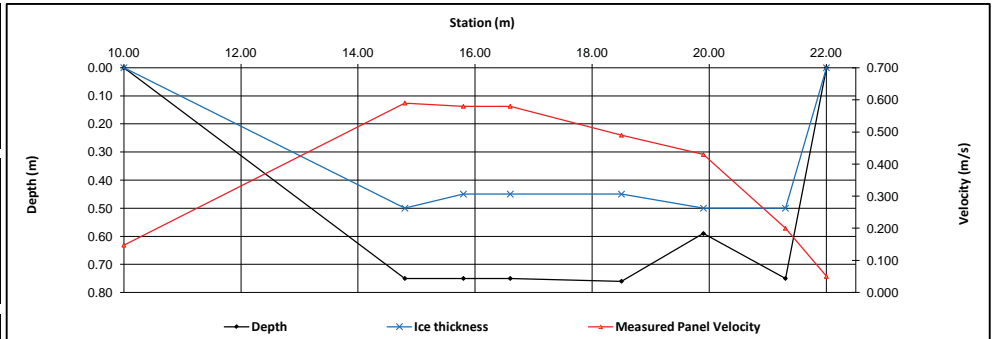
Site: S26 - MacKay River near Fort MacKay  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: January 12, 2012



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)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of Total Flow
L	10.00	0.00	0.00	0.000	0.000	0.000	1.0	10.00	12.40	2.40	0.06	0.148	0.148	0.15	0.022	2%
1	14.80	0.75	0.50	0.590			0.9	12.40	15.30	2.90	0.25	0.590	0.531	0.73	0.385	36%
2	15.80	0.75	0.45	0.580			0.9	15.30	16.20	0.90	0.30	0.580	0.522	0.27	0.141	13%
3	16.60	0.75	0.45	0.580			0.9	16.20	17.55	1.35	0.30	0.580	0.522	0.40	0.211	20%
4	18.50	0.76	0.45	0.490			0.9	17.55	19.20	1.65	0.31	0.490	0.441	0.51	0.226	21%
5	19.90	0.59	0.50	0.430			0.9	19.20	20.60	1.40	0.09	0.430	0.387	0.13	0.049	5%
6	21.30	0.75	0.50	0.200			0.9	20.60	21.65	1.05	0.25	0.200	0.180	0.26	0.047	4%
R	22.00	0.00	0.00	0.000	0.000	0.000	1.0	21.30	22.00	0.70	0.08	0.050	0.050	0.05	0.003	0%
<b>Total Flow</b>															<b>1.08</b>	

Measurement Details:	
Start Time (MST):	13:40
End Time (MST):	15:00
Equipment:	MARSH
Method:	ICE
River Condition:	ICE
Quality/Error (see reverse):	Poor
Weather:	Calm, clear, -5



Flow characteristics:		
Total Flow:	1.08	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.50	(m <sup>2</sup> )
Wetted Width:	12.00	(m)
Hydraulic Depth:	0.209	(m)
Mean Velocity:	0.432	(m/s)
Froude Number:	0.302	

Datalogger Details:	Before	After
WSC Site		

Datalogger / Station Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	4.243	104.243		100.000	100.000	Rock under flagged bush
Bench Mark 2:			1.012	103.231	103.232	Pin near shack
Bench Mark 3:						
Ice/PT:			6.773	97.470		
Water Level:			6.850	97.393		
Other:						
Setup #2						
Bench Mark 1:			4.223	100.002	100.000	Rock under flagged bush
Bench Mark 2:	0.994	104.225		103.231	103.232	Pin near shack
Bench Mark 3:						
Ice/PT:			6.755	97.470		
Water Level:			6.833	97.392		
Other:						

Closing Error	-0.002	Average WL	97.393
WL Check	0.001	Transducer Elevation	-

General Notes:

- Auger ran out of gas after 9 holes, 50 minutes of augering starting with a full tank.
- Three holes were dry.

Field Personnel:	SM, DW	Trip Date:	12-Jan-12
Data Entry Personnel:	DW	Date:	19-Jan-12
Data Check Personnel:	CJ	Date:	19-Jan-12

# Hydrometric Measurement / Site Visit Record

Site: S26 - MacKay River near Fort MacKay  
 UTM Location: 458031 E, 6341078 N

Site Visit Date: February 14, 2012



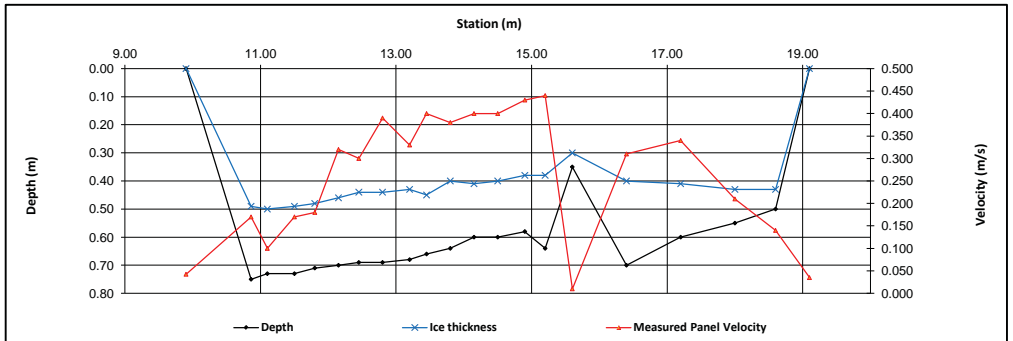
Flow Measurement: Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	19.10	0.00	0.00	0.000	0.000	0.000	0.9	19.10	18.85	0.25	0.02	0.035	0.032	0.00	0.000	0%
1	18.60	0.50	0.43	0.140			0.9	18.85	18.30	0.55	0.07	0.140	0.126	0.04	0.005	1%
2	18.00	0.55	0.43	0.210			0.9	18.30	17.60	0.70	0.12	0.210	0.189	0.08	0.016	3%
3	17.20	0.60	0.41	0.340			0.9	17.60	16.80	0.80	0.19	0.340	0.306	0.15	0.047	10%
4	16.40	0.70	0.40	0.310			0.9	16.80	16.00	0.80	0.30	0.310	0.279	0.24	0.067	15%
5	15.60	0.35	0.30	0.010			0.9	16.00	15.40	0.60	0.05	0.010	0.009	0.03	0.000	0%
6	15.20	0.64	0.38	0.440			0.9	15.40	15.05	0.35	0.26	0.440	0.396	0.09	0.036	8%
7	14.90	0.58	0.38	0.430			0.9	15.05	14.70	0.35	0.20	0.430	0.387	0.07	0.027	6%
8	14.50	0.60	0.40	0.400			0.9	14.70	14.33	0.38	0.20	0.400	0.360	0.08	0.027	6%
9	14.15	0.60	0.41	0.400			0.9	14.33	13.98	0.35	0.19	0.400	0.360	0.07	0.024	5%
10	13.80	0.64	0.40	0.380			0.9	13.98	13.63	0.35	0.24	0.380	0.342	0.08	0.029	6%
11	13.45	0.66	0.45	0.400			0.9	13.63	13.33	0.30	0.21	0.400	0.360	0.06	0.023	5%
12	13.20	0.68	0.43	0.330			0.9	13.33	13.00	0.32	0.25	0.330	0.297	0.08	0.024	5%
13	12.80	0.69	0.44	0.390			0.9	13.00	12.63	0.38	0.25	0.390	0.351	0.09	0.033	7%
14	12.45	0.69	0.44	0.300			0.9	12.63	12.30	0.32	0.25	0.300	0.270	0.08	0.022	5%
15	12.15	0.70	0.46	0.320			0.9	12.30	11.98	0.32	0.24	0.320	0.288	0.08	0.022	5%
16	11.80	0.71	0.48	0.190			0.9	11.98	11.65	0.33	0.23	0.190	0.162	0.07	0.012	3%
17	11.50	0.73	0.49	0.170			0.9	11.65	11.30	0.35	0.24	0.170	0.153	0.08	0.013	3%
18	11.10	0.73	0.50	0.100			0.9	11.30	10.98	0.32	0.23	0.100	0.090	0.07	0.007	1%
19	10.86	0.75	0.49	0.170			0.9	10.98	10.38	0.60	0.26	0.170	0.153	0.16	0.024	5%
LB	9.90	0.00	0.00	0.000	0.000	0.000	1.0	10.38	9.90	0.48	0.07	0.043	0.043	0.03	0.001	0%
<b>Total Flow</b>														<b>0.458</b>		

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	14:00
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Fair
Weather:	overcast, calm, 0

Flow characteristics:	
Total Flow:	0.458 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	1.75 (m <sup>2</sup> )
Wetted Width:	8.47 (m)
Hydraulic Depth:	0.207 (m)
Mean Velocity:	0.261 (m/s)
Froude Number:	0.184

Logger Details:	Before	After
WSC Site		

Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	4.548	104.548		100.000	100.000	Rock under flagged bush
Bench Mark 2:			1.316	103.232	103.232	Pin near shack
Bench Mark 3:						
Ice/PT:			7.050	97.498		
Water Level:			7.212	97.336		
Other:						
Setup #2						
Bench Mark 1:			4.537	100.001	100.000	Rock under flagged bush
Bench Mark 2:	1.306	104.538		103.232	103.232	Pin near shack
Bench Mark 3:						
Ice/PT:			7.039	97.499		
Water Level:			7.202	97.336		
Other:						
Closing Error	-0.001					
WL Check	0.000					
Average WL					97.336	
Transducer Elevation					-	

General Notes:

Field Personnel:	SM, DW	Trip Date:	14-Feb-12
Data Entry Personnel:	CJ	Date:	20-Mar-12
Data Check Personnel:	XP	Date:	24-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S26 - MacKay River near Fort MacKay  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: November 30, 2012



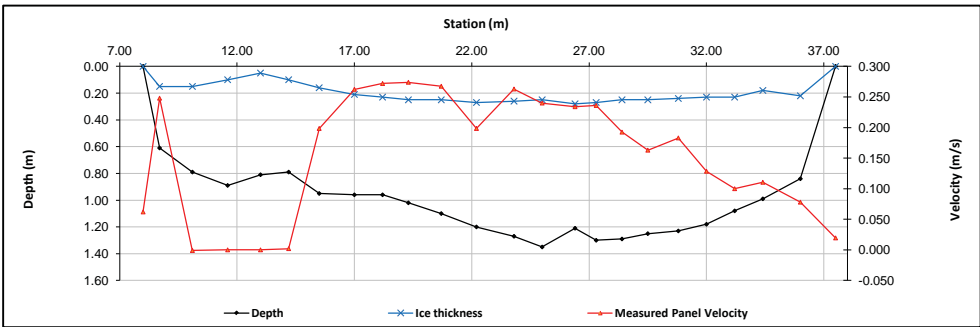
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	8.00	0.00	0.00	0.000	0.000	0.000	0.9	8.00	8.35	0.35	0.12	0.062	0.056	0.04	0.002	0%
1	8.70	0.61	0.15	0.248			0.9	8.35	9.40	1.05	0.46	0.248	0.223	0.48	0.108	3%
2	10.10	0.79	0.15	-0.001			0.9	9.40	10.85	1.45	0.64	-0.001	-0.001	0.93	-0.001	0%
3	11.60	0.89	0.10	0.000			1.0	10.85	12.30	1.45	0.79	0.000	0.000	1.15	0.000	0%
4	13.00	0.81	0.05	0.000			1.0	12.30	13.60	1.30	0.76	0.000	0.000	0.99	0.000	0%
5	14.20	0.79	0.10	0.002			0.9	13.60	14.85	1.25	0.69	0.002	0.002	0.86	0.002	0%
6	15.50	0.95	0.16		0.275	0.123	1.0	14.85	16.25	1.40	0.79	0.199	0.199	1.11	0.220	6%
7	17.00	0.96	0.21		0.313	0.212	1.0	16.25	17.60	1.35	0.75	0.263	0.263	1.01	0.266	7%
8	18.20	0.96	0.23		0.272		0.9	17.60	18.75	1.15	0.73	0.272	0.245	0.84	0.206	5%
9	19.30	1.02	0.25		0.345	0.203	1.0	18.75	20.00	1.25	0.77	0.274	0.274	0.96	0.264	7%
10	20.70	1.10	0.25		0.317	0.218	1.0	20.00	21.45	1.45	0.85	0.268	0.268	1.23	0.330	8%
11	22.20	1.20	0.27		0.413	-0.016	1.0	21.45	23.00	1.55	0.93	0.199	0.199	1.44	0.286	7%
12	23.80	1.27	0.26		0.527	-0.001	1.0	23.00	24.40	1.40	1.01	0.263	0.263	1.41	0.372	9%
13	25.00	1.35	0.25		0.464	0.016	1.0	24.40	25.70	1.30	1.10	0.240	0.240	1.43	0.343	9%
14	26.40	1.21	0.28		0.465	0.003	1.0	25.70	26.85	1.15	0.93	0.234	0.234	1.07	0.250	6%
15	27.30	1.30	0.27		0.425	0.047	1.0	26.85	27.85	1.00	1.03	0.236	0.236	1.03	0.243	6%
16	28.40	1.29	0.25		0.331	0.054	1.0	27.85	28.95	1.10	1.04	0.193	0.193	1.14	0.220	6%
17	29.50	1.25	0.25		0.325	0.001	1.0	28.95	30.15	1.20	1.00	0.163	0.163	1.20	0.196	5%
18	30.80	1.23	0.24		0.366	0.000	1.0	30.15	31.40	1.25	0.99	0.183	0.183	1.24	0.226	6%
19	32.00	1.18	0.23		0.257	0.000	1.0	31.40	32.60	1.20	0.95	0.129	0.129	1.14	0.146	4%
20	33.20	1.08	0.23		0.202	-0.002	1.0	32.60	33.80	1.20	0.85	0.100	0.100	1.02	0.102	3%
21	34.40	0.99	0.18		0.221	0.000	1.0	33.80	35.20	1.40	0.81	0.111	0.111	1.13	0.125	3%
22	36.00	0.84	0.22	0.078			0.9	35.20	36.75	1.55	0.62	0.078	0.070	0.96	0.067	2%
LB	37.50	0.00	0.00	0.00	0.00	0.00	1.0	36.75	37.50	0.75	0.16	0.020	0.020	0.12	0.002	0%
<b>Total Flow</b>															<b>3.98</b>	

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	14:10
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover, slushy
Quality/Error (see reverse):	Fair
Weather:	snowing, -15

Flow characteristics:	
Total Flow:	3.98 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	23.94 (m <sup>2</sup> )
Wetted Width:	29.50 (m)
Hydraulic Depth:	0.811 (m)
Mean Velocity:	0.166 (m/s)
Froude Number:	0.059

Logger Details:	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.372	104.604		103.232	103.232	Pin near Shack
Bench Mark 2:			4.598	100.006	100.000	Painted rock next to bluff
Bench Mark 3:						
Ice/PT:			6.613	97.991		
Water Level:			6.622	97.982		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.362	103.231	103.232	Pin near Shack
Bench Mark 2:	4.587	104.593		100.006	100.000	Painted rock next to bluff
Bench Mark 3:						
Ice/PT:			6.603	97.990		
Water Level:			6.61	97.983		
Other:						

Closing Error	0.001	Average WL	97.983
WL Check	0.001	Transducer Elevation	#VALUE!

**General Notes:**  
 Slush in holes at offsets 10.1 to 14.2.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Nov-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	20-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	3-Jan-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S27 - Firebag River WSC

UTM Location: 488685 E, 6388706 N

Site Visit Date:

January 14, 2012



## 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	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	3.15	1.65	0.11	0.165	0.149	0.17	0.026	0%
1	3.40	0.90	0.42	0.660			0.9	2.45	4.10	1.65	0.42	0.660	0.594	0.69	0.412	4%
2	4.80	0.95	0.53	0.660			0.9	4.10	5.95	1.85	0.45	0.670	0.603	0.83	0.502	5%
3	7.10	0.92	0.47	0.670			0.9	5.95	8.30	2.35	0.60	0.640	0.576	1.41	0.812	8%
4	9.50	1.02	0.42	0.640			0.9	8.30	10.70	2.40	0.68	0.730	0.657	1.63	1.072	11%
5	11.90	1.11	0.43	0.730			0.9	10.70	12.85	2.15	0.59	0.640	0.576	1.27	0.731	7%
6	13.80	1.10	0.51	0.640			0.9	12.85	14.85	2.00	0.48	0.600	0.540	0.69	0.518	5%
7	15.90	1.08	0.60	0.600			0.9	14.85	16.90	2.05	0.40	0.470	0.423	0.82	0.347	4%
8	17.90	1.00	0.60	0.470			0.9	16.90	18.90	2.00	0.38	0.560	0.504	0.76	0.383	4%
9	19.90	0.94	0.56	0.560			0.9	18.90	21.00	2.10	0.37	0.500	0.450	0.78	0.350	4%
10	22.10	0.85	0.48	0.500			0.9	21.00	23.40	2.40	0.22	0.700	0.630	0.53	0.333	3%
11	24.70	0.70	0.48	0.700			0.9	23.40	25.95	2.55	0.24	0.730	0.657	0.61	0.402	4%
12	27.20	0.70	0.46	0.730			0.9	25.95	29.10	3.15	0.18	0.450	0.405	0.57	0.230	2%
13	31.00	0.72	0.54	0.450			0.9	29.10	32.70	3.60	0.13	0.500	0.450	0.47	0.211	2%
14	34.40	0.68	0.55	0.500			0.9	32.70	36.35	3.65	0.03	0.150	0.135	0.11	0.015	0%
15	38.30	0.58	0.55	0.150			0.9	36.35	40.25	3.90	0.07	0.060	0.054	0.27	0.015	0%
16	42.20	0.65	0.58	0.060			0.9	40.25	44.45	4.20	0.21	0.510	0.459	0.88	0.405	4%
17	46.70	0.79	0.58	0.510			0.9	44.45	47.50	3.05	0.27	0.450	0.405	0.82	0.334	3%
18	48.30	0.86	0.59	0.450			0.9	47.50	50.10	2.60	0.35	0.540	0.486	0.91	0.442	4%
19	51.90	0.89	0.54	0.540			0.9	50.10	53.25	3.15	0.27	0.280	0.252	0.85	0.214	2%
20	54.60	0.89	0.62	0.280			0.9	53.25	56.05	2.80	0.39	0.690	0.621	1.09	0.678	7%
21	57.50	0.94	0.55	0.690			0.9	56.05	58.75	2.70	0.48	0.660	0.594	1.30	0.770	8%
22	60.00	1.04	0.56	0.660			0.9	58.75	60.95	2.20	0.35	0.620	0.558	0.77	0.430	4%
23	61.90	0.85	0.50	0.620			0.9	60.95	62.90	1.95	0.26	0.500	0.450	0.51	0.228	2%
24	63.90	0.76	0.50	0.500			0.9	62.90	64.60	1.70	0.12	0.190	0.171	0.20	0.035	0%
25	65.30	0.63	0.51	0.190			0.9	64.60	65.65	1.05	0.07	0.000	0.000	0.07	0.000	0%
LB	66.00	0.00	0.00	0.000	0.000	0.000	1.0	65.30	66.00	0.70	0.09	0.173	0.173	0.06	0.011	0%

**Total Flow 9.90**

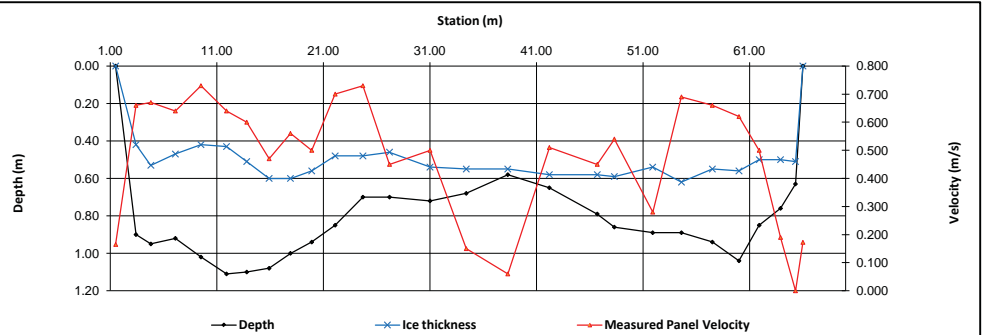
Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	12:30
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	light snow, calm, -15

Flow characteristics:	
Total Flow:	9.9 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	19.35 (m <sup>2</sup> )
Wetted Width:	64.50 (m)
Hydraulic Depth:	0.300 (m)
Mean Velocity:	0.512 (m/s)
Froude Number:	0.298

Datalogger Details:	Before	After

WSC Site

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:					100.000	
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error	-	Average WL	-
WL Check	-	Transducer Elevation	-

**General Notes:**

Field Personnel:	SM, DW	Trip Date:	14-Jan-12
Data Entry Personnel:	CJ	Date:	9-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S27 - Firebag River WSC

UTM Location: 488685 E, 6388706 N

Site Visit Date:

February 6, 2012



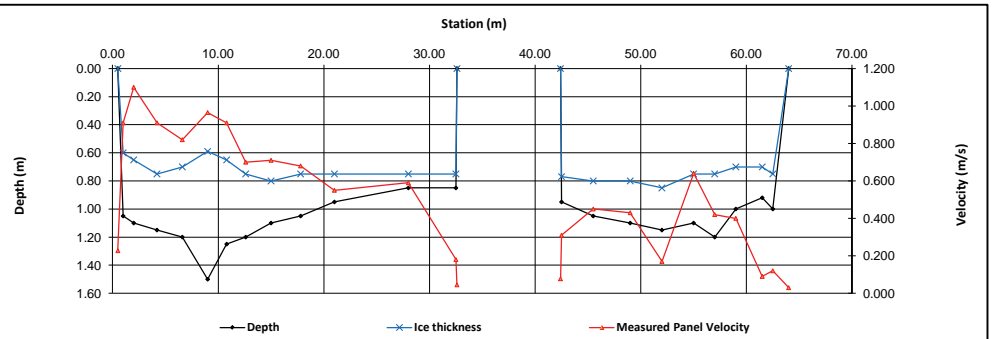
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.50	0.00	0.00	0.000	0.000	0.000										
1	1.00	1.05	0.60	0.910			0.9	0.50	0.75	0.25	0.11	0.228	0.205	0.03	0.006	0%
2	2.00	1.10	0.65	1.100			0.9	0.75	1.50	0.75	0.45	0.910	0.819	0.34	0.276	3%
3	4.20	1.15	0.75	0.910			0.9	1.50	3.10	1.60	0.45	1.100	0.990	0.72	0.713	7%
4	6.60	1.20	0.70	0.820			0.9	3.10	5.40	2.30	0.40	0.910	0.819	0.92	0.753	8%
5	9.00	1.50	0.59		0.950	0.980	0.9	5.40	7.80	2.40	0.50	0.820	0.738	1.20	0.886	9%
6	10.80	1.25	0.65	0.910			1.0	7.80	9.90	2.10	0.91	0.965	0.965	1.91	1.844	19%
7	12.60	1.20	0.75	0.700			0.9	9.90	11.70	1.80	0.60	0.910	0.819	1.08	0.885	9%
8	15.00	1.10	0.80	0.710			0.9	11.70	13.80	2.10	0.45	0.700	0.630	0.95	0.595	6%
9	17.80	1.05	0.75	0.680			0.9	13.80	16.40	2.60	0.30	0.710	0.639	0.78	0.498	5%
10	21.00	0.95	0.75	0.550			0.9	16.40	19.40	3.00	0.30	0.680	0.612	0.90	0.551	6%
11	28.00	0.85	0.75	0.590			0.9	19.40	24.50	5.10	0.20	0.550	0.495	1.02	0.505	5%
12	32.50	0.85	0.75	0.180			0.9	24.50	30.25	5.75	0.10	0.590	0.531	0.58	0.305	3%
	32.50	0.85	0.75	0.180			0.9	30.25	32.55	2.30	0.10	0.180	0.162	0.23	0.037	0%
	32.60	0.00	0.00	0.000	0.000	0.000	1.0	32.55	32.60	0.05	0.03	0.045	0.045	0.00	0.000	0%
SANDBAR																
	42.40	0.00	0.00	0.000	0.000	0.000	0.9	42.40	42.45	0.05	0.05	0.078	0.070	0.00	0.000	0%
16	42.50	0.95	0.77	0.310			0.9	42.45	44.00	1.55	0.18	0.310	0.279	0.28	0.078	1%
17	45.50	1.05	0.80	0.450			0.9	44.00	47.25	3.25	0.25	0.450	0.405	0.81	0.329	3%
18	49.00	1.10	0.80	0.430			0.9	47.25	50.50	3.25	0.30	0.430	0.387	0.98	0.377	4%
19	52.00	1.15	0.85	0.170			0.9	50.50	53.50	3.00	0.30	0.170	0.153	0.90	0.138	1%
20	55.00	1.10	0.75	0.640			0.9	53.50	56.00	2.50	0.35	0.640	0.576	0.88	0.504	5%
21	57.00	1.20	0.75	0.420			0.9	56.00	58.00	2.00	0.45	0.420	0.378	0.90	0.340	3%
22	59.00	1.00	0.70	0.400			0.9	58.00	60.25	2.25	0.30	0.400	0.360	0.68	0.243	2%
23	61.50	0.92	0.70	0.090			0.9	60.25	62.00	1.75	0.22	0.090	0.081	0.39	0.031	0%
24	62.50	1.00	0.75	0.120			0.9	62.00	63.25	1.25	0.25	0.120	0.108	0.31	0.034	0%
RB	64.00	0.00	0.00	0.000	0.000	0.000	1.0	63.25	64.00	0.75	0.06	0.030	0.030	0.05	0.001	0%
<b>Total Flow</b>															<b>9.93</b>	

Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	16:40
Equipment:	Marsh
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	fair
Weather:	clear, breezy, -12

Flow characteristics:	
Total Flow:	9.93 (m <sup>3</sup> /s)
Perceived Measurement Quality:	fair
Cross Section Area:	16.81 (m <sup>2</sup> )
Wetted Width:	63.50 (m)
Hydraulic Depth:	0.265 (m)
Mean Velocity:	0.591 (m/s)
Froude Number:	0.367

Logger Details:	Before	After
WSC Site		

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2					100.000	
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Closing Error	-					
WL Check	-					
Average WL						
Transducer Elevation						

**General Notes:**

- Ice ~1m thick, had to change auger blades several times.
- Sandbar present between offsets of 32.5 and 42.5 m.

Field Personnel:	SM, CJ	Trip Date:	6-Feb-12
Data Entry Personnel:	CJ	Date:	28-Mar-12
Data Check Personnel:	XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S27 - Firebag River WSC

UTM Location: 488685 E, 6388706 N

Site Visit Date:

December 13, 2012



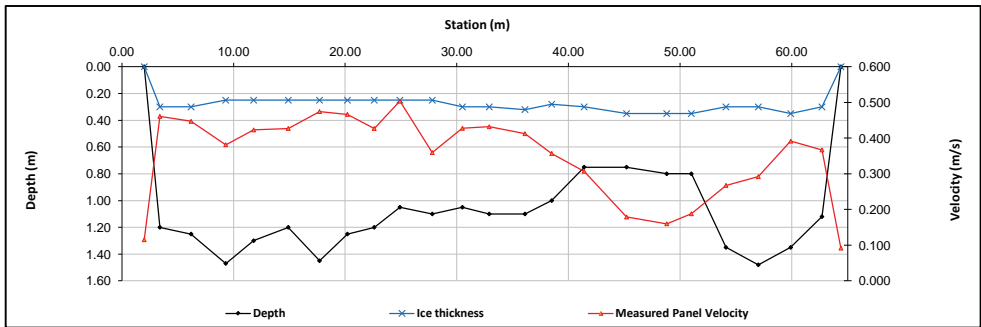
Flow Measurement:													Measured Data				Calculated Data				
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.70	0.70	0.23	0.115	0.115	0.16	0.018	0%					
1	3.40	1.20	0.30	0.437	0.485		1.0	2.70	4.80	2.10	0.90	0.461	0.461	1.89	0.871	4%					
2	6.20	1.25	0.30	0.416	0.478		1.0	4.80	7.75	2.95	0.95	0.447	0.447	2.80	1.253	6%					
3	9.30	1.47	0.25	0.233	0.530		1.0	7.75	10.55	2.80	1.22	0.382	0.382	3.42	1.303	7%					
4	11.80	1.30	0.25	0.339	0.507		1.0	10.55	13.35	2.80	1.05	0.423	0.423	2.94	1.244	6%					
5	14.90	1.20	0.25	0.342	0.512		1.0	13.35	16.30	2.95	0.95	0.427	0.427	2.80	1.197	6%					
6	17.70	1.45	0.25	0.406	0.543		1.0	16.30	18.95	2.65	1.20	0.475	0.475	3.18	1.509	8%					
7	20.20	1.25	0.25	0.403	0.530		1.0	18.95	21.40	2.45	1.00	0.467	0.467	2.45	1.143	6%					
8	22.60	1.20	0.25	0.342	0.512		1.0	21.40	23.75	2.35	0.95	0.427	0.427	2.23	0.953	5%					
9	24.90	1.05	0.25	0.473	0.534		1.0	23.75	26.35	2.60	0.80	0.504	0.504	2.08	1.047	5%					
10	27.80	1.10	0.25	0.245	0.474		1.0	26.35	29.15	2.80	0.85	0.360	0.360	2.38	0.856	4%					
11	30.50	1.05	0.30	0.342	0.513		1.0	29.15	31.70	2.55	0.75	0.428	0.428	1.91	0.818	4%					
12	32.90	1.10	0.30	0.407	0.457		1.0	31.70	34.50	2.80	0.80	0.432	0.432	2.24	0.968	5%					
13	36.10	1.10	0.32	0.375	0.450		1.0	34.50	37.30	2.80	0.78	0.413	0.413	2.18	0.901	5%					
14	38.50	1.00	0.28	0.357			0.9	37.30	39.95	2.65	0.72	0.357	0.321	1.91	0.613	3%					
15	41.40	0.75	0.30	0.307			0.9	39.95	43.30	3.35	0.45	0.307	0.276	1.51	0.417	2%					
16	45.20	0.75	0.35	0.179			0.9	43.30	47.00	3.70	0.40	0.179	0.161	1.48	0.238	1%					
17	48.80	0.80	0.35	0.160			0.9	47.00	49.90	2.90	0.45	0.160	0.144	1.31	0.188	1%					
18	51.00	0.80	0.35	0.188			0.9	49.90	52.55	2.65	0.45	0.188	0.169	1.19	0.202	1%					
19	54.10	1.35	0.30	0.244	0.291		1.0	52.55	55.55	3.00	1.05	0.268	0.268	3.15	0.843	4%					
20	57.00	1.48	0.30	0.216	0.368		1.0	55.55	58.45	2.90	1.18	0.292	0.292	3.42	0.999	5%					
21	59.90	1.35	0.35	0.354	0.429		1.0	58.45	61.30	2.85	1.00	0.392	0.392	2.85	1.116	6%					
22	62.70	1.12	0.30	0.392	0.342		1.0	61.30	63.55	2.25	0.82	0.367	0.367	1.85	0.677	3%					
RB	64.40	0.00	0.00	0.00	0.00		1.0	63.55	64.40	0.85	0.21	0.092	0.092	0.17	0.016	0%					
<b>Total Flow</b>														<b>19.4</b>							

Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	12:10
Equipment:	ADV
Method:	Ice
River Condition:	Good some slush layers in
Quality/Error (see reverse):	Good
Weather:	light snow, calm, -20

Flow Characteristics:	
Total Flow:	19.4 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	51.50 (m <sup>2</sup> )
Wetted Width:	62.40 (m)
Hydraulic Depth:	0.825 (m)
Mean Velocity:	0.377 (m/s)
Froude Number:	0.132

Logger Details:	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Closing Error	-			Average WL	-	
WL Check	-			Transducer Elevation	-	

**General Notes:**

Bullet hole through enclosure and logger, battery is missing.

Ran ADV test, all results good.

slush moving in water column near LB, can feel on wading rod.

Field Personnel:		TR AND CJ	Trip Date:	13-Dec-12
Data Entry Personnel:	TR		Date:	13-Dec-12
Data Check Personnel:	SG		Date:	16-Jan-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			

# Hydrometric Measurement / Site Visit Record

Site: S29 - Christina River near Chard  
 UTM Location: 508183 E, 6187926 N

Site Visit Date:

January 16, 2012



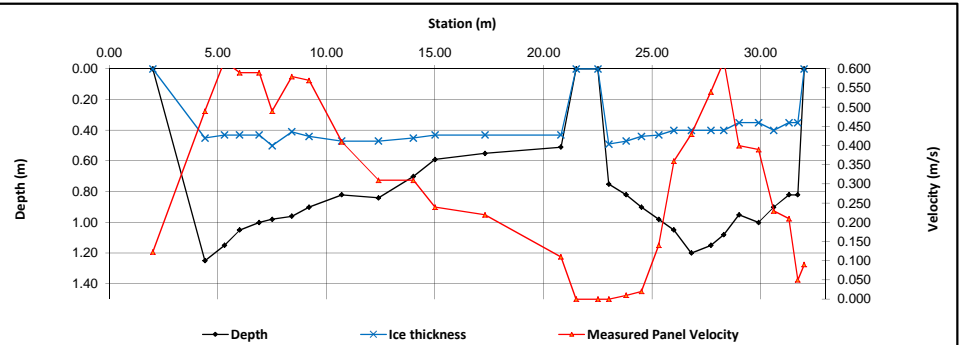
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	3.20	1.20	0.00	0.123	0.12	0.00	0.00	0%
1	4.40	1.25	0.45		0.460	0.520	1.0	3.20	4.85	1.65	0.80	0.490	0.49	1.32	0.65	15%
2	5.30	1.15	0.43	0.620			0.9	4.85	5.65	0.80	0.72	0.620	0.56	0.58	0.32	8%
3	6.00	1.05	0.43	0.590			0.9	5.65	6.45	0.80	0.62	0.590	0.53	0.50	0.26	6%
4	6.90	1.00	0.43	0.590			0.9	6.45	7.20	0.75	0.57	0.590	0.53	0.43	0.23	5%
5	7.50	0.98	0.50	0.490			0.9	7.20	7.95	0.75	0.48	0.490	0.44	0.36	0.16	4%
6	8.40	0.96	0.41	0.580			0.9	7.95	8.80	0.85	0.55	0.580	0.52	0.47	0.24	6%
7	9.20	0.90	0.44	0.570			0.9	8.80	9.95	1.15	0.46	0.570	0.51	0.53	0.27	8%
8	10.70	0.82	0.47	0.410			0.9	9.95	11.55	1.60	0.35	0.410	0.37	0.56	0.21	5%
9	12.40	0.84	0.47	0.310			0.9	11.55	13.20	1.65	0.37	0.310	0.28	0.61	0.17	4%
10	14.00	0.70	0.45	0.310			0.9	13.20	14.50	1.30	0.25	0.310	0.28	0.33	0.09	2%
11	15.00	0.59	0.43	0.240			0.9	14.50	16.15	1.65	0.16	0.240	0.22	0.26	0.06	1%
12	17.30	0.55	0.43	0.220			0.9	16.15	19.05	2.90	0.12	0.220	0.20	0.35	0.07	2%
13	20.80	0.51	0.43	0.110			0.9	19.05	21.15	2.10	0.08	0.110	0.10	0.17	0.02	0%
14	21.50	0.00	0.00	0.000			1.0	21.15	22.00	0.85	0.02	0.000	0.00	0.02	0.00	0%
15	22.50	0.00	0.00	0.000			1.0	22.00	22.75	0.75	0.00	0.000	0.00	0.00	0.00	0%
16	23.00	0.75	0.49	0.000			1.0	22.75	23.40	0.65	0.26	0.000	0.00	0.17	0.00	0%
17	23.80	0.82	0.47	0.010			0.9	23.40	24.15	0.75	0.35	0.010	0.01	0.26	0.00	0%
18	24.50	0.90	0.44	0.020			0.9	24.15	24.90	0.75	0.46	0.020	0.02	0.35	0.01	0%
19	25.30	0.98	0.43	0.140			0.9	24.90	25.65	0.75	0.55	0.140	0.13	0.41	0.05	1%
20	26.00	1.05	0.40	0.360			0.9	25.65	26.40	0.75	0.65	0.360	0.32	0.49	0.16	4%
21	26.80	1.20	0.40		0.420	0.440	1.0	26.40	27.25	0.85	0.80	0.430	0.43	0.68	0.29	7%
22	27.70	1.15	0.40	0.540			0.9	27.25	28.00	0.75	0.75	0.540	0.49	0.56	0.27	6%
23	28.30	1.08	0.40	0.620			0.9	28.00	28.65	0.65	0.68	0.620	0.56	0.44	0.25	6%
24	29.00	0.95	0.35	0.400			0.9	28.65	29.45	0.80	0.60	0.400	0.36	0.48	0.17	4%
25	29.90	1.00	0.35	0.390			0.9	29.45	30.25	0.80	0.65	0.390	0.35	0.52	0.18	4%
26	30.60	0.90	0.40	0.230			0.9	30.25	30.95	0.70	0.50	0.230	0.21	0.35	0.07	2%
27	31.30	0.82	0.35	0.210			0.9	30.95	31.50	0.55	0.47	0.210	0.19	0.26	0.05	1%
28	31.70	0.82	0.35	0.050			0.9	31.50	31.85	0.35	0.47	0.050	0.05	0.16	0.01	0%
RB	32.00	0.00	0.00	0.000	0.000	0.000	1.0	31.85	32.00	0.15	0.12	0.090	0.09	0.02	0.00	0%
<b>Total Flow</b>														<b>4.26</b>		

Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	13:50
Equipment:	Marsh
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Fair
Weather:	clear, calm, -28

Flow characteristics:	
Total Flow:	4.260 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	11.62 (m <sup>2</sup> )
Wetted Width:	30.00 (m)
Hydraulic Depth:	0.387 (m)
Mean Velocity:	0.367 (m/s)
Froude Number:	0.188

Datalogger Details:	Before	After
WSC Site		

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.645	9.615	9.838	94-1: Brass cap by blue stk
Bench Mark 2:			1.399	9.861		Brass Cap
Bench Mark 3:	4.297	11.26	4.297	6.963	6.963	87-1: Bolt w/orange 'BM'
Ice/PT:			5.980	5.280		
Water Level:			5.960	5.300		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.633	9.614		94-1: Brass cap by blue stk
Bench Mark 2:	1.386	11.247		9.861		Brass Cap
Bench Mark 3:			4.282	6.965		87-1: Bolt w/orange 'BM'
Ice/PT:			5.965	5.282		
Water Level:			5.945	5.302		
Other:						

Closing Error	-0.002	Average WL	5.301
WL Check	0.002	Transducer Elevation	-

**General Notes:**

- Measured flow all the way across the channel.

Field Personnel:	SM, GB	Trip Date:	16-Jan-12
Data Entry Personnel:	CJ	Date:	13-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S29 - Christina River near Chard  
 UTM Location: 508183 E, 6187926 N

Site Visit Date: February 12, 2012



## 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
LB	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.40	4.45	0.05	0.06	0.000	0.000	0.00	0.000	0%
1	4.50	0.80	0.55	0.000			1.0	4.45	5.15	0.70	0.25	0.000	0.000	0.18	0.000	0%
2	5.80	0.90	0.52	0.210			0.9	5.15	5.95	0.80	0.38	0.210	0.189	0.30	0.057	3%
3	6.10	1.20	0.47	0.460			0.9	5.95	6.45	0.50	0.73	0.460	0.414	0.37	0.151	8%
4	6.80	1.15	0.50	0.430			0.9	6.45	6.95	0.50	0.65	0.430	0.387	0.33	0.126	7%
5	7.10	1.14	0.47	0.720			0.9	6.95	7.43	0.48	0.67	0.720	0.648	0.32	0.206	11%
6	7.75	1.22	0.45		0.410	0.490	1.0	7.43	7.83	0.40	0.77	0.450	0.450	0.31	0.139	7%
7	7.90	1.09	0.45	0.760			0.9	7.83	8.30	0.48	0.64	0.760	0.684	0.30	0.208	11%
8	8.70	1.05	0.46	0.700			0.9	8.30	8.73	0.42	0.59	0.700	0.630	0.25	0.158	8%
9	8.75	1.07	0.45	0.410			0.9	8.73	9.10	0.38	0.62	0.410	0.369	0.23	0.086	5%
10	9.45	0.99	0.44	0.600			0.9	9.10	9.53	0.42	0.55	0.600	0.540	0.23	0.126	7%
11	9.60	0.93	0.45	0.250			0.9	9.53	9.90	0.38	0.48	0.250	0.225	0.18	0.041	2%
12	10.20	0.96	0.45	0.660			0.9	9.90	10.33	0.43	0.51	0.660	0.594	0.22	0.129	7%
13	10.45	0.90	0.45	0.250			0.9	10.33	10.70	0.38	0.45	0.250	0.225	0.17	0.038	2%
14	10.95	0.90	0.53	0.550			0.9	10.70	11.08	0.38	0.37	0.550	0.495	0.14	0.069	4%
15	11.20	0.81	0.50	0.090			0.9	11.08	11.43	0.35	0.31	0.090	0.081	0.11	0.009	0%
16	11.65	0.94	0.55	0.410			0.9	11.43	11.80	0.38	0.39	0.410	0.369	0.15	0.054	3%
17	11.95	0.80	0.45	0.070			0.9	11.80	12.05	0.25	0.35	0.070	0.063	0.09	0.006	0%
18	12.15	0.89	0.57	0.360			0.9	12.05	12.53	0.48	0.32	0.360	0.324	0.15	0.049	3%
19	12.90	0.83	0.58	0.310			0.9	12.53	13.25	0.73	0.25	0.310	0.279	0.15	0.051	3%
20	13.60	0.80	0.60	0.330			0.9	13.25	13.95	0.70	0.20	0.330	0.297	0.14	0.042	2%
21	14.30	0.80	0.58	0.280			0.9	13.95	14.70	0.75	0.22	0.280	0.252	0.17	0.042	2%
22	15.10	0.76	0.57	0.270			0.9	14.70	15.40	0.70	0.19	0.270	0.243	0.13	0.032	2%
23	15.70	0.70	0.55	0.210			0.9	15.40	16.60	1.20	0.15	0.210	0.189	0.18	0.034	2%
24	17.50	0.58	0.52	0.180			0.9	16.60	18.50	1.90	0.06	0.180	0.162	0.11	0.018	1%
25	19.50	0.56	0.51	0.160			0.9	18.50	20.40	1.90	0.05	0.160	0.144	0.10	0.014	1%
26	21.30	0.56	0.50	0.260			0.9	20.40	21.75	1.35	0.06	0.260	0.234	0.08	0.019	1%
27	22.20	0.59	0.52	0.050			0.9	21.75	22.60	0.85	0.07	0.050	0.045	0.06	0.003	0%
RB	23.00	0.00	0.00	0.000	0.000	0.000	1.0	22.60	23.00	0.40	0.01	0.065	0.065	0.00	0.000	0%

**Total Flow 1.90**

## Measurement Details:

Start Time (MST):	8:40
End Time (MST):	10:30
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	good
Weather:	clear, wind, -15

## Flow characteristics:

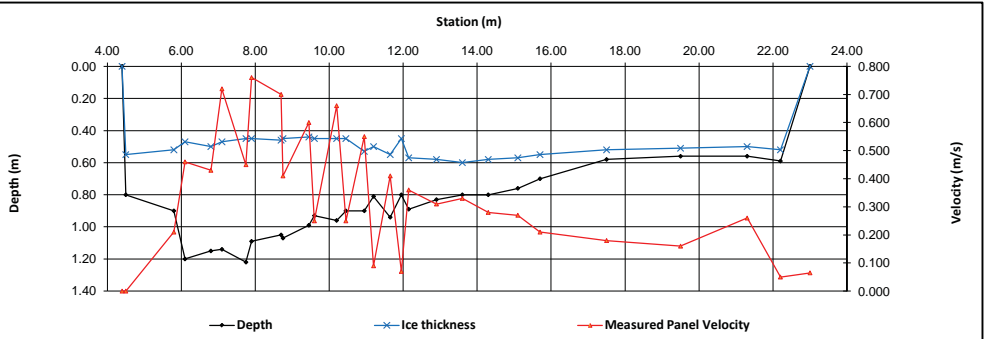
Total Flow:	1.90	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	-
Cross Section Area:	5.17	(m <sup>2</sup> )
Wetted Width:	18.60	(m)
Hydraulic Depth:	0.278	(m)
Mean Velocity:	0.367	(m/s)
Froude Number:	0.223	-

## Datalogger Details:

	Before	After
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WSC Site

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:			1.479	10.224	10.091	94-1: Brass cap beside blue stake
Bench Mark 2:	4.740	11.703		6.963	6.963	87-1: Bolt on bridge piling
Bench Mark 3:						
Ice/PT:			6.479	5.224		
Water Level:			6.561	5.142		
Other:						
Setup #2						
Bench Mark 1:	1.475	11.699		10.224		94-1: Brass cap beside blue stake
Bench Mark 2:			4.731	6.968		87-1: Bolt on bridge piling
Bench Mark 3:						
Ice/PT:			6.478	5.221		
Water Level:			6.558	5.141		
Other:						

Closing Error	-0.005	Average WL	5.142
WL Check	0.001	Transducer Elevation	-

## General Notes:

- Two measurements for flow, sand bar was not measured.

Field Personnel:	SG, DW	Trip Date:	12-Feb-12
Data Entry Personnel:	CJ	Date:	19-Mar-12
Data Check Personnel:	XP	Date:	24-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date:

February 12, 2012



## Flow Measurement:

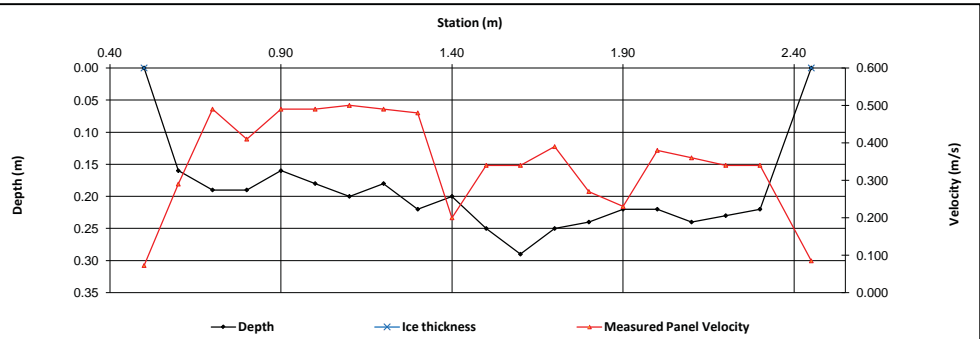
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow
RB	2.45	0.00	0.00	0.000	0.000	0.000	1.0	2.45	2.38	0.08	0.06	0.085	0.085	0.00	0.000	0%
1	2.30	0.22		0.340			1.0	2.38	2.25	0.13	0.22	0.340	0.340	0.03	0.009	6%
2	2.20	0.23		0.340			1.0	2.25	2.15	0.10	0.23	0.340	0.340	0.02	0.008	5%
3	2.10	0.24		0.360			1.0	2.15	2.05	0.10	0.24	0.360	0.360	0.02	0.009	6%
4	2.00	0.22		0.380			1.0	2.05	1.95	0.10	0.22	0.380	0.380	0.02	0.008	6%
5	1.90	0.22		0.230			1.0	1.95	1.85	0.10	0.22	0.230	0.230	0.02	0.005	3%
6	1.80	0.24		0.270			1.0	1.85	1.75	0.10	0.24	0.270	0.270	0.02	0.006	4%
7	1.70	0.25		0.390			1.0	1.75	1.65	0.10	0.25	0.390	0.390	0.03	0.010	7%
8	1.60	0.29		0.340			1.0	1.65	1.55	0.10	0.29	0.340	0.340	0.03	0.010	7%
9	1.50	0.25		0.340			1.0	1.55	1.45	0.10	0.25	0.340	0.340	0.03	0.009	6%
10	1.40	0.20		0.200			1.0	1.45	1.35	0.10	0.20	0.200	0.200	0.02	0.004	3%
11	1.30	0.22		0.480			1.0	1.35	1.25	0.10	0.22	0.480	0.480	0.02	0.011	7%
12	1.20	0.18		0.490			1.0	1.25	1.15	0.10	0.18	0.490	0.490	0.02	0.009	6%
13	1.10	0.20		0.500			1.0	1.15	1.05	0.10	0.20	0.500	0.500	0.02	0.010	7%
14	1.00	0.18		0.490			1.0	1.05	0.95	0.10	0.18	0.490	0.490	0.02	0.009	6%
15	0.90	0.16		0.490			1.0	0.95	0.85	0.10	0.16	0.490	0.490	0.02	0.008	5%
16	0.80	0.19		0.410			1.0	0.85	0.75	0.10	0.19	0.410	0.410	0.02	0.008	5%
17	0.70	0.19		0.490			1.0	0.75	0.65	0.10	0.19	0.490	0.490	0.02	0.009	6%
18	0.60	0.16		0.290			1.0	0.65	0.55	0.10	0.16	0.290	0.290	0.02	0.005	3%
LB	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.55	0.50	0.05	0.04	0.073	0.073	0.00	0.000	0%
<b>Total Flow</b>														<b>0.146</b>		

Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	14:10
Equipment:	Marsh
Method:	Wading
River Condition:	Partial Ice Backwater
Quality/Error (see reverse):	Good
Weather:	Sunny, 0 deg.

Flow characteristics:	
Total Flow:	0.146 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good
Cross Section Area:	0.40 (m <sup>2</sup> )
Wetted Width:	1.83 (m)
Hydraulic Depth:	0.217 (m)
Mean Velocity:	0.369 (m/s)
Froude Number:	0.253

Datalogger Details:		
	Before	After
Transducer Reading (m):		
Water (°C):		
Rainfall (mm):		
Battery (Main):		
Datalogger Clock:		
Laptop Clock:		
Dessicant:		
Logger# (if Δ):		
PT# (if Δ):		

Datalogger / Station Notes:		



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.578	100.706		100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.002	99.704	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.496	98.210		
Other:			1.294	99.412	99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.562	100.131	100.128	T-Post 8 m S of data logger
Bench Mark 2:						
Bench Mark 3:			0.987	99.706	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.483	98.210		
Other:	1.281	100.693			99.412	Nail in Base of Tree

Closing Error	-0.003	Average WL	98.210
WL Check	0.000	Transducer Elevation	

**General Notes:**  
River is open, only thin sheet of ice present downstream.

Field Personnel:	DW, SG	Trip Date:	12-Feb-12
Data Entry Personnel:	SG	Date:	16-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date:

April 21, 2012



## Flow Measurement:

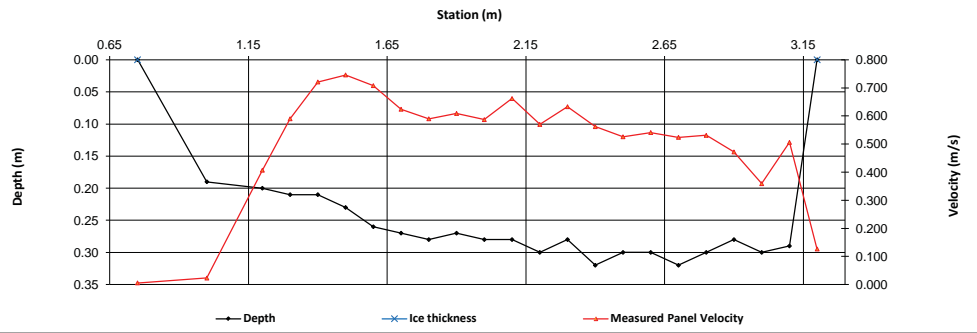
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	0.75	0.00	0.00	0.000	0.000	0.000	1.0	0.75	0.88	0.13	0.05	0.006	0.006	0.01	0.000	0%
1	1.00	0.19		0.023			1.0	0.88	1.10	0.23	0.19	0.023	0.023	0.04	0.001	0%
2	1.20	0.20		0.407			1.0	1.10	1.25	0.15	0.20	0.407	0.407	0.03	0.012	4%
3	1.30	0.21		0.590			1.0	1.25	1.35	0.10	0.21	0.590	0.590	0.02	0.012	4%
4	1.40	0.21		0.721			1.0	1.35	1.45	0.10	0.21	0.721	0.721	0.02	0.015	5%
5	1.50	0.23		0.746			1.0	1.45	1.55	0.10	0.23	0.746	0.746	0.02	0.017	5%
6	1.60	0.26		0.708			1.0	1.55	1.65	0.10	0.26	0.708	0.708	0.03	0.018	6%
7	1.70	0.27		0.624			1.0	1.65	1.75	0.10	0.27	0.624	0.624	0.03	0.017	5%
8	1.80	0.28		0.590			1.0	1.75	1.85	0.10	0.28	0.590	0.590	0.03	0.017	5%
9	1.90	0.27		0.609			1.0	1.85	1.95	0.10	0.27	0.609	0.609	0.03	0.016	5%
10	2.00	0.28		0.587			1.0	1.95	2.05	0.10	0.28	0.587	0.587	0.03	0.016	5%
11	2.10	0.28		0.662			1.0	2.05	2.15	0.10	0.28	0.662	0.662	0.03	0.019	6%
12	2.20	0.30		0.570			1.0	2.15	2.25	0.10	0.30	0.570	0.570	0.03	0.017	5%
13	2.30	0.28		0.633			1.0	2.25	2.35	0.10	0.28	0.633	0.633	0.03	0.018	6%
14	2.40	0.32		0.562			1.0	2.35	2.45	0.10	0.32	0.562	0.562	0.03	0.018	6%
15	2.50	0.30		0.526			1.0	2.45	2.55	0.10	0.30	0.526	0.526	0.03	0.016	5%
16	2.60	0.30		0.541			1.0	2.55	2.65	0.10	0.30	0.541	0.541	0.03	0.016	5%
17	2.70	0.32		0.524			1.0	2.65	2.75	0.10	0.32	0.524	0.524	0.03	0.017	5%
18	2.80	0.30		0.531			1.0	2.75	2.85	0.10	0.30	0.531	0.531	0.03	0.016	5%
19	2.90	0.28		0.472			1.0	2.85	2.95	0.10	0.28	0.472	0.472	0.03	0.013	4%
20	3.00	0.30		0.359			1.0	2.95	3.05	0.10	0.30	0.359	0.359	0.03	0.011	3%
21	3.10	0.29		0.506			1.0	3.05	3.15	0.10	0.29	0.506	0.506	0.03	0.015	5%
RB	3.20	0.00	0.00	0.000	0.000	0.000	1.0	3.15	3.20	0.05	0.07	0.127	0.127	0.00	0.000	0%
<b>Total Flow</b>														<b>0.318</b>		

Measurement Details:	
Start Time (MST):	12:45
End Time (MST):	14:16
Equipment:	ADV
Method:	Wading
River Condition:	open, low
Quality/Error (see reverse):	Excellent
Weather:	overcast, 0 deg.

Flow characteristics:	
Total Flow:	0.318 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.61 (m <sup>2</sup> )
Wetted Width:	2.45 (m)
Hydraulic Depth:	0.249 (m)
Mean Velocity:	0.521 (m/s)
Froude Number:	0.333

Logger Details:		
	Before	After
Transducer Reading (m):	0.331	
Water (°C):	1.7	
Battery (Main):	14.5	
Datalogger Clock:	15:12	
Laptop Clock:	15:12	
Dessicant:	replaced	
Logger# (if Δ):	18168	
PT# (if Δ):	298681	

Datalogger / Station Notes:	
Installed CR800	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.457	100.585		100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:						
Bench Mark 3:			0.875	99.710	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.306	98.279		
Other:			1.163	99.422	99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.449	100.129	100.128	T-Post 8 m S of data logger
Bench Mark 2:						
Bench Mark 3:			0.868	99.710	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.298	98.280		
Other:	1.156	100.578			99.412	Nail in Base of Tree

Closing Error	-0.001	Average WL	98.280
WL Check	0.001	Transducer Elevation	97.949

**General Notes:**  
 TSS @ 2 m  
 Logger tree is showing deterioration, station should be moved to a 2" mast

Field Personnel:		Trip Date:	
TR, SG		21-Apr-12	
Data Entry Personnel:	CJ	Date:	30-Apr-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date:

June 19, 2012



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	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.60	0.10	0.08	0.111	0.111	0.01	0.001	0%
1	0.70	0.30		0.443			1.0	0.60	0.78	0.18	0.30	0.443	0.443	0.05	0.023	6%
2	0.85	0.32		0.504			1.0	0.78	0.89	0.11	0.32	0.504	0.504	0.04	0.018	5%
3	0.93	0.32		0.610			1.0	0.89	0.96	0.08	0.32	0.610	0.610	0.02	0.015	4%
4	1.00	0.34		0.644			1.0	0.96	1.04	0.08	0.34	0.644	0.644	0.03	0.016	5%
5	1.08	0.30		0.610			1.0	1.04	1.11	0.07	0.30	0.610	0.610	0.02	0.014	4%
6	1.15	0.32		0.606			1.0	1.11	1.23	0.11	0.32	0.606	0.606	0.04	0.022	6%
7	1.30	0.31		0.608			1.0	1.23	1.38	0.15	0.31	0.608	0.608	0.05	0.028	8%
8	1.45	0.35		0.617			1.0	1.38	1.53	0.15	0.35	0.617	0.617	0.05	0.032	9%
9	1.60	0.30		0.661			1.0	1.53	1.68	0.15	0.30	0.661	0.661	0.05	0.030	8%
10	1.75	0.32		0.639			1.0	1.68	1.83	0.15	0.32	0.639	0.639	0.05	0.031	8%
11	1.90	0.30		0.599			1.0	1.83	1.98	0.15	0.30	0.599	0.599	0.05	0.027	7%
12	2.05	0.27		0.572			1.0	1.98	2.13	0.15	0.27	0.572	0.572	0.04	0.023	6%
13	2.20	0.27		0.572			1.0	2.13	2.24	0.11	0.27	0.572	0.572	0.03	0.017	5%
14	2.28	0.24		0.703			1.0	2.24	2.31	0.08	0.24	0.703	0.703	0.02	0.013	3%
15	2.35	0.24		0.681			1.0	2.31	2.39	0.08	0.24	0.681	0.681	0.02	0.012	3%
16	2.43	0.20		0.701			1.0	2.39	2.46	0.07	0.20	0.701	0.701	0.01	0.011	3%
17	2.50	0.27		0.606			1.0	2.46	2.58	0.11	0.27	0.606	0.606	0.03	0.018	5%
18	2.65	0.26		0.333			1.0	2.58	2.73	0.15	0.26	0.333	0.333	0.04	0.013	4%
19	2.80	0.26		0.003			1.0	2.73	2.88	0.15	0.26	0.003	0.003	0.04	0.000	0%
20	2.95	0.20		-0.017			1.0	2.88	3.03	0.15	0.20	-0.017	-0.017	0.03	-0.001	0%
21	3.10	0.18		0.008			1.0	3.03	3.20	0.18	0.18	0.008	0.008	0.03	0.000	0%
LB	3.30	0.00	0.00	0.000	0.000	0.000	1.0	3.20	3.30	0.10	0.05	0.002	0.002	0.00	0.000	0%
<b>Total Flow</b>														<b>0.364</b>		

**Measurement Details:**

Start Time (MST):	8:53
End Time (MST):	12:00
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Quality/Error (see reverse):	Excellent
Weather:	Rain, 13 deg.

**Flow characteristics:**

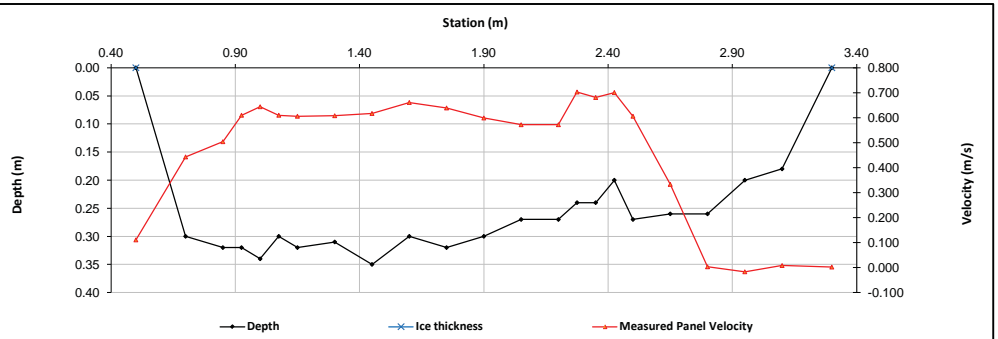
Total Flow:	0.364	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Excellent	
Cross Section Area:	0.74	(m <sup>2</sup> )
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.263	(m)
Mean Velocity:	0.494	(m/s)
Froude Number:	0.307	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.361	0.36
Water (°C):	12.4	12.3
Battery (Main):	13.04	12.77
Datalogger Clock:	8:54	9:36
Laptop Clock:	7:54	9:36
Dessicant:	Replaced	-
Logger# (if Δ):	18168	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

Reset logger clock  
 Installed modem, # 1212684171, and antenna (RSSI - 96)



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.632	100.760		100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:			0.778	99.982	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.035	99.725	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.434	98.326		
Other:			1.347	99.413	99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.672	100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:			0.818	99.982	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:	1.075	100.800		99.725	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.476	98.324		
Other:			1.388	99.412	99.412	Nail in Base of Tree
<b>Closing Error</b>						
			0.000	<b>Average WL</b>		98.325
<b>WL Check</b>			0.002	<b>Transducer Elevation</b>		97.964

**General Notes:**

TSS sampled @ 2.0 m

**Field Personnel:**

TR & GB	Trip Date:	19-Jun-12
TR	Date:	22-Jun-12
CJ	Date:	26-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date:

August 2, 2012



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	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	0.35	0.00	0.00	0.000	0.000	0.000	1.0	0.35	0.43	0.08	0.06	0.018	0.018	0.00	0.000	0%							
1	0.50	0.25		0.070			1.0	0.43	0.58	0.15	0.25	0.070	0.070	0.04	0.003	0%							
2	0.65	0.26		0.700			1.0	0.58	0.73	0.15	0.26	0.700	0.700	0.04	0.027	3%							
3	0.80	0.49		0.950			1.0	0.73	0.88	0.15	0.49	0.950	0.950	0.07	0.070	7%							
4	0.95	0.48		0.870			1.0	0.88	1.03	0.15	0.48	0.870	0.870	0.07	0.063	6%							
5	1.10	0.49		0.950			1.0	1.03	1.18	0.15	0.49	0.950	0.950	0.07	0.070	7%							
6	1.25	0.46		0.870			1.0	1.18	1.33	0.15	0.46	0.870	0.870	0.07	0.060	6%							
7	1.40	0.45		0.950			1.0	1.33	1.48	0.15	0.45	0.950	0.950	0.07	0.064	7%							
8	1.55	0.46		1.020			1.0	1.48	1.63	0.15	0.46	1.020	1.020	0.07	0.070	7%							
9	1.70	0.44		0.990			1.0	1.63	1.78	0.15	0.44	0.990	0.990	0.07	0.065	7%							
10	1.85	0.44		0.880			1.0	1.78	1.93	0.15	0.44	0.880	0.880	0.07	0.058	6%							
11	2.00	0.47		0.890			1.0	1.93	2.08	0.15	0.47	0.890	0.890	0.07	0.063	6%							
12	2.15	0.46		0.930			1.0	2.08	2.23	0.15	0.46	0.930	0.930	0.07	0.064	7%							
13	2.30	0.46		0.930			1.0	2.23	2.38	0.15	0.46	0.930	0.930	0.07	0.064	7%							
14	2.45	0.39		0.930			1.0	2.38	2.53	0.15	0.39	0.930	0.930	0.06	0.054	6%							
15	2.60	0.43		0.890			1.0	2.53	2.68	0.15	0.43	0.890	0.890	0.06	0.057	6%							
16	2.75	0.37		0.780			1.0	2.68	2.83	0.15	0.37	0.780	0.780	0.06	0.043	4%							
17	2.90	0.38		0.720			1.0	2.83	2.98	0.15	0.38	0.720	0.720	0.06	0.041	4%							
18	3.05	0.39		0.510			1.0	2.98	3.13	0.15	0.39	0.510	0.510	0.06	0.030	3%							
19	3.20	0.29		0.000			1.0	3.13	3.28	0.15	0.29	0.000	0.000	0.04	0.000	0%							
20	3.35	0.28		0.180			1.0	3.28	3.43	0.15	0.28	0.180	0.180	0.04	0.008	1%							
21	3.50	0.06		0.070			1.0	3.43	3.58	0.15	0.06	0.070	0.070	0.01	0.001	0%							
LB	3.65	0.00	0.00	0.00	0.00	0.00	1.0	3.58	3.65	0.07	0.02	0.018	0.018	0.00	0.000	0%							
<b>Total Flow</b>														<b>0.976</b>									

**Measurement Details:**

Start Time (MST):	8:43
End Time (MST):	10:20
Equipment:	ADC
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	overcast, calm, 17 deg.

**Flow characteristics:**

Total Flow:	<b>0.976</b>	(m <sup>3</sup> /s)
Perceived Measurement Quality:	<b>Excellent</b>	
Cross Section Area:	<b>1.24</b>	(m <sup>2</sup> )
Wetted Width:	<b>3.30</b>	(m)
Hydraulic Depth:	<b>0.374</b>	(m)
Mean Velocity:	<b>0.790</b>	(m/s)
Froude Number:	<b>0.412</b>	

**Logger Details:**

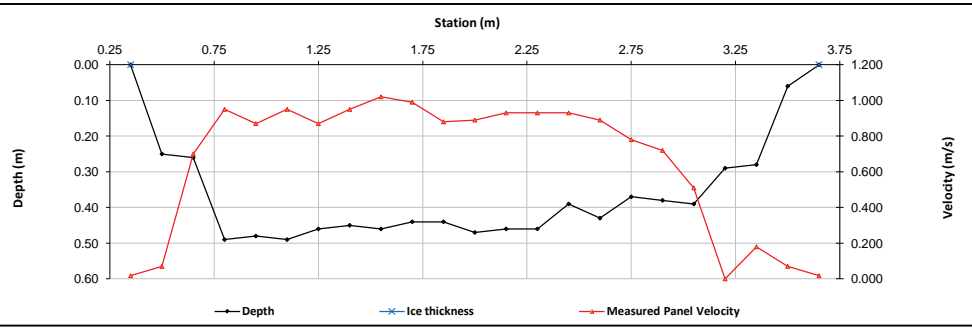
	Before	After
Transducer Reading (m):	0.719	
Water (°C):	15.3	
Battery (Main):	12.6	
Datalogger Clock:	8:46	
Laptop Clock:	8:46	
Dessicant:	replaced	
Logger# (if Δ):	18168	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

Switched modem wiring to SW12V input on data logger to avoid battery drainage.  
 Changed battery

**General Notes:**

Recent beaver dam activity DS  
 TSS sampled @ 2 m  
 ADV discharge measured as 0.933 m<sup>3</sup>/s



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.723	100.851		100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:			0.868	99.983	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.125	99.726	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.417	98.434		
Other:			1.441	99.410	99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.709	100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:	0.854	100.837		99.983	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.112	99.725	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.405	98.432		
Other:			1.426	99.411	99.412	Nail in Base of Tree

Closing Error	0.000	Average WL	98.433
WL Check	0.002	Transducer Elevation	97.714

**Field Personnel:**

SM, TR	Trip Date:	2-Aug-12
CJ	Date:	3-Oct-12
MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: September 11, 2012



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
LB	3.60	0.00	0.00	0.000	0.000	0.000	1.0	3.60	3.80	0.20	0.26	0.048	0.048	0.05	0.002	0%
1	4.00	1.02		0.161	0.220		1.0	3.80	4.15	0.35	1.02	0.191	0.191	0.36	0.068	2%
2	4.30	1.11		0.394	0.148		1.0	4.15	4.45	0.30	1.11	0.271	0.271	0.33	0.090	3%
3	4.60	1.16		0.459	0.287		1.0	4.45	4.75	0.30	1.16	0.373	0.373	0.35	0.130	4%
4	4.90	1.18		0.382	0.507		1.0	4.75	5.05	0.30	1.18	0.445	0.445	0.35	0.157	4%
5	5.20	1.21		0.420	0.449		1.0	5.05	5.35	0.30	1.21	0.435	0.435	0.36	0.158	4%
6	5.50	1.24		0.595	0.614		1.0	5.35	5.65	0.30	1.24	0.605	0.605	0.37	0.225	6%
7	5.80	1.22		0.628	0.628		1.0	5.65	5.95	0.30	1.22	0.628	0.628	0.37	0.230	6%
8	6.10	1.26		0.462	0.751		1.0	5.95	6.25	0.30	1.26	0.607	0.607	0.38	0.229	6%
9	6.40	1.25		0.470	0.720		1.0	6.25	6.55	0.30	1.25	0.595	0.595	0.38	0.223	6%
10	6.70	1.27		0.717	0.546		1.0	6.55	6.85	0.30	1.27	0.632	0.632	0.38	0.241	7%
11	7.00	1.24		0.689	0.715		1.0	6.85	7.15	0.30	1.24	0.702	0.702	0.37	0.261	7%
12	7.30	1.27		0.541	0.760		1.0	7.15	7.45	0.30	1.27	0.651	0.651	0.38	0.248	7%
13	7.60	1.26		0.538	0.692		1.0	7.45	7.75	0.30	1.26	0.615	0.615	0.38	0.232	7%
14	7.90	1.26		0.575	0.576		1.0	7.75	8.05	0.30	1.26	0.576	0.576	0.38	0.218	6%
15	8.20	1.28		0.325	0.609		1.0	8.05	8.45	0.40	1.28	0.467	0.467	0.51	0.239	7%
16	8.70	1.12		0.354	0.456		1.0	8.45	8.95	0.50	1.12	0.405	0.405	0.56	0.227	6%
17	9.20	1.16		0.276	0.420		1.0	8.95	9.45	0.50	1.16	0.348	0.348	0.58	0.202	6%
18	9.70	1.07		0.142	0.357		1.0	9.45	9.95	0.50	1.07	0.250	0.250	0.54	0.133	4%
19	10.20	0.96		0.110	0.062		1.0	9.95	10.45	0.50	0.96	0.086	0.086	0.48	0.041	1%
20	10.70	0.85		0.030	0.043		1.0	10.45	10.85	0.40	0.85	0.037	0.037	0.34	0.012	0%
RB	11.00	0.00	0.00	0.000	0.000	0.000	1.0	10.85	11.00	0.15	0.21	0.009	0.009	0.03	0.000	0%

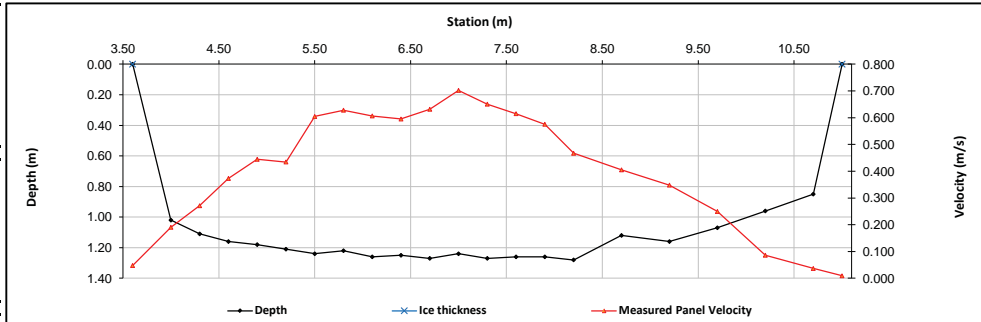
**Total Flow 3.57**

Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	5 deg, heavy rain

Flow characteristics:	
Total Flow:	3.57 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	8.23 (m <sup>2</sup> )
Wetted Width:	7.40 (m)
Hydraulic Depth:	1.112 (m)
Mean Velocity:	0.434 (m/s)
Froude Number:	0.131

Logger Details:		
	Before	After
Transducer Reading (m):	1.286	
Water (°C):	10.7	
Battery (Main):	12.8	
Datalogger Clock:	8:14	
Laptop Clock:	8:14	
Dessicant:	replaced	
Logger# (if Δ):	18168	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 TBRG not working. cable was submerged in flood water.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.795	100.923		100.128	100.128	T-Post 8 m S of data logger
Bench Mark 2:			0.941	99.982	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.197	99.726	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			1.787	99.136		
Other:					99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.784	100.127	100.128	T-Post 8 m S of data logger
Bench Mark 2:	0.929	100.911		99.982	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.186	99.725	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			1.777	99.134		
Other:					99.412	Nail in Base of Tree

Closing Error	0.001	Average WL	99.135
WL Check	0.002	Transducer Elevation	97.849

**General Notes:**

Field Personnel:	SM, DW	Trip Date:	11-Sep-12
Data Entry Personnel:	DW (Field)	Date:	11-Sep-12
Data Check Personnel:	CJ	Date:	10-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date:

October 20, 2012



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	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	1.60	0.00	0.00	0.000	0.000	0.000	1.0	1.60	1.80	0.20	0.12	0.045	0.045	0.02	0.001	0%							
1	2.00	0.49		0.181			1.0	1.80	2.15	0.35	0.49	0.181	0.181	0.17	0.031	4%							
2	2.30	0.55		0.270			1.0	2.15	2.45	0.30	0.55	0.270	0.270	0.17	0.045	6%							
3	2.60	0.58		0.290			1.0	2.45	2.75	0.30	0.58	0.290	0.290	0.17	0.050	7%							
4	2.90	0.60		0.192			1.0	2.75	3.05	0.30	0.60	0.192	0.192	0.18	0.035	5%							
5	3.20	0.65		0.205			1.0	3.05	3.35	0.30	0.65	0.205	0.205	0.20	0.040	5%							
6	3.50	0.67		0.355			1.0	3.35	3.65	0.30	0.67	0.355	0.355	0.20	0.071	9%							
7	3.80	0.70		0.328			1.0	3.65	3.95	0.30	0.70	0.328	0.328	0.21	0.069	9%							
8	4.10	0.72		0.364			1.0	3.95	4.25	0.30	0.72	0.364	0.364	0.22	0.079	10%							
9	4.40	0.73		0.290			1.0	4.25	4.55	0.30	0.73	0.290	0.290	0.22	0.064	8%							
10	4.70	0.72		0.236			1.0	4.55	4.85	0.30	0.72	0.236	0.236	0.22	0.051	7%							
11	5.00	0.69		0.233			1.0	4.85	5.15	0.30	0.69	0.233	0.233	0.21	0.048	6%							
12	5.30	0.67		0.185			1.0	5.15	5.45	0.30	0.67	0.185	0.185	0.20	0.037	5%							
13	5.60	0.62		0.126			1.0	5.45	5.75	0.30	0.62	0.126	0.126	0.19	0.023	3%							
14	5.90	0.59		0.124			1.0	5.75	6.05	0.30	0.59	0.124	0.124	0.18	0.022	3%							
15	6.20	0.58		0.086			1.0	6.05	6.35	0.30	0.58	0.086	0.086	0.17	0.015	2%							
16	6.50	0.52		0.097			1.0	6.35	6.65	0.30	0.52	0.097	0.097	0.16	0.015	2%							
17	6.80	0.40		0.138			1.0	6.65	6.95	0.30	0.40	0.138	0.138	0.12	0.017	2%							
18	7.10	0.30		0.134			1.0	6.95	7.25	0.30	0.30	0.134	0.134	0.09	0.012	2%							
19	7.40	0.21		0.148			1.0	7.25	7.55	0.30	0.21	0.148	0.148	0.06	0.009	1%							
20	7.70	0.18		0.181			1.0	7.55	7.85	0.30	0.18	0.181	0.181	0.05	0.010	1%							
21	8.00	0.14		0.172			1.0	7.85	8.20	0.35	0.14	0.172	0.172	0.05	0.008	1%							
LB	8.40	0.00	0.00	0.00	0.00	0.00	1.0	8.20	8.40	0.20	0.04	0.043	0.043	0.01	0.000	0%							
<b>Total Flow</b>														<b>0.752</b>									

**Measurement Details:**

Start Time (MST):	13:10
End Time (MST):	15:00
Equipment:	ADV
Method:	Wading
River Condition:	Damed around station
Quality/Error (see reverse):	Fair
Weather:	snowing, -3 deg.

**Flow characteristics:**

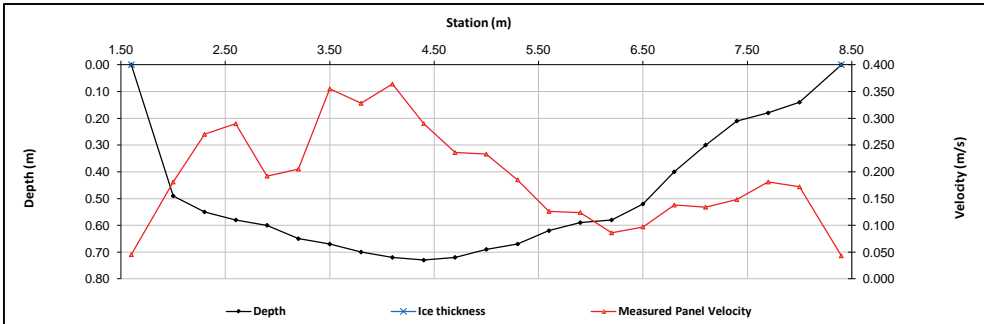
Total Flow:	0.752	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	3.46	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.508	(m)
Mean Velocity:	0.218	(m/s)
Froude Number:	0.097	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.752	0.445
Water (°C):	2.6	2.6
Battery (Main):	12.7	12.7
Datalogger Clock:	1:14	2:18
Laptop Clock:	1:14	2:17
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

PT was caught on a log, it was freed and repositioned.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.366	100.126	100.128	T-Post 8 m S of data logger
Bench Mark 2:			1.508	99.984	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:	1.766	101.492		99.726	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			3.009	98.483		
Other:					99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			1.352	100.129	100.128	T-Post 8 m S of data logger
Bench Mark 2:	1.498	101.482		99.984	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:	1.754	101.480		99.726	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.996	98.485		
Other:					99.412	Nail in Base of Tree
Closing Error	0.000				Average WL	98.484
WL Check	0.002				Transducer Elevation	97.732

**General Notes:**

Beaver dam build under bridge and dam downstream was rebuilt. Both were removed.

Measurement quality is fair, due to the dams being removed 30 minutes prior to measurement.

**Field Personnel:**

DW, TR	Trip Date:	20-Oct-12
DW	Date:	20-Oct-12
TR	Date:	14-Nov-12
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:

December 12, 2012



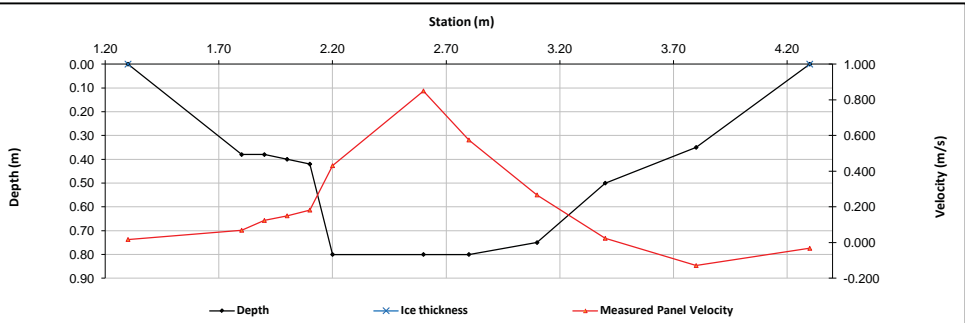
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.30	0.00	0.00	0.000	0.000	0.000	1.0	1.30	1.55	0.25	0.10	0.017	0.017	0.02	0.000	0%
1	1.80	0.38		0.069			1.0	1.55	1.85	0.30	0.38	0.069	0.069	0.11	0.008	2%
2	1.90	0.38		0.124			1.0	1.85	1.95	0.10	0.38	0.124	0.124	0.04	0.005	1%
3	2.00	0.40		0.150			1.0	1.95	2.05	0.10	0.40	0.150	0.150	0.04	0.006	1%
4	2.10	0.42		0.182			1.0	2.05	2.15	0.10	0.42	0.182	0.182	0.04	0.008	2%
5	2.20	0.80		0.431			1.0	2.15	2.40	0.25	0.80	0.431	0.431	0.20	0.086	18%
6	2.60	0.80		0.850			1.0	2.40	2.70	0.30	0.80	0.850	0.850	0.24	0.204	43%
7	2.80	0.80		0.575			1.0	2.70	2.95	0.25	0.80	0.575	0.575	0.20	0.115	24%
8	3.10	0.75		0.267			1.0	2.95	3.25	0.30	0.75	0.267	0.267	0.23	0.060	13%
9	3.40	0.50		0.024			1.0	3.25	3.60	0.35	0.50	0.024	0.024	0.18	0.004	1%
10	3.80	0.35		-0.129			1.0	3.60	4.05	0.45	0.35	-0.129	-0.129	0.16	-0.020	-4%
LB	4.30	0.00	0.00	0.00	0.00	0.00	1.0	4.05	4.30	0.25	0.09	-0.032	-0.032	0.02	-0.001	0%
<b>Total Flow</b>														<b>0.475</b>		

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	15:15
Equipment:	ADV
Method:	Wading
River Condition:	Partially Frozen
Quality/Error (see reverse):	Poor
Weather:	P. Cloudy, -25 deg.

Flow characteristics:	
Total Flow:	0.475 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	1.48 (m <sup>2</sup> )
Wetted Width:	3.00 (m)
Hydraulic Depth:	0.492 (m)
Mean Velocity:	0.322 (m/s)
Froude Number:	0.146

Logger Details:		
	Before	After
Transducer Reading (m):	0.246	
Water (°C):	0.4	
Battery (Main):	14.7	
Datalogger Clock:	14:11	
Laptop Clock:	14:11	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
Winterized and disconnected TBRG	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.938	100.125	100.128	T-Post 8 m S of data logger
Bench Mark 2:			1.082	99.981	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:	1.337	101.063		99.726	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.773	98.290		
Other:					99.412	Nail in Base of Tree
<b>Setup #2</b>						
Bench Mark 1:			0.866	100.123	100.128	T-Post 8 m S of data logger
Bench Mark 2:	1.008	100.989		99.981	99.982	3/4" Pipe 3 m W of data logger
Bench Mark 3:			1.265	99.724	99.726	3/4" Pipe 5 m NW of data logger
Ice/PT:						
Water Level:			2.703	98.286		
Other:					99.412	Nail in Base of Tree
Closing Error	0.002	Average WL		98.288		
WL Check	0.004	Transducer Elevation		98.042		

General Notes:	
Stream open with some patches of thin ice. A few measurements were taken under bridge by reaching wading rod out from shore, poor quality.	

<b>Field Personnel:</b>	TR and CJ	<b>Trip Date:</b>	12-Dec-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	12-Dec-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	18-Dec-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881

UTM Location: 490252 E, 6254511 N

Site Visit Date:

February 12, 2012



## 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)	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	0.04	0.023	0.020	0.01	0.000	0%
1	4.40	0.61	0.45	0.090			0.9	4.20	4.48	0.27	0.16	0.090	0.081	0.04	0.004	3%
2	4.55	0.61	0.45	0.070			0.9	4.48	4.68	0.20	0.16	0.070	0.063	0.03	0.002	2%
3	4.80	0.65	0.40	0.190			0.9	4.68	4.88	0.20	0.25	0.190	0.171	0.05	0.009	7%
4	4.95	0.66	0.40	0.150			0.9	4.88	5.05	0.18	0.26	0.150	0.135	0.05	0.006	5%
5	5.15	0.65	0.39	0.180			0.9	5.05	5.23	0.17	0.26	0.180	0.162	0.05	0.007	6%
6	5.30	0.64	0.39	0.160			0.9	5.23	5.45	0.23	0.25	0.160	0.144	0.06	0.008	7%
7	5.60	0.67	0.40	0.160			0.9	5.45	5.68	0.23	0.27	0.160	0.144	0.06	0.009	7%
8	5.75	0.67	0.40	0.190			0.9	5.68	5.88	0.20	0.27	0.190	0.171	0.05	0.009	8%
9	6.00	0.69	0.38	0.170			0.9	5.88	6.08	0.20	0.31	0.170	0.153	0.06	0.009	8%
10	6.15	0.69	0.38	0.180			0.9	6.08	6.25	0.18	0.31	0.180	0.162	0.05	0.009	7%
11	6.35	0.70	0.39	0.060			0.9	6.25	6.43	0.18	0.31	0.060	0.054	0.05	0.003	2%
12	6.50	0.70	0.39	0.060			0.9	6.43	6.58	0.15	0.31	0.060	0.054	0.05	0.003	2%
13	6.65	0.71	0.40	0.160			0.9	6.58	6.73	0.15	0.31	0.160	0.144	0.05	0.007	6%
14	6.80	0.70	0.40	0.140			0.9	6.73	6.85	0.13	0.30	0.140	0.126	0.04	0.005	4%
15	6.90	0.71	0.39	0.150			0.9	6.85	7.00	0.15	0.32	0.150	0.135	0.05	0.006	5%
16	7.10	0.70	0.39	0.150			0.9	7.00	7.18	0.18	0.31	0.150	0.135	0.05	0.007	6%
17	7.25	0.73	0.40	0.140			0.9	7.18	7.33	0.15	0.33	0.140	0.126	0.05	0.006	5%
18	7.40	0.74	0.40	0.120			0.9	7.33	7.60	0.27	0.34	0.120	0.108	0.09	0.010	8%
RB	7.80	0.00	0.00	0.000	0.000	0.000	1.0	7.60	7.80	0.20	0.09	0.030	0.030	0.02	0.001	0%

**Total Flow 0.120**

## Measurement Details:

Start Time (MST):	11:50
End Time (MST):	12:50
Equipment:	Marsh
Method:	Ice
River Condition:	Ice
Quality/Error (see reverse):	Good
Weather:	Sunny, 0 deg.

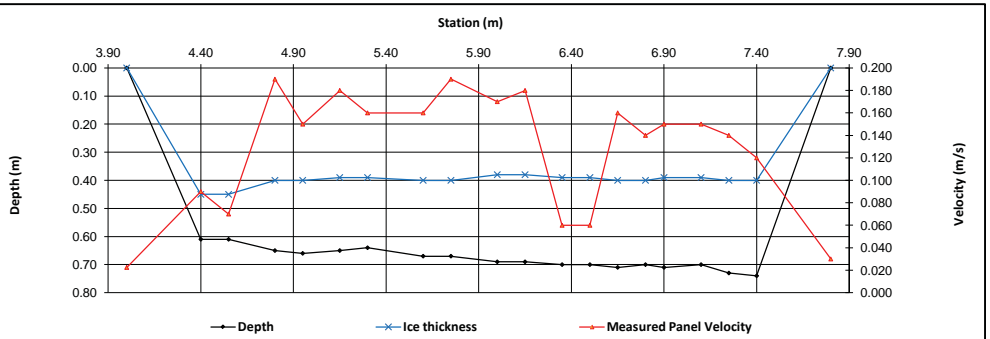
## Flow characteristics:

Total Flow:	0.120	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.96	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.252	(m)
Mean Velocity:	0.125	(m/s)
Froude Number:	0.079	

## Datalogger Details:

	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:	1.145	100.126		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:			3.037	97.089		
Water Level:			3.088	97.038		
Other:			2.186	97.940	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:			1.141	98.981	98.981	Rebar 3 m S of data logger
Ice/PT:			3.031	97.091		
Water Level:			3.082	97.040		
Other:	2.182	100.122		97.940	97.939	Bolt on bridge

Closing Error	0.000	Average WL	97.039
WL Check	0.002	Transducer Elevation	#VALUE!

## General Notes:

Field Personnel:	DW, SG	Trip Date:	12-Feb-12
Data Entry Personnel:	SG	Date:	16-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12



# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881

UTM Location: 490252 E, 6254511 N

Site Visit Date:

April 21, 2012



## Flow Measurement:

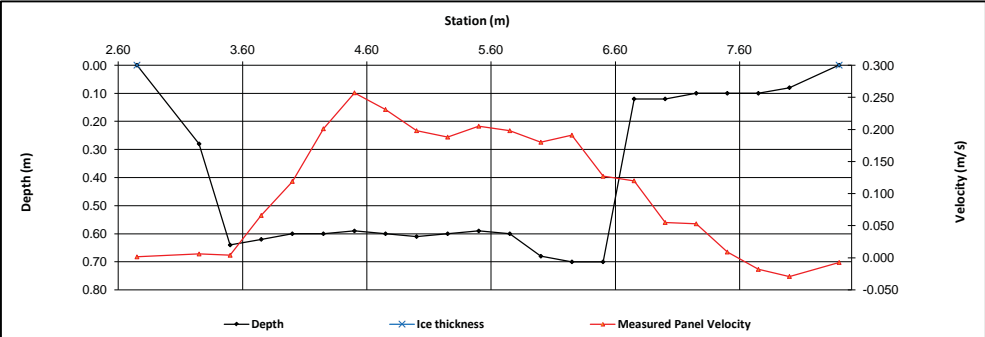
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	2.75	0.00	0.00	0.000	0.000	0.000	1.0	2.75	3.00	0.25	0.07	0.002	0.002	0.02	0.000	0%
1	3.25	0.28		0.006			1.0	3.00	3.38	0.38	0.28	0.006	0.006	0.11	0.001	0%
2	3.50	0.64		0.004			1.0	3.38	3.63	0.25	0.64	0.004	0.004	0.16	0.001	0%
3	3.75	0.62		0.066			1.0	3.63	3.88	0.25	0.62	0.066	0.066	0.16	0.010	3%
4	4.00	0.60		0.119			1.0	3.88	4.13	0.25	0.60	0.119	0.119	0.15	0.018	5%
5	4.25	0.60		0.201			1.0	4.13	4.38	0.25	0.60	0.201	0.201	0.15	0.030	9%
6	4.50	0.59		0.257			1.0	4.38	4.63	0.25	0.59	0.257	0.257	0.15	0.038	11%
7	4.75	0.60		0.231			1.0	4.63	4.88	0.25	0.60	0.231	0.231	0.15	0.035	10%
8	5.00	0.61		0.198			1.0	4.88	5.13	0.25	0.61	0.198	0.198	0.15	0.030	9%
9	5.25	0.60		0.188			1.0	5.13	5.38	0.25	0.60	0.188	0.188	0.15	0.028	8%
10	5.50	0.59		0.205			1.0	5.38	5.63	0.25	0.59	0.205	0.205	0.15	0.030	9%
11	5.75	0.60		0.198			1.0	5.63	5.88	0.25	0.60	0.198	0.198	0.15	0.030	9%
12	6.00	0.68		0.180			1.0	5.88	6.13	0.25	0.68	0.180	0.180	0.17	0.031	9%
13	6.25	0.70		0.191			1.0	6.13	6.38	0.25	0.70	0.191	0.191	0.18	0.033	10%
14	6.50	0.70		0.127			1.0	6.38	6.63	0.25	0.70	0.127	0.127	0.18	0.022	6%
15	6.75	0.12		0.120			1.0	6.63	6.88	0.25	0.12	0.120	0.120	0.03	0.004	1%
16	7.00	0.12		0.055			1.0	6.88	7.13	0.25	0.12	0.055	0.055	0.03	0.002	0%
17	7.25	0.10		0.053			1.0	7.13	7.38	0.25	0.10	0.053	0.053	0.03	0.001	0%
18	7.50	0.10		0.009			1.0	7.38	7.63	0.25	0.10	0.009	0.009	0.03	0.000	0%
19	7.75	0.10		-0.018			1.0	7.63	7.88	0.25	0.10	-0.018	-0.018	0.03	0.000	0%
20	8.00	0.08		-0.029			1.0	7.88	8.20	0.32	0.08	-0.029	-0.029	0.03	-0.001	0%
RB	8.40	0.00	0.00	0.000	0.000	0.000	1.0	8.20	8.40	0.20	0.02	-0.007	-0.007	0.00	0.000	0%
<b>Total Flow</b>															<b>0.342</b>	

Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	16:50
Equipment:	ADV
Method:	Wading
River Condition:	partially frozen
Quality/Error (see reverse):	good
Weather:	overcast, 10 deg.

Flow characteristics:		
Total Flow:	0.342	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	2.32	(m <sup>2</sup> )
Wetted Width:	5.65	(m)
Hydraulic Depth:	0.411	(m)
Mean Velocity:	0.148	(m/s)
Froude Number:	0.074	

Logger Details:		
	Before	After
Transducer Reading (m):	0.286	
Water (°C):	0.3	
Battery (Main):	12.73	
Datalogger Clock:	17:05	
Laptop Clock:	17:05	
Dessicant:	new	
Logger# (if Δ):	20961	
PT# (if Δ):	248958	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:	0.962	99.943		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.893	97.050		
Other:			2.005	97.938	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:			0.938	98.983	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.869	97.052		
Other:	1.983	99.921		97.938	97.939	Bolt on bridge

Closing Error	-0.002	Average WL	97.051
WL Check	0.002	Transducer Elevation	96.765

### General Notes:

Ice in channel at cross section  
Station needs stilling well for PT  
TSS sampled @ 5 m

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	21-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	30-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surrmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date:

June 19, 2012



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	0.80	0.00	0.00	0.000	0.000	0.000	1.0	0.80	0.90	0.10	0.07	0.001	0.001	0.01	0.000	0%
1	1.00	0.28		0.004			1.0	0.90	1.06	0.16	0.28	0.004	0.004	0.05	0.000	0%
2	1.13	0.28		0.774			1.0	1.06	1.19	0.13	0.28	0.774	0.774	0.04	0.027	4%
3	1.25	0.32		0.787			1.0	1.19	1.29	0.10	0.32	0.787	0.787	0.03	0.025	4%
4	1.33	0.26		0.923			1.0	1.29	1.41	0.13	0.26	0.923	0.923	0.03	0.030	4%
5	1.50	0.14		0.440			1.0	1.41	1.63	0.21	0.14	0.440	0.440	0.03	0.013	2%
6	1.75	0.40		0.566			1.0	1.63	1.88	0.25	0.40	0.566	0.566	0.10	0.057	8%
7	2.00	0.40		0.406			1.0	1.88	2.13	0.25	0.40	0.406	0.406	0.10	0.041	6%
8	2.25	0.39		0.294			1.0	2.13	2.38	0.25	0.39	0.294	0.294	0.10	0.029	4%
9	2.50	0.36		0.425			1.0	2.38	2.66	0.19	0.36	0.425	0.425	0.07	0.029	4%
10	2.63	0.36		0.726			1.0	2.56	2.69	0.13	0.36	0.726	0.726	0.05	0.033	5%
11	2.75	0.32		0.732			1.0	2.69	2.79	0.10	0.32	0.732	0.732	0.03	0.023	3%
12	2.83	0.30		0.456			1.0	2.79	2.91	0.13	0.30	0.456	0.456	0.04	0.017	2%
13	3.00	0.30		0.094			1.0	2.91	3.13	0.21	0.30	0.094	0.094	0.06	0.006	1%
14	3.25	0.38		0.482			1.0	3.13	3.38	0.25	0.38	0.482	0.482	0.10	0.046	7%
15	3.50	0.34		0.493			1.0	3.38	3.63	0.25	0.34	0.493	0.493	0.09	0.042	6%
16	3.75	0.36		0.236			1.0	3.63	3.88	0.25	0.36	0.236	0.236	0.09	0.021	3%
17	4.00	0.42		0.358			1.0	3.88	4.13	0.25	0.42	0.358	0.358	0.11	0.038	5%
18	4.25	0.44		0.691			1.0	4.13	4.38	0.25	0.44	0.691	0.691	0.11	0.076	11%
19	4.50	0.38		0.660			1.0	4.38	4.63	0.25	0.38	0.660	0.660	0.10	0.063	9%
20	4.75	0.37		0.440			1.0	4.63	4.88	0.25	0.37	0.440	0.440	0.09	0.041	6%
21	5.00	0.28		0.328			1.0	4.88	5.13	0.25	0.28	0.328	0.328	0.07	0.023	3%
22	5.25	0.15		0.239			1.0	5.13	5.38	0.25	0.15	0.239	0.239	0.04	0.009	1%
23	5.50	0.08		0.192			1.0	5.38	5.60	0.23	0.08	0.192	0.192	0.02	0.003	1%
RB	5.70	0.00	0.00	0.000	0.000	0.000	1.0	5.60	5.70	0.10	0.02	0.048	0.048	0.00	0.000	0%
<b>Total Flow</b>														<b>0.691</b>		

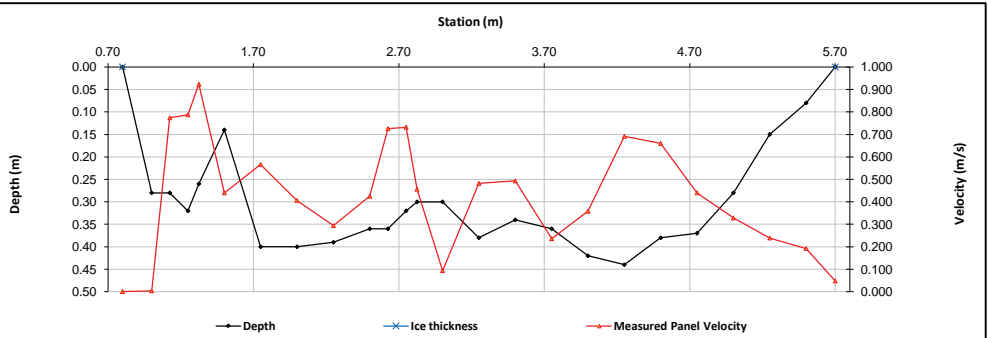
Measurement Details:	
Start Time (MST):	17:20
End Time (MST):	18:40
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	overcast, 12 deg.

Flow characteristics:	
Total Flow:	0.691 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Gross Section Area:	1.53 (m <sup>2</sup> )
Wetted Width:	4.90 (m)
Hydraulic Depth:	0.311 (m)
Mean Velocity:	0.453 (m/s)
Froude Number:	0.259

Logger Details:		
	Before	After
Transducer Reading (m):	0.338	0.338
Water (°C):	12.5	12.5
Battery (Main):	12.6	12.8
Datalogger Clock:	17:39	16:45
Laptop Clock:	16:39	16:45
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PTH (if Δ):	-	-

**Datalogger / Station Notes:**

Reset datalogger clock  
 Changed both batteries  
 Major drop in depth at the end of May, trend very messy possibly due to beaver dam break up.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:	0.812	99.793		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.939	96.854		
Other:			1.853	97.940	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:			0.771	98.980	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.902	96.849		
Other:	1.811	99.751		97.940	97.939	Bolt on bridge

Closing Error	0.001	Average WL	96.852
WL Check	0.005	Transducer Elevation	96.514

**General Notes:**

TSS sampled @ 3 m  
 2 bars of cell phone reception  
 Station needs 2 BMS  
 Site map needs revision, changes made on reverse of field sheet.

<b>Field Personnel:</b>	TR & GB	<b>Trip Date:</b>	19-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	22-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881

UTM Location: 490252 E, 6254511 N

Site Visit Date:

August 2, 2012



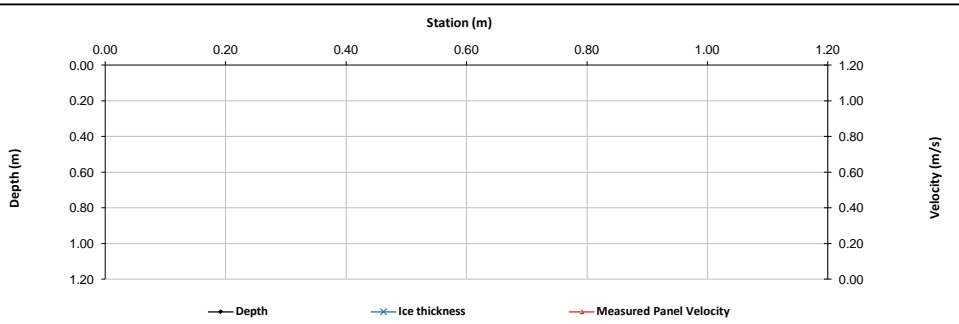
Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (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																					
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
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26																					
27																					
28																					
29																					
30																					
LB																					
<b>No Flow Measurement Conducted</b>																					
															<b>Total Flow</b>		-				

Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	11:40
Equipment:	-
Method:	Wading
River Condition:	high flow
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:	0.00	(m)
Hydraulic Depth:	#DIV/0!	(m)
Mean Velocity:	#VALUE!	(m/s)
Froude Number:	#VALUE!	

Logger Details:	Before	After
Transducer Reading (m):	1.022	
Water (°C):	17.2	
Battery (Main):	12.7	
Datalogger Clock:	11:05	
Laptop Clock:	11:05	
Dessicant:	replaced	
Logger# (if Δ):	20961	
PT# (if Δ):	-	

Datalogger / Station Notes:	
Installed 2BMs	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.953	99.118	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:			0.658	99.413	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:	1.090	100.071		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.548	97.523		
Other:			2.132	97.939	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:			0.939	99.118	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:	0.644	100.057		99.413	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			1.076	98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.535	97.522		
Other:			2.117	97.940	97.939	Bolt on bridge

Closing Error	0.000
WL Check	0.001

Average WL	97.523
Transducer Elevation	96.501

**General Notes:**  
Flow measurement not performed on this visit; ADC with top-set rod on fishcat will not work well, measurement will be performed same day as GRR1A trip.

Field Personnel:	SM, TR	Trip Date:	2-Aug-12
Data Entry Personnel:	CJ	Date:	3-Oct-12
Data Check Personnel:	MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date:

August 18, 2012



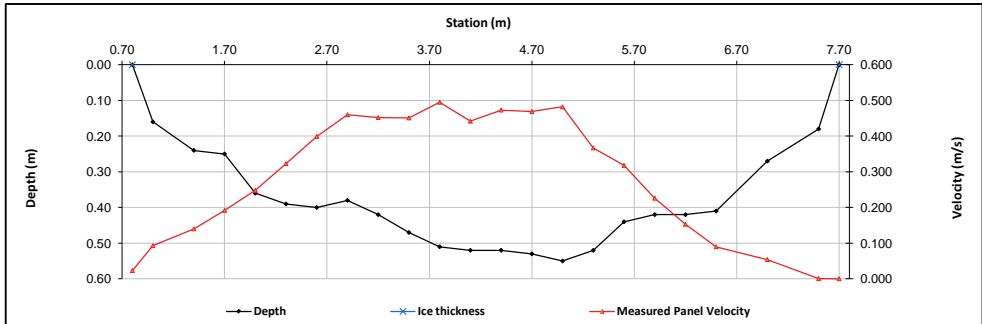
Flow Measurement:													Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	0.90	0.10	0.04	0.023	0.023	0.00	0.000	0%						
1	1.00	0.16		0.093			1.0	0.90	1.20	0.30	0.16	0.093	0.093	0.05	0.004	1%						
2	1.40	0.24		0.140			1.0	1.20	1.55	0.35	0.24	0.140	0.140	0.08	0.012	1%						
3	1.70	0.25		0.192			1.0	1.55	1.85	0.30	0.25	0.192	0.192	0.08	0.014	2%						
4	2.00	0.36		0.248			1.0	1.85	2.15	0.30	0.36	0.248	0.248	0.11	0.027	3%						
5	2.30	0.39		0.323			1.0	2.15	2.45	0.30	0.39	0.323	0.323	0.12	0.038	4%						
6	2.60	0.40		0.399			1.0	2.45	2.75	0.30	0.40	0.399	0.399	0.12	0.048	6%						
7	2.90	0.38		0.460			1.0	2.75	3.05	0.30	0.38	0.460	0.460	0.11	0.052	6%						
8	3.20	0.42		0.452			1.0	3.05	3.35	0.30	0.42	0.452	0.452	0.13	0.057	7%						
9	3.50	0.47		0.451			1.0	3.35	3.65	0.30	0.47	0.451	0.451	0.14	0.064	7%						
10	3.80	0.51		0.495			1.0	3.65	3.95	0.30	0.51	0.495	0.495	0.15	0.076	9%						
11	4.10	0.52		0.442			1.0	3.95	4.25	0.30	0.52	0.442	0.442	0.16	0.069	8%						
12	4.40	0.52		0.473			1.0	4.25	4.55	0.30	0.52	0.473	0.473	0.16	0.074	9%						
13	4.70	0.53		0.469			1.0	4.55	4.85	0.30	0.53	0.469	0.469	0.16	0.075	9%						
14	5.00	0.55		0.482			1.0	4.85	5.15	0.30	0.55	0.482	0.482	0.17	0.080	9%						
15	5.30	0.52		0.367			1.0	5.15	5.45	0.30	0.52	0.367	0.367	0.16	0.057	7%						
16	5.60	0.44		0.318			1.0	5.45	5.75	0.30	0.44	0.318	0.318	0.13	0.042	5%						
17	5.90	0.42		0.226			1.0	5.75	6.05	0.30	0.42	0.226	0.226	0.13	0.028	3%						
18	6.20	0.42		0.153			1.0	6.05	6.35	0.30	0.42	0.153	0.153	0.13	0.019	2%						
19	6.50	0.41		0.090			1.0	6.35	6.75	0.40	0.41	0.090	0.090	0.16	0.015	2%						
20	7.00	0.27		0.054			1.0	6.75	7.25	0.50	0.27	0.054	0.054	0.14	0.007	1%						
21	7.50	0.18		0.001			1.0	7.25	7.60	0.35	0.18	0.001	0.001	0.06	0.000	0%						
LB	7.70	0.00	0.00	0.00	0.00	0.00	1.0	7.60	7.70	0.10	0.05	0.000	0.000	0.00	0.000	0%						
<b>Total Flow</b>															<b>0.858</b>							

Measurement Details:	
Start Time (MST):	14:42
End Time (MST):	16:05
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	Excellent
Weather:	sunny, calm, 18 deg.

Flow characteristics:		
Total Flow:	0.858	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.63	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.382	(m)
Mean Velocity:	0.326	(m/s)
Froude Number:	0.169	

Logger Details:		
	Before	After
Transducer Reading (m):	0.375	
Water (°C):	15.1	
Battery (Main):	12.7	
Datalogger Clock:	2:46	
Laptop Clock:	2:45	
Dessicant:	good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
Installed omni antenna, RSSI-95. Modem phone #604-345-9493	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.093	99.118	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:			0.799	99.412	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:	1.230	100.211		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			3.323	96.888		
Other:			2.272	97.939	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:			1.081	99.117	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:	0.786	100.198		99.412	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			1.218	98.980	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			3.312	96.886		
Other:					97.939	Bolt on bridge
Closing Error	0.001	Average WL		96.887		
WL Check	0.002	Transducer Elevation		96.512		

General Notes:	
TSS sampled @ 5.0 m	

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, CJ	Date:	18-Aug-12
Data Check Personnel:	SM (Field)	Date:	18-Aug-12
	CJ	Date:	3-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: September 11, 2012



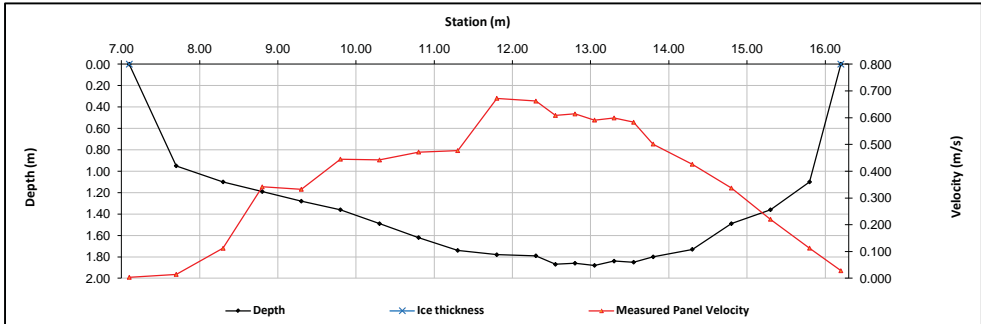
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	7.10	0.00	0.00	0.000	0.000	0.000	1.0	7.10	7.40	0.30	0.24	0.004	0.004	0.07	0.000	0%
1	7.70	0.95		0.004	0.025		1.0	7.40	8.00	0.60	0.95	0.015	0.015	0.57	0.008	0%
2	8.30	1.10		0.063	0.161		1.0	8.00	8.55	0.55	1.10	0.112	0.112	0.61	0.068	1%
3	8.80	1.19		0.276	0.407		1.0	8.55	9.05	0.50	1.19	0.342	0.342	0.60	0.203	4%
4	9.30	1.28		0.291	0.374		1.0	9.05	9.55	0.50	1.28	0.333	0.333	0.64	0.213	4%
5	9.80	1.36		0.359	0.531		1.0	9.55	10.05	0.50	1.36	0.445	0.445	0.68	0.303	5%
6	10.30	1.49		0.409	0.475		1.0	10.05	10.55	0.50	1.49	0.442	0.442	0.75	0.329	6%
7	10.80	1.62		0.415	0.528		1.0	10.55	11.05	0.50	1.62	0.472	0.472	0.81	0.382	7%
8	11.30	1.74		0.351	0.603		1.0	11.05	11.55	0.50	1.74	0.477	0.477	0.87	0.415	8%
9	11.80	1.78		0.624	0.721		1.0	11.55	12.05	0.50	1.78	0.673	0.673	0.89	0.599	11%
10	12.30	1.79		0.601	0.723		1.0	12.05	12.43	0.38	1.79	0.662	0.662	0.67	0.444	8%
11	12.55	1.87		0.579	0.638		1.0	12.43	12.68	0.25	1.87	0.609	0.609	0.47	0.284	5%
12	12.80	1.86		0.566	0.662		1.0	12.68	12.93	0.25	1.86	0.614	0.614	0.47	0.286	5%
13	13.05	1.88		0.552	0.630		1.0	12.93	13.18	0.25	1.88	0.591	0.591	0.47	0.278	5%
14	13.30	1.84		0.564	0.634		1.0	13.18	13.43	0.25	1.84	0.599	0.599	0.46	0.276	5%
15	13.55	1.85		0.579	0.587		1.0	13.43	13.68	0.25	1.85	0.583	0.583	0.46	0.270	5%
16	13.80	1.80		0.483	0.520		1.0	13.68	14.05	0.38	1.80	0.502	0.502	0.68	0.339	6%
17	14.30	1.73		0.424	0.428		1.0	14.05	14.55	0.50	1.73	0.426	0.426	0.87	0.368	7%
18	14.80	1.49		0.325	0.349		1.0	14.55	15.05	0.50	1.49	0.337	0.337	0.75	0.251	5%
19	15.30	1.36		0.189	0.252		1.0	15.05	15.55	0.50	1.36	0.221	0.221	0.68	0.150	3%
20	15.80	1.10		0.077	0.148		1.0	15.55	16.00	0.45	1.10	0.113	0.113	0.49	0.056	1%
RB	16.20	0.00	0.00	0.00	0.00	0.00	1.0	16.00	16.20	0.20	0.28	0.028	0.028	0.05	0.002	0%
<b>Total Flow</b>														<b>5.52</b>		

Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	17:00
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	rain, windy, 5 deg.

Flow characteristics:	
Total Flow:	5.52 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	12.99 (m <sup>2</sup> )
Wetted Width:	9.10 (m)
Hydraulic Depth:	1.427 (m)
Mean Velocity:	0.425 (m/s)
Froude Number:	0.114

Logger Details:		
	Before	After
Transducer Reading (m):	1.480	
Water (°C):	11.3	
Battery (Main):	12.4	
Datalogger Clock:	15:29	
Laptop Clock:	15:29	
Dessicant:	replaced	
Logger# (if Δ):	20961	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 Replaced batteries



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.074	99.117	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:	0.779	100.191		99.412	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			1.212	98.979	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.088	98.103		
Other:					97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:			1.063	99.116	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:			0.768	99.411	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:	1.200	100.179		98.979	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			2.076	98.103		
Other:					97.939	Bolt on bridge

Closing Error	0.001	Average WL	98.103
WL Check	0.000	Transducer Elevation	96.623

**General Notes:**  
 Note: when water depth was greater than 1.80 m, the depths were estimated.

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	11-Sep-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	10-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date:

October 12, 2012



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	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	0.60	0.20	0.05	0.054	0.054	0.01	0.001	0%
1	0.80	0.20		0.214			1.0	0.60	1.00	0.40	0.20	0.214	0.214	0.08	0.017	2%
2	1.20	0.34		0.215			1.0	1.00	1.40	0.40	0.34	0.215	0.215	0.14	0.029	3%
3	1.60	0.45		0.287			1.0	1.40	1.80	0.40	0.45	0.287	0.287	0.18	0.052	5%
4	2.00	0.48		0.343			1.0	1.80	2.15	0.35	0.48	0.343	0.343	0.17	0.058	6%
5	2.30	0.50		0.419			1.0	2.15	2.45	0.30	0.50	0.419	0.419	0.15	0.063	6%
6	2.60	0.55		0.483			1.0	2.45	2.75	0.30	0.55	0.483	0.483	0.17	0.080	8%
7	2.90	0.55		0.429			1.0	2.75	3.05	0.30	0.55	0.429	0.429	0.17	0.071	7%
8	3.20	0.58		0.415			1.0	3.05	3.35	0.30	0.58	0.415	0.415	0.17	0.072	7%
9	3.50	0.58		0.450			1.0	3.35	3.65	0.30	0.58	0.450	0.450	0.17	0.078	8%
10	3.80	0.63		0.448			1.0	3.65	3.95	0.30	0.63	0.448	0.448	0.19	0.085	9%
11	4.10	0.60		0.488			1.0	3.95	4.25	0.30	0.60	0.488	0.488	0.18	0.088	9%
12	4.40	0.57		0.463			1.0	4.25	4.55	0.30	0.57	0.463	0.463	0.17	0.079	8%
13	4.70	0.55		0.446			1.0	4.55	4.85	0.30	0.55	0.446	0.446	0.16	0.074	7%
14	5.00	0.56		0.325			1.0	4.85	5.15	0.30	0.56	0.325	0.325	0.17	0.055	6%
15	5.30	0.50		0.223			1.0	5.15	5.45	0.30	0.50	0.223	0.223	0.15	0.033	3%
16	5.60	0.42		0.186			1.0	5.45	5.75	0.30	0.42	0.186	0.186	0.13	0.023	2%
17	5.90	0.44		0.169			1.0	5.75	6.10	0.35	0.44	0.169	0.169	0.15	0.026	3%
18	6.30	0.23		0.090			1.0	6.10	6.50	0.40	0.23	0.090	0.090	0.09	0.008	1%
19	6.70	0.20		0.026			1.0	6.50	6.90	0.40	0.20	0.026	0.026	0.08	0.002	0%
20	7.10	0.15		-0.032			1.0	6.90	7.30	0.40	0.15	-0.032	-0.032	0.06	-0.002	0%
LB	7.50	0.00	0.00	0.000	0.000	0.000	1.0	7.30	7.50	0.20	0.04	-0.008	-0.008	0.01	0.000	0%

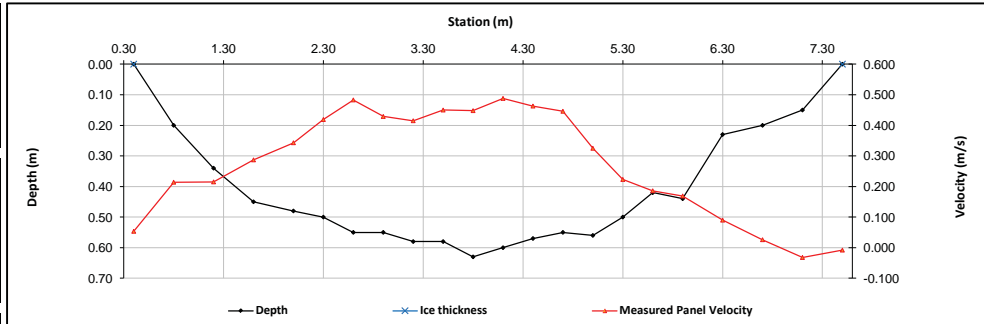
**Total Flow 0.991**

Measurement Details:	
Start Time (MST):	12:30
End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	overcast, -1 deg, light breeze

Flow characteristics:	
Total Flow:	0.991 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	2.94 (m <sup>2</sup> )
Wetted Width:	7.10 (m)
Hydraulic Depth:	0.415 (m)
Mean Velocity:	0.337 (m/s)
Froude Number:	0.167

Logger Details:		
Transducer Reading (m):	Before	After
	0.560	0.756
Water (°C):	1.8	1.4
Battery (Main):	12.2	12.53
Datalogger Clock:	12:37	-
Laptop Clock:	12:37	-
Dessicant:	replaced	-
Logger# (if Δ):	20961	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 Installed stilling well.  
 Installed BM Labels.  
 1 BM needs to be installed to replace rebar BM



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.055	99.119	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:			0.760	99.414	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:	1.193	100.174		98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			3.200	96.974		
Other:			2.233	97.941	97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:			1.046	99.119	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:	0.751	100.165		99.414	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			1.184	98.981	98.981	Rebar 3 m S of data logger
Ice/PT:						
Water Level:			3.190	96.975		
Other:			2.225	97.940	97.939	Bolt on bridge

Closing Error	0.000	Average WL	96.975
WL Check	0.001	Transducer Elevation	96.415

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	12-Oct-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	12-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881

UTM Location: 490252 E, 6254511 N

Site Visit Date:

December 12, 2012



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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25																
26																
27																
28																
29																
30																
LB																

No Flow Measurement Conducted

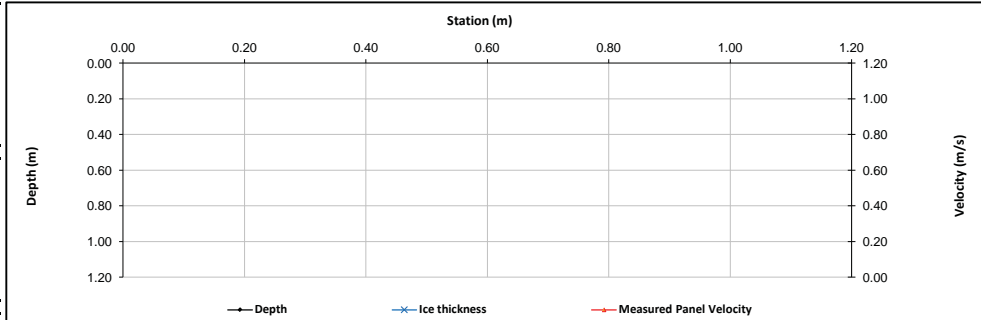
Total Flow

Measurement Details:	
Start Time (MST):	12:52
End Time (MST):	13:15
Equipment:	
Method:	
River Condition:	Ice Covered
Quality/Error (see reverse):	
Weather:	P. Cloudy, -25 deg.

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):	0.688	-
Water (°C):	1.0	-
Battery (Main):	11.8	13.0
Datalogger Clock:	12:55	-
Laptop Clock:	12:55	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
Replaced batteries	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.852	99.970		99.118	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:			0.557	99.413	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			0.989	98.981	98.981	Rebar 3 m S of data logger
Ice/PT:			2.918	97.052		
Water Level:			3.011	96.959		
Other:					97.939	Bolt on bridge
<b>Setup #2</b>						
Bench Mark 1:			0.837	99.119	99.118	3/4" Pipe 10 m S of data logger
Bench Mark 2:	0.543	99.956		99.413	99.412	3/4" Pipe 15 m S of data logger
Bench Mark 3:			0.976	98.980	98.981	Rebar 3 m S of data logger
Ice/PT:			2.905	97.051		
Water Level:			3.000	96.956		
Other:					97.939	Bolt on bridge

Closing Error	-0.001
WL Check	0.003

Average WL	96.958
Transducer Elevation	96.270

General Notes:	

<b>Field Personnel:</b>	TR AND CJ	Trip Date:	12-Dec-12
Data Entry Personnel:	CJ	Date:	12-Dec-12
Data Check Personnel:	TR	Date:	18-Dec-12
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:

January 9, 2012



## 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)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of Total Flow
R	3.50	0.00	0.00	0.000	0.000	0.000	0.9	3.50	3.78	0.28	0.15	0.000	0.000	0.04	0.000	0%
1	4.05	0.60	0.30	0.009			0.9	3.78	4.23	0.45	0.30	0.009	0.008	0.14	0.001	0%
2	4.40	0.70	0.30	0.007			0.9	4.23	4.60	0.38	0.40	0.007	0.006	0.15	0.001	0%
3	4.80	1.05	0.32	0.012			0.9	4.60	5.00	0.40	0.73	0.012	0.011	0.29	0.003	1%
4	5.20	1.20	0.32		0.010	-0.005	1.0	5.00	5.35	0.35	0.88	0.003	0.003	0.31	0.001	0%
5	5.50	1.25	0.32		0.006	-0.009	1.0	5.35	5.70	0.35	0.93	-0.002	-0.002	0.33	0.000	0%
6	5.90	1.35	0.32		0.005	0.001	1.0	5.70	6.10	0.40	1.03	0.003	0.003	0.41	0.001	1%
7	6.30	1.34	0.30		0.003	-0.002	1.0	6.10	6.45	0.35	1.04	0.001	0.001	0.36	0.000	0%
8	6.60	1.38	0.33		0.013	0.009	1.0	6.45	6.80	0.35	1.05	0.011	0.011	0.37	0.004	2%
9	7.00	1.37	0.34		0.027	0.039	1.0	6.80	7.30	0.50	1.03	0.033	0.033	0.52	0.017	7%
10	7.30	1.40	0.34		0.059	0.042	1.0	7.30	7.45	0.15	1.06	0.035	0.035	0.16	0.006	2%
11	7.60	1.40	0.34		0.030	0.040	1.0	7.45	7.90	0.45	1.06	0.051	0.051	0.48	0.024	10%
12	8.50	1.40	0.34		0.056	0.052	1.0	7.90	8.60	0.70	1.06	0.054	0.054	0.74	0.040	17%
13	8.70	1.50	0.36		0.047	0.062	1.0	8.60	8.75	0.15	1.14	0.055	0.055	0.17	0.009	4%
14	8.80	1.50	0.33		0.057	0.061	1.0	8.75	9.00	0.25	1.17	0.059	0.059	0.29	0.017	7%
15	9.20	1.55	0.34		0.067	0.071	1.0	9.00	9.35	0.35	1.21	0.069	0.069	0.42	0.029	12%
16	9.50	1.55	0.34		0.058	0.071	1.0	9.35	9.70	0.35	1.21	0.065	0.065	0.42	0.027	11%
17	9.90	1.50	0.34		0.053	0.049	1.0	9.70	10.01	0.31	1.16	0.051	0.051	0.35	0.018	7%
18	10.11	1.52	0.30		0.027	0.030	1.0	10.01	10.46	0.45	1.22	0.029	0.029	0.55	0.016	6%
19	10.80	1.34	0.28		0.031	0.028	1.0	10.46	11.05	0.60	1.06	0.030	0.030	0.63	0.019	8%
20	11.30	1.15	0.35		0.027	0.007	1.0	11.05	11.55	0.50	0.80	0.017	0.017	0.40	0.007	3%
21	11.80	0.85	0.20	0.006			0.9	11.55	11.95	0.40	0.65	0.006	0.005	0.26	0.001	1%
L	12.10	0.00	0.00	0.000	0.000	0.000	1.0	11.95	12.10	0.15	0.16	0.002	0.002	0.02	0.000	0%

**Total Flow 0.241**

## Measurement Details:

Start Time (MST):	14:15
End Time (MST):	15:30
Equipment:	ADV
Method:	Ice
River Condition:	Ice Cover
Quality/Error (see reverse):	Good
Weather:	Light Rain, OC

## Flow Characteristics:

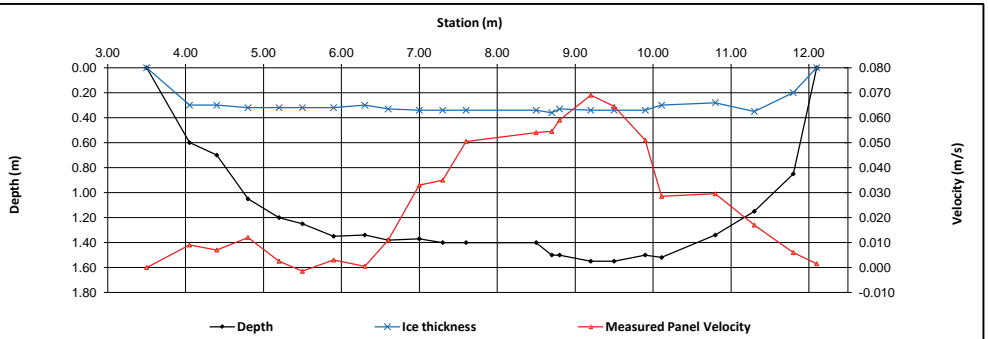
Total Flow:	0.241	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.82	(m <sup>2</sup> )
Wetted Width:	8.60	(m)
Hydraulic Depth:	0.909	(m)
Mean Velocity:	0.031	(m/s)
Froude Number:	0.010	

## Datalogger Details:

	Before	After
Transducer Reading (m):	0.924	
Water (°C):	0.4	
Battery (Main):	13.0	
Datalogger Clock:	14:15	
Laptop Clock:	14:18	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:

- Good



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:			0.993	281.553	281.550	T-post w/pink flagging
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.685	279.861		
Water Level:			2.735	279.811		
Other:	0.710	282.546		281.836		Rebar 15 m W of logger
Setup #2						
Bench Mark 1:	0.984	282.537	0.984	281.553	281.550	T-post w/pink flagging
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.678	279.859		
Water Level:			2.722	279.815		
Other:			0.700	281.837	281.836	Rebar 15 m W of logger
Closing Error	-0.001					Average WL 279.813
WL Check	0.004					Transducer Elevation 278.889

## General Notes:

Field Personnel:	DW, SM	Trip Date:	9-Jan-12
Data Entry Personnel:	DW	Date:	18-Jan-12
Data Check Personnel:	CJ	Date:	18-Jan-12



# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

February 6, 2012



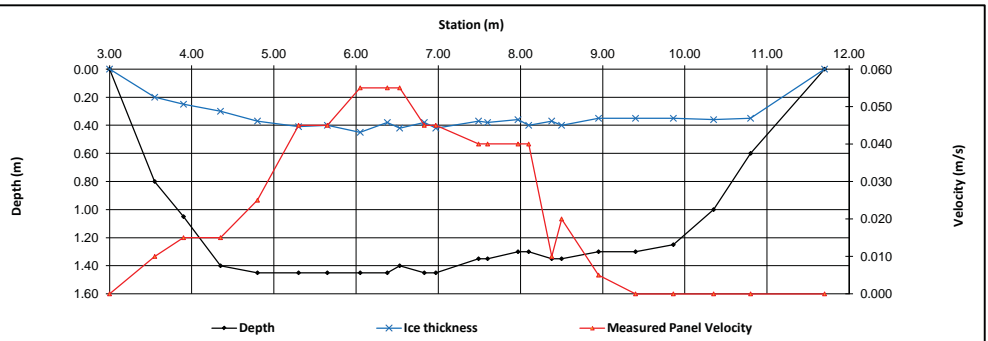
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	3.00	0.00	0.00	0.000	0.000	0.000	0.9	3.00	3.28	0.28	0.20	0.000	0.000	0.05	0.000	0%
1	3.55	0.80	0.20	0.010			0.9	3.28	3.73	0.45	0.60	0.010	0.009	0.27	0.002	1%
2	3.90	1.05	0.25		0.010	0.020	1.0	3.73	4.13	0.40	0.80	0.015	0.015	0.32	0.005	3%
3	4.35	1.40	0.30		0.020	0.010	1.0	4.13	4.58	0.45	1.10	0.015	0.015	0.49	0.007	4%
4	4.80	1.45	0.37		0.030	0.020	1.0	4.58	5.05	0.48	1.08	0.025	0.025	0.51	0.013	7%
5	5.30	1.45	0.41		0.050	0.040	1.0	5.05	5.48	0.43	1.04	0.045	0.045	0.44	0.020	11%
6	5.65	1.45	0.40		0.050	0.040	1.0	5.48	5.85	0.38	1.05	0.045	0.045	0.39	0.018	10%
7	6.05	1.45	0.45		0.050	0.060	1.0	5.85	6.22	0.37	1.00	0.055	0.055	0.37	0.020	11%
8	6.38	1.45	0.38		0.050	0.060	1.0	6.22	6.46	0.24	1.07	0.055	0.055	0.26	0.014	8%
9	6.53	1.40	0.42		0.050	0.060	1.0	6.46	6.68	0.23	0.98	0.055	0.055	0.22	0.012	7%
10	6.83	1.45	0.38		0.040	0.050	1.0	6.68	6.90	0.22	1.07	0.045	0.045	0.24	0.011	6%
11	6.97	1.45	0.42		0.040	0.050	1.0	6.90	7.23	0.33	1.03	0.045	0.045	0.34	0.015	8%
12	7.49	1.35	0.37		0.030	0.050	1.0	7.23	7.55	0.32	0.98	0.040	0.040	0.31	0.012	7%
13	7.60	1.35	0.38		0.030	0.050	1.0	7.55	7.79	0.24	0.97	0.040	0.040	0.23	0.009	5%
14	7.97	1.30	0.36		0.040	0.040	1.0	7.79	8.04	0.25	0.94	0.040	0.040	0.24	0.009	5%
15	8.10	1.30	0.40		0.030	0.050	1.0	8.04	8.24	0.21	0.90	0.040	0.040	0.18	0.007	4%
16	8.38	1.35	0.37		0.010	0.010	1.0	8.24	8.44	0.20	0.98	0.010	0.010	0.20	0.002	1%
17	8.50	1.35	0.40		0.020	0.020	1.0	8.44	8.73	0.28	0.95	0.020	0.020	0.27	0.005	3%
18	8.95	1.30	0.35		0.000	0.010	1.0	8.73	9.18	0.45	0.95	0.005	0.005	0.43	0.002	1%
19	9.40	1.30	0.35		-0.010	0.010	1.0	9.18	9.63	0.45	0.95	0.000	0.000	0.43	0.000	0%
20	9.86	1.25	0.35		0.000	0.000	1.0	9.63	10.11	0.48	0.90	0.000	0.000	0.43	0.000	0%
21	10.35	1.00	0.36	0.000			1.0	10.11	10.58	0.47	0.64	0.000	0.000	0.30	0.000	0%
22	10.80	0.60	0.35	0.000			1.0	10.58	11.25	0.68	0.25	0.000	0.000	0.17	0.000	0%
RB	11.70	0.00	0.00	0.000	0.000	0.000	1.0	11.25	11.70	0.45	0.06	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>															<b>0.185</b>	

Measurement Details:	
Start Time (MST):	11:40
End Time (MST):	12:50
Equipment:	Marsh McBirney
Method:	Ice
River Condition:	Ice Covered
Quality/Error (see reverse):	Good
Weather:	clear, light -10°C

Flow Characteristics:	
Total Flow:	0.185 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good
Cross Section Area:	7.12 (m <sup>2</sup> )
Wetted Width:	8.70 (m)
Hydraulic Depth:	0.818 (m)
Mean Velocity:	0.026 (m/s)
Froude Number:	0.009

Datalogger Details:		
	Before	After
Transducer Reading (m):		0.908
Water (°C):	0.4	
Battery (Main):	15.3	
Datalogger Clock:	11:46	
Laptop Clock:	11:48	
Dessicant:	OK	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.928	281.547	281.550	T-post w/pink flagging
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.653	279.822		
Water Level:			2.695	279.780		
Other:	0.639	282.475			281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:	0.917	282.464		281.547	281.550	T-post w/pink flagging
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.642	279.822		
Water Level:			2.681	279.783		
Other:	0.628	281.836			281.836	Rebar 15 m W of logger
Closing Error		0.000	Average WL		279.782	
WL Check		0.003	Transducer Elevation		278.874	

**General Notes:**

Field Personnel:	SM, CJ	Trip Date:	6-Feb-12
Data Entry Personnel:	SG	Date:	24-Feb-12
Data Check Personnel:	CJ	Date:	16-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: February 29, 2012



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	3.10	0.00	0.00	0.000	0.000	0.000	1.0	3.10	3.25	0.15	0.13	0.003	0.003	0.02	0.000	0%
1	3.40	0.85	0.35	0.010			1.0	3.25	3.58	0.33	0.50	0.010	0.010	0.16	0.002	1%
2	3.75	1.10	0.35	0.030			1.0	3.58	3.93	0.35	0.75	0.030	0.030	0.26	0.008	4%
3	4.10	1.20	0.40		0.040	0.030	1.0	3.93	4.28	0.35	0.80	0.035	0.035	0.28	0.010	5%
4	4.45	1.30	0.37		0.030	0.040	1.0	4.28	4.63	0.35	0.93	0.035	0.035	0.33	0.011	5%
5	4.80	1.30	0.35		0.060	0.050	1.0	4.63	5.00	0.38	0.95	0.055	0.055	0.36	0.020	9%
6	5.20	1.30	0.37		0.060	0.060	1.0	5.00	5.40	0.40	0.93	0.033	0.033	0.37	0.012	6%
7	5.60	1.40	0.35		0.070	0.070	1.0	5.40	5.73	0.32	1.05	0.070	0.070	0.34	0.024	11%
8	5.85	1.40	0.35		0.060	0.070	1.0	5.73	5.90	0.18	1.05	0.065	0.065	0.18	0.012	6%
9	5.95	1.40	0.35		0.050	0.070	1.0	5.90	6.10	0.20	1.05	0.060	0.060	0.21	0.013	6%
10	6.25	1.40	0.40		0.050	0.070	1.0	6.10	6.30	0.20	1.00	0.060	0.060	0.20	0.012	6%
11	6.35	1.40	0.40		0.050	0.080	1.0	6.30	6.55	0.25	1.00	0.065	0.065	0.25	0.016	8%
12	6.75	1.40	0.40		0.060	0.060	1.0	6.55	7.00	0.45	1.00	0.060	0.060	0.45	0.027	13%
13	7.25	1.45	0.30		0.040	0.060	1.0	7.00	7.43	0.43	1.15	0.050	0.050	0.49	0.024	12%
14	7.60	1.35	0.33		0.010	0.040	1.0	7.43	7.78	0.35	1.02	0.025	0.025	0.36	0.009	4%
15	7.95	1.30	0.30		0.010	0.010	1.0	7.78	8.13	0.35	1.00	0.010	0.010	0.35	0.004	2%
16	8.30	1.30	0.30		0.010	0.010	1.0	8.13	8.48	0.35	1.00	0.010	0.010	0.35	0.004	2%
17	8.65	1.28	0.30		0.000	0.010	1.0	8.48	8.88	0.98	0.98	0.005	0.005	0.39	0.002	1%
18	9.10	1.30	0.25		0.010	0.010	1.0	8.88	9.23	0.35	1.05	0.010	0.010	0.37	0.004	2%
19	9.35	1.28	0.25		0.000	0.000	1.0	9.23	9.53	0.30	1.03	0.000	0.000	0.31	0.000	0%
20	9.70	1.00	0.25		0.000	0.000	1.0	9.53	9.85	0.33	0.75	0.000	0.000	0.24	0.000	0%
RB	10.00	0.00	0.00	0.000	0.000	0.000	1.0	9.85	10.00	0.15	0.19	0.000	0.000	0.03	0.000	0%

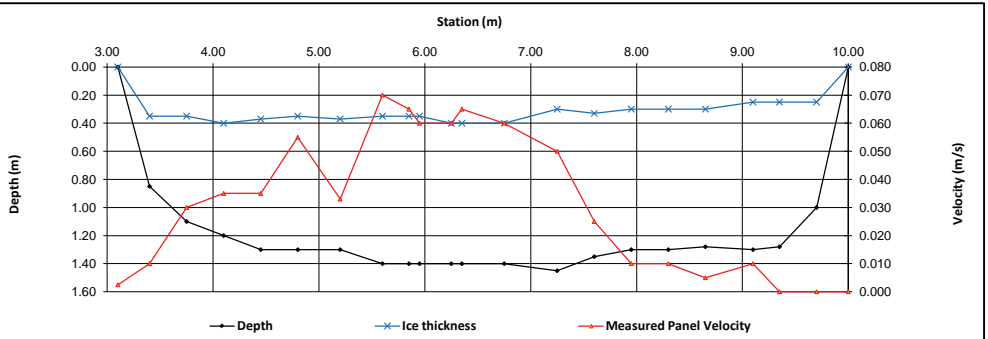
**Total Flow 0.212**

Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	12:35
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	good
Weather:	clear, windy, -8

Flow Characteristics:	
Total Flow:	0.212 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	6.30 (m <sup>2</sup> )
Wetted Width:	6.90 (m)
Hydraulic Depth:	0.913 (m)
Mean Velocity:	0.034 (m/s)
Froude Number:	0.011

Datalogger Details:		Before	After
Transducer Reading (m):		0.926	
Water (°C):		0.3	-
Battery (Main):		15.2	-
Datalogger Clock:		11:49	-
Laptop Clock:		11:51	-
Dessicant:		good	-
Logger# (if Δ):		6482	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2			0.970	281.540	281.550	T-post w/pink flagging
Bench Mark 1:					281.836	Rebar in ABS
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.696	279.814		
Water Level:			2.712	279.798		
Other:	0.674	282.510		281.836	281.836	Rebar 15 m W of logger
Setup #2						
Bench Mark 1:	0.960	282.500		281.540	281.550	T-post w/pink flagging
Bench Mark 2:					281.836	Rebar in ABS
Bench Mark 3:						
Ice/PT:			2.685	279.815		
Water Level:			2.701	279.799		
Other:			0.663	281.837	281.836	Rebar 15 m W of logger
Closing Error		-0.001				
WL Check		0.001				
Average WL				279.799		
Transducer Elevation				278.873		

**General Notes:**

- BM2: 0.528 m
- BM1: 0.745 m
- soft ice

Field Personnel:	SM, GB	Trip Date:	29-Feb-12
Data Entry Personnel:	CJ	Date:	20-Mar-12
Data Check Personnel:	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

April 3, 2012



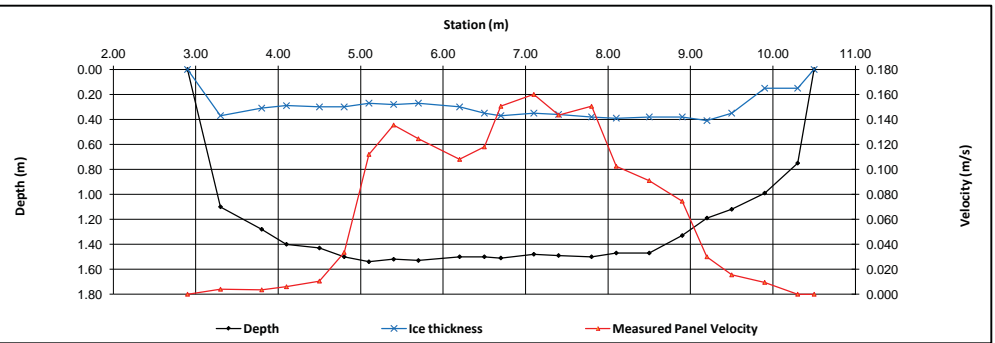
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.90	0.00	0.00	0.000	0.000	0.000	0.9	2.90	3.10	0.20	0.27	0.000	0.000	0.05	0.000	0%
1	3.30	1.10	0.37	0.004			0.9	3.10	3.55	0.45	0.73	0.004	0.004	0.33	0.001	0%
2	3.80	1.28	0.31		0.000	0.007	1.0	3.55	3.95	0.40	0.97	0.004	0.004	0.39	0.001	0%
3	4.10	1.40	0.29		0.008	0.004	1.0	3.95	4.30	0.35	1.11	0.006	0.006	0.39	0.002	0%
4	4.50	1.43	0.30		0.008	0.013	1.0	4.30	4.65	0.35	1.13	0.011	0.011	0.40	0.004	1%
5	4.80	1.50	0.30		0.043	0.024	1.0	4.65	4.95	0.30	1.20	0.034	0.034	0.36	0.012	2%
6	5.10	1.54	0.27		0.118	0.106	1.0	4.95	5.25	0.30	1.27	0.112	0.112	0.38	0.043	7%
7	5.40	1.52	0.28		0.121	0.150	1.0	5.25	5.55	0.30	1.24	0.136	0.136	0.37	0.050	8%
8	5.70	1.53	0.27		0.097	0.152	1.0	5.55	5.95	0.40	1.26	0.125	0.125	0.50	0.063	10%
9	6.20	1.50	0.30		0.074	0.142	1.0	5.95	6.35	0.40	1.20	0.108	0.108	0.48	0.052	8%
10	6.50	1.50	0.35		0.080	0.156	1.0	6.35	6.60	0.25	1.15	0.118	0.118	0.29	0.034	6%
11	6.70	1.51	0.37		0.150	0.151	1.0	6.60	6.90	0.30	1.14	0.151	0.151	0.34	0.051	8%
12	7.10	1.48	0.35		0.165	0.155	1.0	6.90	7.25	0.35	1.13	0.160	0.160	0.40	0.063	10%
13	7.40	1.49	0.36		0.159	0.128	1.0	7.25	7.60	0.35	1.13	0.144	0.144	0.40	0.057	9%
14	7.80	1.50	0.38		0.135	0.166	1.0	7.60	7.95	0.35	1.12	0.151	0.151	0.39	0.059	10%
15	8.10	1.47	0.39		0.101	0.104	1.0	7.95	8.30	0.35	1.08	0.103	0.103	0.38	0.039	6%
16	8.50	1.47	0.38		0.101	0.081	1.0	8.30	8.70	0.40	1.09	0.091	0.091	0.44	0.040	6%
17	8.90	1.33	0.38		0.094	0.055	1.0	8.70	9.05	0.35	0.95	0.075	0.075	0.33	0.025	4%
18	9.20	1.19	0.41		0.035	0.025	1.0	9.05	9.35	0.30	0.78	0.030	0.030	0.23	0.007	1%
19	9.50	1.12	0.35		0.028	0.003	1.0	9.35	9.70	0.35	0.77	0.016	0.016	0.27	0.004	1%
20	9.90	0.99	0.15		0.004	0.015	1.0	9.70	10.10	0.40	0.84	0.010	0.010	0.34	0.003	1%
21	10.30	0.75	0.15	0.000			1.0	10.10	10.40	0.30	0.60	0.000	0.000	0.18	0.000	0%
LB	10.50	0.00	0.00	0.000	0.000	0.000	1.0	10.40	10.50	0.10	0.15	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>0.611</b>	

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	10:55
Equipment:	ADV
Method:	Ice
River Condition:	thinning ice
Quality/Error (see reverse):	good
Weather:	overcast, +5

Flow characteristics:	
Total Flow:	0.611 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	7.65 (m <sup>2</sup> )
Wetted Width:	7.60 (m)
Hydraulic Depth:	1.006 (m)
Mean Velocity:	0.080 (m/s)
Froude Number:	0.025

Datalogger Details:		
	Before	After
Transducer Reading (m):		0.999
Water (°C):	0.4	-
Battery (Main):	14.8	-
Datalogger Clock:	8:55	-
Laptop Clock:	8:57	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.077	281.525	281.550	T-post w/pink flagging
Bench Mark 2:					281.836	Rebar in ABS
Bench Mark 3:						
Ice/PT:			2.743	279.859		
Water Level:			2.739	279.863		
Other:	0.766	282.602		281.836	281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:	1.057	282.582		281.525	281.550	T-post w/pink flagging
Bench Mark 2:					281.836	Rebar in ABS
Bench Mark 3:						
Ice/PT:			2.727	279.855		
Water Level:			2.721	279.861		
Other:			0.746	281.836	281.836	Rebar 15 m W of logger

Closing Error	0.000	Average WL	279.862
WL Check	0.002	Transducer Elevation	278.863

**General Notes:**

-open spot downstream

Field Personnel:	DW, TR	Trip Date:	3-Apr-12
Data Entry Personnel:	CJ	Date:	11-Apr-12
Data Check Personnel:	DW	Date:	23-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

May 11, 2012



## Flow Measurement:

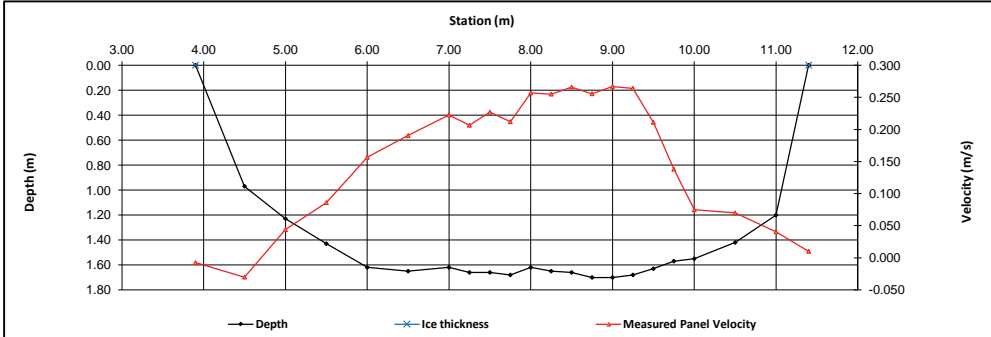
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	3.90	0.00	0.00	0.000	0.000	0.000	1.0	3.90	4.20	0.30	0.24	-0.008	-0.008	0.07	-0.001	0%
1	4.50	0.97		-0.020	-0.040		1.0	4.20	4.75	0.55	0.97	-0.030	-0.030	0.53	-0.016	-1%
2	5.00	1.23		0.071	0.017		1.0	4.75	5.25	0.50	1.23	0.044	0.044	0.62	0.027	2%
3	5.50	1.43		0.077	0.095		1.0	5.25	5.75	0.50	1.43	0.086	0.086	0.72	0.061	4%
4	6.00	1.62		0.136	0.177		1.0	5.75	6.25	0.50	1.62	0.157	0.157	0.81	0.127	8%
5	6.50	1.65		0.203	0.178		1.0	6.25	6.75	0.50	1.65	0.191	0.191	0.83	0.157	9%
6	7.00	1.62		0.225	0.220		1.0	6.75	7.13	0.38	1.62	0.223	0.223	0.61	0.135	8%
7	7.25	1.66		0.167	0.246		1.0	7.13	7.38	0.25	1.66	0.207	0.207	0.42	0.086	5%
8	7.50	1.66		0.195	0.259		1.0	7.38	7.63	0.25	1.66	0.227	0.227	0.42	0.094	6%
9	7.75	1.68		0.123	0.301		1.0	7.63	7.88	0.25	1.68	0.212	0.212	0.42	0.089	5%
10	8.00	1.62		0.200	0.314		1.0	7.88	8.13	0.25	1.62	0.257	0.257	0.41	0.104	6%
11	8.25	1.65		0.173	0.337		1.0	8.13	8.38	0.25	1.65	0.255	0.255	0.41	0.105	6%
12	8.50	1.66		0.194	0.338		1.0	8.38	8.63	0.25	1.66	0.266	0.266	0.42	0.110	7%
13	8.75	1.70		0.179	0.332		1.0	8.63	8.88	0.25	1.70	0.256	0.256	0.43	0.109	7%
14	9.00	1.70		0.199	0.335		1.0	8.88	9.13	0.25	1.70	0.267	0.267	0.43	0.113	7%
15	9.25	1.68		0.210	0.318		1.0	9.13	9.38	0.25	1.68	0.264	0.264	0.42	0.111	7%
16	9.50	1.63		0.172	0.250		1.0	9.38	9.63	0.25	1.63	0.211	0.211	0.41	0.086	5%
17	9.75	1.57		0.120	0.156		1.0	9.63	9.88	0.25	1.57	0.138	0.138	0.39	0.054	3%
18	10.00	1.55		0.079	0.071		1.0	9.88	10.25	0.38	1.55	0.075	0.075	0.58	0.044	3%
19	10.50	1.42		0.054	0.086		1.0	10.25	10.75	0.50	1.42	0.070	0.070	0.71	0.050	3%
20	11.00	1.20		-0.003	0.084		1.0	10.75	11.20	0.45	1.20	0.041	0.041	0.54	0.022	1%
RB	11.40	0.00	0.00	0.000	0.000	0.000	1.0	11.20	11.40	0.20	0.30	0.010	0.010	0.06	0.001	0%
<b>Total Flow</b>															<b>1.67</b>	

Measurement Details:	
Start Time (MST):	11:19
End Time (MST):	12:40
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow, no ice
Quality/Error (see reverse):	Excellent
Weather:	overcast, windy, +8

Flow characteristics:	
Total Flow:	1.67 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	10.62 (m <sup>2</sup> )
Wetted Width:	7.50 (m)
Hydraulic Depth:	1.416 (m)
Mean Velocity:	0.157 (m/s)
Froude Number:	0.042

Logger Details:		
Transducer Reading (m):	Before	After
	1.171	1.169
Water (°C):	8.7	8.8
Battery (Main):	14.6	14.6
Datalogger Clock:	11:18	11:21
Laptop Clock:	11:20	11:23
Dessicant:	replaced	-
Logger# (if Δ):	6482	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
-uploaded new program	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>			0.944	281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.443	280.010		
Other:	0.617	282.453		281.836	281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:	0.932	282.441		281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.430	280.011		
Other:			0.606	281.835	281.836	Rebar 15 m W of logger

Closing Error	0.001	Average WL	280.011
WL Check	0.001	Transducer Elevation	278.840

General Notes:	
-TSS sampled at 8.0 m	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	11-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	31-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	5-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date:

June 11, 2012



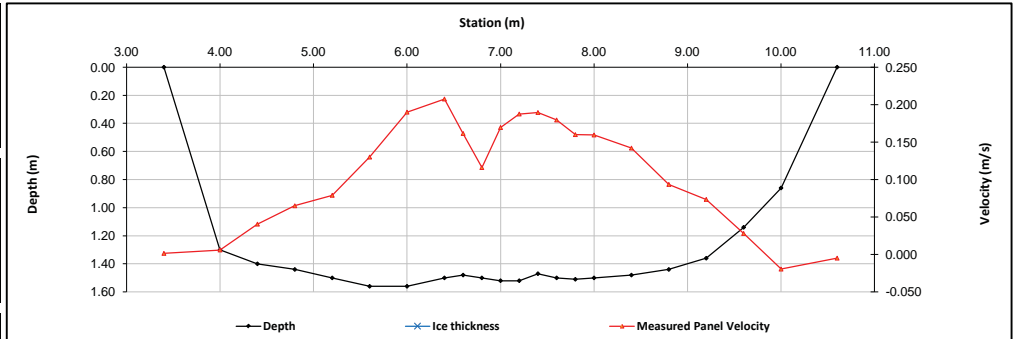
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	3.40	0.00	0.00	0.000	0.000	0.000	1.0	3.40	3.70	0.30	0.33	0.002	0.002	0.10	0.000	0%
1	4.00	1.30		-0.009	0.021		1.0	3.70	4.20	0.50	1.30	0.006	0.006	0.65	0.004	0%
2	4.40	1.40		0.045	0.036		1.0	4.20	4.60	0.40	1.40	0.041	0.041	0.56	0.023	2%
3	4.80	1.44		0.072	0.058		1.0	4.60	5.00	0.40	1.44	0.065	0.065	0.58	0.037	4%
4	5.20	1.50		0.071	0.087		1.0	5.00	5.40	0.40	1.50	0.079	0.079	0.60	0.047	5%
5	5.60	1.56		0.092	0.168		1.0	5.40	5.80	0.40	1.56	0.130	0.130	0.62	0.081	8%
6	6.00	1.56		0.157	0.223		1.0	5.80	6.20	0.40	1.56	0.190	0.190	0.62	0.119	12%
7	6.40	1.50		0.162	0.253		1.0	6.20	6.50	0.30	1.50	0.208	0.208	0.45	0.093	9%
8	6.60	1.48		0.115	0.208		1.0	6.50	6.70	0.20	1.48	0.162	0.162	0.30	0.048	5%
9	6.80	1.50		0.000	0.232		1.0	6.70	6.90	0.20	1.50	0.116	0.116	0.30	0.035	3%
10	7.00	1.52		0.120	0.219		1.0	6.90	7.10	0.20	1.52	0.170	0.170	0.30	0.052	5%
11	7.20	1.52		0.201	0.174		1.0	7.10	7.30	0.20	1.52	0.188	0.188	0.30	0.057	6%
12	7.40	1.47		0.208	0.171		1.0	7.30	7.50	0.20	1.47	0.190	0.190	0.29	0.056	6%
13	7.60	1.50		0.186	0.173		1.0	7.50	7.70	0.20	1.50	0.180	0.180	0.30	0.054	5%
14	7.80	1.51		0.174	0.146		1.0	7.70	7.90	0.20	1.51	0.160	0.160	0.30	0.048	5%
15	8.00	1.50		0.194	0.125		1.0	7.90	8.20	0.30	1.50	0.160	0.160	0.45	0.072	7%
16	8.40	1.48		0.169	0.115		1.0	8.20	8.60	0.40	1.48	0.142	0.142	0.59	0.084	8%
17	8.80	1.44		0.090	0.097		1.0	8.60	9.00	0.40	1.44	0.094	0.094	0.58	0.054	5%
18	9.20	1.36		0.044	0.103		1.0	9.00	9.40	0.40	1.36	0.074	0.074	0.54	0.040	4%
19	9.60	1.14		0.014	0.042		1.0	9.40	9.80	0.40	1.14	0.028	0.028	0.46	0.013	1%
20	10.00	0.86		-0.041	0.002		1.0	9.80	10.30	0.50	0.86	-0.020	-0.020	0.43	-0.008	-1%
LB	10.60	0.00	0.00	0.000	0.000	0.000	1.0	10.30	10.60	0.30	0.22	-0.005	-0.005	0.06	0.000	0%
<b>Total Flow</b>															<b>1.01</b>	

Measurement Details:	
Start Time (MST):	13:15
End Time (MST):	14:55
Equipment:	ADV
Method:	Fishcat
River Condition:	open, high flow
Quality/Error (see reverse):	good
Weather:	clear, calm, 20°C

Flow characteristics:	
Total Flow:	1.01 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	9.39 (m <sup>2</sup> )
Wetted Width:	7.20 (m)
Hydraulic Depth:	1.305 (m)
Mean Velocity:	0.108 (m/s)
Froude Number:	0.030

Logger Details:		
	Before	After
Transducer Reading (m):	1.024	
Water (°C):	17.0	
Battery (Main):	14.2	
Datalogger Clock:	13:16	
Laptop Clock:	13:17	
Dessicant:	Replaced	
Logger# (if Δ):	6482	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.924	281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.567	279.866		
Other:	0.597	282.433		281.836	281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:	0.913	282.422		281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.556	279.866		
Other:			0.586	281.836	281.836	Rebar 15 m W of logger

Closing Error	0.000	Average WL	279.866
WL Check	0.000	Transducer Elevation	278.842

General Notes:	
-TSS sampled at offset = 4.8 m	

Field Personnel:		SM, CJ	Trip Date:	11-Jun-12
Data Entry Personnel:		CJ	Date:	25-Jun-12
Data Check Personnel:		MY	Date:	26-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date:

August 7, 2012



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
LB	4.20	0.00	0.00	0.000	0.000	0.000	1.0	4.20	4.50	0.30	0.20	0.001	0.001	0.06	0.000	0%
1	4.80	0.80		0.003	0.004		1.0	4.50	5.05	0.55	0.80	0.004	0.004	0.44	0.002	0%
2	5.30	1.03		-0.006	-0.029		1.0	5.05	5.80	0.75	1.03	-0.018	-0.018	0.77	-0.014	-2%
3	6.30	1.45		0.041	0.003		1.0	5.80	6.45	0.65	1.45	0.022	0.022	0.94	0.021	2%
4	6.60	1.48		0.059	0.034		1.0	6.45	6.75	0.30	1.48	0.047	0.047	0.44	0.021	2%
5	6.90	1.50		0.102	0.063		1.0	6.75	7.05	0.30	1.50	0.083	0.083	0.45	0.037	4%
6	7.20	1.50		0.141	0.097		1.0	7.05	7.35	0.30	1.50	0.119	0.119	0.45	0.054	6%
7	7.50	1.54		0.180	0.144		1.0	7.35	7.65	0.30	1.54	0.162	0.162	0.46	0.075	9%
8	7.80	1.57		0.184	0.177		1.0	7.65	7.95	0.30	1.57	0.181	0.181	0.47	0.085	10%
9	8.10	1.55		0.140	0.224		1.0	7.95	8.25	0.30	1.55	0.182	0.182	0.47	0.085	10%
10	8.40	1.52		0.099	0.230		1.0	8.25	8.55	0.30	1.52	0.165	0.165	0.46	0.075	9%
11	8.70	1.50		0.074	0.232		1.0	8.55	8.85	0.30	1.50	0.153	0.153	0.45	0.069	8%
12	9.00	1.50		0.055	0.214		1.0	8.85	9.15	0.30	1.50	0.135	0.135	0.45	0.061	7%
13	9.30	1.52		0.035	0.191		1.0	9.15	9.45	0.30	1.52	0.113	0.113	0.46	0.052	6%
14	9.60	1.46		0.062	0.169		1.0	9.45	9.75	0.30	1.46	0.116	0.116	0.44	0.051	6%
15	9.90	1.46		-0.010	0.148		1.0	9.75	10.05	0.30	1.46	0.069	0.069	0.44	0.030	4%
16	10.20	1.41		0.073	0.140		1.0	10.05	10.35	0.30	1.41	0.107	0.107	0.42	0.045	5%
17	10.50	1.39		0.113	0.153		1.0	10.35	10.65	0.30	1.39	0.133	0.133	0.42	0.055	6%
18	10.80	1.30		0.097	0.172		1.0	10.65	10.95	0.30	1.30	0.135	0.135	0.39	0.052	6%
19	11.10	1.20		-0.015	0.177		1.0	10.95	11.25	0.30	1.20	0.001	0.001	0.36	0.000	0%
20	11.40	0.69		0.005			1.0	11.25	11.50	0.25	0.69	0.005	0.005	0.17	0.001	0%
RB	11.60	0.00	0.00	0.00	0.00	0.00	1.0	11.50	11.60	0.10	0.17	0.001	0.001	0.02	0.000	0%
<b>Total Flow</b>															<b>0.856</b>	

Measurement Details:	
Start Time (MST):	14:00
End Time (MST):	15:33
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow
Quality/Error (see reverse):	good
Weather:	sunny, 25

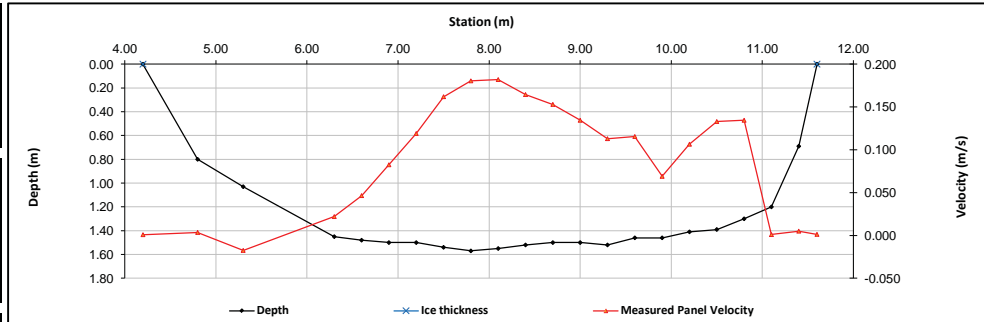
Flow characteristics:		
Total Flow:	0.856	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	9.42	(m <sup>2</sup> )
Wetted Width:	7.40	(m)
Hydraulic Depth:	1.274	(m)
Mean Velocity:	0.091	(m/s)
Froude Number:	0.026	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	1.003	20.6
Battery (Main):	14.0	
Datalogger Clock:	14:09	
Laptop Clock:	14:11	
Dessicant:	replaced	
Logger# (if Δ):	6482	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-power was disconnected from logger-problem was corrected

-power reconnected-checked logger operation and telemetry-ok



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.865	281.517	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:						
Bench Mark 3:			1.025	281.357		3/4" Pipe 8 m W of logger
Ice/PT:						
Water Level:			2.523	279.859		
Other:	0.546	282.382		281.836	281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:	0.854	282.371		281.517	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:						
Bench Mark 3:			1.012	281.359		3/4" Pipe 8 m W of logger
Ice/PT:						
Water Level:			2.512	279.859		
Other:			0.534	281.837	281.836	Rebar 15 m W of logger

Closing Error	-0.001
WL Check	0.000

Average WL	279.859
Transducer Elevation	278.856

**General Notes:**

-installed 1 3/4" Pipe BM

-TSS sampled at offset 8.4 m

Field Personnel:	SM, TR	Trip Date:	7-Aug-12
Data Entry Personnel:	CJ	Date:	22-Aug-12
Data Check Personnel:	DW	Date:	23-Aug-12

# Hydrometric Measurement Field Data Sheet

Site: S33 - Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

September 25, 2012



## 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	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	5.25	0.25	0.34	0.017	0.017	0.09	0.001	0%	
1	5.50	1.37			0.000	0.135	1.0	5.25	5.75	0.50	1.37	0.068	0.068	0.69	0.046	1%	
2	6.00	2.21			0.014	-0.026	1.0	5.75	6.25	0.50	2.21	-0.006	-0.006	1.11	-0.007	0%	
3	6.50	2.41			0.112	0.184	1.0	6.25	6.75	0.50	2.41	0.148	0.148	1.21	0.178	3%	
4	7.00	2.67			0.248	0.251	1.0	6.75	7.25	0.50	2.67	0.250	0.250	1.34	0.333	5%	
5	7.50	2.71			0.285	0.369	1.0	7.25	7.75	0.50	2.71	0.327	0.327	1.36	0.443	6%	
6	8.00	2.77			0.420	0.404	1.0	7.75	8.25	0.50	2.77	0.412	0.412	1.39	0.571	8%	
7	8.50	2.85			0.485	0.459	1.0	8.25	8.63	0.38	2.85	0.472	0.472	1.07	0.504	7%	
8	8.75	2.84			0.563	0.430	1.0	8.63	8.88	0.25	2.84	0.497	0.497	0.71	0.353	5%	
9	9.00	2.84			0.499	0.478	1.0	8.88	9.13	0.25	2.84	0.489	0.489	0.71	0.347	5%	
10	9.25	2.81			0.473	0.540	1.0	9.13	9.38	0.25	2.81	0.507	0.507	0.70	0.356	5%	
11	9.50	2.80			0.524	0.487	1.0	9.38	9.63	0.25	2.80	0.506	0.506	0.70	0.354	5%	
12	9.75	2.72			0.487	0.507	1.0	9.63	9.88	0.25	2.72	0.497	0.497	0.68	0.338	5%	
13	10.00	2.74			0.484	0.528	1.0	9.88	10.25	0.38	2.74	0.506	0.506	1.03	0.520	7%	
14	10.50	2.74			0.417	0.558	1.0	10.25	10.75	0.50	2.74	0.488	0.488	1.37	0.668	9%	
15	11.00	2.73			0.457	0.499	1.0	10.75	11.25	0.50	2.73	0.478	0.478	1.37	0.652	9%	
16	11.50	2.69			0.420	0.504	1.0	11.25	11.75	0.50	2.69	0.462	0.462	1.35	0.621	9%	
17	12.00	2.53			0.408	0.357	1.0	11.75	12.25	0.50	2.53	0.383	0.383	1.27	0.484	7%	
18	12.50	2.38			0.300	0.284	1.0	12.25	12.75	0.50	2.38	0.292	0.292	1.19	0.347	5%	
19	13.00	0.78			0.000	0.008	1.0	12.75	13.75	1.00	0.78	0.004	0.004	0.78	0.003	0%	
20	14.50	0.21		0.095			1.0	13.75	14.75	1.00	0.21	0.095	0.095	0.21	0.020	0%	
RB	15.00	0.00	0.00	0.00	0.00	0.00	1.0	14.75	15.00	0.25	0.05	0.024	0.024	0.01	0.000	0%	
<b>Total Flow</b>														<b>7.13</b>			

### Measurement Details:

Start Time (MST):	10:45
End Time (MST):	12:30
Equipment:	ADV
Method:	fishcat
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	12, overcast, light breeze

### Flow characteristics:

Total Flow:	7.13	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	20.29	(m <sup>2</sup> )
Wetted Width:	10.00	(m)
Hydraulic Depth:	2.029	(m)
Mean Velocity:	0.351	(m/s)
Froude Number:	0.079	

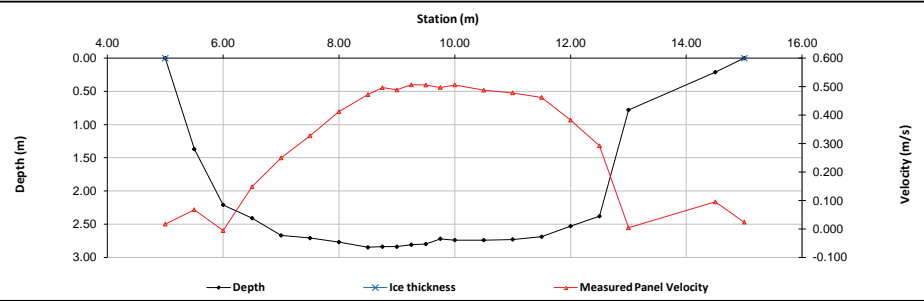
### Logger Details:

	Before	After
Transducer Reading (m):	2.263	
Water (°C):	10.9	
Battery (Main):	14.5	
Datalogger Clock:	10:51	
Laptop Clock:	10:52	
Dessicant:	replaced	
Logger# (if Δ):	6482	
PT# (if Δ):	-	

### Datalogger / Station Notes:

### General Notes:

- Flow measurement quality: Good
- installed 1 3/4" Pipe BM



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.999	282.508		281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:			1.007	281.501		3/4" Pipe 8 m S of logger
Bench Mark 3:			1.175	281.333		3/4" Pipe 8 m W of logger
Ice/PT:						
Water Level:			1.413	281.095		
Other:					281.836	Rebar 15 m W of logger
<b>Setup #2</b>			0.991	281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 1:				281.501		3/4" Pipe 8 m S of logger
Bench Mark 2:	0.999	282.500		281.338		3/4" Pipe 8 m W of logger
Bench Mark 3:			1.162	281.338		
Ice/PT:						
Water Level:			1.403	281.097		
Other:					281.836	Rebar 15 m W of logger

Closing Error	0.000	Average WL	281.096
WL Check	0.002	Transducer Elevation	278.833

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	25-Sep-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	25-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S33 - Muskeg River @ Aurora / Albion Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date:

October 22, 2012



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
LB	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	0.75	0.75	0.33	-0.005	-0.005	0.25	-0.001	0%
1	1.50	1.33		-0.042	0.005		1.0	0.75	1.75	1.00	1.33	-0.019	-0.019	1.33	-0.025	0%
2	2.00	1.50		0.042	0.104		1.0	1.75	2.25	0.50	1.50	0.073	0.073	0.75	0.055	1%
3	2.50	1.80		0.144	0.129		1.0	2.25	2.75	0.50	1.80	0.137	0.137	0.90	0.123	2%
4	3.00	2.04		0.191	0.057		1.0	2.75	3.25	0.50	2.04	0.124	0.124	1.02	0.126	2%
5	3.50	2.22		0.251	0.231		1.0	3.25	3.75	0.50	2.22	0.241	0.241	1.11	0.268	5%
6	4.00	2.25		0.369	0.326		1.0	3.75	4.15	0.40	2.25	0.348	0.348	0.90	0.313	6%
7	4.30	2.32		0.471	0.327		1.0	4.15	4.45	0.30	2.32	0.399	0.399	0.70	0.278	5%
8	4.60	2.38		0.509	0.364		1.0	4.45	4.75	0.30	2.38	0.437	0.437	0.71	0.312	6%
9	4.90	2.32		0.499	0.409		1.0	4.75	5.05	0.30	2.32	0.454	0.454	0.70	0.316	6%
10	5.20	2.39		0.529	0.436		1.0	5.05	5.35	0.30	2.39	0.483	0.483	0.72	0.345	7%
11	5.50	2.29		0.437	0.432		1.0	5.35	5.65	0.30	2.29	0.435	0.435	0.69	0.299	6%
12	5.80	2.29		0.435	0.478		1.0	5.65	5.95	0.30	2.29	0.457	0.457	0.69	0.314	6%
13	6.10	2.32		0.515	0.402		1.0	5.95	6.25	0.30	2.32	0.459	0.459	0.70	0.319	6%
14	6.40	2.32		0.458	0.473		1.0	6.25	6.55	0.30	2.32	0.466	0.466	0.70	0.324	6%
15	6.70	2.37		0.418	0.423		1.0	6.55	6.85	0.30	2.37	0.421	0.421	0.71	0.299	6%
16	7.00	2.34		0.479	0.272		1.0	6.85	7.25	0.40	2.34	0.376	0.376	0.94	0.351	7%
17	7.50	2.26		0.422	0.215		1.0	7.25	7.75	0.50	2.26	0.319	0.319	1.13	0.360	7%
18	8.00	2.24		0.364	0.239		1.0	7.75	8.25	0.50	2.24	0.302	0.302	1.12	0.338	6%
19	8.50	2.24		0.344	0.271		1.0	8.25	8.75	0.50	2.24	0.308	0.308	1.12	0.344	7%
20	9.00	1.87		0.259	0.164		1.0	8.75	9.23	0.48	1.87	0.212	0.212	0.89	0.188	4%
RB	9.45	0.00	0.00	0.00	0.00	0.00	1.0	9.23	9.45	0.23	0.47	0.053	0.053	0.11	0.006	0%

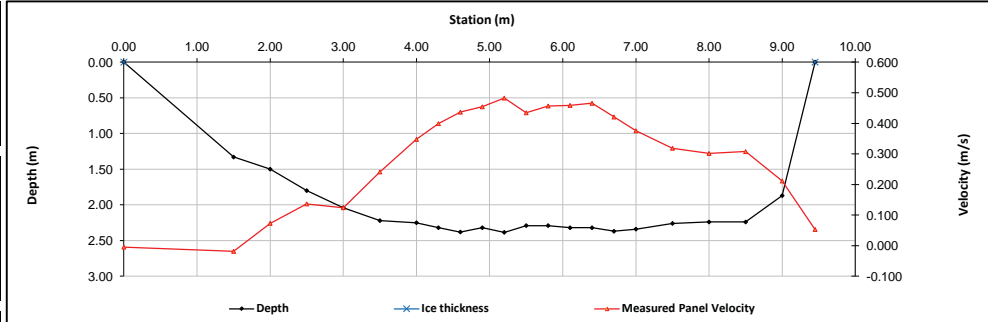
**Total Flow 5.25**

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	14:30
Equipment:	ADV
Method:	Fishcat
River Condition:	Good,
Quality/Error (see reverse):	Fair
Weather:	overcast, snow, -3 deg

Flow characteristics:	
Total Flow:	5.25 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	17.86 (m <sup>2</sup> )
Wetted Width:	9.45 (m)
Hydraulic Depth:	1.890 (m)
Mean Velocity:	0.294 (m/s)
Froude Number:	0.068

Logger Details:		
	Before	After
Transducer Reading (m):	1.812	
Water (°C):	2.6	
Battery (Main):	12.9	
Datalogger Clock:	13:02	
Laptop Clock:	13:04	
Dessicant:	REPLACED	
Logger# (if Δ):	6482	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.861	282.370		281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:			0.867	281.503		3/4" Pipe 8 m S of logger
Bench Mark 3:			1.027	281.343		3/4" Pipe 8 m W of logger
Ice/PT:						
Water Level:			1.716	280.654		
Other:			0.515	281.855	281.836	Rebar 15 m W of logger
<b>Setup #2</b>						
Bench Mark 1:			0.847	281.508	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:			0.851	281.504		3/4" Pipe 8 m S of logger
Bench Mark 3:	1.012	282.355		281.343		3/4" Pipe 8 m W of logger
Ice/PT:						
Water Level:			1.702	280.653		
Other:			0.500	281.855	281.836	Rebar 15 m W of logger

Closing Error	0.001
WL Check	0.001

Average WL	280.654
Transducer Elevation	278.842

**General Notes:**

Ran ADV test, all results good.

0.8d measurement taken at 1.8 m depth when depth is greater

TSS @ 5.7 m

Field Personnel:		TR AND DW	Trip Date:
Data Entry Personnel:		TR	22-Oct-12
Data Check Personnel:		CJ	8-Nov-12
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: December 17, 2012



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																
14																
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22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																

No Flow Measurement Conducted

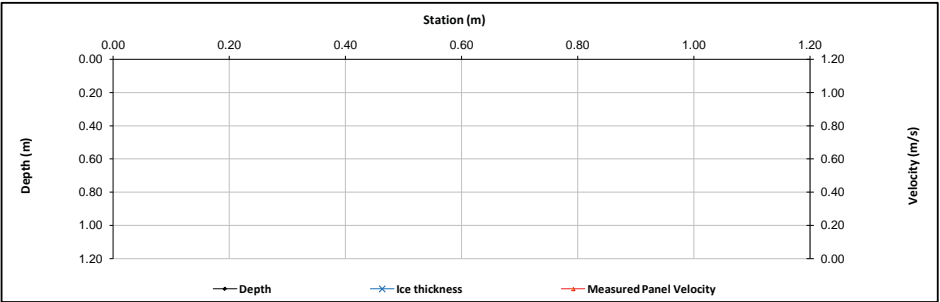
Total Flow -

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	10:30
Equipment:	
Method:	
River Condition:	full ice cover, thin unstable ice
Quality/Error (see reverse):	
Weather:	clear, -13

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):	1.137	
Water (°C):	0.3	
Battery (Main):	12.8	
Datalogger Clock:	10:03	
Laptop Clock:	10:05	
Dessicant:	replaced	
Logger# (if Δ):	6482	
PT# (if Δ):	-	

Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:	0.964	282.473		281.509	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:			0.964	281.509		3/4" Pipe 8 m S of logger
Bench Mark 3:			1.124	281.349		3/4" Pipe 8 m W of logger
Ice/PT:			2.454	280.019		
Water Level:			2.494	279.979		
Other:					281.836	Rebar 15 m W of logger
Setup #2						
Bench Mark 1:			0.982	281.508	281.509	3/4" Pipe 3 m W of logger
Bench Mark 2:			0.981	281.509		3/4" Pipe 8 m S of logger
Bench Mark 3:	1.141	282.490		281.349		3/4" Pipe 8 m W of logger
Ice/PT:			2.472	280.018		
Water Level:			2.513	279.977		
Other:					281.836	Rebar 15 m W of logger

Closing Error	0.001	Average WL	279.978
WL Check	0.002	Transducer Elevation	278.841

General Notes:

-flow measurement was not performed due to thin, and unstable ice cover. installed padlock.

<u>Field Personnel:</u>	SM, TR	Trip Date:	17-Dec-12
Data Entry Personnel:	SM	Date:	17-Dec-12
Data Check Personnel:	CJ	Date:	2-Jan-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

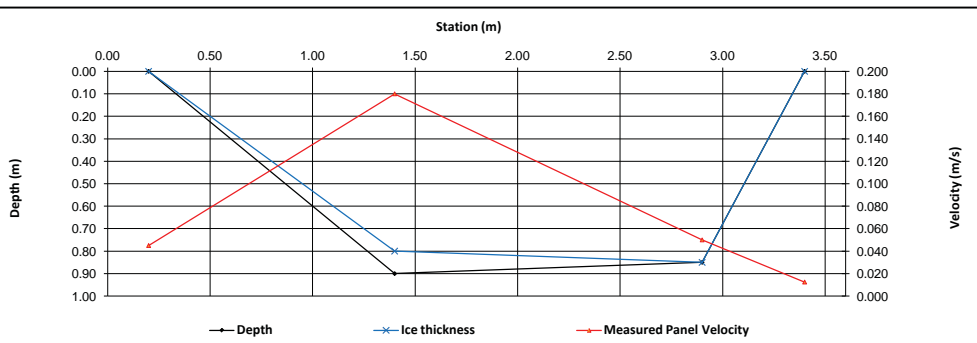
Site Visit Date: January 20, 2012



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)	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	0.00	0.000	0.000	0.9	0.20	0.80	0.60	0.03	0.045	0.041	0.02	0.001	3%
1	1.40	0.90	0.80	0.180			0.9	0.80	2.15	1.35	0.10	0.180	0.162	0.14	0.022	97%
	2.90	0.85	0.85	0.050			0.9	2.15	3.15	1.00	0.00	0.050	0.045	0.00	0.000	0%
RB	3.40	0.00	0.00	0.00	0.000	0.000	1.0	3.15	3.40	0.25	0.00	0.013	0.013	0.00	0.000	0%
<b>Total Flow</b>														<b>0.022</b>		

Measurement Details:	
Start Time (MST):	12:25
End Time (MST):	13:25
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	poor
Weather:	clear, light breeze, -17

Flow characteristics:	
Total Flow:	0.022 (m <sup>3</sup> /s)
Perceived Measurement Quality:	poor
Cross Section Area:	0.15 (m <sup>2</sup> )
Wetted Width:	3.20 (m)
Hydraulic Depth:	0.047 (m)
Mean Velocity:	0.150 (m/s)
Froude Number:	0.221



Datalogger Details:		Before	After
Transducer Reading (m):			0.910
Water (°C):		0.2	
Battery (Main):		14.5	
Datalogger Clock:		12:30	
Laptop Clock:		12:29	
Dessicant:		good	
Logger# (if Δ):		-	
PT# (if Δ):		-	

**Datalogger / Station Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.348	98.309	98.415	Nail in tree
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.198	97.459		
Water Level:			2.175	97.482		
Other:	1.027	99.657		98.630	98.630	Rebar w/lagging
<b>Setup #2</b>						
Bench Mark 1:	1.334	99.643		98.309	98.415	Nail in tree
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.184	97.459		
Water Level:			2.164	97.479		
Other:			1.009	98.634	98.630	Rebar w/lagging

Closing Error	-0.004	Average WL	97.481
WL Check	0.003	Transducer Elevation	96.571

**General Notes:**

- Augered a number of holes and could only find water between 0.2 m and 3.4 m

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	20-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	13-Jan-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: February 9, 2012



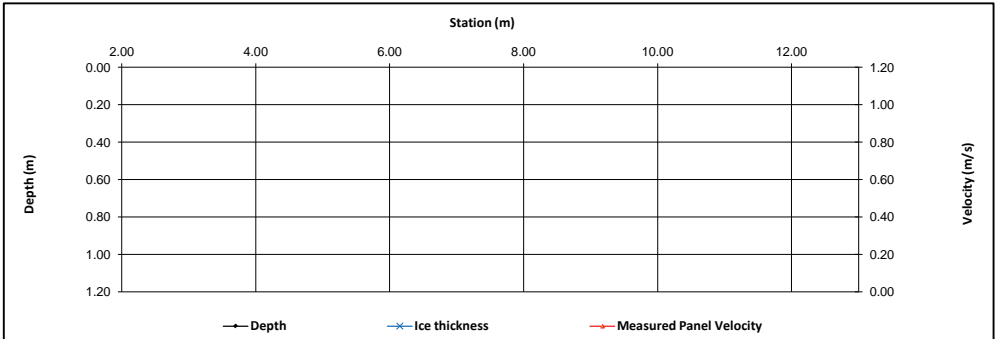
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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																
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9																
10																
11																
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13																
14																
15																
16																
17																
18																
19																
20																
No Flow Measurement Conducted																
<b>Total Flow 0.000</b>																

Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	15:00
Equipment:	-
Method:	-
River Condition:	Ice cover
Quality/Error (see reverse):	-
Weather:	clear, calm, -13

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:	

Datalogger Details:		
	Before	After
Transducer Reading (m):	1.123	
Water (°C):	0.2	-
Battery (Main):	15.3	-
Datalogger Clock:	14:49	-
Laptop Clock:	14:47	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

- lots of overflow, ice level is high, see photos
- auger does not reach through ice
- no flow measurement
- no water level survey

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	9-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	28-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: March 11, 2012



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)	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																
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9																
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11																
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13																
14																
15																
16																
17																
18																
19																
20																

No Flow Measurement Conducted

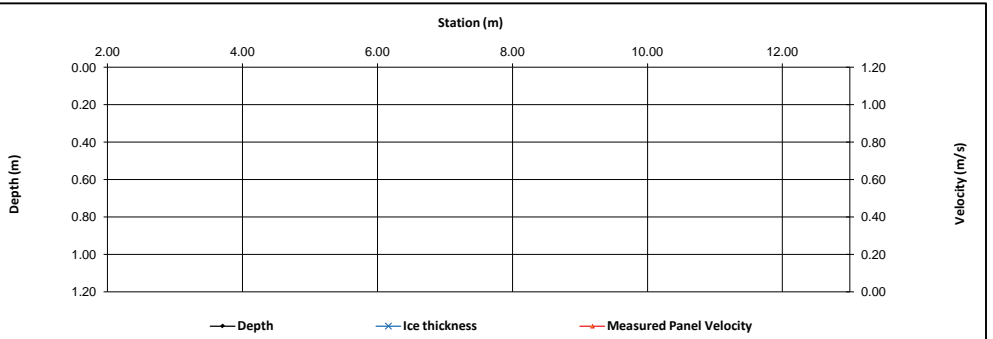
Total Flow

Measurement Details:	
Start Time (MST):	9:40
End Time (MST):	10:10
Equipment:	ADV
Method:	Ice cover
River Condition:	high ice level
Quality/Error (see reverse):	-
Weather:	0 C, snowy, calm

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:	

Datalogger Details:		
	Before	After
Transducer Reading (m):	0.130	
Water (°C):	0.2	-
Battery (Main):	13.1	-
Datalogger Clock:	8:46	-
Laptop Clock:	8:44	-
Dessicant:	good	-
Logger# (if Δ):	6104	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

- ice level very high (see photos).
- Drilled 3 holes, found no water.
- No WL survey, no flow measurement.

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, TR	Date:	11-Mar-12
Data Check Personnel:	MY	Date:	26-Mar-12
	CJ	Date:	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake

UTM Location: 440712 E, 6361615 N

Site Visit Date:

March 28, 2012



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
1																
2																
3																
4																
5																
6																
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30																

No Flow Measurement Conducted

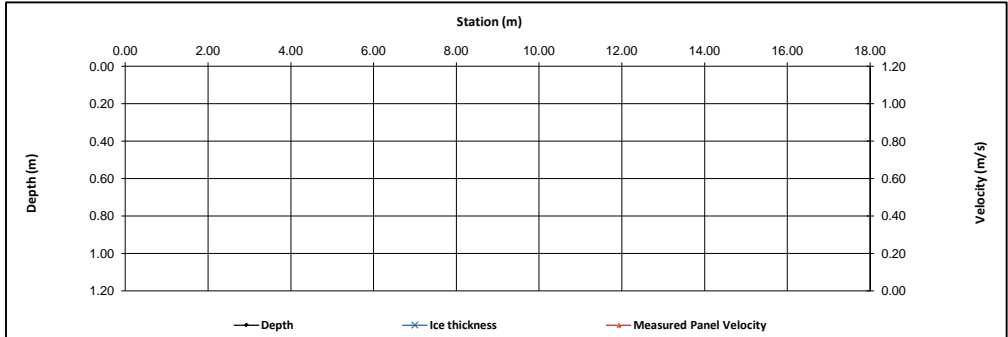
Total Flow

Measurement Details:	
Start Time (MST):	10:05
End Time (MST):	11:00
Equipment:	-
Method:	-
River Condition:	flooded/frozen
Quality/Error (see reverse):	-
Weather:	-

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):	0.148	-
Water (°C):	0.2	-
Battery (Main):	14.94	-
Datalogger Clock:	9:14	-
Laptop Clock:	9:13	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

- auger extension needed
- river is flooded
- frozen to depth, ~1.425 m of ice
- no discharge measurement; no survey

Field Personnel:	DW, BL	Trip Date:	28-Mar-12
Data Entry Personnel:	CJ	Date:	12-Apr-12
Data Check Personnel:	DW	Date:	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date:

May 17, 2012



## Flow Measurement:

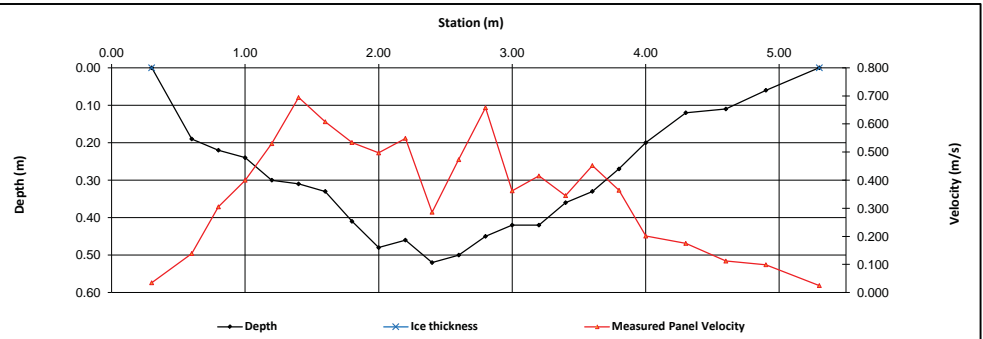
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	0.30	0.00	0.00	0.000	0.000	0.000	1.0	0.30	0.45	0.15	0.05	0.035	0.035	0.01	0.000	0%
1	0.60	0.19		0.139			1.0	0.45	0.70	0.25	0.19	0.139	0.139	0.05	0.007	1%
2	0.80	0.22		0.305			1.0	0.70	0.90	0.20	0.22	0.305	0.305	0.04	0.013	2%
3	1.00	0.24		0.400			1.0	0.90	1.10	0.20	0.24	0.400	0.400	0.05	0.019	3%
4	1.20	0.30		0.530			1.0	1.10	1.30	0.20	0.30	0.530	0.530	0.06	0.032	5%
5	1.40	0.31		0.694			1.0	1.30	1.50	0.20	0.31	0.694	0.694	0.06	0.043	7%
6	1.60	0.33		0.608			1.0	1.50	1.70	0.20	0.33	0.608	0.608	0.07	0.040	7%
7	1.80	0.41		0.534			1.0	1.70	1.90	0.20	0.41	0.534	0.534	0.08	0.044	7%
8	2.00	0.48		0.497			1.0	1.90	2.10	0.20	0.48	0.497	0.497	0.10	0.048	8%
9	2.20	0.46		0.549			1.0	2.10	2.30	0.20	0.46	0.549	0.549	0.09	0.051	8%
10	2.40	0.52		0.286			1.0	2.30	2.50	0.20	0.52	0.286	0.286	0.10	0.030	5%
11	2.60	0.50		0.473			1.0	2.50	2.70	0.20	0.50	0.473	0.473	0.10	0.047	8%
12	2.80	0.45		0.658			1.0	2.70	2.90	0.20	0.45	0.658	0.658	0.09	0.059	10%
13	3.00	0.42		0.362			1.0	2.90	3.10	0.20	0.42	0.362	0.362	0.08	0.030	5%
14	3.20	0.42		0.415			1.0	3.10	3.30	0.20	0.42	0.415	0.415	0.08	0.035	6%
15	3.40	0.36		0.345			1.0	3.30	3.50	0.20	0.36	0.345	0.345	0.07	0.025	4%
16	3.60	0.33		0.452			1.0	3.50	3.70	0.20	0.33	0.452	0.452	0.07	0.030	5%
17	3.80	0.27		0.364			1.0	3.70	3.90	0.20	0.27	0.364	0.364	0.05	0.020	3%
18	4.00	0.20		0.201			1.0	3.90	4.15	0.25	0.20	0.201	0.201	0.05	0.010	2%
19	4.30	0.12		0.175			1.0	4.15	4.45	0.30	0.12	0.175	0.175	0.04	0.006	1%
20	4.60	0.11		0.112			1.0	4.45	4.75	0.30	0.11	0.112	0.112	0.03	0.004	1%
21	4.90	0.06		0.099			1.0	4.75	5.10	0.35	0.06	0.099	0.099	0.02	0.002	0%
RB	5.30	0.00	0.00	0.000	0.000	0.000	1.0	5.10	5.30	0.20	0.02	0.025	0.025	0.00	0.000	0%
<b>Total Flow</b>															<b>0.594</b>	

Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	12:50
Equipment:	ADV
Method:	Wading
River Condition:	open, no ice
Quality/Error (see reverse):	good
Weather:	clear, calm, +12

Flow characteristics:	
Total Flow:	0.594 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	1.40 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.280 (m)
Mean Velocity:	0.424 (m/s)
Froude Number:	0.256

Logger Details:		
	Before	After
Transducer Reading (m):	0.404	-
Water (°C):	8.6	-
Battery (Main):	14.4	-
Datalogger Clock:	12:03	-
Laptop Clock:	12:01	-
Dessicant:	replaced	-
Logger# (if Δ):	6104	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.188	98.325	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.562	96.951		
Other:	0.883	99.513		98.630	98.630	Rebar w/flagging
<b>Setup #2</b>						
Bench Mark 1:	1.176	99.501		98.325	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.548	96.953		
Other:			0.870	98.631	98.630	Rebar w/flagging
Closing Error		-0.001		Average WL		96.952
WL Check		0.002		Transducer Elevation		96.548

### General Notes:

-TSS sampled at 2.4 m

Field Personnel:		Trip Date:	
SM, CJ		17-May-12	
Data Entry Personnel:	CJ	Date:	31-May-12
Data Check Personnel:	DW	Date:	5-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: June 22, 2012



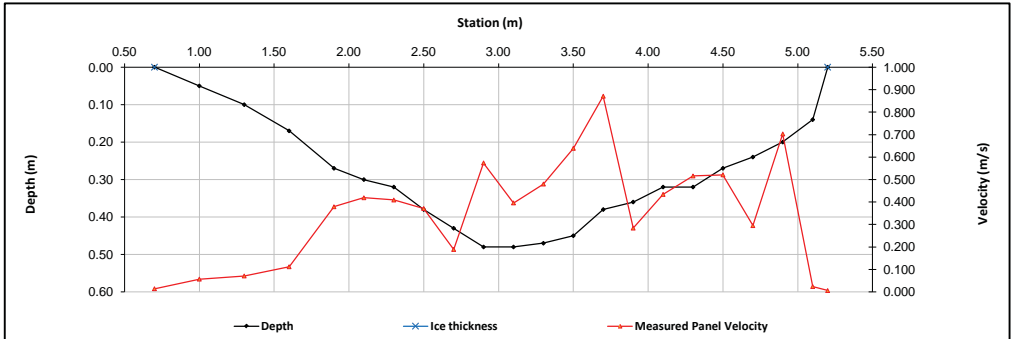
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.70	0.00	0.00	0.000	0.000	0.000	1.0	0.70	0.85	0.15	0.01	0.014	0.014	0.00	0.000	0%
1	1.00	0.05		0.057			1.0	0.85	1.15	0.30	0.05	0.057	0.057	0.02	0.001	0%
2	1.30	0.10		0.071			1.0	1.15	1.45	0.30	0.10	0.071	0.071	0.03	0.002	0%
3	1.60	0.17		0.112			1.0	1.45	1.75	0.30	0.17	0.112	0.112	0.05	0.006	1%
4	1.90	0.27		0.379			1.0	1.75	2.00	0.25	0.27	0.379	0.379	0.07	0.026	5%
5	2.10	0.30		0.419			1.0	2.00	2.20	0.20	0.30	0.419	0.419	0.06	0.025	5%
6	2.30	0.32		0.409			1.0	2.20	2.40	0.20	0.32	0.409	0.409	0.06	0.026	5%
7	2.50	0.38		0.371			1.0	2.40	2.60	0.20	0.38	0.371	0.371	0.08	0.028	5%
8	2.70	0.43		0.189			1.0	2.60	2.80	0.20	0.43	0.189	0.189	0.09	0.016	3%
9	2.90	0.48		0.574			1.0	2.80	3.00	0.20	0.48	0.574	0.574	0.10	0.055	10%
10	3.10	0.48		0.396			1.0	3.00	3.20	0.20	0.48	0.396	0.396	0.10	0.038	7%
11	3.30	0.47		0.480			1.0	3.20	3.40	0.20	0.47	0.480	0.480	0.09	0.045	8%
12	3.50	0.45		0.639			1.0	3.40	3.60	0.20	0.45	0.639	0.639	0.09	0.058	11%
13	3.70	0.38		0.871			1.0	3.60	3.80	0.20	0.38	0.871	0.871	0.08	0.066	12%
14	3.90	0.36		0.284			1.0	3.80	4.00	0.20	0.36	0.284	0.284	0.07	0.020	4%
15	4.10	0.32		0.434			1.0	4.00	4.20	0.20	0.32	0.434	0.434	0.06	0.028	5%
16	4.30	0.32		0.516			1.0	4.20	4.40	0.20	0.32	0.516	0.516	0.06	0.033	6%
17	4.50	0.27		0.521			1.0	4.40	4.60	0.20	0.27	0.521	0.521	0.05	0.028	5%
18	4.70	0.24		0.295			1.0	4.60	4.80	0.20	0.24	0.295	0.295	0.05	0.014	3%
19	4.90	0.20		0.703			1.0	4.80	5.00	0.20	0.20	0.703	0.703	0.04	0.028	5%
20	5.10	0.14		0.024			1.0	5.00	5.15	0.15	0.14	0.024	0.024	0.02	0.001	0%
LB	5.20	0.00	0.00	0.000	0.000	0.000	1.0	5.15	5.20	0.05	0.04	0.006	0.006	0.00	0.000	0%
<b>Total Flow</b>															<b>0.544</b>	

Measurement Details:	
Start Time (MST):	16:35
End Time (MST):	17:20
Equipment:	ADV
Method:	Wading
River Condition:	open
Quality/Error (see reverse):	good
Weather:	partial cloud, breezy

Flow characteristics:	
Total Flow:	0.544 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	1.27 (m <sup>2</sup> )
Wetted Width:	4.50 (m)
Hydraulic Depth:	0.282 (m)
Mean Velocity:	0.429 (m/s)
Froude Number:	0.258

Logger Details:		
	Before	After
Transducer Reading (m):	0.384	
Water (°C):	14.8	
Battery (Main):	14.0	
Datalogger Clock:	4:40	
Laptop Clock:	4:38	
Dessicant:	replaced	
Logger# (if Δ):	6104	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.127	98.327	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.516	96.938		
Other:	0.824	99.454		98.630	98.630	Rebar w/lagging
<b>Setup #2</b>						
Bench Mark 1:	1.113	99.440		98.327	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.502	96.938		
Other:			0.807	98.633	98.630	Rebar w/lagging

Closing Error	-0.003	Average WL	96.938
WL Check	0.000	Transducer Elevation	96.554

**General Notes:**

-TSS sampled at offset 3.3 m

Field Personnel:		SM, GB	Trip Date:	22-Jun-12
Data Entry Personnel:		CJ	Date:	4-Jul-12
Data Check Personnel:		MY	Date:	4-Jul-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date:

August 17, 2012



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	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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.50	0.10	0.03	0.002	0.002	0.00	0.000	0%
1	0.60	0.12		0.007			1.0	0.50	0.70	0.20	0.12	0.007	0.007	0.02	0.000	0%
2	0.80	0.12		0.223			1.0	0.70	0.90	0.20	0.12	0.223	0.223	0.02	0.005	3%
3	1.00	0.29		0.165			1.0	0.90	1.10	0.20	0.29	0.165	0.165	0.06	0.010	5%
4	1.20	0.24		0.020			1.0	1.10	1.25	0.15	0.24	0.020	0.020	0.04	0.001	0%
5	1.30	0.20		0.064			1.0	1.25	1.33	0.08	0.20	0.064	0.064	0.02	0.001	0%
6	1.35	0.22		0.326			1.0	1.33	1.38	0.05	0.22	0.326	0.326	0.01	0.004	2%
7	1.40	0.20		0.307			1.0	1.38	1.50	0.13	0.20	0.307	0.307	0.03	0.008	4%
8	1.60	0.20		0.314			1.0	1.50	1.70	0.20	0.20	0.314	0.314	0.04	0.013	6%
9	1.80	0.25		0.339			1.0	1.70	1.90	0.20	0.25	0.339	0.339	0.05	0.017	9%
10	2.00	0.34		0.281			1.0	1.90	2.10	0.20	0.34	0.281	0.281	0.07	0.019	10%
11	2.20	0.32		0.389			1.0	2.10	2.30	0.20	0.32	0.389	0.389	0.06	0.025	13%
12	2.40	0.35		0.346			1.0	2.30	2.50	0.20	0.35	0.346	0.346	0.07	0.024	12%
13	2.60	0.34		0.362			1.0	2.50	2.70	0.20	0.34	0.362	0.362	0.07	0.025	12%
14	2.80	0.32		0.263			1.0	2.70	2.90	0.20	0.32	0.263	0.263	0.06	0.017	8%
15	3.00	0.30		0.243			1.0	2.90	3.10	0.20	0.30	0.243	0.243	0.06	0.015	7%
16	3.20	0.25		0.212			1.0	3.10	3.30	0.20	0.25	0.212	0.212	0.05	0.011	5%
17	3.40	0.22		0.121			1.0	3.30	3.50	0.20	0.22	0.121	0.121	0.04	0.005	3%
18	3.60	0.24		0.041			1.0	3.50	3.70	0.20	0.24	0.041	0.041	0.05	0.002	1%
19	3.80	0.20		-0.001			1.0	3.70	4.00	0.30	0.20	-0.001	-0.001	0.06	0.000	0%
20	4.20	0.08		-0.005			1.0	4.00	4.45	0.45	0.08	-0.005	-0.005	0.04	0.000	0%
RB	4.70	0.00	0.00	0.00	0.00	0.00	1.0	4.45	4.70	0.25	0.02	-0.001	-0.001	0.01	0.000	0%

**Total Flow 0.199**

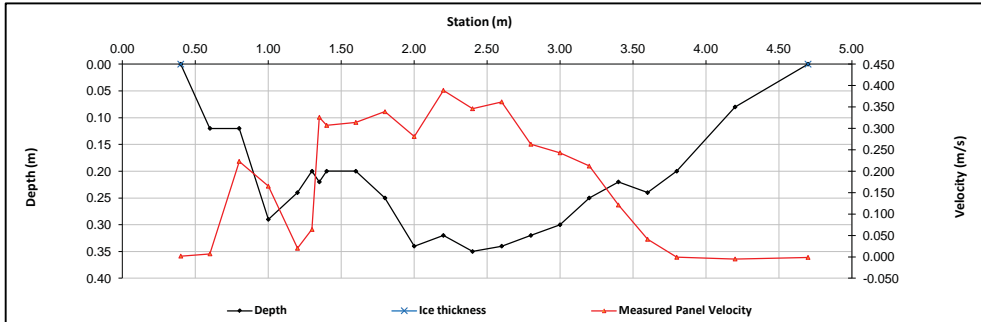
Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	10:45
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Quality/Error (see reverse):	Good
Weather:	Overcast, 15

Flow characteristics:		
Total Flow:	0.199	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.92	(m <sup>2</sup> )
Wetted Width:	4.30	(m)
Hydraulic Depth:	0.215	(m)
Mean Velocity:	0.216	(m/s)
Froude Number:	0.149	

Logger Details:		
Transducer Reading (m):	0.297	-
Water (°C):	13.2	-
Battery (Main):	14.2	-
Datalogger Clock:	8:20	-
Laptop Clock:	8:19	-
Dessicant:	replaced	-
Logger# (if Δ):	-	6104
PT# (if Δ):	-	304028

Datalogger / Station Notes:	
-replaced PT	

General Notes:	
-TSS sampled at offset 2.8 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.248	98.328	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.712	96.864		
Other:	0.946	99.576		98.630	98.630	Rebar w/flagging
<b>Setup #2</b>						
Bench Mark 1:	1.207	99.535		98.328	98.328	2 m South of Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.669	96.866		
Other:			0.905	98.630	98.630	Rebar w/flagging

Closing Error	0.000	Average WL	96.865
WL Check	0.002	Transducer Elevation	96.568

Field Personnel:	TR, CJ	Trip Date:	17-Aug-12
Data Entry Personnel:	CJ	Date:	22-Aug-12
Data Check Personnel:	DW	Date:	23-Aug-12



# Hydrometric Measurement Field Data Sheet

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: September 18, 2012



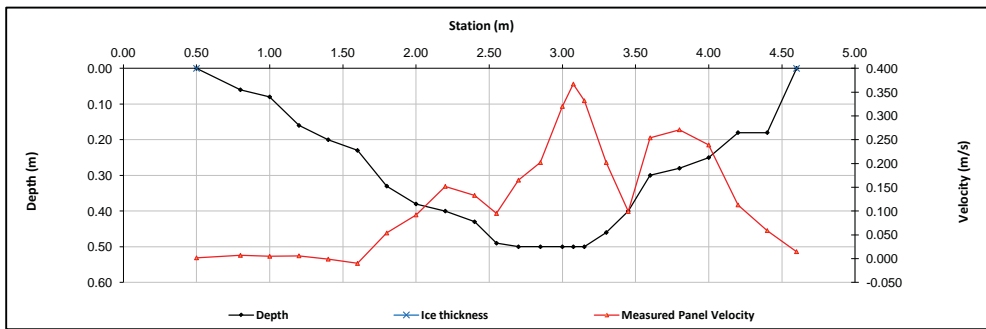
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.65	0.15	0.02	0.002	0.002	0.00	0.000	0%
1	0.80	0.06		0.007			1.0	0.65	0.90	0.25	0.06	0.007	0.007	0.02	0.000	0%
2	1.00	0.08		0.005			1.0	0.90	1.10	0.20	0.08	0.005	0.005	0.02	0.000	0%
3	1.20	0.16		0.006			1.0	1.10	1.30	0.20	0.16	0.006	0.006	0.03	0.000	0%
4	1.40	0.20		-0.001			1.0	1.30	1.50	0.20	0.20	-0.001	-0.001	0.04	0.000	0%
5	1.60	0.23		-0.010			1.0	1.50	1.70	0.20	0.23	-0.010	-0.010	0.05	0.000	0%
6	1.80	0.33		0.054			1.0	1.70	1.90	0.20	0.33	0.054	0.054	0.07	0.004	2%
7	2.00	0.38		0.092			1.0	1.90	2.10	0.20	0.38	0.092	0.092	0.08	0.007	4%
8	2.20	0.40		0.152			1.0	2.10	2.30	0.20	0.40	0.152	0.152	0.08	0.012	7%
9	2.40	0.43		0.133			1.0	2.30	2.48	0.18	0.43	0.133	0.133	0.08	0.010	5%
10	2.55	0.49		0.095			1.0	2.48	2.63	0.15	0.49	0.095	0.095	0.07	0.007	4%
11	2.70	0.50		0.165			1.0	2.63	2.78	0.15	0.50	0.165	0.165	0.08	0.012	7%
12	2.85	0.50		0.202			1.0	2.78	2.93	0.15	0.50	0.202	0.202	0.07	0.015	8%
13	3.00	0.50		0.320			1.0	2.93	3.04	0.11	0.50	0.320	0.320	0.06	0.018	10%
14	3.08	0.50		0.367			1.0	3.04	3.11	0.07	0.50	0.367	0.367	0.04	0.014	7%
15	3.15	0.50		0.332			1.0	3.11	3.23	0.11	0.50	0.332	0.332	0.06	0.019	10%
16	3.30	0.46		0.202			1.0	3.23	3.38	0.15	0.46	0.202	0.202	0.07	0.014	8%
17	3.45	0.40		0.099			1.0	3.38	3.53	0.15	0.40	0.099	0.099	0.06	0.006	3%
18	3.60	0.30		0.254			1.0	3.53	3.70	0.18	0.30	0.254	0.254	0.05	0.013	7%
19	3.80	0.28		0.271			1.0	3.70	3.90	0.20	0.28	0.271	0.271	0.06	0.015	8%
20	4.00	0.25		0.239			1.0	3.90	4.10	0.20	0.25	0.239	0.239	0.05	0.012	6%
21	4.20	0.18		0.113			1.0	4.10	4.30	0.20	0.18	0.113	0.113	0.04	0.004	2%
22	4.40	0.18		0.059			1.0	4.30	4.50	0.20	0.18	0.059	0.059	0.04	0.002	1%
LB	4.60	0.00	0.00	0.000	0.000	0.000	1.0	4.50	4.60	0.10	0.05	0.015	0.015	0.00	0.000	0%
<b>Total Flow</b>														<b>0.184</b>		

Measurement Details:	
Start Time (MST):	15:45
End Time (MST):	17:00
Equipment:	ADV
Method:	Wading
River Condition:	Low
Quality/Error (see reverse):	Good
Weather:	Drizzle

Flow characteristics:		
Total Flow:	0.184	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	4.10	(m)
Hydraulic Depth:	0.289	(m)
Mean Velocity:	0.155	(m/s)
Froude Number:	0.092	

Logger Details:		
	Before	After
Transducer Reading (m):	0.277	
Water (°C):	10.4	
Battery (Main):	14.0	
Datalogger Clock:	16:05	
Laptop Clock:	16:03	
Dessicant:	changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	1.193	99.521		98.328	98.328	2 m South of Logger
Bench Mark 2:			1.013	98.508	98.508	2 m East of Logger
Bench Mark 3:			1.443	98.078	98.078	8 m South of Logger
Ice/PT:						
Water Level:			2.626	96.895		
Other:			0.891	98.630		Rebar w/lagging
Setup #2						
Bench Mark 1:			1.168	98.328	98.328	2 m South of Logger
Bench Mark 2:			0.988	98.508	98.508	2 m East of Logger
Bench Mark 3:	1.418	99.496		98.078	98.078	8 m South of Logger
Ice/PT:						
Water Level:			2.602	96.894		
Other:						Rebar w/lagging

Closing Error	0.000	Average WL	96.895
WL Check	0.001	Transducer Elevation	96.618

General Notes:	

Field Personnel:	DW, SG	Trip Date:	18-Sep-12
Data Entry Personnel:	SG (Field)	Date:	18-Sep-12
Data Check Personnel:	CJ	Date:	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: October 18, 2012



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	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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.50	0.10	0.04	0.012	0.012	0.00	0.000	0%
1	0.60	0.14		0.048			1.0	0.50	0.70	0.20	0.14	0.048	0.048	0.03	0.001	0%
2	0.80	0.19		0.001			1.0	0.70	0.90	0.20	0.19	0.001	0.001	0.04	0.000	0%
3	1.00	0.20		0.129			1.0	0.90	1.10	0.20	0.20	0.129	0.129	0.04	0.005	2%
4	1.20	0.21		0.148			1.0	1.10	1.30	0.20	0.21	0.148	0.148	0.04	0.006	2%
5	1.40	0.24		0.301			1.0	1.30	1.45	0.15	0.24	0.301	0.301	0.04	0.011	4%
6	1.50	0.32		0.400			1.0	1.45	1.55	0.10	0.32	0.400	0.400	0.03	0.013	4%
7	1.60	0.26		0.456			1.0	1.55	1.70	0.15	0.26	0.456	0.456	0.04	0.018	6%
8	1.80	0.33		0.358			1.0	1.70	1.90	0.20	0.33	0.358	0.358	0.07	0.024	8%
9	2.00	0.44		0.221			1.0	1.90	2.05	0.15	0.44	0.221	0.221	0.07	0.015	5%
10	2.10	0.43		0.241			1.0	2.05	2.15	0.10	0.43	0.241	0.241	0.04	0.010	4%
11	2.20	0.47		0.434			1.0	2.15	2.25	0.10	0.47	0.434	0.434	0.05	0.020	7%
12	2.30	0.50		0.417			1.0	2.25	2.35	0.10	0.50	0.417	0.417	0.05	0.021	7%
13	2.40	0.53		0.331			1.0	2.35	2.50	0.15	0.53	0.331	0.331	0.08	0.026	9%
14	2.60	0.54		0.361			1.0	2.50	2.70	0.20	0.54	0.361	0.361	0.11	0.039	13%
15	2.80	0.52		0.139			1.0	2.70	2.90	0.20	0.52	0.139	0.139	0.10	0.014	5%
16	3.00	0.50		0.076			1.0	2.90	3.10	0.20	0.50	0.076	0.076	0.10	0.008	3%
17	3.20	0.49		0.136			1.0	3.10	3.30	0.20	0.49	0.136	0.136	0.10	0.013	5%
18	3.40	0.39		0.208			1.0	3.30	3.50	0.20	0.39	0.208	0.208	0.08	0.016	6%
19	3.60	0.38		0.208			1.0	3.50	3.70	0.20	0.38	0.208	0.208	0.08	0.016	6%
20	3.80	0.28		0.200			1.0	3.70	3.90	0.20	0.28	0.200	0.200	0.06	0.011	4%
21	4.00	0.20		0.028			1.0	3.90	4.10	0.20	0.20	0.028	0.028	0.04	0.001	0%
22	4.20	0.14		-0.002			1.0	4.10	4.65	0.55	0.14	-0.002	-0.002	0.08	0.000	0%
RB	5.10	0.00	0.00	0.00	0.00	0.00	1.0	4.65	5.10	0.45	0.04	-0.001	-0.001	0.02	0.000	0%

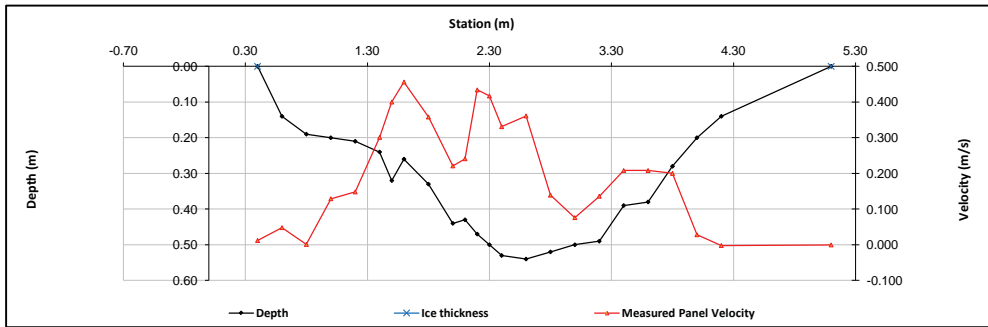
**Total Flow 0.289**

Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	clear, -1C

Flow characteristics:		
Total Flow:	0.289	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.36	(m <sup>2</sup> )
Wetted Width:	4.70	(m)
Hydraulic Depth:	0.290	(m)
Mean Velocity:	0.212	(m/s)
Froude Number:	0.126	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.32	0.4
Battery (Main):	12.95	
Datalogger Clock:	8:51	
Laptop Clock:	8:50	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.232	99.560		98.328	98.328	2 m South of Logger
Bench Mark 2:			1.052	98.508	98.508	2 m East of Logger
Bench Mark 3:			1.482	98.078	98.078	8 m South of Logger
Ice/PT:						
Water Level:			2.627	96.933		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.211	98.326	98.328	2 m South of Logger
Bench Mark 2:	1.029	99.537		98.508	98.508	2 m East of Logger
Bench Mark 3:			1.459	98.078	98.078	8 m South of Logger
Ice/PT:						
Water Level:			2.605	96.932		
Other:						

Closing Error	0.002	Average WL	96.933
WL Check	0.001	Transducer Elevation	96.813

General Notes:	
- ADV test performed - Good	

Field Personnel:	TR, DW, ACM	Trip Date:	18-Oct-12
Data Entry Personnel:	TR	Date:	26-Oct-12
Data Check Personnel:	DW	Date:	9-Nov-12
Entered Digitally in the Field:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above CNRL Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date:

December 8, 2012



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	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	1.0	0.30	0.63	0.33	0.04	0.000	0.000	0.01	0.000	0%						
1	0.95	0.32	0.15	0.000			1.0	0.63	1.08	0.45	0.17	0.000	0.000	0.08	0.000	0%						
2	1.20	0.35	0.15	0.417			0.9	1.08	1.35	0.28	0.20	0.417	0.375	0.06	0.021	14%						
3	1.50	0.35	0.15	0.436			0.9	1.35	1.58	0.23	0.20	0.436	0.392	0.05	0.018	12%						
4	1.65	0.35	0.15	0.501			0.9	1.58	1.70	0.13	0.20	0.501	0.451	0.03	0.011	8%						
5	1.75	0.33	0.15	0.348			0.9	1.70	1.83	0.13	0.18	0.348	0.313	0.02	0.007	5%						
6	1.90	0.30	0.15	0.477			0.9	1.83	1.98	0.15	0.15	0.477	0.429	0.02	0.010	7%						
7	2.05	0.30	0.15	0.500			0.9	1.98	2.13	0.15	0.15	0.500	0.450	0.02	0.010	7%						
8	2.20	0.30	0.15	0.350			0.9	2.13	2.28	0.15	0.15	0.350	0.315	0.02	0.007	5%						
9	2.35	0.25	0.10	0.310			0.9	2.28	2.40	0.13	0.15	0.310	0.279	0.02	0.005	4%						
10	2.45	0.28	0.10	0.248			0.9	2.40	2.53	0.13	0.18	0.248	0.223	0.02	0.005	3%						
11	2.60	0.30	0.10	0.383			0.9	2.53	2.68	0.15	0.20	0.383	0.345	0.03	0.010	7%						
12	2.75	0.25	0.12	0.238			0.9	2.68	2.88	0.20	0.13	0.238	0.214	0.03	0.006	4%						
13	3.00	0.25	0.12	0.109			0.9	2.88	3.05	0.18	0.13	0.109	0.098	0.02	0.002	2%						
14	3.10	0.25	0.10	0.370			0.9	3.05	3.23	0.18	0.15	0.370	0.333	0.03	0.009	6%						
15	3.35	0.30	0.13	0.281			0.9	3.23	3.50	0.28	0.17	0.281	0.235	0.05	0.011	7%						
16	3.65	0.23	0.18	0.300			0.9	3.50	3.80	0.30	0.05	0.300	0.270	0.02	0.004	3%						
17	3.95	0.24	0.15	0.000			1.0	3.80	4.10	0.30	0.09	0.000	0.000	0.03	0.000	0%						
18	4.25	0.25	0.13	0.258			0.9	4.10	4.43	0.33	0.12	0.258	0.232	0.04	0.009	6%						
19	4.60	0.22	0.13	0.102			0.9	4.43	4.78	0.35	0.09	0.102	0.092	0.03	0.003	2%						
20	4.95	0.20	0.15	0.001			0.9	4.78	5.03	0.25	0.05	0.001	0.001	0.01	0.000	0%						
RB	5.10	0.00	0.00	0.00	0.00	0.00	1.0	5.03	5.10	0.07	0.01	0.000	0.000	0.00	0.000	0%						

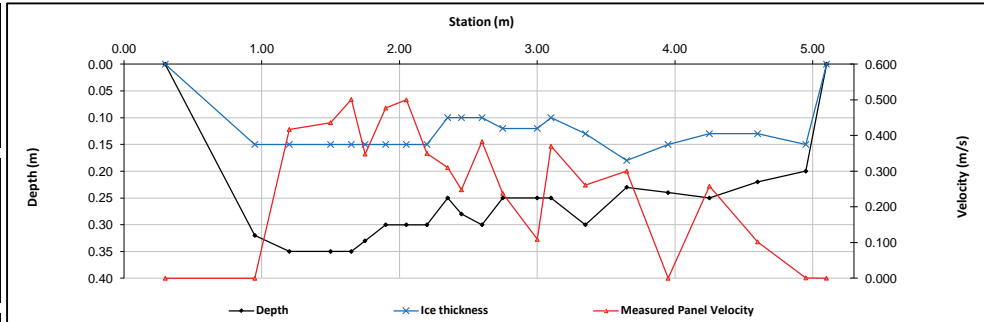
**Total Flow 0.148**

Measurement Details:	
Start Time (MST):	12:15
End Time (MST):	13:54
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -27

Flow characteristics:		
Total Flow:	0.148	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.62	(m <sup>2</sup> )
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.130	(m)
Mean Velocity:	0.237	(m/s)
Froude Number:	0.210	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.0	-0.1
Battery (Main):	12.2	12.8
Datalogger Clock:	12:28	12:49
Laptop Clock:	12:26	12:47
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

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>						
Bench Mark 1:	1.364	99.692		98.328	98.328	2 m South of Logger
Bench Mark 2:			1.183	98.509	98.508	2 m East of Logger
Bench Mark 3:			1.612	98.080	98.078	8 m South of Logger
Ice/PT:			2.576	97.116		
Water Level:			2.703	96.989		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.349	98.329	98.328	2 m South of Logger
Bench Mark 2:	1.169	99.678		98.509	98.508	2 m East of Logger
Bench Mark 3:			1.599	98.079	98.078	8 m South of Logger
Ice/PT:			2.564	97.114		
Water Level:			2.693	96.985		
Other:						

Closing Error	-0.001	Average WL	96.987
WL Check	0.004	Transducer Elevation	96.614

General Notes:	

<b>Field Personnel:</b>		SM, CJ	Trip Date:	8-Dec-12
Data Entry Personnel:	SM		Date:	8-Dec-12
Data Check Personnel:	DW		Date:	11-Dec-12
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: February 11, 2012



## Flow Measurement:

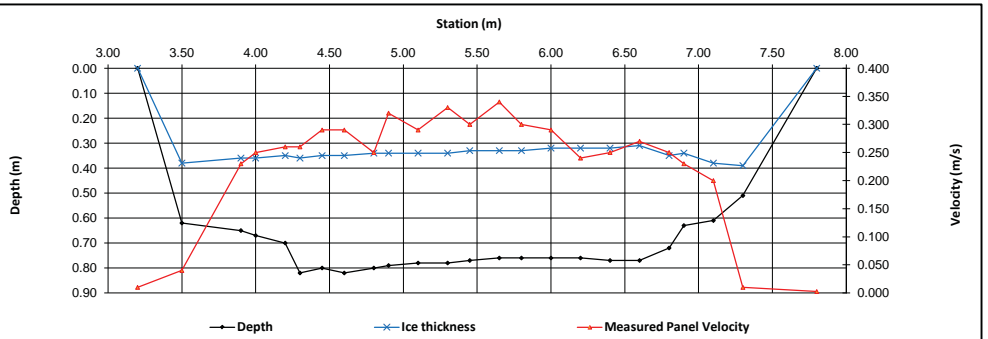
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	3.20	0.00	0.00	0.000	0.000	0.000	0.9	3.20	3.35	0.15	0.06	0.010	0.009	0.01	0.000	0%
1	3.50	0.62	0.38	0.040			0.9	3.35	3.70	0.35	0.24	0.040	0.036	0.08	0.003	1%
2	3.90	0.65	0.36	0.230			0.9	3.70	3.95	0.25	0.29	0.230	0.207	0.07	0.015	4%
3	4.00	0.67	0.36	0.250			0.9	3.95	4.10	0.15	0.31	0.250	0.225	0.05	0.010	3%
4	4.20	0.70	0.35	0.260			0.9	4.10	4.25	0.15	0.35	0.260	0.234	0.05	0.012	3%
5	4.30	0.82	0.36	0.260			0.9	4.25	4.38	0.13	0.46	0.260	0.234	0.06	0.013	4%
6	4.45	0.80	0.35	0.290			0.9	4.38	4.53	0.15	0.45	0.290	0.261	0.07	0.018	5%
7	4.60	0.82	0.35	0.290			0.9	4.53	4.70	0.17	0.47	0.290	0.261	0.08	0.021	6%
8	4.80	0.80	0.34	0.250			0.9	4.70	4.85	0.15	0.46	0.250	0.225	0.07	0.016	4%
9	4.90	0.79	0.34	0.320			0.9	4.85	5.00	0.15	0.45	0.320	0.288	0.07	0.019	6%
10	5.10	0.78	0.34	0.290			0.9	5.00	5.20	0.20	0.44	0.290	0.261	0.09	0.023	7%
11	5.30	0.78	0.34	0.330			0.9	5.20	5.38	0.18	0.44	0.330	0.297	0.08	0.023	6%
12	5.45	0.77	0.33	0.300			0.9	5.38	5.55	0.18	0.44	0.300	0.270	0.08	0.021	6%
13	5.65	0.76	0.33	0.340			0.9	5.55	5.73	0.17	0.43	0.340	0.306	0.08	0.023	7%
14	5.80	0.76	0.33	0.300			0.9	5.73	5.90	0.18	0.43	0.300	0.270	0.08	0.020	6%
15	6.00	0.76	0.32	0.290			0.9	5.90	6.10	0.20	0.44	0.290	0.261	0.09	0.023	7%
16	6.20	0.76	0.32	0.240			0.9	6.10	6.30	0.20	0.44	0.240	0.216	0.09	0.019	5%
17	6.40	0.77	0.32	0.250			0.9	6.30	6.50	0.20	0.45	0.250	0.225	0.09	0.020	6%
18	6.60	0.77	0.31	0.270			0.9	6.50	6.70	0.20	0.46	0.270	0.243	0.09	0.022	6%
19	6.80	0.72	0.35	0.250			0.9	6.70	6.85	0.15	0.37	0.250	0.225	0.06	0.012	4%
20	6.90	0.63	0.34	0.230			0.9	6.85	7.00	0.15	0.29	0.230	0.207	0.04	0.009	3%
21	7.10	0.61	0.38	0.200			0.9	7.00	7.20	0.20	0.23	0.200	0.180	0.05	0.008	2%
22	7.30	0.51	0.39	0.010			0.9	7.20	7.55	0.35	0.12	0.010	0.009	0.04	0.000	0%
LB	7.80	0.00	0.00	0.000	0.000	0.000	1.0	7.55	7.80	0.25	0.03	0.003	0.003	0.01	0.000	0%
<b>Total Flow</b>														<b>0.353</b>		

Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	9:30
Equipment:	Marsh
Method:	Ice
River Condition:	Ice
Quality/Error (see reverse):	Good
Weather:	Calm, Clear -20°

Flow Characteristics:		
Total Flow:	0.353	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.55	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.338	(m)
Mean Velocity:	0.227	(m/s)
Froude Number:	0.125	

Datalogger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.076	100.999		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.416	99.583		
Water Level:			1.475	99.524		
Other:			0.938	100.061	100.034	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.068	99.925	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			1.409	99.584		
Water Level:			1.468	99.525		
Other:	0.932	100.993			100.034	Nail in tree
Closing Error	-0.002					
WL Check	0.001					
Average WL				99.525		
Transducer Elevation				-		

**General Notes:**

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	11-Feb-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	16-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date:

April 25, 2012



## Flow Measurement:

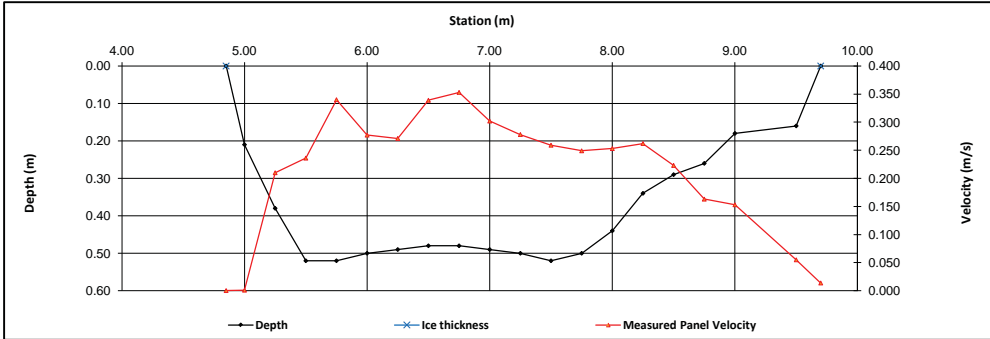
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	4.85	0.00	0.00	0.000	0.000	0.000	1.0	4.85	4.93	0.08	0.05	0.000	0.000	0.00	0.000	0%
1	5.00	0.21		0.001			1.0	4.93	5.13	0.20	0.21	0.001	0.001	0.04	0.000	0%
2	5.25	0.38		0.210			1.0	5.13	5.38	0.25	0.38	0.210	0.210	0.10	0.020	4%
3	5.50	0.52		0.236			1.0	5.38	5.63	0.25	0.52	0.236	0.236	0.13	0.031	6%
4	5.75	0.52		0.340			1.0	5.63	5.88	0.25	0.52	0.340	0.340	0.13	0.044	9%
5	6.00	0.50		0.277			1.0	5.88	6.13	0.25	0.50	0.277	0.277	0.13	0.035	7%
6	6.25	0.49		0.271			1.0	6.13	6.38	0.25	0.49	0.271	0.271	0.12	0.033	7%
7	6.50	0.48		0.339			1.0	6.38	6.63	0.25	0.48	0.339	0.339	0.12	0.041	9%
8	6.75	0.48		0.353			1.0	6.63	6.88	0.25	0.48	0.353	0.353	0.12	0.042	9%
9	7.00	0.49		0.302			1.0	6.88	7.13	0.25	0.49	0.302	0.302	0.12	0.037	8%
10	7.25	0.50		0.278			1.0	7.13	7.38	0.25	0.50	0.278	0.278	0.13	0.035	7%
11	7.50	0.52		0.259			1.0	7.38	7.63	0.25	0.52	0.259	0.259	0.13	0.034	7%
12	7.75	0.50		0.249			1.0	7.63	7.88	0.25	0.50	0.249	0.249	0.13	0.031	7%
13	8.00	0.44		0.253			1.0	7.88	8.13	0.25	0.44	0.253	0.253	0.11	0.028	6%
14	8.25	0.34		0.262			1.0	8.13	8.38	0.25	0.34	0.262	0.262	0.09	0.022	5%
15	8.50	0.29		0.223			1.0	8.38	8.63	0.25	0.29	0.223	0.223	0.07	0.016	3%
16	8.75	0.26		0.163			1.0	8.63	8.88	0.25	0.26	0.163	0.163	0.07	0.011	2%
17	9.00	0.18		0.153			1.0	8.88	9.25	0.38	0.18	0.153	0.153	0.07	0.010	2%
18	9.50	0.16		0.055			1.0	9.25	9.60	0.35	0.16	0.055	0.055	0.06	0.003	1%
RB	9.70	0.00	0.00	0.000	0.000	0.000	1.0	9.60	9.70	0.10	0.04	0.014	0.014	0.00	0.000	0%
<b>Total Flow</b>															<b>0.473</b>	

Measurement Details:	
Start Time (MST):	8:05
End Time (MST):	9:08
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	excellent
Weather:	clear, light breeze, +4

Flow characteristics:	
Total Flow:	0.473 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	1.85 (m <sup>2</sup> )
Wetted Width:	4.85 (m)
Hydraulic Depth:	0.382 (m)
Mean Velocity:	0.255 (m/s)
Froude Number:	0.132

Logger Details:		
Transducer Reading (m):	0.493	-
Water (°C):	2.1	-
Battery (Main):	12.95	-
Datalogger Clock:	8:28	-
Laptop Clock:	8:28	-
Dessicant:	replaced	-
Logger# (if Δ):	18207	-
PT# (if Δ):	276581	-

**Datalogger / Station Notes:**  
 -Installed logger and PLS  
 -GOES west should work for telecomm.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.323	101.246		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.007	99.239		
Other:			1.142	100.104	100.034	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.311	99.922	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			1.999	99.234		
Other:	1.129	101.233		100.104	100.034	Nail in tree

Closing Error	0.001	Average WL	99.237
WL Check	0.005	Transducer Elevation	98.744

### General Notes:

-PLS s/n: 276581

<b>Field Personnel:</b>	SM, SG	<b>Trip Date:</b>	25-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date:

June 15, 2012



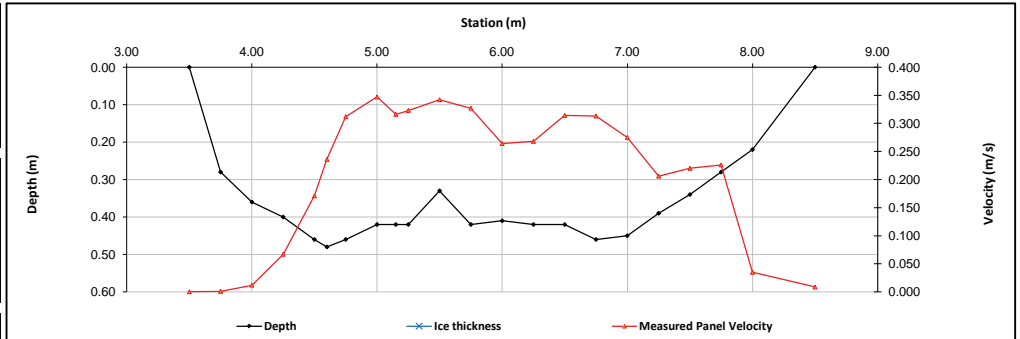
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	3.50	0.00	0.00	0.000	0.000	0.000	1.0	3.50	3.63	0.13	0.07	0.000	0.000	0.01	0.000	0%
1	3.75	0.28		0.001			1.0	3.63	3.88	0.25	0.28	0.001	0.001	0.07	0.000	0%
2	4.00	0.36		0.012			1.0	3.88	4.13	0.25	0.36	0.012	0.012	0.09	0.001	0%
3	4.25	0.40		0.067			1.0	4.13	4.38	0.25	0.40	0.067	0.067	0.10	0.007	2%
4	4.50	0.46		0.171			1.0	4.38	4.55	0.18	0.46	0.171	0.171	0.08	0.014	3%
5	4.60	0.48		0.236			1.0	4.55	4.68	0.13	0.48	0.236	0.236	0.06	0.014	3%
6	4.75	0.46		0.312			1.0	4.68	4.88	0.20	0.46	0.312	0.312	0.09	0.029	7%
7	5.00	0.42		0.347			1.0	4.88	5.08	0.20	0.42	0.347	0.347	0.08	0.029	7%
8	5.15	0.42		0.316			1.0	5.08	5.20	0.13	0.42	0.316	0.316	0.05	0.017	4%
9	5.25	0.42		0.323			1.0	5.20	5.38	0.18	0.42	0.323	0.323	0.07	0.024	6%
10	5.50	0.33		0.342			1.0	5.38	5.63	0.25	0.33	0.342	0.342	0.08	0.028	7%
11	5.75	0.42		0.327			1.0	5.63	5.88	0.25	0.42	0.327	0.327	0.11	0.034	8%
12	6.00	0.41		0.264			1.0	5.88	6.13	0.25	0.41	0.264	0.264	0.10	0.027	7%
13	6.25	0.42		0.268			1.0	6.13	6.38	0.25	0.42	0.268	0.268	0.11	0.028	7%
14	6.50	0.42		0.314			1.0	6.38	6.63	0.25	0.42	0.314	0.314	0.11	0.033	8%
15	6.75	0.46		0.313			1.0	6.63	6.88	0.25	0.46	0.313	0.313	0.12	0.036	9%
16	7.00	0.45		0.275			1.0	6.88	7.13	0.25	0.45	0.275	0.275	0.11	0.031	8%
17	7.25	0.39		0.206			1.0	7.13	7.38	0.25	0.39	0.206	0.206	0.10	0.020	5%
18	7.50	0.34		0.220			1.0	7.38	7.63	0.25	0.34	0.220	0.220	0.09	0.019	5%
19	7.75	0.28		0.226			1.0	7.63	7.88	0.25	0.28	0.226	0.226	0.07	0.016	4%
20	8.00	0.22		0.035			1.0	7.88	8.25	0.38	0.22	0.035	0.035	0.08	0.003	1%
RB	8.50	0.00	0.00	0.000	0.000	0.000	1.0	8.25	8.50	0.25	0.06	0.009	0.009	0.01	0.000	0%
<b>Total Flow</b>														<b>0.409</b>		

Measurement Details:	
Start Time (MST):	11:35
End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	excellent
Weather:	p. cloudy, 18°C

Flow characteristics:		
Total Flow:	0.409	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	1.79	(m <sup>2</sup> )
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.358	(m)
Mean Velocity:	0.229	(m/s)
Froude Number:	0.122	

Logger Details:		
Transducer Reading (m):	0.488	-
Water (°C):	11.7	-
Battery (Main):	14.3	-
Datalogger Clock:	10:39	-
Laptop Clock:	10:39	-
Dessicant:	replaced	-
Logger# (if Δ):	18207	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.038	100.961		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.648	100.313	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			0.755	100.206	100.206	Pipe 8 m W of Data Logger
Ice/PT:						
Water Level:			1.736	99.225		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.009	99.924	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.619	100.314	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:	0.727	100.933		100.206	100.206	Pipe 8 m W of Data Logger
Ice/PT:						
Water Level:			1.703	99.230		
Other:						

Closing Error	-0.001	Average WL	99.228
WL Check	0.005	Transducer Elevation	98.740

**General Notes:**

-TSS taken at offset 6.0 m

Field Personnel:	TR, CJ	Trip Date:	15-Jun-12
Data Entry Personnel:	CJ	Date:	27-Jun-12
Data Check Personnel:	DW	Date:	28-Jun-12

# Hydrometric Measurement Field Data Sheets

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: August 15, 2012



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	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	1.0	3.50	3.75	0.25	0.08	0.037	0.037	0.02	0.001	0%
1	4.00	0.30		0.146			1.0	3.75	4.13	0.38	0.30	0.146	0.146	0.11	0.016	4%
2	4.25	0.36		0.048			1.0	4.13	4.38	0.25	0.36	0.048	0.048	0.09	0.004	1%
3	4.50	0.41		0.128			1.0	4.38	4.63	0.25	0.41	0.128	0.128	0.10	0.013	3%
4	4.75	0.47		0.076			1.0	4.63	4.88	0.25	0.47	0.076	0.076	0.12	0.009	2%
5	5.00	0.50		0.288			1.0	4.88	5.13	0.25	0.50	0.288	0.288	0.13	0.036	9%
6	5.25	0.53		0.341			1.0	5.13	5.38	0.25	0.53	0.341	0.341	0.13	0.045	11%
7	5.50	0.52		0.336			1.0	5.38	5.56	0.19	0.52	0.336	0.336	0.10	0.032	8%
8	5.62	0.53		0.328			1.0	5.56	5.69	0.13	0.53	0.328	0.328	0.07	0.022	5%
9	5.75	0.51		0.360			1.0	5.69	5.81	0.13	0.51	0.360	0.360	0.06	0.023	6%
10	5.87	0.50		0.386			1.0	5.81	5.94	0.13	0.50	0.386	0.386	0.06	0.024	6%
11	6.00	0.49		0.379			1.0	5.94	6.06	0.13	0.49	0.379	0.379	0.06	0.023	6%
12	6.12	0.50		0.382			1.0	6.06	6.19	0.13	0.50	0.382	0.382	0.06	0.024	6%
13	6.25	0.50		0.365			1.0	6.19	6.31	0.13	0.50	0.365	0.365	0.06	0.023	6%
14	6.37	0.50		0.354			1.0	6.31	6.44	0.13	0.50	0.354	0.354	0.06	0.022	5%
15	6.50	0.50		0.330			1.0	6.44	6.56	0.13	0.50	0.330	0.330	0.06	0.021	5%
16	6.62	0.52		0.314			1.0	6.56	6.69	0.13	0.52	0.314	0.314	0.07	0.020	5%
17	6.75	0.54		0.222			1.0	6.69	6.88	0.19	0.54	0.222	0.222	0.10	0.023	6%
18	7.00	0.53		0.154			1.0	6.88	7.13	0.25	0.53	0.154	0.154	0.13	0.020	5%
19	7.25	0.50		0.073			1.0	7.13	7.38	0.25	0.50	0.073	0.073	0.13	0.009	2%
20	7.50	0.46		0.000			1.0	7.38	7.63	0.25	0.46	0.000	0.000	0.12	0.000	0%
21	7.75	0.34		0.000			1.0	7.63	7.88	0.25	0.34	0.000	0.000	0.09	0.000	0%
22	8.00	0.26		0.000			1.0	7.88	8.25	0.38	0.26	0.000	0.000	0.10	0.000	0%
LB	8.50	0.00	0.00	0.000	0.000	0.000	1.0	8.25	8.50	0.25	0.07	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>															<b>0.411</b>	

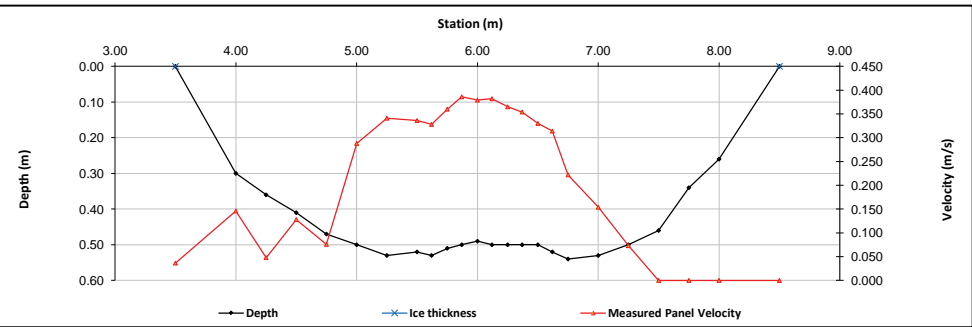
Measurement Details:	
Start Time (MST):	11:00
End Time (MST):	12:10
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	18 deg, clear, breezy

Flow Characteristics:	
Total Flow:	0.411 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.04 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.408 (m)
Mean Velocity:	0.202 (m/s)
Froude Number:	0.101

Logger Details:		
	Before	After
Transducer Reading (m):	0.528	
Water (°C):	10.1	
Battery (Main):	14.2	
Datalogger Clock:	11:12	
Laptop Clock:	11:12	
Dessiccant:	replaced	
Logger# (if Δ):	18207	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:	
TSS Sampled at 6.0 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.075	100.998		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.685	100.313	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			0.792	100.206	100.206	Pipe 8 m W of Data Logger
Water Level:			1.733	99.265		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.063	100.986		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.674	100.312	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			0.780	100.206	100.206	Pipe 8 m W of Data Logger
Water Level:			1.724	99.262		
Other:						

Closing Error	0.000	Average WL	99.264
WL Check	0.003	Transducer Elevation	98.736

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, CJ	Date:	15-Aug-12
Data Check Personnel:	SM (Field)	Date:	15-Aug-12
	CJ	Date:	10-Oct-12

# Hydrometric Measurement Field Data Sheets

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date:

August 22, 2012



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	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	1.30	0.00	0.00	0.000	0.000	0.000	1.0	1.30	2.15	0.85	0.11	0.005	0.005	0.09	0.000	0%						
1	3.00	0.42		0.021			1.0	2.15	3.10	0.95	0.42	0.021	0.021	0.40	0.008	2%						
2	3.20	0.47		0.059			1.0	3.10	3.30	0.20	0.47	0.059	0.059	0.09	0.006	1%						
3	3.40	0.50		0.029			1.0	3.30	3.50	0.20	0.50	0.029	0.029	0.10	0.003	1%						
4	3.60	0.49		0.138			1.0	3.50	3.70	0.20	0.49	0.138	0.138	0.10	0.014	3%						
5	3.80	0.50		0.210			1.0	3.70	3.90	0.20	0.50	0.210	0.210	0.10	0.021	5%						
6	4.00	0.48		0.237			1.0	3.90	4.10	0.20	0.48	0.237	0.237	0.10	0.023	5%						
7	4.20	0.48		0.304			1.0	4.10	4.30	0.20	0.48	0.304	0.304	0.10	0.029	7%						
8	4.40	0.48		0.328			1.0	4.30	4.50	0.20	0.48	0.328	0.328	0.10	0.031	7%						
9	4.60	0.46		0.344			1.0	4.50	4.70	0.20	0.46	0.344	0.344	0.09	0.032	7%						
10	4.80	0.46		0.368			1.0	4.70	4.90	0.20	0.46	0.368	0.368	0.09	0.034	8%						
11	5.00	0.47		0.295			1.0	4.90	5.10	0.20	0.47	0.295	0.295	0.09	0.028	6%						
12	5.20	0.46		0.329			1.0	5.10	5.30	0.20	0.46	0.329	0.329	0.09	0.030	7%						
13	5.40	0.49		0.315			1.0	5.30	5.50	0.20	0.49	0.315	0.315	0.10	0.031	7%						
14	5.60	0.50		0.302			1.0	5.50	5.70	0.20	0.50	0.302	0.302	0.10	0.030	7%						
15	5.80	0.50		0.326			1.0	5.70	5.90	0.20	0.50	0.326	0.326	0.10	0.033	7%						
16	6.00	0.49		0.275			1.0	5.90	6.08	0.18	0.49	0.275	0.275	0.09	0.024	5%						
17	6.15	0.48		0.234			1.0	6.08	6.23	0.15	0.48	0.234	0.234	0.07	0.017	4%						
18	6.30	0.42		0.209			1.0	6.23	6.38	0.15	0.42	0.209	0.209	0.06	0.013	3%						
19	6.45	0.38		0.162			1.0	6.38	6.53	0.15	0.38	0.162	0.162	0.06	0.009	2%						
20	6.60	0.36		0.124			1.0	6.53	6.70	0.17	0.36	0.124	0.124	0.06	0.008	2%						
21	6.80	0.36		0.113			1.0	6.70	7.00	0.30	0.36	0.113	0.113	0.11	0.012	3%						
22	7.20	0.28		0.011			1.0	7.00	7.60	0.60	0.28	0.011	0.011	0.17	0.002	0%						
LB	8.00	0.00	0.00	0.00	0.00	0.00	1.0	7.60	8.00	0.40	0.07	0.003	0.003	0.03	0.000	0%						
<b>Total Flow</b>															<b>0.437</b>							

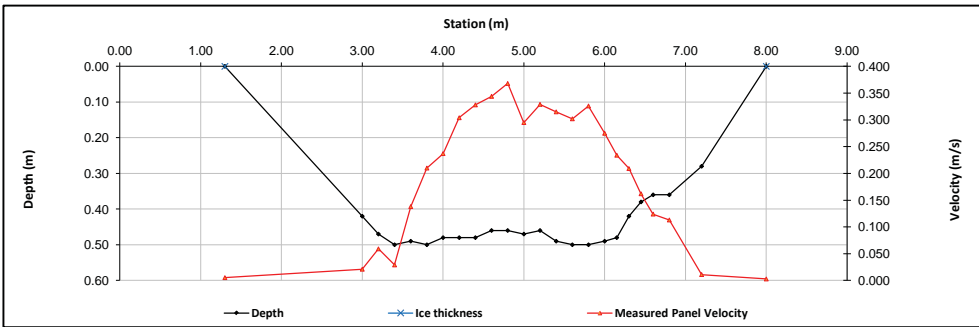
Measurement Details:	
Start Time (MST):	15:46
End Time (MST):	17:30
Equipment:	ADV
Method:	Wading
River Condition:	Open
Quality/Error (see reverse):	Excellent
Weather:	-

Flow characteristics:	
Total Flow:	0.437 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	2.48 (m <sup>2</sup> )
Wetted Width:	6.70 (m)
Hydraulic Depth:	0.370 (m)
Mean Velocity:	0.176 (m/s)
Froude Number:	0.092

Logger Details:		
	Before	After
Transducer Reading (m):	0.497	
Water (°C):	13.6	
Battery (Main):	14.16	
Datalogger Clock:	10:54	
Laptop Clock:	10:53	
Dessicant:	good	
Logger# (if Δ):	18207	
PT# (if Δ):	-	

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>						
Bench Mark 1:					99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:					100.313	Pipe 6 m N of Data Logger
Bench Mark 3:					100.206	Pipe 8 m W of Data Logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:					100.313	Pipe 6 m N of Data Logger
Bench Mark 3:					100.206	Pipe 8 m W of Data Logger
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, HH, XP	Date:	22-Aug-12
Data Check Personnel:	XP	Date:	22-Aug-12
	CJ	Date:	25-Aug-12



# Hydrometric Measurement Field Data Sheets

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: September 13, 2012



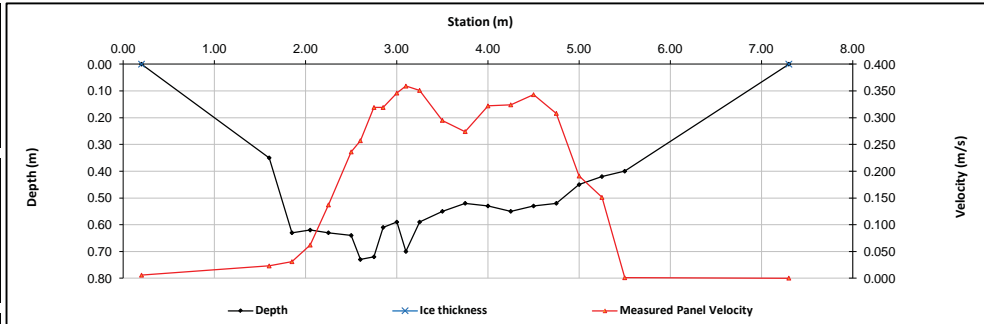
Flow Measurement:										Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured 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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.90	0.70	0.09	0.006	0.006	0.06	0.000	0%			
1	1.60	0.35		0.023			1.0	0.90	1.73	0.83	0.35	0.023	0.023	0.29	0.007	1%			
2	1.85	0.63		0.031			1.0	1.73	1.95	0.23	0.63	0.031	0.031	0.14	0.004	1%			
3	2.05	0.62		0.062			1.0	1.95	2.15	0.20	0.62	0.062	0.062	0.12	0.008	1%			
4	2.25	0.63		0.137			1.0	2.15	2.38	0.23	0.63	0.137	0.137	0.14	0.019	4%			
5	2.50	0.64		0.236			1.0	2.38	2.55	0.18	0.64	0.236	0.236	0.11	0.026	5%			
6	2.60	0.73		0.257			1.0	2.55	2.68	0.13	0.73	0.257	0.257	0.09	0.023	4%			
7	2.75	0.72		0.319			1.0	2.68	2.80	0.13	0.72	0.319	0.319	0.09	0.029	5%			
8	2.85	0.61		0.319			1.0	2.80	2.93	0.13	0.61	0.319	0.319	0.08	0.024	5%			
9	3.00	0.59		0.346			1.0	2.93	3.05	0.13	0.59	0.346	0.346	0.07	0.026	5%			
10	3.10	0.70		0.359			1.0	3.05	3.18	0.13	0.70	0.359	0.359	0.09	0.031	6%			
11	3.25	0.59		0.351			1.0	3.18	3.38	0.20	0.59	0.351	0.351	0.12	0.041	8%			
12	3.50	0.55		0.295			1.0	3.38	3.63	0.25	0.55	0.295	0.295	0.14	0.041	8%			
13	3.75	0.52		0.274			1.0	3.63	3.88	0.25	0.52	0.274	0.274	0.13	0.036	7%			
14	4.00	0.53		0.322			1.0	3.88	4.13	0.25	0.53	0.322	0.322	0.13	0.043	8%			
15	4.25	0.55		0.324			1.0	4.13	4.38	0.25	0.55	0.324	0.324	0.14	0.045	8%			
16	4.50	0.53		0.343			1.0	4.38	4.63	0.25	0.53	0.343	0.343	0.13	0.045	9%			
17	4.75	0.52		0.308			1.0	4.63	4.88	0.25	0.52	0.308	0.308	0.13	0.040	8%			
18	5.00	0.45		0.191			1.0	4.88	5.13	0.25	0.45	0.191	0.191	0.11	0.021	4%			
19	5.25	0.42		0.151			1.0	5.13	5.38	0.25	0.42	0.151	0.151	0.11	0.016	3%			
20	5.50	0.40		0.001			1.0	5.38	6.40	1.03	0.40	0.001	0.001	0.41	0.000	0%			
RB	7.30	0.00	0.00	0.00	0.00	0.00	1.0	6.40	7.30	0.90	0.10	0.000	0.000	0.09	0.000	0%			
<b>Total Flow</b>														<b>0.526</b>					

Measurement Details:	
Start Time (MST):	10:33
End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	Partial cloud, 15

Flow characteristics:	
Total Flow:	0.526 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.92 (m <sup>2</sup> )
Wetted Width:	7.10 (m)
Hydraulic Depth:	0.412 (m)
Mean Velocity:	0.180 (m/s)
Froude Number:	0.090

Logger Details:		
	Before	After
Transducer Reading (m):	0.568	
Water (°C):	6.9	
Battery (Main):	12.8	
Datalogger Clock:	9:40	
Laptop Clock:	9:40	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	
IQ	
-STAGE: 100.32	
-MEAN VELOCITY: 0	
-WATER DEPTH: 1.49	
-INDEX VELOCITY: 0.291	
-WATER TEMP: 7.14	
-BATT VOLTAGE: 11.85	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.243	101.166		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.853	100.313	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			0.959	100.207	100.206	Pipe 8 m W of Datat Logger
Ice/PT:						
Water Level:			1.856	99.310		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.209	101.132		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.820	100.312	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			0.925	100.207	100.206	Pipe 8 m W of Datat Logger
Ice/PT:						
Water Level:			1.824	99.308		
Other:						

Closing Error	0.000	Average WL	99.309
WL Check	0.002	Transducer Elevation	98.741

General Notes:	
-Below base of Sontek IQ is eroded and water is flowing below it	
-SONTEK BASE is no longer level, pointing downward	
-IQ has not recorded flow since Sept. 4th	
-1.4 m to 5.8 m is main flow. Remainder is flooded grass-Good Measurement Quality	
-TSS @ 3.9 m	

Field Personnel:		TR, DW	Trip Date:	13-Sep-12
Data Entry Personnel:	TR (Field)		Date:	13-Sep-12
Data Check Personnel:	CJ		Date:	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: October 25, 2012



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	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	3.10	0.00	0.00	0.000	0.000	0.000	1.0	3.10	3.43	0.33	0.07	0.000	0.000	0.02	0.000	0%						
1	3.75	0.26		0.001				3.43	3.88	0.45	0.26	0.001	0.001	0.12	0.000	0%						
2	4.00	0.26		0.014			1.0	3.88	4.13	0.25	0.26	0.014	0.014	0.07	0.001	0%						
3	4.25	0.38		0.040			1.0	4.13	4.38	0.25	0.38	0.040	0.040	0.10	0.004	1%						
4	4.50	0.42		0.132			1.0	4.38	4.63	0.25	0.42	0.132	0.132	0.11	0.014	3%						
5	4.75	0.42		0.139			1.0	4.63	4.88	0.25	0.42	0.139	0.139	0.11	0.015	3%						
6	5.00	0.48		0.190			1.0	4.88	5.13	0.25	0.48	0.190	0.190	0.12	0.023	5%						
7	5.25	0.54		0.214			1.0	5.13	5.38	0.25	0.54	0.214	0.214	0.14	0.029	6%						
8	5.50	0.60		0.226			1.0	5.38	5.63	0.25	0.60	0.226	0.226	0.15	0.034	7%						
9	5.75	0.62		0.263			1.0	5.63	5.88	0.25	0.62	0.263	0.263	0.16	0.041	8%						
10	6.00	0.62		0.290			1.0	5.88	6.13	0.25	0.62	0.290	0.290	0.16	0.045	9%						
11	6.25	0.68		0.262			1.0	6.13	6.38	0.25	0.68	0.262	0.262	0.17	0.045	9%						
12	6.50	0.72		0.255			1.0	6.38	6.63	0.25	0.72	0.255	0.255	0.18	0.046	9%						
13	6.75	0.71		0.280			1.0	6.63	6.88	0.25	0.71	0.280	0.280	0.18	0.050	10%						
14	7.00	0.70		0.316			1.0	6.88	7.08	0.20	0.70	0.316	0.316	0.14	0.044	9%						
15	7.15	0.68		0.310			1.0	7.08	7.20	0.13	0.68	0.310	0.310	0.09	0.026	5%						
16	7.25	0.64		0.284			1.0	7.20	7.38	0.18	0.64	0.284	0.284	0.11	0.032	6%						
17	7.50	0.64		0.206			1.0	7.38	7.63	0.25	0.64	0.206	0.206	0.16	0.033	7%						
18	7.75	0.59		0.133			1.0	7.63	7.88	0.25	0.59	0.133	0.133	0.15	0.020	4%						
19	8.00	0.51		0.049			1.0	7.88	8.13	0.25	0.51	0.049	0.049	0.13	0.006	1%						
20	8.25	0.50		-0.006			1.0	8.13	9.23	1.10	0.50	-0.006	-0.006	0.55	-0.003	-1%						
RB	10.20	0.00	0.00	0.00	0.00	0.00	1.0	9.23	10.20	0.98	0.13	-0.002	-0.002	0.12	0.000	0%						

**Total Flow 0.502**

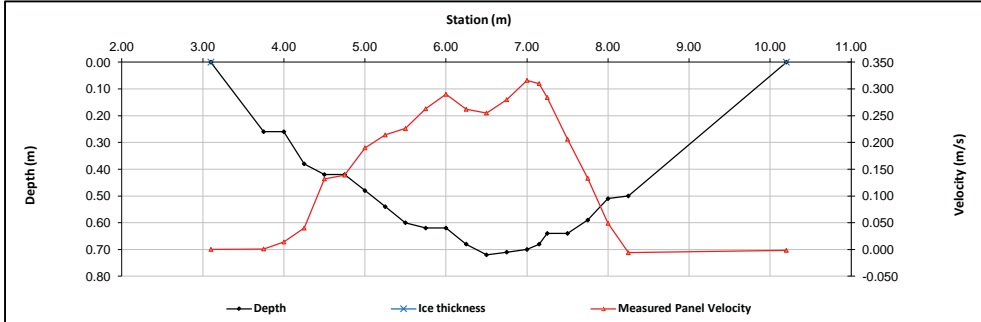
Measurement Details:	
Start Time (MST):	8:15
End Time (MST):	9:05
Equipment:	ADV
Method:	Wading
River Condition:	Open
Quality/Error (see reverse):	Excellent
Weather:	light snow, -5C

Flow characteristics:		
Total Flow:	0.502	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.19	(m <sup>2</sup> )
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.450	(m)
Mean Velocity:	0.157	(m/s)
Froude Number:	0.075	

Logger Details:		
	Before	After
Transducer Reading (m):	0.555	
Water (°C):	1.8	
Battery (Main):	12.5	
Datalogger Clock:	8:17	
Laptop Clock:	8:17	
Dessicant:	Good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**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>						
Bench Mark 1:	1.341	101.264		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.951	100.313	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			1.057	100.207	100.206	Pipe 8 m W of Datal Logger
Ice/PT:						
Water Level:			1.967	99.297		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.328	99.922	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:	0.937	101.250		100.313	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			1.043	100.207	100.206	Pipe 8 m W of Datal Logger
Ice/PT:						
Water Level:			1.951	99.299		
Other:						

Closing Error	0.001	Average WL	99.298
WL Check	0.002	Transducer Elevation	98.743

<b>Field Personnel:</b>		DW, TR	Trip Date:	25-Oct-12
Data Entry Personnel:	DW		Date:	25-Oct-12
Data Check Personnel:	DW		Date:	4-Nov-12
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: December 9, 2012



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	0.50	0.00	0.00	0.000	0.000	0.000		0.50	0.78	0.28	0.16	0.085	0.076	0.04	0.003	1%
1	1.05	0.90	0.25	0.338			0.9	0.78	1.18	0.40	0.65	0.338	0.304	0.26	0.079	17%
2	1.30	0.70	0.27	0.420			0.9	1.18	1.40	0.23	0.43	0.420	0.378	0.10	0.037	8%
3	1.50	0.70	0.30	0.510			0.9	1.40	1.70	0.30	0.40	0.510	0.459	0.12	0.055	12%
4	1.90	0.70	0.30	0.457			0.9	1.70	2.00	0.30	0.40	0.457	0.411	0.12	0.049	11%
5	2.10	0.60	0.30	0.257			0.9	2.00	2.15	0.15	0.30	0.257	0.231	0.05	0.010	2%
6	2.20	0.65	0.35	0.003			0.9	2.15	2.33	0.18	0.30	0.003	0.003	0.05	0.000	0%
7	2.45	0.65	0.30	0.422			0.9	2.33	2.50	0.18	0.35	0.422	0.380	0.06	0.023	5%
8	2.55	0.60	0.35	0.345			0.9	2.50	2.63	0.13	0.25	0.345	0.311	0.03	0.010	2%
9	2.70	0.60	0.35	0.261			0.9	2.63	2.75	0.13	0.25	0.261	0.235	0.03	0.007	2%
10	2.80	0.65	0.35	0.472			0.9	2.75	2.90	0.15	0.30	0.472	0.425	0.05	0.019	4%
11	3.00	0.65	0.35	0.283			0.9	2.90	3.05	0.15	0.30	0.283	0.255	0.05	0.011	3%
12	3.10	0.60	0.30	0.288			0.9	3.05	3.20	0.15	0.30	0.288	0.259	0.05	0.012	3%
13	3.30	0.60	0.70	0.483			0.9	3.20	3.35	0.15	-0.10	0.483	0.435	-0.01	-0.007	-1%
14	3.40	0.60	0.25	0.498			0.9	3.35	3.53	0.18	0.35	0.498	0.448	0.06	0.027	6%
15	3.65	0.50	0.25	0.482			0.9	3.53	3.75	0.23	0.25	0.482	0.434	0.06	0.024	5%
16	3.85	0.40	0.25	0.254			0.9	3.75	4.00	0.25	0.15	0.254	0.229	0.04	0.009	2%
17	4.15	0.50	0.20	0.444			0.9	4.00	4.28	0.28	0.30	0.444	0.400	0.08	0.033	7%
18	4.40	0.50	0.25	0.359			0.9	4.28	4.58	0.30	0.25	0.359	0.323	0.08	0.024	5%
19	4.75	0.50	0.20	0.287			0.9	4.58	4.88	0.30	0.30	0.287	0.258	0.09	0.023	5%
20	5.00	0.40	0.23	0.031			0.9	4.88	5.25	0.38	0.17	0.031	0.028	0.06	0.002	0%
RB	5.50	0.00	0.00	0.00	0.00	0.00	1.0	5.25	5.50	0.25	0.04	0.008	0.008	0.01	0.000	0%
<b>Total Flow</b>															<b>0.453</b>	

Measurement Details:	
Start Time (MST):	12:40
End Time (MST):	13:59
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	overcast, -20C

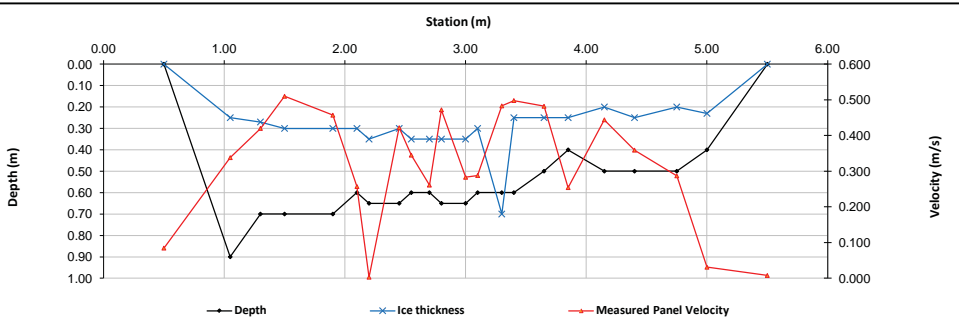
Flow characteristics:	
Total Flow:	0.453 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	1.46 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.292 (m)
Mean Velocity:	0.310 (m/s)
Froude Number:	0.184

Logger Details:		
	Before	After
Transducer Reading (m):	0.717	
Water (°C):	0.1	
Battery (Main):	11.3	
Datalogger Clock:	12:54	
Laptop Clock:	12:54	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

**General Notes:**

- flow MMT Start 1:16, end 1:37



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.330	101.253		99.923	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:			0.941	100.312	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			1.047	100.206	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.787	99.466		
Water Level:			1.793	99.460		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.318	99.922	99.923	Pipe 8 m NE of Data Logger
Bench Mark 2:	0.928	101.240		100.312	100.313	Pipe 6 m N of Data Logger
Bench Mark 3:			1.034	100.206	100.206	Pipe 8 m W of Data Logger
Ice/PT:			1.775	99.465		
Water Level:			1.779	99.461		
Other:						

Closing Error	0.001	Average WL	99.461
WL Check	0.001	Transducer Elevation	98.744

Field Personnel:		Trip Date:	9-Dec-12
Data Entry Personnel:	SM, CJ	Date:	9-Dec-12
Data Check Personnel:	DW	Date:	11-Dec-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S37 - East Jackpine Creek (487840 E, 6325424 N)

UTM Location: 487840 E, 6325424 N

Site Visit Date:

April 25, 2012



## Flow Measurement:

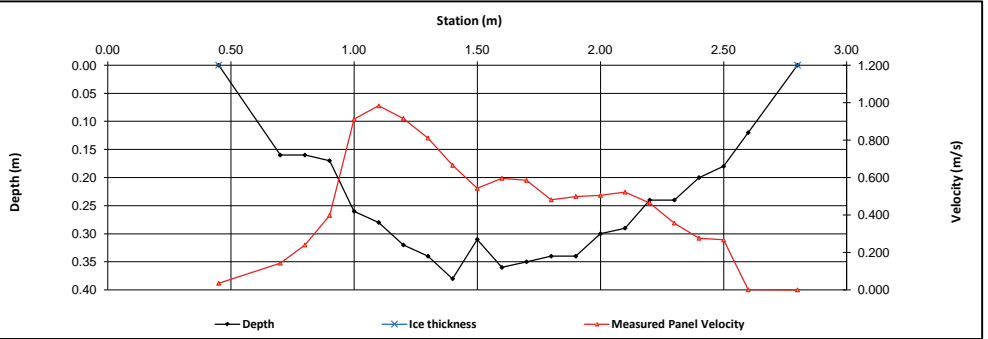
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.45	0.00	0.00	0.000	0.000	0.000	1.0	0.45	0.58	0.13	0.04	0.036	0.036	0.01	0.000	0%
1	0.70	0.16		0.143			1.0	0.58	0.75	0.18	0.16	0.143	0.03	0.004	0.004	1%
2	0.80	0.16		0.240			1.0	0.75	0.85	0.10	0.16	0.240	0.02	0.004	0.004	1%
3	0.90	0.17		0.398			1.0	0.85	0.95	0.10	0.17	0.398	0.02	0.007	0.007	2%
4	1.00	0.26		0.912			1.0	0.95	1.05	0.10	0.26	0.912	0.03	0.024	0.024	8%
5	1.10	0.28		0.983			1.0	1.05	1.15	0.10	0.28	0.983	0.03	0.028	0.028	9%
6	1.20	0.32		0.916			1.0	1.15	1.25	0.10	0.32	0.916	0.03	0.029	0.029	10%
7	1.30	0.34		0.811			1.0	1.25	1.35	0.10	0.34	0.811	0.03	0.028	0.028	9%
8	1.40	0.38		0.665			1.0	1.35	1.45	0.10	0.38	0.665	0.04	0.025	0.025	8%
9	1.50	0.31		0.543			1.0	1.45	1.55	0.10	0.31	0.543	0.03	0.017	0.017	6%
10	1.60	0.36		0.596			1.0	1.55	1.65	0.10	0.36	0.596	0.04	0.021	0.021	7%
11	1.70	0.35		0.585			1.0	1.65	1.75	0.10	0.35	0.585	0.04	0.020	0.020	7%
12	1.80	0.34		0.481			1.0	1.75	1.85	0.10	0.34	0.481	0.03	0.016	0.016	5%
13	1.90	0.34		0.499			1.0	1.85	1.95	0.10	0.34	0.499	0.03	0.017	0.017	6%
14	2.00	0.30		0.505			1.0	1.95	2.05	0.10	0.30	0.505	0.03	0.015	0.015	5%
15	2.10	0.29		0.522			1.0	2.05	2.15	0.10	0.29	0.522	0.03	0.015	0.015	5%
16	2.20	0.24		0.465			1.0	2.15	2.25	0.10	0.24	0.465	0.02	0.011	0.011	4%
17	2.30	0.24		0.357			1.0	2.25	2.35	0.10	0.24	0.357	0.02	0.009	0.009	3%
18	2.40	0.20		0.276			1.0	2.35	2.45	0.10	0.20	0.276	0.02	0.006	0.006	2%
19	2.50	0.18		0.267			1.0	2.45	2.55	0.10	0.18	0.267	0.02	0.005	0.005	2%
20	2.60	0.12		0.001			1.0	2.55	2.70	0.15	0.12	0.001	0.001	0.000	0.000	0%
LB	2.80	0.00	0.00	0.000	0.000	0.000	1.0	2.70	2.80	0.10	0.03	0.000	0.000	0.000	0.000	0%
<b>Total Flow</b>															<b>0.301</b>	

Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	15:00
Equipment:	ADV
Method:	Wading
River Condition:	open, bed ice
Quality/Error (see reverse):	good
Weather:	sunny, +8

Flow characteristics:	
Total Flow:	0.301 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	0.56 (m <sup>2</sup> )
Wetted Width:	2.35 (m)
Hydraulic Depth:	0.238 (m)
Mean Velocity:	0.537 (m/s)
Froude Number:	0.351

Logger Details:		
	Before	After
Transducer Reading (m):	0.316	-
Water (°C):	1.0	-
Battery (Main):	14.55	-
Datalogger Clock:	15:05	-
Laptop Clock:	15:05	-
Dessicant:	replaced	-
Logger# (if Δ):	18165	-
PT# (if Δ):	284726	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.383	102.221		100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			2.180	100.041		Nail in stump by river
Bench Mark 3:						
Ice/PT:						
Water Level:			2.103	100.118		
Other:			0.908	101.313		Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.372	100.842	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			2.171	100.043		Nail in stump by river
Bench Mark 3:						
Ice/PT:						
Water Level:			2.093	100.121		
Other:	0.901	102.214		101.313		Nail in tree

Closing Error	-0.004	Average WL	100.120
WL Check	0.003	Transducer Elevation	99.804

**General Notes:**

-installed logger and PLS

<b>Field Personnel:</b>	SM, SG	<b>Trip Date:</b>	25-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S37 - East Jackpine Creek (487840 E, 6325424 N)

UTM Location: 487840 E, 6325424 N

Site Visit Date:

June 15, 2012



### 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
LB	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.28	0.08	0.06	-0.005	-0.005	0.00	0.000	0%
1	0.35	0.22		-0.020			1.0	0.28	0.43	0.15	0.22	-0.020	-0.020	0.03	-0.001	0%
2	0.50	0.59		0.095			1.0	0.43	0.58	0.15	0.59	0.095	0.095	0.09	0.008	3%
3	0.65	0.62		0.075			1.0	0.58	0.73	0.15	0.62	0.075	0.075	0.09	0.007	3%
4	0.80	0.54		0.221			1.0	0.73	0.88	0.15	0.54	0.221	0.221	0.08	0.018	6%
5	0.95	0.58		0.267			1.0	0.88	1.03	0.15	0.58	0.267	0.267	0.09	0.023	8%
6	1.10	0.60		0.303			1.0	1.03	1.18	0.15	0.60	0.303	0.303	0.09	0.027	10%
7	1.25	0.66		0.312			1.0	1.18	1.33	0.15	0.66	0.312	0.312	0.10	0.031	11%
8	1.40	0.66		0.347			1.0	1.33	1.48	0.15	0.66	0.347	0.347	0.10	0.034	12%
9	1.55	0.68		0.194			1.0	1.48	1.63	0.15	0.68	0.194	0.194	0.10	0.020	7%
10	1.70	0.70		0.160			1.0	1.63	1.78	0.15	0.70	0.160	0.160	0.11	0.017	6%
11	1.85	0.66		0.142			1.0	1.78	1.93	0.15	0.66	0.142	0.142	0.10	0.014	5%
12	2.00	0.62		0.177			1.0	1.93	2.08	0.15	0.62	0.177	0.177	0.09	0.016	6%
13	2.15	0.51		0.257			1.0	2.08	2.23	0.15	0.51	0.257	0.257	0.08	0.020	7%
14	2.30	0.46		0.190			1.0	2.23	2.38	0.15	0.46	0.190	0.190	0.07	0.013	5%
15	2.45	0.37		0.152			1.0	2.38	2.53	0.15	0.37	0.152	0.152	0.06	0.008	3%
16	2.60	0.32		0.173			1.0	2.53	2.68	0.15	0.32	0.173	0.173	0.05	0.008	3%
17	2.75	0.28		0.148			1.0	2.68	2.83	0.15	0.28	0.148	0.148	0.04	0.006	2%
18	2.90	0.28		0.076			1.0	2.83	2.98	0.15	0.28	0.076	0.076	0.04	0.003	1%
19	3.05	0.26		0.068			1.0	2.98	3.13	0.15	0.26	0.068	0.068	0.04	0.003	1%
20	3.20	0.16		0.004			1.0	3.13	3.28	0.15	0.16	0.004	0.004	0.02	0.000	0%
21	3.35	0.11		-0.009			1.0	3.28	3.43	0.15	0.11	-0.009	-0.009	0.02	0.000	0%
22	3.50	0.09		0.004			1.0	3.43	3.55	0.13	0.09	0.004	0.004	0.01	0.000	0%
RB	3.60	0.00	0.00	0.000	0.000	0.000	1.0	3.55	3.60	0.05	0.02	0.001	0.001	0.00	0.000	0%
<b>Total Flow</b>															<b>0.277</b>	

### Measurement Details:

Start Time (MST):	17:30
End Time (MST):	19:10
Equipment:	ADV
Method:	Wading
River Condition:	good flow
Quality/Error (see reverse):	good
Weather:	cloudy, 15°C

### Flow characteristics:

Total Flow:	0.277	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	1.50	(m <sup>2</sup> )
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.441	(m)
Mean Velocity:	0.185	(m/s)
Froude Number:	0.089	

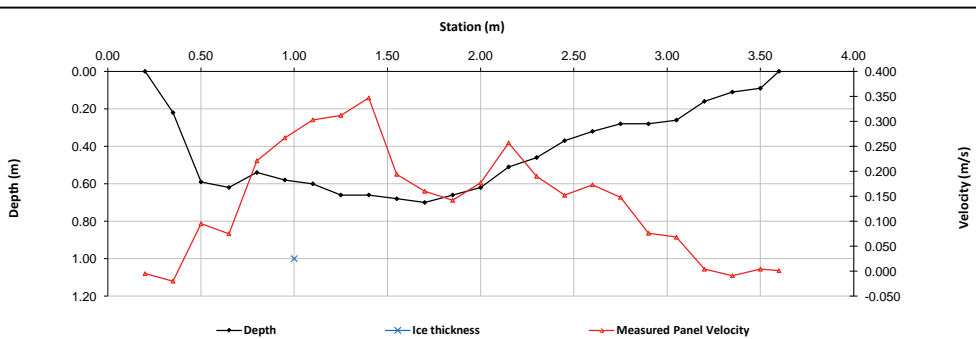
### Logger Details:

	Before	After
Transducer Reading (m):	0.614	-
Water (°C):	23.2	-
Battery (Main):	14.2	-
Datalogger Clock:	16:46	-
Laptop Clock:	16:45	-
Dessicant:	replaced	-
Logger# (if Δ):	18165	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:


### General Notes:

-installed 2 BM, 1 needs more hits



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.562	102.400		100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			1.321	101.079	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:						
Ice/PT:						
Water Level:			2.358	100.042		
Other:			1.099	101.301		Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.531	100.840	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:	1.292	102.371		101.079	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:						
Ice/PT:						
Water Level:			2.329	100.042		
Other:			1.068	101.303		Nail in tree

Closing Error	-0.002	Average WL	100.042
WL Check	0.000	Transducer Elevation	99.428

Field Personnel:	TR, CJ	Trip Date:	15-Jun-12
Data Entry Personnel:	CJ	Date:	27-Jun-12
Data Check Personnel:	XP	Date:	28-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: S37 - East Jackpine Creek (487840 E, 6325424 N)

UTM Location: 487840 E, 6325424 N

Site Visit Date:

August 24, 2012



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	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	0.90	0.10	0.04	0.026	0.026	0.00	0.000	0%
1	1.00	0.17		0.102			1.0	0.90	1.05	0.15	0.17	0.102	0.102	0.03	0.003	9%
2	1.10	0.20		0.081			1.0	1.05	1.15	0.10	0.20	0.081	0.081	0.02	0.002	5%
3	1.20	0.23		0.062			1.0	1.15	1.28	0.13	0.23	0.062	0.062	0.03	0.002	6%
4	1.35	0.20		0.104			1.0	1.28	1.39	0.11	0.20	0.104	0.104	0.02	0.002	8%
5	1.42	0.20		0.079			1.0	1.39	1.46	0.08	0.20	0.079	0.079	0.02	0.001	4%
6	1.50	0.22		0.053			1.0	1.46	1.54	0.08	0.22	0.053	0.053	0.02	0.001	3%
7	1.57	0.20		0.086			1.0	1.54	1.61	0.07	0.20	0.086	0.086	0.01	0.001	4%
8	1.65	0.21		0.090			1.0	1.61	1.69	0.08	0.21	0.090	0.090	0.02	0.001	5%
9	1.72	0.20		0.088			1.0	1.69	1.76	0.08	0.20	0.088	0.088	0.02	0.001	4%
10	1.80	0.21		0.091			1.0	1.76	1.84	0.08	0.21	0.091	0.091	0.02	0.001	5%
11	1.87	0.20		0.088			1.0	1.84	1.91	0.08	0.20	0.088	0.088	0.02	0.001	4%
12	1.95	0.18		0.049			1.0	1.91	1.99	0.07	0.18	0.049	0.049	0.01	0.001	2%
13	2.02	0.18		0.055			1.0	1.99	2.06	0.08	0.18	0.055	0.055	0.01	0.001	2%
14	2.10	0.20		0.082			1.0	2.06	2.14	0.07	0.20	0.082	0.082	0.01	0.001	4%
15	2.17	0.20		0.059			1.0	2.14	2.21	0.08	0.20	0.059	0.059	0.02	0.001	3%
16	2.25	0.18		0.096			1.0	2.21	2.33	0.12	0.18	0.096	0.096	0.02	0.002	7%
17	2.40	0.16		0.098			1.0	2.33	2.48	0.15	0.16	0.098	0.098	0.02	0.002	8%
18	2.55	0.16		0.064			1.0	2.48	2.63	0.15	0.16	0.064	0.064	0.02	0.002	5%
19	2.70	0.16		0.085			1.0	2.63	2.75	0.13	0.16	0.085	0.085	0.02	0.002	6%
20	2.80	0.16		0.068			1.0	2.75	2.91	0.16	0.16	0.068	0.068	0.03	0.002	6%
LB	3.02	0.00	0.00	0.000	0.000	0.000	1.0	2.91	3.02	0.11	0.04	0.017	0.017	0.00	0.000	0%
<b>Total Flow</b>															<b>0.030</b>	

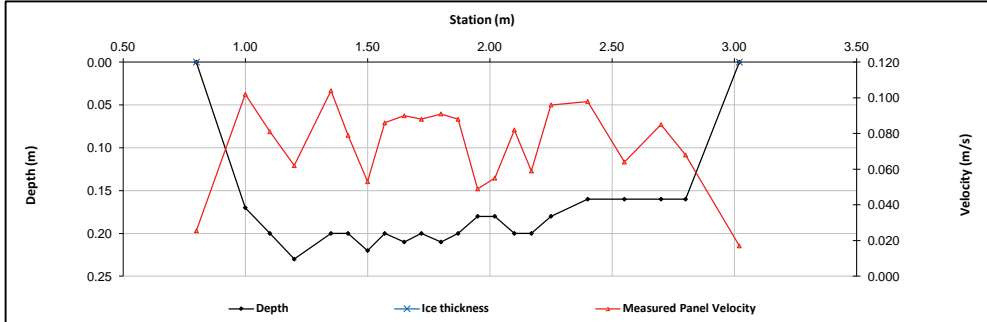
Measurement Details:	
Start Time (MST):	14:15
End Time (MST):	14:55
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	-

Flow characteristics:		
Total Flow:	0.0301	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.38	(m <sup>2</sup> )
Wetted Width:	2.22	(m)
Hydraulic Depth:	0.173	(m)
Mean Velocity:	0.078	(m/s)
Froude Number:	0.060	

Logger Details:		
	Before	After
Transducer Reading (m):	0.365	
Water (°C):	14.4	
Battery (Main):	14.3	
Datalogger Clock:	14:12	
Laptop Clock:	14:11	
Dessicant:	replaced	
Logger# (if Δ):	18165	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-TSS sampled at 2.8m	
-Cell service weak at top of hill	

General Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.027	101.865		100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			0.787	101.078	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:						
Ice/PT:						
Water Level:			2.086	99.779		
Other:			1.827	100.038		Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.016	100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			0.776	101.078	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:						
Ice/PT:						
Water Level:			2.076	99.778		
Other:	1.816	101.854		100.038		Nail in tree

Closing Error	0.000	Average WL	99.779
WL Check	0.001	Transducer Elevation	99.414

<b>Field Personnel:</b>	SM, XP	<b>Trip Date:</b>	24-Aug-12
<b>Data Entry Personnel:</b>	SM (Field)	<b>Date:</b>	24-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	10-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S37 - East Jackpine Creek (487840 E, 6325424 N)  
 UTM Location: 487840 E, 6325424 N

Site Visit Date:

September 14, 2012



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	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	6.30	0.00	0.00	0.000	0.000	0.000	1.0	6.30	6.38	0.08	0.30	0.082	0.082	0.02	0.002	0%
1	6.45	1.20		0.534	0.121		1.0	6.38	6.53	0.15	1.20	0.328	0.328	0.18	0.059	3%
2	6.60	1.20		0.691	0.497		1.0	6.53	6.68	0.15	1.20	0.594	0.594	0.18	0.107	6%
3	6.75	1.30		0.770	0.406		1.0	6.68	6.83	0.15	1.30	0.588	0.588	0.20	0.115	7%
4	6.90	1.26		0.916	0.434		1.0	6.83	6.98	0.15	1.26	0.675	0.675	0.19	0.128	8%
5	7.05	1.27		0.810	0.401		1.0	6.98	7.13	0.15	1.27	0.606	0.606	0.19	0.115	7%
6	7.20	1.29		1.008	0.477		1.0	7.13	7.24	0.11	1.29	0.743	0.743	0.14	0.105	6%
7	7.27	1.31		1.062	0.435		1.0	7.24	7.31	0.08	1.31	0.749	0.749	0.10	0.074	4%
8	7.35	1.30		1.031	0.500		1.0	7.31	7.39	0.08	1.30	0.766	0.766	0.10	0.075	4%
9	7.42	1.31		1.028	0.470		1.0	7.39	7.46	0.08	1.31	0.749	0.749	0.10	0.074	4%
10	7.50	1.28		1.071	0.479		1.0	7.46	7.54	0.08	1.28	0.775	0.775	0.10	0.074	4%
11	7.57	1.32		0.999	0.455		1.0	7.54	7.61	0.08	1.32	0.727	0.727	0.10	0.072	4%
12	7.65	1.30		0.965	0.457		1.0	7.61	7.69	0.08	1.30	0.711	0.711	0.10	0.069	4%
13	7.72	1.29		0.973	0.558		1.0	7.69	7.76	0.07	1.29	0.766	0.766	0.10	0.074	4%
14	7.80	1.30		0.958	0.574		1.0	7.76	7.84	0.08	1.30	0.766	0.766	0.10	0.075	4%
15	7.87	1.24		0.859	0.606		1.0	7.84	7.91	0.08	1.24	0.733	0.733	0.09	0.068	4%
16	7.95	1.25		0.760	0.572		1.0	7.91	8.03	0.12	1.25	0.666	0.666	0.14	0.096	6%
17	8.10	1.25		0.741	0.680		1.0	8.03	8.15	0.12	1.25	0.371	0.371	0.16	0.058	3%
18	8.20	1.22		0.714	0.687		1.0	8.15	8.30	0.15	1.22	0.357	0.357	0.18	0.065	4%
19	8.40	1.23		0.681	0.452		1.0	8.30	8.45	0.15	1.23	0.341	0.341	0.18	0.063	4%
20	8.50	1.20		0.517	0.429		1.0	8.45	8.65	0.20	1.20	0.259	0.259	0.24	0.062	4%
21	8.80	0.88		0.451	0.248		1.0	8.65	8.95	0.30	0.88	0.226	0.226	0.26	0.060	4%
22	9.10	0.38		-0.002			1.0	8.95	9.65	0.70	0.38	-0.002	-0.002	0.27	-0.001	0%
RB	10.20	0.00	0.00	0.000	0.000	0.000	1.0	9.65	10.20	0.55	0.10	-0.001	-0.001	0.05	0.000	0%

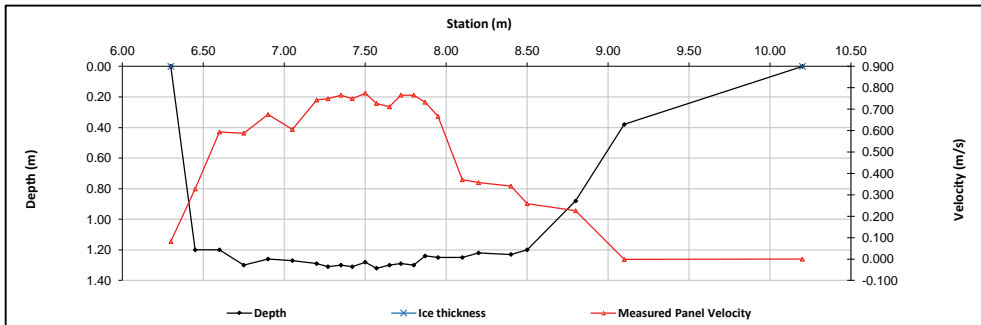
**Total Flow 1.690**

Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	10:57
Equipment:	ADV
Method:	Fishcat
River Condition:	HIGH
Quality/Error (see reverse):	Excellent
Weather:	P. CLOUDY, 12 DEG.

Flow characteristics:	
Total Flow:	1.69 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	3.46 (m <sup>2</sup> )
Wetted Width:	3.90 (m)
Hydraulic Depth:	0.888 (m)
Mean Velocity:	0.488 (m/s)
Froude Number:	0.165

Logger Details:		
	Before	After
Transducer Reading (m):	1.223	
Water (°C):	8.7	
Battery (Main):	12.8	
Datalogger Clock:	7:19	
Laptop Clock:	7:19	
Dessicant:	REPLACED	
Logger# (if Δ):	18165	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.314	102.152		100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			1.076	101.076	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:			0.973	101.179	101.178	3/4" Pipe 1.5 m from Station
Water Level:			1.527	100.625		
Other:						Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.289	100.840	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:	1.053	102.129		101.076	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:			0.949	101.180	101.178	3/4" Pipe 1.5 m from Station
Water Level:			1.502	100.627		
Other:						Nail in tree

Closing Error	-0.002	Average WL	100.626
WL Check	0.002	Transducer Elevation	99.403

General Notes:	
-Flow is very high	

Field Personnel:		Trip Date:	
Data Entry Personnel:	DW, TR	Date:	14-Sep-12
Data Check Personnel:	DW (Field)	Date:	14-Sep-12
	CJ	Date:	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S37 - East Jackpine Creek (487840 E, 6325424 N)

UTM Location: 487840 E, 6325424 N

Site Visit Date:

November 5, 2012



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	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	0.23	0.08	0.03	0.005	0.005	0.00	0.000	0%				
1	0.30	0.12		0.021			1.0	0.23	0.40	0.18	0.12	0.021	0.021	0.02	0.000	0%				
2	0.50	0.16		0.189			1.0	0.40	0.63	0.23	0.16	0.189	0.189	0.04	0.007	2%				
3	0.75	0.18		0.240			1.0	0.63	0.88	0.25	0.18	0.240	0.240	0.05	0.011	3%				
4	1.00	0.26		0.309			1.0	0.88	1.13	0.25	0.26	0.309	0.309	0.07	0.020	6%				
5	1.25	0.36		0.338			1.0	1.13	1.33	0.20	0.36	0.338	0.338	0.07	0.024	7%				
6	1.40	0.44		0.340			1.0	1.33	1.48	0.15	0.44	0.340	0.340	0.07	0.022	6%				
7	1.55	0.50		0.343			1.0	1.48	1.63	0.15	0.50	0.343	0.343	0.08	0.026	7%				
8	1.70	0.54		0.334			1.0	1.63	1.78	0.15	0.54	0.334	0.334	0.08	0.027	8%				
9	1.85	0.60		0.326			1.0	1.78	1.93	0.15	0.60	0.326	0.326	0.09	0.029	8%				
10	2.00	0.64		0.341			1.0	1.93	2.08	0.15	0.64	0.341	0.341	0.10	0.033	9%				
11	2.15	0.62		0.329			1.0	2.08	2.23	0.15	0.62	0.329	0.329	0.09	0.031	9%				
12	2.30	0.61		0.328			1.0	2.23	2.38	0.15	0.61	0.328	0.328	0.09	0.030	8%				
13	2.45	0.61		0.233			1.0	2.38	2.53	0.15	0.61	0.233	0.233	0.09	0.021	6%				
14	2.60	0.56		0.245			1.0	2.53	2.68	0.15	0.56	0.245	0.245	0.08	0.021	6%				
15	2.75	0.50		0.249			1.0	2.68	2.83	0.15	0.50	0.249	0.249	0.08	0.019	5%				
16	2.90	0.42		0.191			1.0	2.83	2.98	0.15	0.42	0.191	0.191	0.06	0.012	3%				
17	3.05	0.35		0.244			1.0	2.98	3.13	0.15	0.35	0.244	0.244	0.05	0.013	4%				
18	3.20	0.30		0.160			1.0	3.13	3.28	0.15	0.30	0.160	0.160	0.05	0.007	2%				
19	3.35	0.24		0.110			1.0	3.28	3.43	0.15	0.24	0.110	0.110	0.04	0.004	1%				
20	3.50	0.12		0.001			1.0	3.43	3.65	0.23	0.12	0.001	0.001	0.03	0.000	0%				
LB	3.80	0.00	0.00	0.00	0.00	0.00	1.0	3.65	3.80	0.15	0.03	0.000	0.000	0.00	0.000	0%				

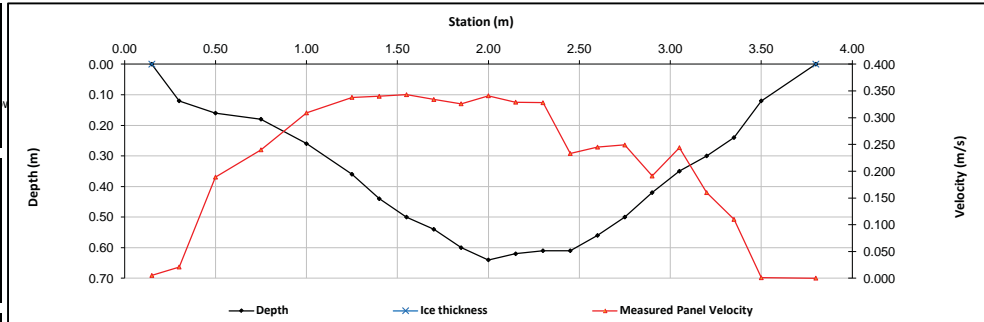
**Total Flow 0.357**

Measurement Details:	
Start Time (MST):	13:26
End Time (MST):	14:25
Equipment:	ADV
Method:	Wading
River Condition:	high flow, partial ice
Quality/Error (see reverse):	Good
Weather:	overcast, calm, +7 deg

Flow Characteristics:		
Total Flow:	0.357	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.31	(m <sup>2</sup> )
Wetted Width:	3.65	(m)
Hydraulic Depth:	0.360	(m)
Mean Velocity:	0.272	(m/s)
Froude Number:	0.145	

Logger Details:		
	Before	After
Transducer Reading (m):	0.765	
Water (°C):	0.4	
Battery (Main):	14.7	
Datalogger Clock:	13:28	
Laptop Clock:	13:28	
Dessicant:	replaced	
Logger# (if Δ):	18165	
PT# (if Δ):	-	

Datalogger / Station Notes:	
tested radio communication- good	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.916	101.754		100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			0.678	101.076	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:			0.576	101.178	101.178	3/4" Pipe 1.5 m from Station
Ice/PT:						
Water Level:			1.599	100.155		
Other:						Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.903	100.838	100.838	3/4" Pipe 3 m S of logger
Bench Mark 2:			0.665	101.076	101.078	3/4" Pipe 4 m SW of Station
Bench Mark 3:	0.563	101.741		101.178	101.178	3/4" Pipe 1.5 m from Station
Ice/PT:						
Water Level:			1.582	100.159		
Other:						

Closing Error	0.000	Average WL	100.157
WL Check	0.004	Transducer Elevation	99.392

General Notes:	
Flow meas, waded., quality good because of partial ice cover.	
TSS sampled at 2.0 m	

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	5-Nov-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	5-Nov-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	8-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S38 - Steepbank River near Ft. McMurray  
 UTM Location: 475293 E, 6317385 N

Site Visit Date: January 20, 2012



Flow Measurement:							Measured Data									Calculated Data				
Bank/	Offset	Depth	Ice	Velocity	Velocity	Velocity	Velocity	Pannel	Pannel	Pannel	Effective	Measured Pannel	Average	Pannel	Pannel	Percent of				
Mmt #	(m)	(m)	Thickness	@ 0.6	@ 0.8	@ 0.2	Correction	Start	End	Width	Pannel Depth	Velocity	Pannel	Area	Discharge	Total Flow				
			(m)	Depth	Depth	Depth	Factor	(m)	(m)	(m)	(m)	(m/s)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
LB	6.00	0.00	0.00	0.000	0.000	0.000	1.0	6.00	6.65	0.65	0.02	0.003	0.003	0.01	0.000	0%				
2	7.30	0.52	0.45	0.010			1.0	6.65	7.70	1.05	0.07	0.010	0.010	0.07	0.001	0%				
3	8.10	0.40	0.40	0.000			1.0	7.70	8.40	0.70	0.00	0.000	0.000	0.00	0.000	0%				
4	8.70	0.65	0.45	0.000			1.0	8.40	8.95	0.55	0.20	0.000	0.000	0.11	0.000	0%				
5	9.20	0.70	0.45	0.110			1.0	8.95	9.50	0.55	0.25	0.110	0.110	0.14	0.015	3%				
6	9.80	0.82	0.43	0.120			1.0	9.50	9.95	0.45	0.39	0.120	0.120	0.18	0.021	4%				
7	10.10	0.85	0.43	0.140			1.0	9.95	10.35	0.40	0.42	0.140	0.140	0.17	0.024	5%				
8	10.60	0.90	0.41	0.170			1.0	10.35	10.75	0.40	0.49	0.170	0.170	0.20	0.033	7%				
9	10.90	0.95	0.41	0.170			1.0	10.75	11.10	0.35	0.54	0.170	0.170	0.19	0.032	6%				
10	11.30	0.95	0.40	0.190			1.0	11.10	11.50	0.40	0.55	0.190	0.190	0.22	0.042	8%				
11	11.70	1.00	0.40	0.160			1.0	11.50	11.90	0.40	0.60	0.160	0.160	0.24	0.038	8%				
12	12.10	1.00	0.45	0.130			1.0	11.90	12.30	0.40	0.55	0.130	0.130	0.22	0.029	6%				
13	12.50	1.04	0.41	0.130			1.0	12.30	12.70	0.40	0.63	0.130	0.130	0.25	0.033	7%				
14	12.90	1.05	0.43	0.140			1.0	12.70	13.20	0.50	0.62	0.140	0.140	0.31	0.043	9%				
15	13.50	1.10	0.44	0.100			1.0	13.20	13.75	0.55	0.66	0.100	0.100	0.36	0.036	7%				
16	14.00	1.15	0.45	0.120			1.0	13.75	14.20	0.45	0.70	0.120	0.120	0.32	0.038	8%				
17	14.40	1.10	0.47	0.110			1.0	14.20	14.65	0.45	0.63	0.110	0.110	0.28	0.031	6%				
18	14.90	1.04	0.50	0.080			1.0	14.65	15.20	0.55	0.54	0.080	0.080	0.30	0.024	5%				
19	15.50	1.04	0.49	0.050			1.0	15.20	15.75	0.55	0.55	0.050	0.050	0.30	0.015	3%				
20	16.00	0.95	0.45	0.070			1.0	15.75	16.30	0.55	0.50	0.070	0.070	0.28	0.019	4%				
21	16.60	0.85	0.45	0.050			1.0	16.30	16.88	0.57	0.40	0.050	0.050	0.23	0.012	2%				
22	17.15	0.80	0.45	0.040			1.0	16.88	17.43	0.55	0.35	0.040	0.040	0.19	0.008	2%				
23	17.70	0.70	0.45	0.020			1.0	17.43	17.98	0.55	0.25	0.020	0.020	0.14	0.003	1%				
24	18.25	0.60	0.45	0.010			1.0	17.98	18.63	0.65	0.15	0.010	0.010	0.10	0.001	0%				
RB	19.00	0.00	0.00	0.000	0.000	0.000	1.0	18.63	19.00	0.38	0.04	0.003	0.003	0.01	0.000	0%				
<b>Total Flow</b>															<b>0.497</b>					

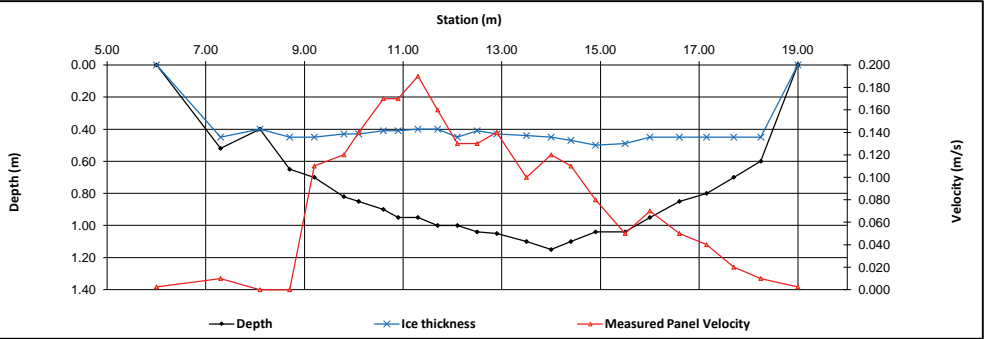
Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	15:30
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -15

Flow characteristics:	
Total Flow:	0.497 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	4.81 (m <sup>2</sup> )
Wetted Width:	13.00 (m)
Hydraulic Depth:	0.370 (m)
Mean Velocity:	0.103 (m/s)
Froude Number:	0.054

Datalogger Details:	Before	After

Level Survey:	
Station	BS + (m)   HI (m)   FS - (m)   Elevation (m)   Elevation as given (m)   Description
Setup #2	
Bench Mark 1:	1.509   100.181
Bench Mark 2:	1.140   98.672   98.672   WSC Brass Cap near cabin
Bench Mark 3:	
Ice/PT:	3.087   97.094
Water Level:	3.105   97.076
Other:	

Datalogger / Station Notes:	



Level Survey:	
Station	BS + (m)   HI (m)   FS - (m)   Elevation (m)   Elevation as given (m)   Description
Setup #2	
Bench Mark 1:	1.509   100.181
Bench Mark 2:	1.140   98.672   98.672   WSC Brass Cap near cabin
Bench Mark 3:	
Ice/PT:	3.087   97.094
Water Level:	3.105   97.076
Other:	
Setup #2	
Bench Mark 1:	
Bench Mark 2:	1.130   100.171
Bench Mark 3:	
Ice/PT:	3.075   97.096
Water Level:	3.092   97.079
Other:	
Closing Error	-0.002
WL Check	0.003
Average WL	97.078
Transducer Elevation	-

**General Notes:**

Field Personnel:	SM, GB	Trip Date:	20-Jan-12
Data Entry Personnel:	CJ	Date:	13-Feb-12
Data Check Personnel:	DW	Date:	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S38 - Steepbank River near Ft. McMurray  
 UTM Location: 475293 E, 6317385 N

Site Visit Date: February 11, 2012



## 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)	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	3.80	0.30	0.02	0.003	0.002	0.01	0.000	0%
1	4.10	0.66	0.57	0.010			0.9	3.80	4.30	0.50	0.09	0.010	0.009	0.05	0.000	0%
2	4.50	0.76	0.60	0.020			0.9	4.30	4.70	0.40	0.16	0.020	0.018	0.06	0.001	0%
3	4.90	0.91	0.61	0.020			0.9	4.70	5.15	0.45	0.30	0.020	0.018	0.14	0.002	1%
4	5.40	0.97	0.63	0.030			0.9	5.15	5.65	0.50	0.34	0.030	0.027	0.17	0.005	1%
5	5.90	1.08	0.63	0.040			0.9	5.65	6.15	0.50	0.45	0.040	0.036	0.23	0.008	2%
6	6.40	1.13	0.65	0.050			0.9	6.15	6.65	0.50	0.48	0.050	0.045	0.24	0.011	3%
7	6.90	1.23	0.64	0.050			0.9	6.65	7.10	0.45	0.59	0.050	0.045	0.27	0.012	3%
8	7.30	1.24	0.63	0.040			0.9	7.10	7.55	0.45	0.61	0.040	0.036	0.27	0.010	2%
9	7.80	1.21	0.61	0.120			0.9	7.55	8.00	0.45	0.60	0.120	0.108	0.27	0.029	7%
10	8.20	1.23	0.60	0.120			0.9	8.00	8.40	0.40	0.63	0.120	0.108	0.25	0.027	7%
11	8.60	1.20	0.59	0.140			0.9	8.40	8.80	0.40	0.61	0.140	0.126	0.24	0.031	8%
12	9.00	1.18	0.57	0.150			0.9	8.80	9.20	0.40	0.61	0.150	0.135	0.24	0.033	8%
13	9.40	1.20	0.56	0.120			0.9	9.20	9.58	0.38	0.64	0.120	0.108	0.24	0.026	6%
14	9.75	1.19	0.56	0.100			0.9	9.58	9.98	0.40	0.63	0.100	0.090	0.25	0.023	6%
15	10.20	1.18	0.55	0.150			0.9	9.98	10.45	0.48	0.63	0.150	0.135	0.30	0.040	10%
16	10.70	1.12	0.55	0.140			0.9	10.45	10.85	0.40	0.57	0.140	0.126	0.23	0.029	7%
17	11.00	1.10	0.55	0.200			0.9	10.85	11.25	0.40	0.55	0.200	0.180	0.22	0.040	10%
18	11.50	1.01	0.53	0.150			0.9	11.25	11.70	0.45	0.48	0.150	0.135	0.21	0.029	7%
19	11.90	0.92	0.54	0.120			0.9	11.70	12.10	0.40	0.38	0.120	0.108	0.15	0.016	4%
20	12.30	0.81	0.53	0.120			0.9	12.10	12.50	0.40	0.28	0.120	0.108	0.11	0.012	3%
21	12.70	0.86	0.54	0.100			0.9	12.50	12.95	0.45	0.32	0.100	0.090	0.14	0.013	3%
22	13.20	0.78	0.55	0.080			0.9	12.95	13.45	0.50	0.23	0.080	0.072	0.12	0.008	2%
23	13.70	0.73	0.57	0.040			0.9	13.45	14.00	0.55	0.16	0.040	0.036	0.09	0.003	1%
24	14.30	0.67	0.60	0.020			0.9	14.00	14.65	0.65	0.07	0.020	0.018	0.05	0.001	0%
LB	15.00	0.00	0.00	0.000	0.000	0.000	1.0	14.65	15.00	0.35	0.02	0.005	0.005	0.01	0.000	0%
<b>Total Flow</b>															<b>0.409</b>	

## Measurement Details:

Start Time (MST):	14:10
End Time (MST):	15:30
Equipment:	Marsh
Method:	ice
River Condition:	frozen
Quality/Error (see reverse):	good
Weather:	- 10C, Clear

## Flow Characteristics:

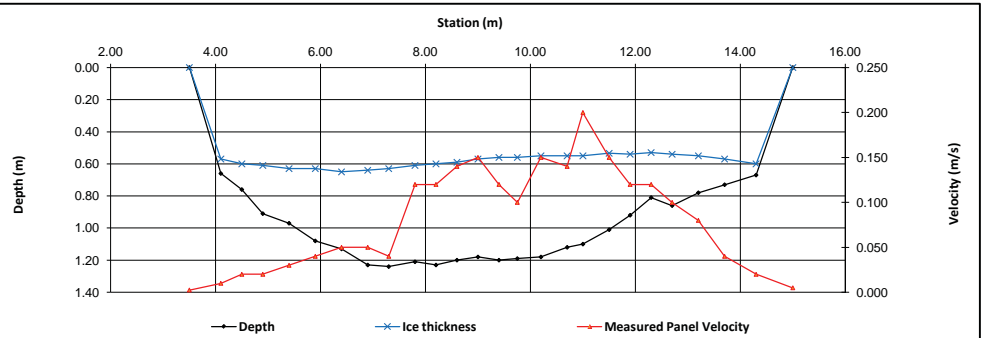
Total Flow:	0.409	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	good	
Cross Section Area:	4.55	(m <sup>2</sup> )
Wetted Width:	11.50	(m)
Hydraulic Depth:	0.396	(m)
Mean Velocity:	0.090	(m/s)
Froude Number:	0.046	

## Datalogger Details:

	Before	After
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WSC Site

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	1.377	100.049		98.672	98.672	WSC Brass Cap near cabin
Bench Mark 2:			1.008	99.041	100.000	Brass Cap away from shack
Bench Mark 3:						
Ice/PT:			2.826	97.223		
Water Level:			2.842	97.207		
Other:						
Setup #2						
Bench Mark 1:			1.360	98.673		WSC Brass Cap near cabin
Bench Mark 2:	0.992	100.033		99.041		Brass Cap away from shack
Bench Mark 3:						
Ice/PT:			2.810	97.223		
Water Level:			2.824	97.209		
Other:						

Closing Error	-0.001	Average WL	97.208
WL Check	0.002	Transducer Elevation	-

## General Notes:

Field Personnel:	TR, SG	Trip Date:	11-Feb-12
Data Entry Personnel:	MY	Date:	19-Mar-12
Data Check Personnel:	CJ	Date:	2-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S39 - Beaver River above Syncrude WSC

UTM Location: 465542 E, 6311435 N

Site Visit Date:

January 17, 2012



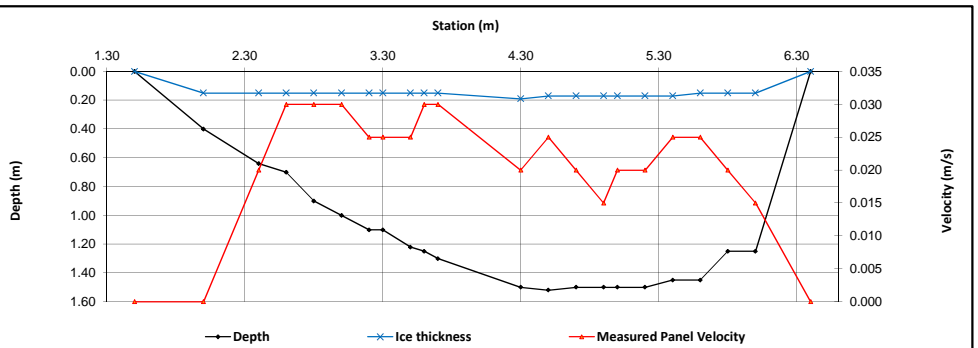
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.50	0.00	0.00	0.000	0.000	0.000	1.0	1.50	1.75	0.25	0.00	0.000	0.00	0.00	0.00	0%
1	2.00	0.40	0.15	0.000			1.0	1.75	2.20	0.45	0.25	0.000	0.00	0.11	0.00	0%
2	2.40	0.64	0.15	0.020			0.9	2.20	2.50	0.30	0.49	0.020	0.00	0.15	0.00	0%
3	2.60	0.70	0.15	0.030			0.9	2.50	2.70	0.20	0.55	0.030	0.00	0.11	0.00	0%
4	2.80	0.90	0.15		0.030	0.030	1.0	2.70	2.90	0.20	0.75	0.030	0.03	0.15	0.00	5%
5	3.00	1.00	0.15		0.030	0.030	1.0	2.90	3.10	0.20	0.85	0.030	0.03	0.17	0.01	6%
6	3.20	1.10	0.15		0.030	0.020	1.0	3.10	3.25	0.15	0.95	0.025	0.02	0.14	0.00	3%
7	3.30	1.10	0.15		0.020	0.030	1.0	3.25	3.40	0.15	0.95	0.025	0.03	0.14	0.00	5%
8	3.50	1.22	0.15		0.020	0.030	1.0	3.40	3.55	0.15	1.07	0.025	0.03	0.16	0.00	6%
9	3.60	1.25	0.15		0.030	0.030	1.0	3.55	3.65	0.10	1.10	0.030	0.03	0.11	0.00	4%
10	3.70	1.30	0.15		0.030	0.030	1.0	3.65	4.00	0.35	1.15	0.030	0.03	0.40	0.01	14%
11	4.30	1.50	0.19		0.020	0.020	1.0	4.00	4.40	0.40	1.31	0.020	0.02	0.52	0.01	12%
12	4.50	1.52	0.17		0.030	0.020	1.0	4.40	4.60	0.20	1.35	0.025	0.02	0.27	0.01	6%
13	4.70	1.50	0.17		0.020	0.020	1.0	4.60	4.80	0.20	1.33	0.020	0.02	0.27	0.01	6%
14	4.90	1.50	0.17		0.020	0.010	1.0	4.80	4.95	0.15	1.33	0.015	0.01	0.20	0.00	2%
15	5.00	1.50	0.17		0.020	0.020	1.0	4.95	5.10	0.15	1.33	0.020	0.02	0.20	0.00	5%
16	5.20	1.50	0.17		0.020	0.020	1.0	5.10	5.30	0.20	1.33	0.020	0.02	0.27	0.01	6%
17	5.40	1.45	0.17		0.030	0.020	1.0	5.30	5.50	0.20	1.28	0.025	0.02	0.26	0.01	6%
18	5.60	1.45	0.15		0.030	0.020	1.0	5.50	5.70	0.20	1.30	0.025	0.02	0.26	0.01	6%
19	5.80	1.25	0.15		0.020	0.020	1.0	5.70	5.90	0.20	1.10	0.020	0.02	0.22	0.00	5%
20	6.00	1.25	0.15		0.020	0.010	1.0	5.90	6.20	0.30	1.10	0.015	0.01	0.33	0.00	4%
LB	6.40	0.00	0.00	0.000	0.000	0.000	1.0	6.20	6.40	0.20	0.00	0.000	0.00	0.00	0.00	0%
<b>Total Flow</b>															<b>0.087</b>	

Measurement Details:	
Start Time (MST):	12:05
End Time (MST):	13:00
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -26

Flow characteristics:	
Total Flow:	0.087 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	4.44 (m <sup>2</sup> )
Wetted Width:	4.90 (m)
Hydraulic Depth:	0.906 (m)
Mean Velocity:	0.020 (m/s)
Froude Number:	0.007

Datalogger Details:	Before	After
WSC Site		

Datalogger / Station Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.934	31.63		29.696	29.696	Brass cap near cable way
Bench Mark 2:			1.165	30.465	30.464	Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.215	28.415		
Water Level:			3.365	28.265		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.923	29.696		Brass cap near cable way
Bench Mark 2:	1.154	31.619		30.465		Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.203	28.416		
Water Level:			3.357	28.262		
Other:						

Closing Error	0.000	Average WL	28.264
WL Check	0.003	Transducer Elevation	-

General Notes:

<u>Field Personnel:</u>	SM, GB, TR	<u>Trip Date:</u>	17-Jan-12
<u>Data Entry Personnel:</u>	CJ	<u>Date:</u>	13-Feb-12
<u>Data Check Personnel:</u>	DW	<u>Date:</u>	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S39 - Beaver River above Syncrude WSC

UTM Location: 465542 E, 6311435 N

Site Visit Date:

February 8, 2012



## 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
1	3.30	0.00	0.00	0.000	0.000	0.000	1.0	3.30	3.48	0.18	0.25	0.003	0.003	0.04	0.000	0%
2	3.65	1.13	0.15	0.010	0.010	0.010	1.0	3.48	3.73	0.25	0.98	0.010	0.010	0.25	0.002	4%
3	3.80	1.13	0.14	0.010	0.010	0.000	1.0	3.73	3.88	0.15	0.99	0.005	0.005	0.15	0.001	1%
4	3.95	1.22	0.14	0.010	0.010	0.010	1.0	3.88	4.03	0.15	1.08	0.010	0.010	0.16	0.002	2%
5	4.10	1.26	0.16	0.010	0.020	0.020	1.0	4.03	4.18	0.15	1.10	0.015	0.015	0.16	0.002	4%
6	4.25	1.37	0.16	0.020	0.020	0.020	1.0	4.18	4.40	0.23	1.21	0.020	0.020	0.27	0.005	8%
7	4.55	1.50	0.20	0.010	0.030	0.030	1.0	4.40	4.60	0.20	1.30	0.020	0.020	0.26	0.005	8%
8	4.65	1.52	0.20	0.020	0.020	0.020	1.0	4.60	4.78	0.18	1.32	0.020	0.020	0.23	0.005	7%
9	4.90	1.52	0.24	0.020	0.020	0.020	1.0	4.78	4.95	0.18	1.28	0.020	0.020	0.22	0.004	7%
10	5.00	1.52	0.24	0.020	0.020	0.020	1.0	4.95	5.13	0.18	1.28	0.020	0.020	0.22	0.004	7%
11	5.25	1.50	0.26	0.020	0.010	0.010	1.0	5.13	5.33	0.20	1.24	0.015	0.015	0.25	0.004	6%
12	5.40	1.47	0.26	0.020	0.020	0.020	1.0	5.33	5.58	0.25	1.21	0.020	0.020	0.30	0.006	9%
13	5.75	1.48	0.26	0.010	0.020	0.020	1.0	5.58	5.83	0.25	1.22	0.015	0.015	0.31	0.005	7%
14	5.90	1.44	0.26	0.020	0.010	0.010	1.0	5.83	6.08	0.25	1.18	0.015	0.015	0.30	0.004	7%
15	6.25	1.33	0.24	0.020	0.010	0.010	1.0	6.08	6.28	0.20	1.09	0.015	0.015	0.22	0.003	5%
16	6.30	1.22	0.24	0.020	0.010	0.010	1.0	6.28	6.43	0.15	0.98	0.015	0.015	0.15	0.002	3%
17	6.55	1.11	0.23	0.020	0.020	0.020	1.0	6.43	6.68	0.25	0.88	0.020	0.020	0.22	0.004	7%
18	6.80	0.90	0.24	0.010	0.010	0.010	0.9	6.68	6.95	0.27	0.66	0.010	0.009	0.18	0.002	2%
19	7.10	0.69	0.24	0.020	0.020	0.020	0.9	6.95	7.25	0.30	0.45	0.020	0.018	0.14	0.002	4%
20	7.40	0.57	0.24	0.020	0.020	0.020	0.9	7.25	7.60	0.35	0.33	0.020	0.018	0.12	0.002	3%
21	7.80	0.46	0.23	0.000	0.000	0.000	1.0	7.60	7.90	0.30	0.23	0.000	0.000	0.07	0.000	0%
22	8.00	0.00	0.00	0.000	0.000	0.000	1.0	7.90	8.00	0.10	0.06	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>0.066</b>	

## Measurement Details:

Start Time (MST):	9:20
End Time (MST):	10:30
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	good
Weather:	overcast, calm, -15

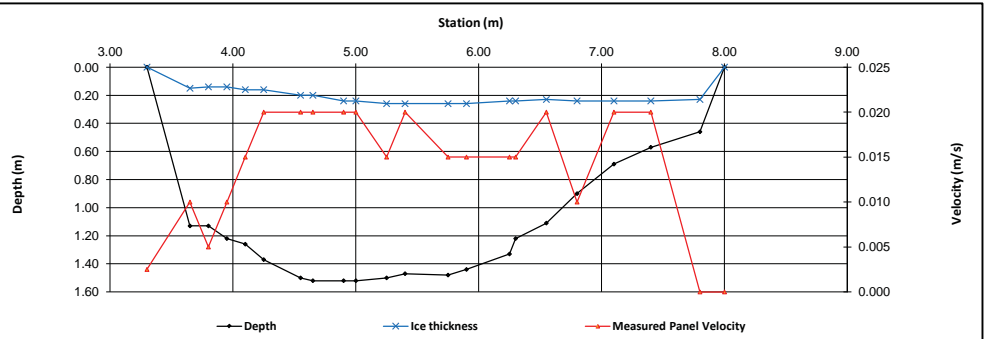
## Flow characteristics:

Total Flow:	0.066	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	4.22	(m <sup>2</sup> )
Wetted Width:	4.70	(m)
Hydraulic Depth:	0.897	(m)
Mean Velocity:	0.016	(m/s)
Froude Number:	0.005	

## Logger Details:

	Before	After
WSC Site		

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.965	31.661	1.198	29.696	29.696	Brass cap near cable way
Bench Mark 2:			1.198	30.463	30.464	Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.250	28.411		
Water Level:			3.450	28.211		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.957	29.694		Brass cap near cable way
Bench Mark 2:	1.188	31.651		30.463		Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.241	28.410		
Water Level:			3.440	28.211		
Other:						

Closing Error	0.002	Average WL	28.211
WL Check	0.000	Transducer Elevation	-

## General Notes:

Field Personnel:	SM, TR	Trip Date:	8-Feb-12
Data Entry Personnel:	CJ	Date:	28-Mar-12
Data Check Personnel:	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S39 - Beaver River above Syncrude WSC  
 UTM Location: 465542 E, 6311435 N

Site Visit Date: November 30, 2012



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	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	4.70	0.10	0.06	0.003	0.003	0.01	0.000	0%
1	4.60	0.30	0.05	0.012			0.9	4.70	4.45	0.25	0.25	0.012	0.011	0.06	0.001	0%
2	4.30	0.35	0.05	0.018			0.9	4.45	4.15	0.30	0.30	0.018	0.016	0.09	0.001	1%
3	4.00	0.50	0.13	0.083			0.9	4.15	3.95	0.20	0.37	0.075	0.075	0.07	0.006	3%
4	3.90	0.55	0.13	0.074			0.9	3.95	3.80	0.15	0.42	0.074	0.067	0.06	0.004	2%
5	3.70	0.55	0.13	0.082			0.9	3.80	3.65	0.15	0.42	0.082	0.074	0.06	0.005	2%
6	3.60	0.65	0.14	0.084			0.9	3.65	3.50	0.15	0.51	0.084	0.076	0.08	0.006	3%
7	3.40	0.70	0.13	0.081			0.9	3.50	3.35	0.15	0.57	0.081	0.073	0.09	0.006	3%
8	3.30	0.75	0.15	0.093			0.9	3.35	3.20	0.15	0.60	0.093	0.084	0.09	0.008	4%
9	3.10	0.80	0.15	0.081			0.9	3.20	3.05	0.15	0.65	0.081	0.073	0.10	0.007	4%
10	3.00	0.85	0.17	0.082			0.9	3.05	2.90	0.15	0.68	0.082	0.074	0.10	0.008	4%
11	2.80	0.90	0.20	0.087			0.9	2.90	2.75	0.15	0.70	0.087	0.078	0.11	0.008	4%
12	2.70	0.95	0.22	0.094			0.9	2.75	2.55	0.20	0.73	0.094	0.085	0.15	0.012	6%
13	2.40	1.00	0.20		0.109	0.105	1.0	2.55	2.35	0.20	0.80	0.107	0.107	0.16	0.017	9%
14	2.30	1.05	0.17		0.098	0.095	1.0	2.35	2.25	0.10	0.88	0.097	0.097	0.09	0.008	4%
15	2.20	1.15	0.15		0.115	0.100	1.0	2.25	2.15	0.10	1.00	0.108	0.108	0.10	0.011	5%
16	2.10	1.20	0.13		0.118	0.099	1.0	2.15	1.95	0.20	1.07	0.109	0.109	0.21	0.023	12%
17	1.80	1.30	0.13		0.119	0.099	1.0	1.95	1.75	0.20	1.17	0.109	0.109	0.23	0.026	13%
18	1.70	1.25	0.10		0.116	0.098	1.0	1.75	1.60	0.15	1.15	0.107	0.107	0.17	0.018	9%
19	1.50	1.20	0.05		-0.001	0.073	1.0	1.60	1.30	0.30	1.15	0.036	0.036	0.35	0.012	6%
20	1.10	0.60	0.05	0.044			0.9	1.30	0.90	0.40	0.55	0.044	0.040	0.22	0.009	4%
LB	0.70	0.00	0.00	0.00	0.00	0.00	1.0	0.90	0.70	0.20	0.14	0.011	0.011	0.03	0.000	0%

**Total Flow 0.196**

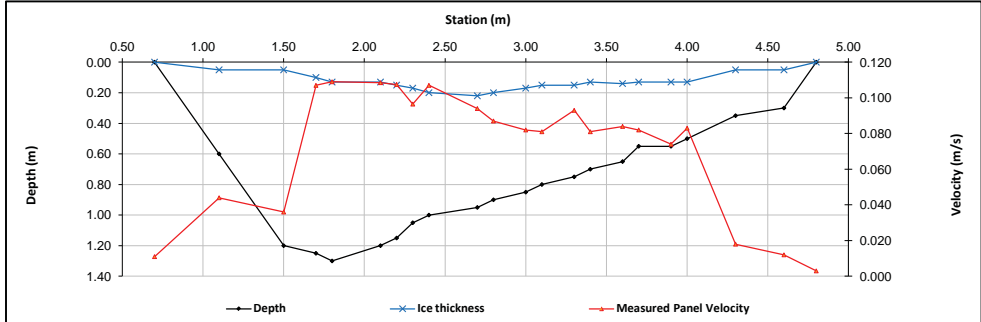
Measurement Details:	
Start Time (MST):	15:30
End Time (MST):	16:40
Equipment:	ADV
Method:	Ice
River Condition:	ice cover
Quality/Error (see reverse):	Good
Weather:	snowing, -15

Flow characteristics:		
Total Flow:	0.196	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.62	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.690	(m)
Mean Velocity:	0.075	(m/s)
Froude Number:	0.029	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**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>						
Bench Mark 1:	1.978	31.674		29.696	29.696	Brass cap near cable way
Bench Mark 2:			1.210	30.464	30.464	Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.651	28.023		
Water Level:			3.695	27.979		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.965	29.697		Brass cap near cable way
Bench Mark 2:	1.198	31.662		30.464		Brass cap 4 m from cabin
Bench Mark 3:						
Ice/PT:			3.64	28.022		
Water Level:			3.685	27.977		
Other:						

Closing Error	-0.001	Average WL	27.978
WL Check	0.002	Transducer Elevation	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	30-Nov-12
Data Entry Personnel:	TR	Date:	30-Nov-12
Data Check Personnel:	CJ	Date:	20-Dec-12
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:

January 17, 2012



## Flow Measurement:

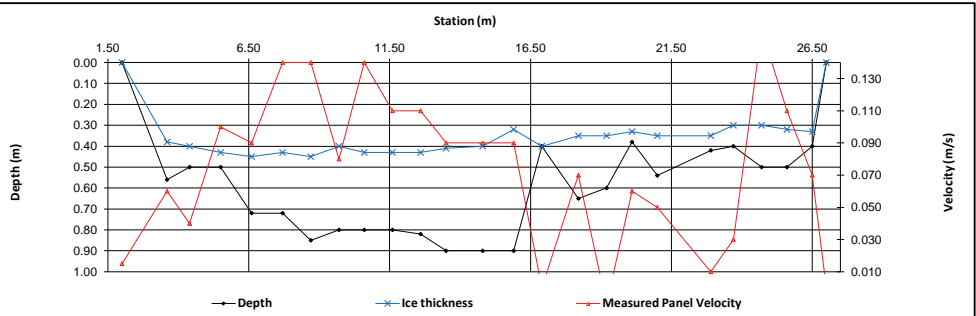
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.80	0.80	0.00	0.015	0.01	0.00	0.00	0.00%
1	3.60	0.56	0.38	0.060			0.9	3.60	4.00	0.40	0.18	0.060	0.05	0.07	0.00	1.56%
2	4.40	0.50	0.40	0.040			0.9	4.40	4.95	0.55	0.10	0.040	0.04	0.06	0.00	0.79%
3	5.50	0.50	0.43	0.100			0.9	5.50	6.05	0.55	0.07	0.100	0.09	0.04	0.00	1.39%
4	6.60	0.72	0.45	0.090			0.9	6.60	7.15	0.55	0.27	0.090	0.08	0.15	0.01	4.81%
5	7.70	0.72	0.43	0.140			0.9	7.70	8.20	0.50	0.29	0.140	0.13	0.15	0.02	7.31%
6	8.70	0.85	0.45	0.140			0.9	8.70	9.20	0.50	0.40	0.140	0.13	0.20	0.03	10.08%
7	9.70	0.80	0.40	0.080			0.9	9.70	10.15	0.45	0.40	0.080	0.07	0.18	0.01	5.18%
8	10.60	0.80	0.43	0.140			0.9	10.60	11.10	0.50	0.37	0.140	0.13	0.19	0.02	9.32%
9	11.60	0.80	0.43	0.110			0.9	11.60	12.10	0.50	0.37	0.110	0.10	0.19	0.02	7.33%
10	12.60	0.82	0.43	0.110			0.9	12.60	13.05	0.45	0.39	0.110	0.10	0.18	0.02	6.95%
11	13.50	0.90	0.41	0.090			0.9	13.50	14.15	0.65	0.49	0.090	0.08	0.32	0.03	10.32%
12	14.80	0.90	0.40	0.090			0.9	14.80	15.35	0.55	0.50	0.090	0.08	0.28	0.02	8.91%
13	15.90	0.90	0.32	0.090			0.9	15.90	16.40	0.50	0.58	0.090	0.08	0.29	0.02	9.40%
14	16.90	0.40	0.40	0.000			1.0	16.90	17.55	0.65	0.00	0.000	0.00	0.00	0.00	0.00%
15	18.20	0.65	0.35	0.070			0.9	18.20	18.70	0.50	0.30	0.070	0.06	0.15	0.01	3.78%
16	19.20	0.60	0.35	-0.010			0.9	19.20	19.65	0.45	0.25	-0.010	-0.01	0.11	0.00	-0.40%
17	20.10	0.38	0.33	0.060			0.9	20.10	20.55	0.45	0.05	0.060	0.05	0.02	0.00	0.49%
18	21.00	0.54	0.35	0.050			0.9	21.00	21.95	0.95	0.19	0.050	0.05	0.18	0.01	3.25%
19	22.90	0.42	0.35	0.010			0.9	22.90	23.30	0.40	0.07	0.010	0.01	0.03	0.00	0.10%
20	23.70	0.40	0.30	0.030			0.9	23.70	24.20	0.50	0.10	0.030	0.03	0.05	0.00	0.54%
21	24.70	0.50	0.30	0.160			0.9	24.70	25.15	0.45	0.20	0.160	0.14	0.09	0.01	5.18%
22	25.60	0.50	0.32	0.110			0.9	25.60	26.05	0.45	0.18	0.110	0.10	0.08	0.01	3.21%
23	26.50	0.40	0.33	0.070			0.9	26.50	26.75	0.25	0.07	0.070	0.06	0.02	0.00	0.44%
LB	27.00	0.00	0.00	0.000	0.000	0.000	1.0	27.00	27.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00%
<b>Total Flow</b>															<b>0.250</b>	

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	11:30
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	good
Weather:	clear, calm, -35

Flow characteristics:	
Total Flow:	0.250 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	3.00 (m <sup>2</sup> )
Wetted Width:	25.00 (m)
Hydraulic Depth:	0.120 (m)
Mean Velocity:	0.083 (m/s)
Froude Number:	0.077

Datalogger Details:		
	Before	After
Transducer Reading (m):		0.733
Water (°C):	0.1	
Rainfall (mm):	0.00	
Battery (Main):	15.7	
Datalogger Clock:	9:52	
Laptop Clock:	9:55	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.258	101.258		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.325	97.933	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.934	96.324		
Water Level:			4.975	96.283		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.245	100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.312	101.245		97.933	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.925	96.320		
Water Level:			4.965	96.280		
Other:						

Closing Error	0.000	Average WL	96.282
WL Check	0.003	Transducer Elevation	95.549

**General Notes:**

Field Personnel:	SM, GB, TR	Trip Date:	17-Jan-12
Data Entry Personnel:	CJ	Date:	13-Feb-12
Data Check Personnel:	CJ	Date:	20-Feb-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

February 7, 2012



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)	Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of Total Flow
1	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.35	0.35	0.03	0.005	0.005	0.01	0.000	0%
2	2.70	0.63	0.51	0.020			0.9	2.35	3.00	0.65	0.12	0.020	0.018	0.08	0.001	0%
3	3.30	0.75	0.48	0.040			0.9	3.00	3.45	0.45	0.27	0.040	0.036	0.12	0.004	1%
4	3.60	0.77	0.45	0.070			0.9	3.45	3.80	0.35	0.32	0.070	0.063	0.11	0.007	2%
5	4.00	0.78	0.51	0.100			0.9	3.80	4.30	0.50	0.27	0.100	0.090	0.14	0.012	3%
6	4.60	0.75	0.55	0.100			0.9	4.30	4.80	0.50	0.20	0.100	0.090	0.10	0.009	2%
7	5.00	0.79	0.55	0.080			0.9	4.80	5.35	0.55	0.24	0.080	0.072	0.13	0.010	2%
8	5.70	0.77	0.57	0.080			0.9	5.35	5.93	0.58	0.20	0.080	0.072	0.12	0.008	2%
9	6.15	0.76	0.56	0.040			0.9	5.93	6.43	0.50	0.20	0.040	0.036	0.10	0.004	1%
10	6.70	0.77	0.55	0.100			0.9	6.43	7.00	0.57	0.22	0.100	0.090	0.13	0.011	3%
11	7.30	0.79	0.57	0.120			0.9	7.00	7.60	0.60	0.22	0.120	0.108	0.13	0.014	4%
12	7.90	0.82	0.57	0.130			0.9	7.60	8.30	0.70	0.25	0.130	0.117	0.18	0.020	5%
13	8.70	0.85	0.57	0.120			0.9	8.30	8.85	0.55	0.28	0.120	0.108	0.15	0.017	4%
14	9.00	0.80	0.57	0.110			0.9	8.85	9.35	0.50	0.23	0.110	0.099	0.12	0.011	3%
15	9.70	0.80	0.55	0.140			0.9	9.35	9.93	0.58	0.25	0.140	0.126	0.14	0.018	5%
16	10.15	0.82	0.55	0.130			0.9	9.93	10.83	0.90	0.27	0.130	0.117	0.24	0.028	7%
17	11.50	0.85	0.55	0.120			0.9	10.83	12.05	1.23	0.30	0.120	0.108	0.37	0.040	10%
18	12.60	0.89	0.55	0.130			0.9	12.05	13.25	1.20	0.34	0.130	0.117	0.41	0.048	12%
19	13.90	0.89	0.53	0.090			0.9	13.25	14.40	1.15	0.36	0.090	0.081	0.41	0.034	9%
20	14.90	0.88	0.51	0.070			0.9	14.40	15.33	0.92	0.37	0.070	0.063	0.34	0.022	6%
21	15.75	0.81	0.49	0.060			0.9	15.33	16.18	0.85	0.32	0.060	0.054	0.27	0.015	4%
22	16.60	0.70	0.51	0.040			0.9	16.18	17.10	0.93	0.19	0.040	0.036	0.18	0.006	2%
23	17.60	0.60	0.46	0.060			0.9	17.10	18.40	1.30	0.14	0.060	0.054	0.18	0.010	3%
24	19.20	0.59	0.47	0.070			0.9	18.40	21.65	3.25	0.12	0.070	0.063	0.39	0.025	6%
25	24.10	0.60	0.55	0.090			0.9	21.65	24.70	3.05	0.05	0.090	0.081	0.15	0.012	3%
	25.30	0.46	0.25	0.000			1.0	24.70	25.65	0.95	0.21	0.000	0.000	0.20	0.000	0%
	26.00	0.00	0.00	0.000	0.000	0.000	1.0	25.65	26.00	0.35	0.05	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>															<b>0.386</b>	

**Measurement Details:**

Start Time (MST):	14:00
End Time (MST):	15:45
Equipment:	Marsh
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	good
Weather:	clear, calm, -7

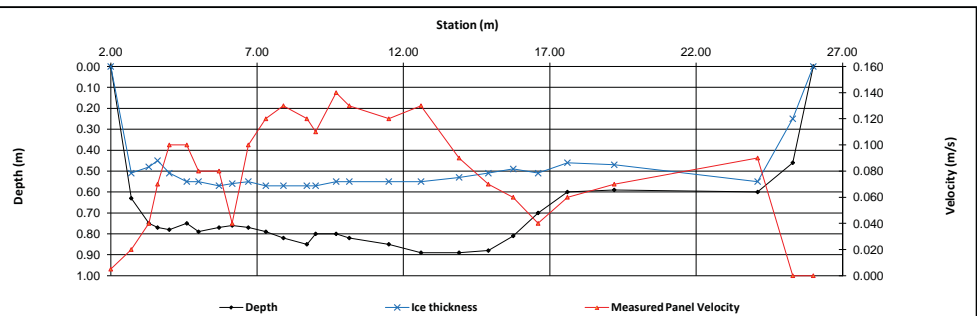
**Flow characteristics:**

Total Flow:	0.386	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	4.92	(m <sup>2</sup> )
Wetted Width:	24.00	(m)
Hydraulic Depth:	0.295	(m)
Mean Velocity:	0.079	(m/s)
Froude Number:	0.055	

**Logger Details:**

	Before	After
Transducer Reading (m):		0.749
Water (°C):	0.1	
Rainfall (mm):	-	
Battery (Main):	14.72	
Datalogger Clock:	14:05	
Laptop Clock:	14:07	
Dessicant:	good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.282	101.282		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.320	97.962	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.915	96.367		
Water Level:			4.977	96.305		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.272	100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.310	101.272		97.962	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.905	96.367		
Water Level:			4.963	96.309		
Other:						

Closing Error	0.000	Average WL	96.307
WL Check	0.004	Transducer Elevation	95.558

**General Notes:**

**Field Personnel:**

SM, CJ	Trip Date:	7-Feb-12
CJ	Date:	28-Mar-12
XP	Date:	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

February 29, 2012



## Flow Measurement:

Measured Data							Calculated Data									
Bank/	Offset	Depth	Ice Thickness	Velocity @ 0.6 Depth	Velocity @ 0.8 Depth	Velocity @ 0.2 Depth	Velocity Correction Factor	Pannel Start	Pannel End	Pannel Width	Effective Pannel Depth	Measured Pannel Velocity	Effective Average Pannel Velocity	Pannel Area	Pannel Discharge	Percent of Total Flow
Mmt #	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
RB	1.50	0.00	0.00	0.000	0.000	0.000	0.9	1.50	1.85	0.35	0.03	0.008	0.007	0.01	0.000	0%
1	2.20	0.75	0.65	0.030			0.9	1.85	2.98	1.13	0.10	0.030	0.027	0.11	0.003	1%
2	3.75	0.80	0.65	0.110			0.9	2.98	4.63	1.65	0.15	0.110	0.099	0.25	0.025	7%
3	5.50	0.85	0.66	0.070			0.9	4.63	6.05	1.43	0.19	0.070	0.063	0.27	0.017	5%
4	6.60	1.00	0.65	0.100			0.9	6.05	6.90	0.85	0.35	0.100	0.090	0.30	0.027	7%
5	7.20	0.98	0.64	0.120			0.9	6.90	7.75	0.85	0.34	0.120	0.108	0.29	0.031	9%
6	8.30	0.90	0.65	0.150			0.9	7.75	8.90	1.15	0.25	0.150	0.135	0.29	0.039	11%
7	9.50	0.90	0.65	0.130			0.9	8.90	9.95	1.05	0.25	0.130	0.117	0.26	0.031	8%
8	10.40	0.95	0.65	0.110			0.9	9.95	11.00	1.05	0.30	0.110	0.099	0.32	0.031	9%
9	11.60	1.00	0.65	0.100			0.9	11.00	12.05	1.05	0.35	0.100	0.090	0.37	0.033	9%
10	12.50	1.04	0.65	0.120			0.9	12.05	13.13	1.08	0.39	0.120	0.108	0.42	0.045	12%
11	13.75	1.08	0.60	0.040			0.9	13.13	14.25	1.13	0.48	0.040	0.036	0.54	0.019	5%
12	14.75	0.87	0.60	0.060			0.9	14.25	15.38	1.13	0.27	0.060	0.054	0.30	0.016	5%
13	16.00	0.75	0.60	0.130			0.9	15.38	16.55	1.18	0.15	0.130	0.117	0.18	0.021	6%
14	17.10	0.72	0.59	0.120			0.9	16.55	17.55	1.00	0.13	0.120	0.108	0.13	0.014	4%
15	18.00	0.77	0.57	0.040			0.9	17.55	18.55	1.00	0.20	0.040	0.036	0.20	0.007	2%
16	19.10	0.68	0.55	0.010			0.9	18.55	19.60	1.05	0.13	0.010	0.009	0.14	0.001	0%
17	20.10	0.64	0.55	0.020			0.9	19.60	20.80	1.20	0.09	0.020	0.018	0.11	0.002	1%
18	21.50	0.64	0.55	0.000			1.0	20.80	22.00	1.20	0.09	0.000	0.000	0.11	0.000	0%
19	22.50	0.68	0.56	0.010			0.9	22.00	23.13	1.13	0.12	0.010	0.009	0.14	0.001	0%
20	23.75	0.65	0.57	0.000			1.0	23.13	24.38	1.25	0.08	0.000	0.000	0.10	0.000	0%
LB	25.00	0.00	0.00	0.000	0.000	0.000	1.0	24.38	25.00	0.63	0.02	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>0.364</b>	

## Measurement Details:

Start Time (MST):	15:40
End Time (MST):	16:35
Equipment:	Marsh
Method:	Ice
River Condition:	low flow, snow cover
Quality/Error (see reverse):	good
Weather:	-12 C clear, breezy

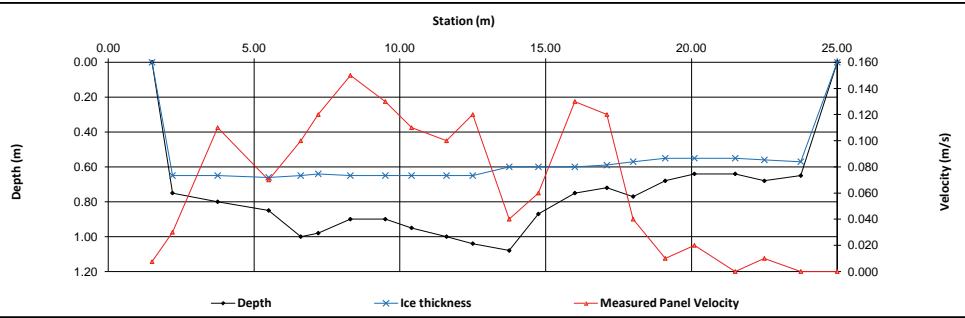
## Flow Characteristics:

Total Flow:	0.364	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	4.83	(m <sup>2</sup> )
Wetted Width:	23.50	(m)
Hydraulic Depth:	0.205	(m)
Mean Velocity:	0.075	(m/s)
Froude Number:	0.053	

## Datalogger Details:

	Before	After
Transducer Reading (m):	-	0.818
Water (°C):	-	0.1
Rainfall (mm):	-	-
Battery (Main):	14.8	-
Datalogger Clock:	15:40	-
Laptop Clock:	15:42	-
Dessicant:	good	-
Logger# (if Δ):	9632	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.232	101.232		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.253	97.979	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.862	96.370		
Water Level:			4.862	96.370		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.223	100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.244	101.223		97.979	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.853	96.370		
Water Level:			4.853	96.370		
Other:						

Closing Error	0.000	Average WL	96.370
WL Check	0.000	Transducer Elevation	95.552

## General Notes:

- WL + ice are same.
- BM Hieghts: BM2: 0.255 m, BM1: 0.472 m

Field Personnel:	SM, GB	Trip Date:	29-Feb-12
Data Entry Personnel:	MY	Date:	26-Mar-12
Data Check Personnel:	CJ	Date:	13-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date:

March 27, 2012



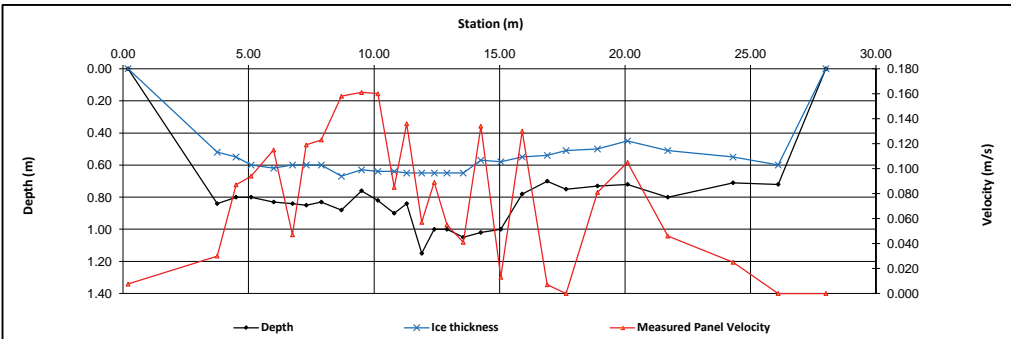
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (m/s)	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	0.9	0.20	1.98	1.78	0.08	0.008	0.007	0.14	0.001	0%
1	3.75	0.84	0.52	0.030			0.9	1.98	4.13	2.15	0.32	0.030	0.027	0.69	0.019	5%
2	4.50	0.80	0.55	0.087			0.9	4.13	4.80	0.68	0.25	0.087	0.078	0.17	0.013	3%
3	5.10	0.80	0.60	0.094			0.9	4.80	5.55	0.75	0.20	0.094	0.085	0.15	0.013	3%
4	6.00	0.83	0.62	0.115			0.9	5.55	6.38	0.83	0.21	0.115	0.104	0.17	0.018	5%
5	6.75	0.84	0.60	0.047			0.9	6.38	7.03	0.65	0.24	0.047	0.042	0.16	0.007	2%
6	7.30	0.85	0.60	0.119			0.9	7.03	7.60	0.57	0.25	0.119	0.107	0.14	0.015	4%
7	7.90	0.83	0.60	0.123			0.9	7.60	8.30	0.70	0.23	0.123	0.111	0.16	0.018	5%
8	8.70	0.88	0.67	0.158			0.9	8.30	9.10	0.80	0.21	0.158	0.142	0.17	0.024	6%
9	9.50	0.76	0.63	0.161			0.9	9.10	9.83	0.73	0.13	0.161	0.145	0.09	0.014	4%
10	10.15	0.82	0.64	0.160			0.9	9.83	10.48	0.65	0.18	0.160	0.144	0.12	0.017	4%
11	10.80	0.90	0.64	0.085			0.9	10.48	11.05	0.57	0.26	0.085	0.077	0.15	0.011	3%
12	11.30	0.84	0.65	0.136			0.9	11.05	11.60	0.55	0.19	0.136	0.122	0.10	0.013	3%
13	11.90	1.15	0.65	0.057			0.9	11.60	12.15	0.55	0.50	0.057	0.051	0.27	0.014	4%
14	12.40	1.00	0.65	0.089			0.9	12.15	12.65	0.50	0.35	0.089	0.080	0.18	0.014	4%
15	12.90	1.00	0.65	0.055			0.9	12.65	13.23	0.58	0.35	0.055	0.050	0.20	0.010	3%
16	13.55	1.05	0.65	0.041			0.9	13.23	13.90	0.67	0.40	0.041	0.037	0.27	0.010	3%
17	14.25	1.02	0.57	0.134			0.9	13.90	14.65	0.75	0.45	0.134	0.121	0.34	0.041	10%
18	15.05	1.00	0.58	0.013			0.9	14.65	15.48	0.83	0.42	0.013	0.012	0.35	0.004	1%
19	15.90	0.78	0.55	0.130			0.9	15.48	16.40	0.92	0.23	0.130	0.117	0.21	0.025	6%
20	16.90	0.70	0.54	0.007			0.9	16.40	17.28	0.88	0.16	0.007	0.006	0.14	0.001	0%
21	17.65	0.75	0.51	0.000			1.0	17.28	18.28	1.00	0.24	0.000	0.000	0.24	0.000	0%
22	18.90	0.73	0.50	0.081			0.9	18.28	19.50	1.23	0.23	0.081	0.073	0.28	0.021	5%
23	20.10	0.72	0.45	0.105			0.9	19.50	20.90	1.40	0.27	0.105	0.095	0.38	0.036	9%
24	21.70	0.80	0.51	0.046			0.9	20.90	23.00	2.10	0.29	0.046	0.041	0.61	0.025	6%
25	24.30	0.71	0.55	0.025			0.9	23.00	25.20	2.20	0.16	0.025	0.023	0.35	0.008	2%
26	26.10	0.72	0.60	0.000			1.0	25.20	27.05	1.85	0.12	0.000	0.000	0.22	0.000	0%
LB	28.00	0.00	0.00	0.000	0.000	0.000	1.0	27.05	28.00	0.95	0.03	0.000	0.000	0.03	0.000	0%
<b>Total Flow</b>															<b>0.390</b>	

Measurement Details:	
Start Time (MST):	15:35
End Time (MST):	16:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, melting snow
Quality/Error (see reverse):	Good
Weather:	Sunny, slight breeze

Flow characteristics:	
Total Flow:	0.390 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	6.49 (m <sup>2</sup> )
Wetted Width:	27.80 (m)
Hydraulic Depth:	0.233 (m)
Mean Velocity:	0.060 (m/s)
Froude Number:	0.040

Logger Details:		
	Before	After
Transducer Reading (m):	0.75	
Water (°C):	0.1	
Rainfall (mm):	-	
Battery (Main):	14.7	
Datalogger Clock:	15:45	
Laptop Clock:	15:47	
Dessiccant:	good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 -vent tube hose was adjusted to remove potential kink



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.079	101.079		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.101	97.978	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.595	96.484		
Water Level:			4.778	96.301		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.052	100.003	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.077	101.055		97.978	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:			4.569	96.486		
Water Level:			4.754	96.301		
Other:						

Closing Error	-0.003	Average WL	96.301
WL Check	0.000	Transducer Elevation	95.551

**General Notes:**

<b>Field Personnel:</b>	DW, BL	<b>Trip Date:</b>	27-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	12-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

April 24, 2012



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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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26																
27																
28																
29																
30																
NO DISCHARGE MEASUREMENT CONDUCTED																
<b>Total Flow</b>																

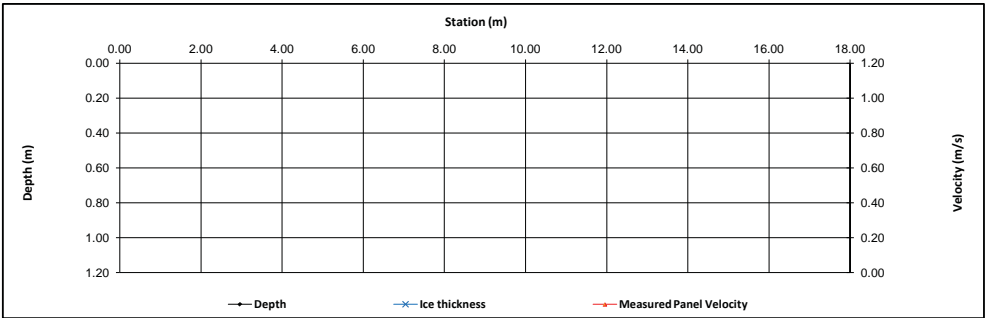
Measurement Details:	
Start Time (MST):	10:08
End Time (MST):	11:15
Equipment:	-
Method:	-
River Condition:	Open
Quality/Error (see reverse):	-
Weather:	flurries, light breeze, 0

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):	0.698	
Water (°C):	0.2	-
Rainfall (mm):	0	0.762
Battery (Main):	14.6	-
Datalogger Clock:	9:09	-
Laptop Clock:	9:10	-
Dessicant:	good	-
Logger# (if Δ):	9632	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- activated and tested precip gauge
- installed cell antenna and tested comm. -94
- no modem installed
- site needs enclosure, use old extra one



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:				100.000		Pipe 4 m NE of Logger
Bench Mark 2:				97.982		T-Post on lower bench
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:				100.000		Pipe 4 m NE of Logger
Bench Mark 2:				97.982		T-Post on lower bench
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

- no flow measurement performed
- river open, see photos

Field Personnel:	SM, SG	Trip Date:	24-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

May 12, 2012



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)	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	1.0	2.00	2.25	0.25	0.07	0.032	0.032	0.02	0.001	0%
1	2.50	0.28		0.128			1.0	2.25	3.25	1.00	0.28	0.128	0.28	0.28	0.036	0%
2	4.00	0.45		0.227			1.0	3.25	4.75	1.50	0.45	0.227	0.68	0.153	1%	
3	5.50	0.56		0.298			1.0	4.75	6.25	1.50	0.56	0.298	0.84	0.250	1%	
4	7.00	0.64		0.326			1.0	6.25	7.75	1.50	0.64	0.326	0.96	0.313	2%	
5	8.50	0.74		0.454			1.0	7.75	9.25	1.50	0.74	0.454	1.11	0.504	3%	
6	10.00	0.88			0.672	0.764	1.0	9.25	10.75	1.50	0.88	0.718	1.32	0.948	6%	
7	11.50	1.12			0.470	0.762	1.0	10.75	12.25	1.50	1.12	0.616	1.68	1.035	6%	
8	13.00	1.12			0.362	0.459	1.0	12.25	13.75	1.50	1.12	0.411	0.411	1.68	0.690	4%
9	14.50	1.20			0.410	0.688	1.0	13.75	15.25	1.50	1.20	0.549	0.549	1.80	0.988	6%
10	16.00	1.20			0.552	0.811	1.0	15.25	16.75	1.50	1.20	0.682	0.682	1.80	1.227	7%
11	17.50	1.12			0.519	0.645	1.0	16.75	18.25	1.50	1.12	0.582	0.582	1.68	0.978	6%
12	19.00	1.00			0.584	0.825	1.0	18.25	19.75	1.50	1.00	0.705	0.705	1.50	1.057	6%
13	20.50	1.04			0.690	0.714	1.0	19.75	21.50	1.75	1.04	0.702	0.702	1.82	1.278	7%
14	22.50	1.20			0.642	0.862	1.0	21.50	23.25	1.75	1.20	0.752	0.752	2.10	1.579	9%
15	24.00	1.40			0.478	0.786	1.0	23.25	24.75	1.50	1.40	0.632	0.632	2.10	1.327	8%
16	25.50	1.40			0.533	0.686	1.0	24.75	26.25	1.50	1.40	0.610	0.610	2.10	1.280	7%
17	27.00	1.25			0.417	0.758	1.0	26.25	27.75	1.50	1.25	0.588	0.588	1.88	1.102	6%
18	28.50	1.12			0.245	0.311	1.0	27.75	29.25	1.50	1.12	0.278	0.278	1.68	0.467	3%
19	30.00	1.20			0.324	0.425	1.0	29.25	30.75	1.50	1.20	0.375	0.375	1.80	0.674	4%
20	31.50	1.20			0.262	0.394	1.0	30.75	32.25	1.50	1.20	0.328	0.328	1.80	0.590	3%
21	33.00	0.98			0.298	0.413	1.0	32.25	33.75	1.50	0.98	0.351	0.351	1.47	0.515	3%
22	34.50	0.70		0.233			1.0	33.75	34.85	1.10	0.70	0.233	0.233	0.77	0.179	1%
RB	35.20	0.00	0.00	0.000	0.000	0.000	1.0	34.85	35.20	0.35	0.18	0.058	0.058	0.06	0.004	0%
<b>Total Flow</b>															<b>17.2</b>	

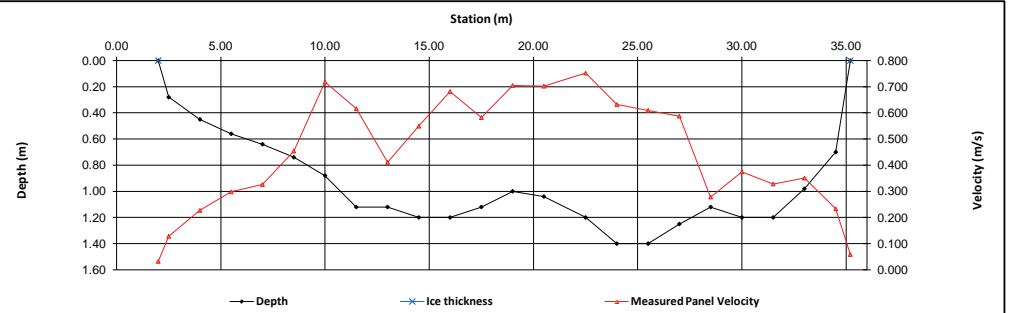
Measurement Details:	
Start Time (MST):	18:00
End Time (MST):	20:36
Equipment:	ADV
Method:	Fishcat
River Condition:	open, swift
Quality/Error (see reverse):	excellent
Weather:	cloudy, +18

Flow characteristics:	
Total Flow:	17.2 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	32.92 (m <sup>2</sup> )
Wetted Width:	33.20 (m)
Hydraulic Depth:	0.992 (m)
Mean Velocity:	0.522 (m/s)
Froude Number:	0.168

Logger Details:		Before	After
Transducer Reading (m):		0.748	
Water (°C):		10.3	
Rainfall (mm):		0.0	
Battery (Main):		14.1	
Datalogger Clock:		5:11	
Laptop Clock:		5:13	
Dessicant:		replaced	
Logger# (if Δ):		-	
PT# (if Δ):		-	

**Datalogger / Station Notes:**

- installed HSPA modem: network and service lights are solid, RSSI: -94
- new program sent
- modem should be secured better in future. Currently held onto door of enclosure with electrical tape due to lack of space in logger box



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.025	101.025		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.047	97.978	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:						
Water Level:			4.355	96.670		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.007	100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.029	101.007		97.978	97.982	T-Post on lower bench
Bench Mark 3:						
Ice/PT:						
Water Level:			4.337	96.670		
Other:						

Closing Error	0.000	Average WL	96.670
WL Check	0.000	Transducer Elevation	95.922

**General Notes:**

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	12-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	31-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	5-Jun-12

# Hydrometric Measurement / Site Visit Record

96.4

UTM Location: 445023 E, 6314256 N

Site Visit Date:

June 26, 2012



## 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
LB	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.50	0.50	0.09	0.061	0.061	0.05	0.003	0%
1	3.00	0.36		0.242			1.0	2.50	3.75	1.25	0.36	0.242	0.242	0.45	0.109	1%
2	4.50	0.32		0.164			1.0	3.75	5.25	1.50	0.32	0.164	0.164	0.48	0.079	1%
3	6.00	0.34		0.219			1.0	5.25	6.75	1.50	0.34	0.219	0.219	0.51	0.112	1%
4	7.50	0.42		0.443			1.0	6.75	8.25	1.50	0.42	0.443	0.443	0.63	0.279	3%
5	9.00	0.44		0.490			1.0	8.25	9.75	1.50	0.44	0.490	0.490	0.66	0.323	3%
6	10.50	0.54		0.476			1.0	9.75	11.25	1.50	0.54	0.476	0.476	0.81	0.386	4%
7	12.00	0.60		0.494			1.0	11.25	12.75	1.50	0.60	0.494	0.494	0.90	0.445	5%
8	13.50	0.60		0.396			1.0	12.75	14.25	1.50	0.60	0.396	0.396	0.90	0.356	4%
9	15.00	0.60		0.458			1.0	14.25	15.75	1.50	0.60	0.458	0.458	0.90	0.412	4%
10	16.50	0.64		0.506			1.0	15.75	17.25	1.50	0.64	0.506	0.506	0.96	0.486	5%
11	18.00	0.68		0.519			1.0	17.25	18.75	1.50	0.68	0.519	0.519	1.02	0.529	6%
12	19.50	0.82			0.356	0.586	1.0	18.75	20.25	1.50	0.82	0.471	0.471	1.23	0.579	6%
13	21.00	0.84			0.500	0.596	1.0	20.25	21.75	1.50	0.84	0.548	0.548	1.26	0.690	7%
14	22.50	1.02			0.330	0.520	1.0	21.75	23.25	1.50	1.02	0.425	0.425	1.53	0.650	7%
15	24.00	1.14			0.508	0.507	1.0	23.25	24.75	1.50	1.14	0.508	0.508	1.71	0.868	9%
16	25.50	1.06			0.513	0.526	1.0	24.75	26.25	1.50	1.06	0.520	0.520	1.59	0.826	9%
17	27.00	0.90			0.353	0.490	1.0	26.25	27.75	1.50	0.90	0.422	0.422	1.35	0.569	6%
18	28.50	0.85			0.371	0.432	1.0	27.75	29.25	1.50	0.85	0.402	0.402	1.28	0.512	6%
19	30.00	0.74		0.418			1.0	29.25	30.75	1.50	0.74	0.418	0.418	1.11	0.464	5%
20	31.50	0.60		0.318			1.0	30.75	32.25	1.50	0.60	0.318	0.318	0.90	0.286	3%
21	33.00	0.52		0.299			1.0	32.25	33.75	1.50	0.52	0.299	0.299	0.78	0.233	3%
22	34.50	0.24		0.144			1.0	33.75	35.60	1.85	0.24	0.144	0.144	0.44	0.064	1%
RB	36.70	0.00	0.00	0.000	0.000	0.000	1.0	35.60	36.70	1.10	0.06	0.036	0.036	0.07	0.002	0%
<b>Total Flow</b>														<b>9.26</b>		

## Measurement Details:

Start Time (MST):	10:20
End Time (MST):	13:45
Equipment:	ADV
Method:	Wading
River Condition:	Good Flow
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 24C

## Flow characteristics:

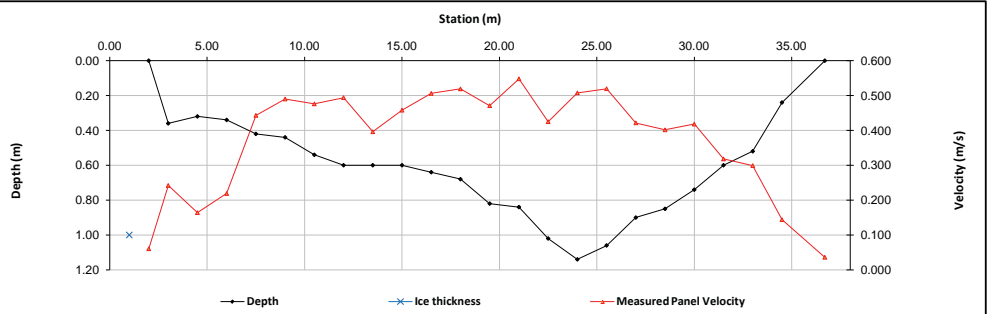
Total Flow:	9.26	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	21.51	(m <sup>2</sup> )
Wetted Width:	34.70	(m)
Hydraulic Depth:	0.620	(m)
Mean Velocity:	0.430	(m/s)
Froude Number:	0.175	

## Logger Details:

	Before	After
Transducer Reading (m):	0.527	
Water (°C):	19.5	
Battery (Main):	14.0	
Datalogger Clock:	9:42	
Laptop Clock:	9:44	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:

-Fix telemetry wiring, RSSI not checked



## Level Survey:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.078	101.078		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.095	97.983	97.982	T-Post on lower bench
Bench Mark 3:			1.145	99.933	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.628	96.450		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.052	99.999	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.068	101.051		97.983	97.982	T-Post on lower bench
Bench Mark 3:			1.119	99.932	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.605	96.446		
Other:						

Closing Error	0.001
WL Check	0.004

Average WL	96.448
Transducer Elevation	95.921

## General Notes:

-installed 1 BM  
-needs bigger enclosure because the surge protector doesn't fit inside and grounding wire is too short.

## Field Personnel:

	TR, RM	Trip Date:	26-Jun-12
Data Entry Personnel:	CJ	Date:	27-Jun-12
Data Check Personnel:	MY	Date:	6-Jul-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

August 30, 2012



## 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	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	2.30	0.00	0.00	0.000	0.000	0.000	1.0	2.30	3.15	0.85	0.05	0.021	0.021	0.04	0.001	0%
1	4.00	0.20		0.085			1.0	3.15	5.00	1.85	0.20	0.085	0.085	0.37	0.031	1%
2	6.00	0.29		0.032			1.0	5.00	7.00	2.00	0.29	0.032	0.032	0.58	0.019	0%
3	8.00	0.34		0.255			1.0	7.00	9.00	2.00	0.34	0.255	0.255	0.68	0.173	4%
4	10.00	0.42		0.329			1.0	9.00	11.00	2.00	0.42	0.329	0.329	0.84	0.276	6%
5	12.00	0.51		0.322			1.0	11.00	13.00	2.00	0.51	0.322	0.322	1.02	0.328	7%
6	14.00	0.49		0.351			1.0	13.00	15.00	2.00	0.49	0.351	0.351	0.98	0.344	7%
7	16.00	0.52		0.328			1.0	15.00	17.00	2.00	0.52	0.328	0.328	1.04	0.341	7%
8	18.00	0.61		0.345			1.0	17.00	19.00	2.00	0.61	0.345	0.345	1.22	0.421	9%
9	20.00	0.73		0.335			1.0	19.00	20.50	1.50	0.73	0.335	0.335	1.10	0.367	8%
10	21.00	0.78			0.349	0.408	1.0	20.50	21.50	1.00	0.78	0.379	0.379	0.78	0.295	6%
11	22.00	0.65		0.370			1.0	21.50	22.50	1.00	0.65	0.370	0.370	0.65	0.241	5%
12	23.00	0.90			0.277	0.319	1.0	22.50	23.50	1.00	0.90	0.298	0.298	0.90	0.268	5%
13	24.00	0.91			0.300	0.312	1.0	23.50	24.50	1.00	0.91	0.306	0.306	0.91	0.278	6%
14	25.00	1.00			0.274	0.346	1.0	24.50	25.50	1.00	1.00	0.310	0.310	1.00	0.310	6%
15	26.00	0.95			0.039	0.340	1.0	25.50	26.50	1.00	0.95	0.190	0.190	0.95	0.180	4%
16	27.00	0.79			0.246	0.380	1.0	26.50	27.50	1.00	0.79	0.313	0.313	0.79	0.247	5%
17	28.00	0.80			-0.001	0.302	1.0	27.50	29.00	1.50	0.80	0.151	0.151	1.20	0.181	4%
18	30.00	0.68			0.279		1.0	29.00	31.00	2.00	0.68	0.279	0.279	1.36	0.379	8%
19	32.00	0.55			0.190		1.0	31.00	32.75	1.75	0.55	0.190	0.190	0.96	0.183	4%
20	33.50	0.41			0.042		1.0	32.75	34.25	1.50	0.41	0.042	0.042	0.62	0.026	1%
RB	35.00	0.00	0.00	0.00	0.00	0.00	1.0	34.25	35.00	0.75	0.10	0.011	0.011	0.08	0.001	0%
<b>Total Flow</b>														<b>4.89</b>		

### Measurement Details:

Start Time (MST):	11:00
End Time (MST):	13:25
Equipment:	ADV
Method:	Wading
River Condition:	Level dropping, good flow
Quality/Error (see reverse):	Excellent
Weather:	overcast, windy, 15

### Flow characteristics:

Total Flow:	4.89	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	18.06	(m <sup>2</sup> )
Wetted Width:	32.70	(m)
Hydraulic Depth:	0.552	(m)
Mean Velocity:	0.271	(m/s)
Froude Number:	0.116	

### Logger Details:

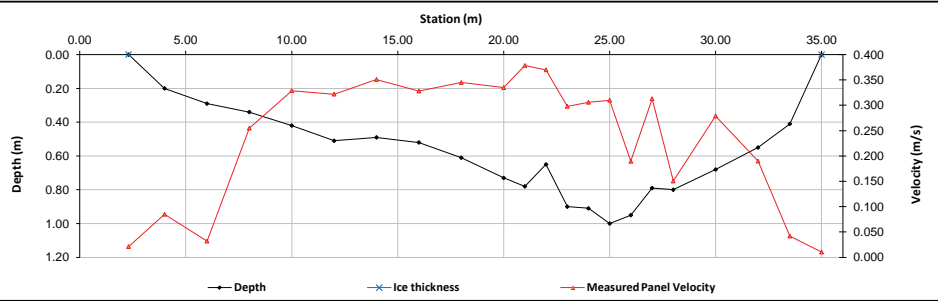
	Before	After
Transducer Reading (m):	0.400	
Water (°C):	15.8	
Battery (Main):	14.3	
Datalogger Clock:	11:07	
Laptop Clock:	11:08	
Dessiccant:	replaced	
Logger# (if Δ):	9632	
PT# (if Δ):		

### Datalogger / Station Notes:

- RSSI: -107,
- With 1 extra 3/4" Pipe section, the antenna was reoriented we achieved an RSSI: -98

### General Notes:

- TSS sampled at offset 33.5 m



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.225	101.225		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.243	97.982	97.982	T-Post on lower bench
Bench Mark 3:			1.293	99.932	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.898	96.327		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.214	100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.232	101.214		97.982	97.982	T-Post on lower bench
Bench Mark 3:			1.283	99.931	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.888	96.326		
Other:						

Closing Error	0.000	Average WL	96.327
WL Check	0.001	Transducer Elevation	95.927

Field Personnel:	SM, TR	Trip Date:	30-Aug-12
Data Entry Personnel:	CJ	Date:	4-Oct-12
Data Check Personnel:	MY	Date:	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

September 10, 2012



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	3.90	0.00	0.00	0.000	0.000	0.000	1.0	3.90	4.45	0.55	0.04	0.048	0.048	0.02	0.001	0%
1	5.00	0.15		0.192			1.0	4.45	6.00	1.55	0.15	0.192	0.192	0.23	0.045	1%
2	7.00	0.23		0.199			1.0	6.00	8.00	2.00	0.23	0.199	0.199	0.46	0.092	2%
3	9.00	0.30		0.250			1.0	8.00	10.00	2.00	0.30	0.250	0.250	0.60	0.150	2%
4	11.00	0.40		0.310			1.0	10.00	12.00	2.00	0.40	0.310	0.310	0.80	0.248	4%
5	13.00	0.55		0.445			1.0	12.00	14.00	2.00	0.55	0.445	0.445	1.10	0.490	8%
6	15.00	0.50		0.409			1.0	14.00	16.00	2.00	0.50	0.409	0.409	1.00	0.409	7%
7	17.00	0.49		0.438			1.0	16.00	18.00	2.00	0.49	0.438	0.438	0.98	0.429	7%
8	19.00	0.58		0.451			1.0	18.00	20.00	2.00	0.58	0.451	0.451	1.16	0.523	9%
9	21.00	0.65		0.359			1.0	20.00	22.00	2.00	0.65	0.359	0.359	1.30	0.467	8%
10	23.00	0.81			0.312	0.402	1.0	22.00	23.50	1.50	0.81	0.357	0.357	1.22	0.434	7%
11	24.00	0.90			0.254	0.385	1.0	23.50	24.50	1.00	0.90	0.320	0.320	0.90	0.288	5%
12	25.00	0.93			0.308	0.342	1.0	24.50	25.50	1.00	0.93	0.325	0.325	0.93	0.302	5%
13	26.00	0.94			0.326	0.367	1.0	25.50	26.50	1.00	0.94	0.347	0.347	0.94	0.326	5%
14	27.00	1.00			0.322	0.379	1.0	26.50	27.50	1.00	1.00	0.351	0.351	1.00	0.351	6%
15	28.00	1.00			0.185	0.417	1.0	27.50	28.50	1.00	1.00	0.301	0.301	1.00	0.301	5%
16	29.00	0.82			0.282	0.385	1.0	28.50	29.50	1.00	0.82	0.334	0.334	0.82	0.273	5%
17	30.00	0.84			0.269	0.335	1.0	29.50	30.50	1.00	0.84	0.302	0.302	0.84	0.254	4%
18	31.00	0.79			0.242	0.297	1.0	30.50	31.50	1.00	0.79	0.270	0.270	0.79	0.213	4%
19	32.00	0.60			0.269		1.0	31.50	32.50	1.00	0.60	0.269	0.269	0.60	0.161	3%
20	33.00	0.56			0.221		1.0	32.50	33.50	1.00	0.56	0.221	0.221	0.56	0.124	2%
21	34.00	0.52			0.180		1.0	33.50	34.50	1.00	0.52	0.180	0.180	0.52	0.094	2%
22	35.00	0.48			0.114		1.0	34.50	35.75	1.25	0.48	0.114	0.114	0.60	0.068	1%
RB	36.50	0.00	0.00	0.00	0.00	0.00	1.0	35.75	36.50	0.75	0.12	0.029	0.029	0.09	0.003	0%
<b>Total Flow</b>															<b>6.04</b>	

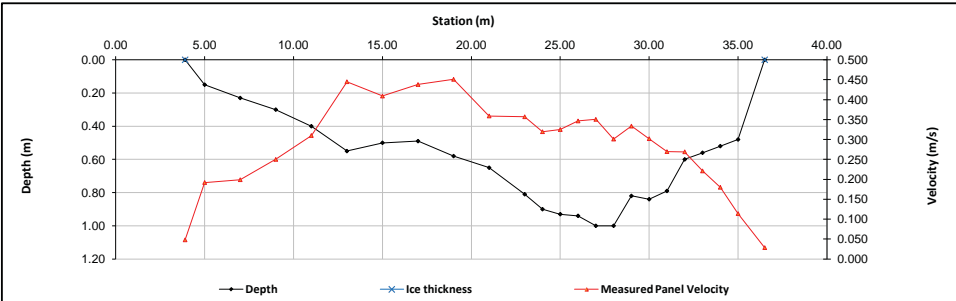
Measurement Details:	
Start Time (MST):	15:10
End Time (MST):	16:10
Equipment:	ADV
Method:	Fishcat
River Condition:	med-high flow
Quality/Error (see reverse):	Excellent
Weather:	rain, 16 C

Flow characteristics:		
Total Flow:	6.04	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	18.46	(m <sup>2</sup> )
Wetted Width:	32.60	(m)
Hydraulic Depth:	0.566	(m)
Mean Velocity:	0.327	(m/s)
Froude Number:	0.139	

Logger Details:		
	Before	After
Transducer Reading (m):	0.430	
Water (°C):	14.8	
Battery (Main):	13.0	
Datalogger Clock:	15:10	
Laptop Clock:	15:10	
Dessicant:	replaced	
Logger# (if Δ):	9632	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-	Tested precip. gauge: 0.2 mm - ok

General Notes:	
-	TSS sampled at 34 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.214	101.214		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.232	97.982	97.982	T-Post on lower bench
Bench Mark 3:			1.282	99.932	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.865	96.349		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.200	99.998	100.000	Pipe 4 m NE of Logger
Bench Mark 2:	3.216	101.198		97.982	97.982	T-Post on lower bench
Bench Mark 3:			1.267	99.931	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.849	96.349		
Other:						
Closing Error	0.002		Average WL		96.349	
WL Check	0.000		Transducer Elevation		95.919	

Field Personnel:		Trip Date:
	SM, TR	10-Sep-12
Data Entry Personnel:	CJ	Date: 10-Oct-12
Data Check Personnel:	DW	Date: 1-Nov-12
Entered Digitally in the Field:	<input type="checkbox"/> YES <input checked="" 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:

October 17, 2012



## 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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.50	0.50	0.04	0.046	0.046	0.02	0.001	0%
1	4.00	0.16		0.19			1.0	3.50	5.00	1.50	0.16	0.185	0.185	0.24	0.044	1%
2	6.00	0.25		0.23			1.0	5.00	7.00	2.00	0.25	0.231	0.231	0.50	0.116	1%
3	8.00	0.38		0.32			1.0	7.00	9.00	2.00	0.38	0.317	0.317	0.76	0.241	3%
4	10.00	0.41		0.33			1.0	9.00	11.00	2.00	0.41	0.333	0.333	0.82	0.273	4%
5	12.00	0.59		0.54			1.0	11.00	13.00	2.00	0.59	0.542	0.542	1.18	0.640	8%
6	14.00	0.57		0.45			1.0	13.00	15.00	2.00	0.57	0.453	0.453	1.14	0.516	7%
7	16.00	0.54		0.47			1.0	15.00	17.00	2.00	0.54	0.474	0.474	1.08	0.512	7%
8	18.00	0.63		0.51			1.0	17.00	19.00	2.00	0.63	0.510	0.510	1.26	0.643	8%
9	20.00	0.74		0.35			1.0	19.00	20.50	1.50	0.74	0.350	0.350	1.11	0.389	5%
10	21.00	0.84			0.491	0.395	1.0	20.50	21.50	1.00	0.84	0.443	0.443	0.84	0.372	5%
11	22.00	0.88			0.446	0.515	1.0	21.50	22.50	1.00	0.88	0.481	0.481	0.88	0.423	5%
12	23.00	0.96			0.414	0.378	1.0	22.50	23.50	1.00	0.96	0.396	0.396	0.96	0.380	5%
13	24.00	1.00			0.384	0.374	1.0	23.50	24.50	1.00	1.00	0.379	0.379	1.00	0.379	5%
14	25.00	1.03			0.402	0.434	1.0	24.50	25.50	1.00	1.03	0.418	0.418	1.03	0.431	6%
15	26.00	1.06			0.376	0.447	1.0	25.50	26.50	1.00	1.06	0.412	0.412	1.06	0.436	6%
16	27.00	1.02			0.241	0.442	1.0	26.50	27.50	1.00	1.02	0.342	0.342	1.02	0.348	4%
17	28.00	0.90			0.300	0.446	1.0	27.50	28.50	1.00	0.90	0.373	0.373	0.90	0.336	4%
18	29.00	0.86			0.314	0.388	1.0	28.50	29.50	1.00	0.86	0.351	0.351	0.86	0.302	4%
19	30.00	0.80			0.310	0.321	1.0	29.50	31.00	1.50	0.80	0.316	0.316	1.20	0.379	5%
20	32.00	0.70		0.29			1.0	31.00	33.00	2.00	0.70	0.288	0.288	1.40	0.403	5%
21	34.00	0.46		0.21			1.0	33.00	35.00	2.00	0.46	0.211	0.211	0.92	0.194	3%
RB	36.00	0.00	0.00	0.00	0.00	0.00	1.0	35.00	36.00	1.00	0.12	0.053	0.053	0.12	0.006	0%
<b>Total Flow</b>															<b>7.76</b>	

### Measurement Details:

Start Time (MST):	11:50
End Time (MST):	12:55
Equipment:	ADV
Method:	Wading
River Condition:	Med-Low Flow
Quality/Error (see reverse):	Excellent
Weather:	Overcast, Calm

### Flow characteristics:

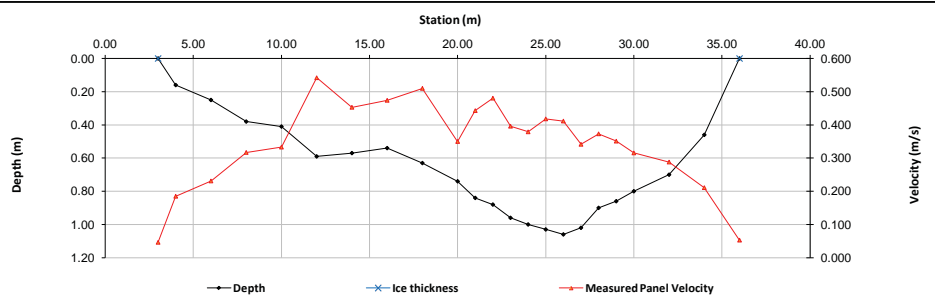
Total Flow:	7.76	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	20.30	(m <sup>2</sup> )
Wetted Width:	33.00	(m)
Hydraulic Depth:	0.615	(m)
Mean Velocity:	0.382	(m/s)
Froude Number:	0.156	

### Logger Details:

	Before	After
Transducer Reading (m):	0.490	
Water (°C):	3.2	
Rain (mm):	4.2	
Battery (Main):	13.6	
Datalogger Clock:	11:54	
Laptop Clock:	11:56	
Dessicant:	Replaced	
Logger# (if Δ):	9632	
PT# (if Δ):	-	

### Datalogger / Station Notes:

- Checked precip gauge: 0.1 mm



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.070	101.070		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.087	97.983	97.982	T-Post on lower bench
Bench Mark 3:			1.138	99.932	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.656	96.414		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.057	100.001	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.077	97.981	97.982	T-Post on lower bench
Bench Mark 3:	1.126	101.058		99.932	99.932	Pipe 4 m S of Logger
Ice/PT:						
Water Level:			4.645	96.413		
Other:						
Closing Error	-0.001		Average WL	96.414		
WL Check	0.001		Transducer Elevation	95.924		

### General Notes:

- BM labels were installed  
 - ADV test - ok  
 - TSS sampled at 32 m

<b>Field Personnel:</b>	SM, TR, ACM	Trip Date:	17-Oct-12
<b>Data Entry Personnel:</b>	DW	Date:	21-Oct-12
<b>Data Check Personnel:</b>	MY	Date:	2-Nov-12
<b>Entered Digitally in the Field:</b>	<input type="checkbox"/> YES <input checked="" 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: November 29, 2012



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	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	37.00	0.00	0.00	0.000	0.000	0.000	0.9	37.00	36.00	1.00	0.07	0.050	0.045	0.07	0.003	0%
1	35.00	0.55	0.27	0.198			0.9	36.00	34.10	1.90	0.28	0.198	0.178	0.53	0.095	3%
2	33.20	0.68	0.25	0.432			0.9	34.10	32.60	1.50	0.43	0.432	0.389	0.65	0.251	7%
3	32.00	0.91	0.26	0.494			0.9	32.60	31.25	1.35	0.65	0.494	0.445	0.88	0.390	11%
4	30.50	1.07	0.26		0.350	0.407	1.0	31.25	30.00	1.25	0.81	0.379	0.379	1.01	0.383	11%
5	29.50	1.15	0.28		0.244	0.452	1.0	30.00	29.10	0.90	0.87	0.348	0.348	0.78	0.272	8%
6	28.70	1.10	0.18		0.366	0.448	1.0	29.10	28.25	0.85	0.92	0.407	0.407	0.78	0.318	9%
7	27.80	1.13	0.15		0.441	0.000	1.0	28.25	27.40	0.85	0.98	0.221	0.221	0.83	0.184	5%
8	27.00	1.18	0.15		0.290	0.000	1.0	27.40	26.55	0.85	1.03	0.145	0.145	0.88	0.127	4%
9	26.10	1.15	0.15		0.000	-0.001	1.0	26.55	25.70	0.85	1.00	-0.001	-0.001	0.85	0.000	0%
10	25.30	1.16	0.15		0.000	-0.001	1.0	25.70	25.05	0.65	1.01	-0.001	-0.001	0.66	0.000	0%
11	24.80	1.17	0.14		0.001	-0.001	1.0	25.05	24.00	1.05	1.03	0.000	0.000	1.08	0.000	0%
12	23.20	1.20	0.14		-0.037	0.002	1.0	24.00	22.25	1.75	1.06	-0.018	-0.018	1.86	-0.032	-1%
13	21.30	1.16	0.15		0.002	0.002	1.0	22.25	20.15	2.10	1.01	0.002	0.002	2.12	0.004	0%
14	19.00	1.10	0.16		0.246	0.000	1.0	20.15	18.30	1.85	0.94	0.123	0.123	1.74	0.214	6%
15	17.60	0.89	0.15	0.045			0.9	18.30	16.80	1.50	0.74	0.045	0.041	1.11	0.045	1%
16	16.00	0.69	0.14	0.000			1.0	16.80	14.40	2.40	0.55	0.000	0.000	1.32	0.000	0%
17	12.80	0.60	0.14	0.483			0.9	14.40	12.00	2.40	0.46	0.483	0.435	1.10	0.480	14%
18	11.20	0.56	0.14	0.002			0.9	12.00	10.50	1.50	0.42	0.002	0.002	0.63	0.001	0%
19	9.80	0.60	0.15	0.187			0.9	10.50	8.95	1.55	0.45	0.187	0.187	0.70	0.117	3%
20	8.10	0.55	0.14	0.576			0.9	8.95	7.25	1.70	0.41	0.576	0.518	0.70	0.361	10%
21	6.40	0.50	0.20	0.327			0.9	7.25	5.80	1.45	0.30	0.327	0.294	0.44	0.128	4%
22	5.20	0.46	0.23	0.327			0.9	5.80	4.10	1.70	0.23	0.327	0.294	0.39	0.115	3%
LB	3.00	0.00	0.00	0.00	0.00	0.00	1.0	4.10	3.00	1.10	0.06	0.082	0.082	0.06	0.005	0%
<b>Total Flow</b>														<b>3.46</b>		

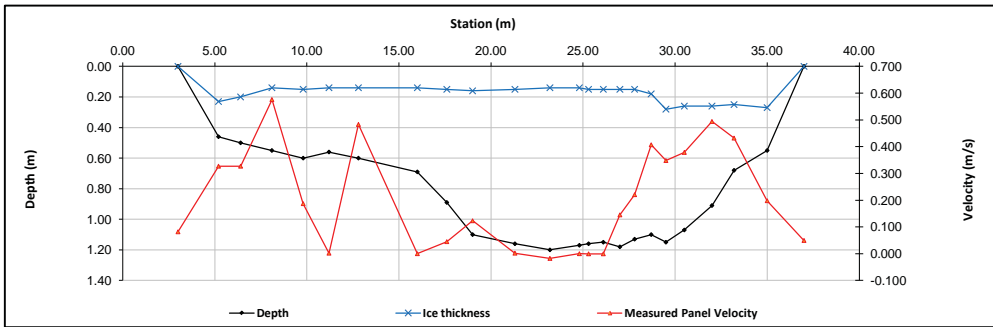
Measurement Details:	
Start Time (MST):	13:40
End Time (MST):	15:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Poor
Weather:	-20 deg. snowing

Flow characteristics:		
Total Flow:	3.46	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	21.16	(m <sup>2</sup> )
Wetted Width:	31.90	(m)
Hydraulic Depth:	0.663	(m)
Mean Velocity:	0.164	(m/s)
Froude Number:	0.064	

Logger Details:		
	Before	After
Transducer Reading (m):	0.650	
Water (°C):	0.1	
Battery (Main):	12.4	
Datalogger Clock:	13:42	
Laptop Clock:	13:43	
Dessicant:	good	
Logger# (if Δ):	9632	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 -Covered precip gauge for winter

**General Notes:**  
 -Slush in channel about offset 19 m to 27.8 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.183	101.183		100.000	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.202	97.981	97.982	T-Post on lower bench
Bench Mark 3:			1.252	99.931	99.932	Pipe 4 m S of Logger
Ice/PT:			4.601	96.582		
Water Level:			4.614	96.569		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.168	100.001	100.000	Pipe 4 m NE of Logger
Bench Mark 2:			3.189	97.980	97.982	T-Post on lower bench
Bench Mark 3:	1.238	101.169		99.931	99.932	Pipe 4 m S of Logger
Ice/PT:			4.588	96.581		
Water Level:			4.601	96.568		
Other:						

Closing Error	-0.001	Average WL	96.569
WL Check	0.001	Transducer Elevation	95.919

<b>Field Personnel:</b>	SM, TR	Trip Date:	29-Nov-12
<b>Data Entry Personnel:</b>	SM	Date:	29-Nov-12
<b>Data Check Personnel:</b>	DW	Date:	11-Dec-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S42 - Clearwater River above Christina River

UTM Location: 504427 E, 6279666 N

Site Visit Date:

January 20, 2012



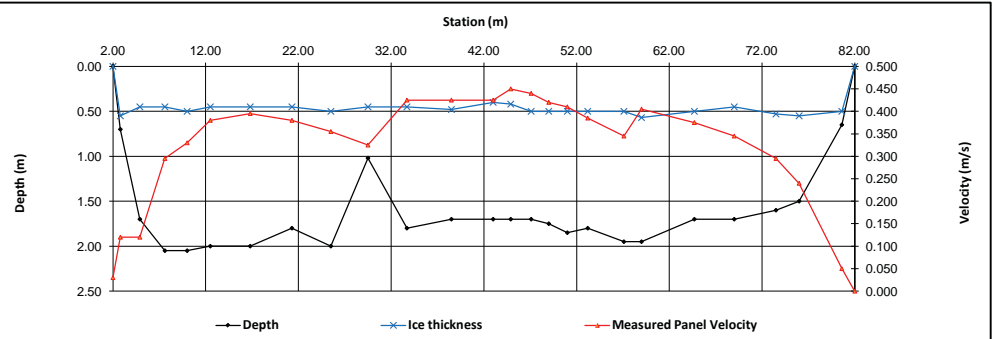
Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	2.40	0.40	0.00	0.027	0.00	0.000	0%								
1	2.80	0.70	0.55	0.120			0.9	2.40	3.85	1.45	0.15	0.108	0.22	0.023	0%								
2	4.90	1.70	0.45		0.030	0.210	1.0	3.85	6.25	2.40	1.25	0.120	3.00	0.360	1%								
3	7.60	2.05	0.45		0.270	0.320	1.0	6.25	8.80	2.55	1.60	0.295	4.08	1.204	3%								
4	10.00	2.05	0.50		0.320	0.340	1.0	8.80	11.25	2.45	1.55	0.330	3.80	1.253	4%								
5	12.50	2.00	0.45		0.380	0.380	1.0	11.25	14.65	3.40	1.55	0.380	5.27	2.003	6%								
6	16.80	2.00	0.45		0.340	0.450	1.0	14.65	19.05	4.40	1.55	0.395	6.82	2.694	8%								
7	21.30	1.80	0.45		0.290	0.470	1.0	19.05	23.40	4.35	1.35	0.380	5.87	2.232	6%								
8	25.50	2.00	0.50		0.290	0.420	1.0	23.40	27.50	4.10	1.50	0.355	6.15	2.183	6%								
9	29.50	1.02	0.45		0.240	0.410	1.0	27.50	31.60	4.10	0.57	0.325	2.34	0.760	2%								
10	33.70	1.80	0.45		0.390	0.460	1.0	31.60	36.10	4.50	1.35	0.425	6.08	2.582	7%								
11	38.50	1.70	0.48		0.410	0.440	1.0	36.10	40.75	4.65	1.22	0.425	5.67	2.411	7%								
12	43.00	1.70	0.40		0.390	0.460	1.0	40.75	43.95	3.20	1.30	0.425	4.16	1.768	5%								
13	44.90	1.70	0.42		0.410	0.490	1.0	43.95	46.00	2.05	1.28	0.450	2.62	1.181	3%								
14	47.10	1.70	0.50		0.400	0.480	1.0	46.00	48.05	2.05	1.20	0.440	2.46	1.082	3%								
15	49.00	1.75	0.50		0.360	0.480	1.0	48.05	50.00	1.95	1.25	0.420	2.44	1.024	3%								
16	51.00	1.85	0.50		0.390	0.430	1.0	50.00	52.10	2.10	1.35	0.410	2.84	1.162	3%								
17	53.20	1.80	0.50		0.330	0.440	1.0	52.10	55.15	3.05	1.30	0.385	3.97	1.527	4%								
18	57.10	1.95	0.50		0.290	0.400	1.0	55.15	58.05	2.90	1.45	0.345	4.20	1.451	4%								
19	59.00	1.95	0.57		0.380	0.430	1.0	58.05	61.85	3.80	1.38	0.405	5.24	2.124	6%								
20	64.70	1.70	0.50		0.360	0.390	1.0	61.85	66.85	5.00	1.20	0.375	6.00	2.250	6%								
21	69.00	1.70	0.45		0.360	0.330	1.0	66.85	71.25	4.40	1.25	0.345	5.50	1.898	5%								
22	73.50	1.60	0.53		0.280	0.310	1.0	71.25	74.75	3.50	1.07	0.295	3.75	1.105	3%								
23	76.00	1.50	0.55		0.220	0.260	1.0	74.75	78.30	3.55	0.95	0.240	3.37	0.809	2%								
24	80.60	0.65	0.50	0.050			0.9	78.30	81.30	3.00	0.15	0.050	0.45	0.020	0%								
LB	82.00	0.00	0.00	0.000	0.000	0.000	1.0	82.00	82.00	0.00	0.04	0.000	0.00	0.000	0%								
<b>Total Flow</b>														<b>35.1</b>									

Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	10:10
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, -25

Flow characteristics:	
Total Flow:	35.1 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	96.29 (m <sup>2</sup> )
Wetted Width:	80.00 (m)
Hydraulic Depth:	1.204 (m)
Mean Velocity:	0.365 (m/s)
Froude Number:	0.106

Datalogger Details:	Before	After
WSC Site		

Datalogger / Station Notes:	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #1						
Bench Mark 1:	2.234	27.533		25.299	25.299	Brass cap on Right Bank
Bench Mark 2:			0.788	26.745	26.749	T-post
Bench Mark 3:						
Ice/PT:			4.220	23.313		
Water Level:			4.173	23.360		
Other:						
Setup #2						
Bench Mark 1:			2.220	25.299		Brass cap on Right Bank
Bench Mark 2:	0.774	27.519		26.745		T-post
Bench Mark 3:						
Ice/PT:			4.204	23.315		
Water Level:			4.161	23.358		
Other:						
Closing Error	0.000					
WL Check	0.002					
Average WL					23.359	
Transducer Elevation					-	

**General Notes:**

Field Personnel:	SM, GB	Trip Date:	20-Jan-12
Data Entry Personnel:	CJ	Date:	13-Feb-12
Data Check Personnel:	DW	Date:	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S42 - Clearwater River above Christina River  
 UTM Location: 504427 E, 6279666 N

Site Visit Date: February 10, 2012



## Flow Measurement:

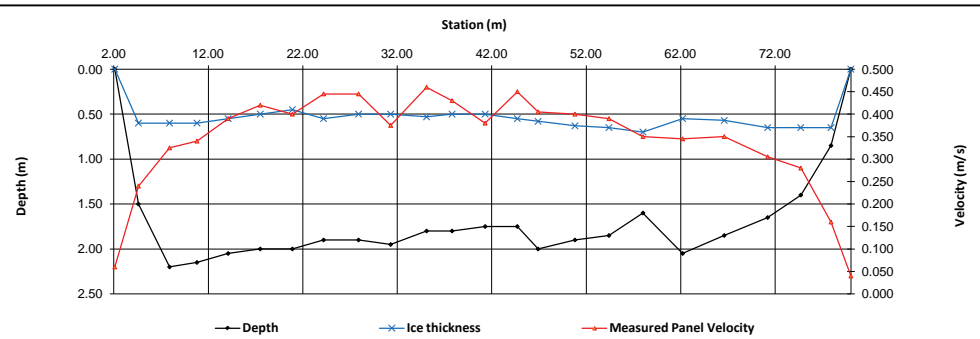
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.10	0.00	0.00	0.000	0.000	0.000	1.0	2.10	3.35	1.25	0.23	0.060	0.060	0.28	0.017	0%
1	4.60	1.50	0.60	0.230	0.250		1.0	3.35	6.25	2.90	0.90	0.240	0.240	2.61	0.626	2%
2	7.90	2.20	0.60	0.310	0.340		1.0	6.25	9.35	3.10	1.60	0.325	0.325	4.96	1.612	4%
3	10.80	2.15	0.60	0.290	0.390		1.0	9.35	12.45	3.10	1.55	0.340	0.340	4.81	1.634	5%
4	14.10	2.05	0.55	0.350	0.430		1.0	12.45	15.80	3.35	1.50	0.390	0.390	5.03	1.960	5%
5	17.50	2.00	0.50	0.360	0.480		1.0	15.80	19.20	3.40	1.50	0.420	0.420	5.10	2.142	6%
6	20.90	2.00	0.45	0.340	0.460		1.0	19.20	22.55	3.35	1.55	0.400	0.400	5.19	2.077	6%
7	24.20	1.90	0.55	0.400	0.490		1.0	22.55	26.05	3.50	1.35	0.445	0.445	4.73	2.103	6%
8	27.90	1.90	0.50	0.390	0.500		1.0	26.05	29.60	3.55	1.40	0.445	0.445	4.97	2.212	6%
9	31.30	1.95	0.50	0.310	0.440		1.0	29.60	33.20	3.60	1.45	0.375	0.375	5.22	1.958	5%
10	35.10	1.80	0.53	0.450	0.470		1.0	33.20	36.45	3.25	1.27	0.460	0.460	4.13	1.899	5%
11	37.80	1.80	0.50	0.420	0.440		1.0	36.45	39.55	3.10	1.30	0.430	0.430	4.03	1.733	5%
12	41.30	1.75	0.50	0.290	0.470		1.0	39.55	43.00	3.45	1.25	0.380	0.380	4.31	1.639	5%
13	44.70	1.75	0.55	0.450	0.450		1.0	43.00	45.80	2.80	1.20	0.450	0.450	3.36	1.512	4%
14	46.90	2.00	0.58	0.350	0.460		1.0	45.80	48.85	3.05	1.42	0.405	0.405	4.33	1.754	5%
15	50.80	1.90	0.63	0.330	0.470		1.0	48.85	52.60	3.75	1.27	0.400	0.400	4.76	1.905	5%
16	54.40	1.85	0.65	0.360	0.420		1.0	52.60	56.20	3.60	1.20	0.390	0.390	4.32	1.685	5%
17	58.00	1.60	0.70	0.330	0.370		1.0	56.20	60.10	3.90	0.90	0.350	0.350	3.51	1.229	3%
18	62.20	2.05	0.55	0.330	0.360		1.0	60.10	64.40	4.30	1.50	0.345	0.345	6.45	2.225	6%
19	66.60	1.85	0.57	0.340	0.360		1.0	64.40	68.90	4.50	1.28	0.350	0.350	5.76	2.016	6%
20	71.20	1.65	0.65	0.280	0.330		1.0	68.90	72.95	4.05	1.00	0.305	0.305	4.05	1.235	3%
21	74.70	1.40	0.65	0.280	0.280		1.0	72.95	76.30	3.35	0.75	0.280	0.280	2.51	0.704	2%
22	77.90	0.85	0.65	0.160			0.9	76.30	78.95	2.65	0.20	0.160	0.144	0.53	0.076	0%
LB	80.00	0.00	0.00	0.000	0.000	0.000	1.0	78.95	80.00	1.05	0.05	0.040	0.040	0.05	0.002	0%
<b>Total Flow</b>															<b>36.0</b>	

**Measurement Details:**

Start Time (MST):	13:15
End Time (MST):	14:45
Equipment:	Marsh
Method:	Ice
River Condition:	Ice covered
Quality/Error (see reverse):	Good
Weather:	-

**Flow Characteristics:**

Total Flow:	36.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	95.00	(m <sup>2</sup> )
Wetted Width:	77.90	(m)
Hydraulic Depth:	1.219	(m)
Mean Velocity:	0.379	(m/s)
Froude Number:	0.110	



**Datalogger Details:**

	Before	After
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**WSC Site**

**Datalogger / Station Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	2.167	27.466		25.299	25.299	Brass cap on Right Bank
Bench Mark 2:			0.723	26.743	26.749	T-post
Bench Mark 3:						
Ice/PT:			4.037	23.429		
Water Level:			4.018	23.448		
Other:						
Setup #2						
Bench Mark 1:			2.157	25.299		Brass cap on Right Bank
Bench Mark 2:	0.713	27.456		26.743		T-post
Bench Mark 3:						
Ice/PT:			4.032	23.424		
Water Level:			4.009	23.447		
Other:						

Closing Error	0.000	Average WL	23.448
WL Check	0.001	Transducer Elevation	-

**General Notes:**

**Field Personnel:**

TR & SM	Trip Date:	10-Feb-12	
Data Entry Personnel:	TR	Date:	20-Mar-12
Data Check Personnel:	CJ	Date:	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S42 - Clearwater River above Christina River  
 UTM Location: 504427 E, 6279666 N

Site Visit Date:

December 7, 2012



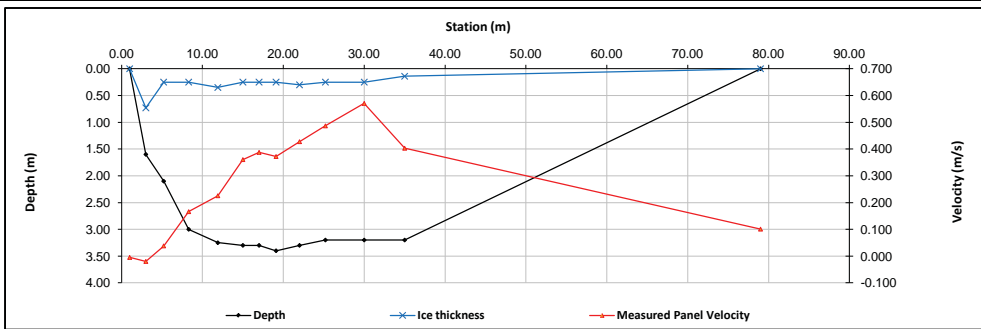
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	2.00	1.00	0.22	-0.005	-0.005	0.22	-0.001	0%
1	3.00	1.60	0.73	-0.021	-0.019		1.0	2.00	4.10	2.10	0.87	-0.020	-0.020	1.83	-0.037	0%
2	5.20	2.10	0.25	0.061	0.015		1.0	4.10	6.75	2.65	1.85	0.038	0.038	4.90	0.186	0%
3	8.30	3.00	0.25	0.123	0.209		1.0	6.75	10.10	3.35	2.75	0.166	0.166	9.21	1.529	2%
4	11.90	3.25	0.35	0.215	0.236		1.0	10.10	13.45	3.35	2.90	0.226	0.226	9.71	2.191	4%
5	15.00	3.30	0.25	0.358	0.363		1.0	13.45	16.00	2.55	3.05	0.361	0.361	7.78	2.804	5%
6	17.00	3.30	0.25	0.391	0.394		1.0	16.00	18.05	2.05	3.05	0.388	0.388	6.25	2.423	4%
7	19.10	3.40	0.25	0.362	0.382		1.0	18.05	20.55	2.50	3.15	0.372	0.372	7.88	2.930	5%
8	22.00	3.30	0.30	0.434	0.421		1.0	20.55	23.60	3.05	3.00	0.428	0.428	9.15	3.912	6%
9	25.20	3.20	0.25	0.494	0.479		1.0	23.60	27.60	4.00	2.95	0.487	0.487	11.80	5.741	9%
10	30.00	3.20	0.25	0.468	0.673		1.0	27.60	32.50	4.90	2.95	0.571	0.571	14.46	8.247	13%
11	35.00	3.20	0.14	0.400	0.406		1.0	32.50	57.00	24.50	3.06	0.403	0.403	74.97	30.213	49%
LB	79.00	0.00	0.00	0.00	0.00		1.0	57.00	79.00	22.00	0.77	0.101	0.101	16.83	1.696	3%
<b>Total Flow</b>														<b>61.8</b>		

Measurement Details:	
Start Time (MST):	12:30
End Time (MST):	2:40
Equipment:	ADV
Method:	Ice
River Condition:	THIN ICE
Quality/Error (see reverse):	Poor
Weather:	LIGHT snow

Flow characteristics:		
Total Flow:	61.8	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	174.98	(m <sup>2</sup> )
Wetted Width:	78.00	(m)
Hydraulic Depth:	2.243	(m)
Mean Velocity:	0.353	(m/s)
Froude Number:	0.075	

Logger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			2.251	25.301	25.299	Brass cap on Right Bank
Bench Mark 2:	0.803	27.552		26.749	26.749	T-post
Bench Mark 3:						
Ice/PT:			2.898	24.654		
Water Level:			2.938	24.614		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	2.228	27.529		25.301		Brass cap on Right Bank
Bench Mark 2:			0.782	26.747		T-post
Bench Mark 3:						
Ice/PT:			2.877	24.652		
Water Level:			2.915	24.614		
Other:						
Closing Error	0.002				24.614	
WL Check	0.000				#VALUE!	

**General Notes:**

- Ice was less than 10 cm in the middle of the river and would be unsafe to cross.
- A few test holes were made after 35 m with an ice screw and the ice thickness continued to drop to below 10 cm.
- LB offset was estimated.

<b>Field Personnel:</b>	DW, CJ	<b>Trip Date:</b>	7-Dec-12
<b>Data Entry Personnel:</b>	DW	<b>Date:</b>	7-Dec-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	20-Dec-12
<b>Entered Digitally in the Field:</b>	<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:

January 19, 2012



## 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	0.00	0.00	0.00	0.00	0.000	0.000	1.0	0.00	0.40	0.40	0.00	0.000	0.000	0.00	0.000	0%
1	0.80	0.40	0.40	0.000			1.0	0.40	1.00	0.60	0.00	0.000	0.00	0.00	0.00	0.00%
2	1.20	0.45	0.47	0.070			0.9	1.00	2.10	1.10	-0.02	0.070	0.06	-0.02	0.00	-0.03%
3	3.00	0.96	0.50	0.370			0.9	2.10	3.60	1.50	0.46	0.370	0.33	0.69	0.23	5.56%
4	4.20	1.22	0.55	0.250			0.9	3.60	5.10	1.50	0.67	0.250	0.23	1.01	0.23	5.48%
5	6.00	1.38	0.57		0.200	0.380	1.0	5.10	7.00	1.90	0.81	0.290	0.29	1.54	0.45	10.81%
6	8.00	1.46	0.55		0.200	0.160	1.0	7.00	8.65	1.65	0.91	0.180	0.18	1.50	0.27	6.54%
7	9.30	1.40	0.57		0.110	0.170	1.0	8.65	10.15	1.50	0.83	0.140	0.14	1.25	0.17	4.22%
8	11.00	1.40	0.54		0.200	0.260	1.0	10.15	11.75	1.60	0.86	0.230	0.23	1.38	0.32	7.66%
9	12.50	1.30	0.50		0.290	0.310	1.0	11.75	13.25	1.50	0.80	0.300	0.30	1.20	0.36	8.72%
10	14.00	1.35	0.50		0.280	0.460	1.0	13.25	14.65	1.40	0.85	0.370	0.37	1.19	0.44	10.66%
11	15.30	1.30	0.51		0.200	0.250	1.0	14.65	15.80	1.15	0.79	0.225	0.23	0.91	0.20	4.95%
12	16.30	1.05	0.50	0.290			0.9	15.80	16.90	1.10	0.55	0.290	0.26	0.60	0.16	3.82%
13	17.50	1.10	0.60	0.370			0.9	16.90	18.00	1.10	0.50	0.370	0.33	0.55	0.18	4.43%
14	18.50	1.10	0.57	0.340			0.9	18.00	19.15	1.15	0.53	0.340	0.31	0.61	0.19	4.52%
15	19.80	1.08	0.60	0.290			0.9	19.15	20.30	1.15	0.48	0.290	0.26	0.55	0.14	3.49%
16	20.80	1.05	0.70	0.290			0.9	20.30	21.40	1.10	0.35	0.290	0.26	0.38	0.10	2.43%
17	22.00	0.98	0.56	0.340			0.9	21.40	22.75	1.35	0.42	0.340	0.31	0.57	0.17	4.20%
18	23.50	1.00	0.56	0.330			0.9	22.75	24.00	1.25	0.44	0.330	0.30	0.55	0.16	3.96%
19	24.50	0.95	0.55	0.280			0.9	24.00	25.20	1.20	0.40	0.280	0.25	0.48	0.12	2.93%
20	25.90	0.87	0.55	0.210			0.9	25.20	26.35	1.15	0.32	0.210	0.19	0.37	0.07	1.68%
21	26.80	0.85	0.55	0.230			0.9	26.35	27.40	1.05	0.30	0.230	0.21	0.31	0.07	1.58%
22	28.00	0.85	0.62	0.140			0.9	27.40	28.55	1.15	0.23	0.140	0.13	0.26	0.03	0.81%
23	29.10	1.10	0.60	0.080			0.9	28.55	30.30	1.75	0.50	0.080	0.07	0.88	0.06	1.53%
24	31.50	0.80	0.52	0.013			0.9	30.30	32.50	2.20	0.28	0.013	0.01	0.62	0.01	0.17%
LB	33.50	0.00	0.00	0.000	0.000	0.000	1.0	32.50	33.50	1.00	0.00	0.05	0.05	0.00	0.00	0.00%
<b>Total Flow</b>															<b>4.130</b>	

## Measurement Details:

Start Time (MST):	9:30
End Time (MST):	10:20
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -20

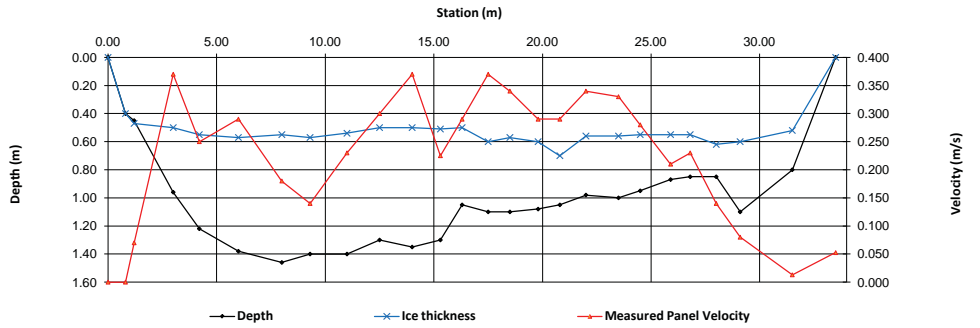
## Flow characteristics:

Total Flow:	4.13	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	17.37	(m <sup>2</sup> )
Wetted Width:	33.50	(m)
Hydraulic Depth:	0.519	(m)
Mean Velocity:	0.238	(m/s)
Froude Number:	0.105	

## Datalogger Details:

	Before	After
Transducer Reading (m):		0.911
Water (°C):	0.3	
Rainfall (mm):	-	
Battery (Main):	13.5	
Datalogger Clock:	9:42	
Laptop Clock:	9:41	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.026	101.296		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.183	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			1.929	99.367		
Water Level:			2.017	99.279		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.008	100.273	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.168	101.281		100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			1.963	99.318		
Water Level:			2.003	99.278		
Other:						

Closing Error	-0.003	Average WL	99.279
WL Check	0.001	Transducer Elevation	98.368

## General Notes:

Field Personnel:	SM, GB	Trip Date:	19-Jan-12
Data Entry Personnel:	CJ	Date:	13-Feb-12
Data Check Personnel:	DW	Date:	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: February 17, 2012



## 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	1.50	0.00	0.00	0.000	0.000	0.000	0.9	1.50	2.35	0.85	0.09	0.055	0.050	0.07	0.004	0%
1	3.20	0.85	0.50	0.220			0.9	2.35	3.85	1.50	0.35	0.220	0.198	0.53	0.104	3%
2	4.50	0.78	0.55	0.260			0.9	3.85	5.30	1.45	0.23	0.260	0.234	0.33	0.078	2%
3	6.10	0.95	0.57	0.320			0.9	5.30	6.55	1.25	0.38	0.320	0.288	0.48	0.137	4%
4	7.00	1.08	0.65	0.170			0.9	6.55	8.05	1.50	0.43	0.170	0.153	0.65	0.099	3%
5	9.10	1.25	0.85	0.420			0.9	8.05	9.80	1.75	0.60	0.420	0.378	1.05	0.397	11%
6	10.50	1.23	0.60	0.300			0.9	9.80	11.25	1.45	0.63	0.300	0.270	0.91	0.247	7%
7	12.00	1.20	0.65	0.020			0.9	11.25	12.75	1.50	0.55	0.020	0.018	0.83	0.015	0%
8	13.50	1.30	0.65	0.030			0.9	12.75	14.15	1.40	0.65	0.030	0.027	0.91	0.025	1%
9	14.80	1.40	0.63		0.160	0.190	1.0	14.15	15.65	1.50	0.77	0.175	0.175	1.16	0.202	6%
10	16.50	1.35	0.65		0.270	0.270	1.0	15.65	17.30	1.65	0.70	0.270	0.270	1.16	0.312	9%
11	18.10	1.30	0.60	0.350			0.9	17.30	18.85	1.55	0.70	0.350	0.315	1.09	0.342	10%
12	19.60	1.20	0.65	0.140			0.9	18.85	20.30	1.45	0.55	0.140	0.126	0.80	0.100	3%
13	21.00	1.22	0.65	0.290			0.9	20.30	21.50	1.20	0.57	0.290	0.261	0.68	0.179	5%
14	22.00	1.22	0.62	0.330			0.9	21.50	22.70	1.20	0.60	0.330	0.297	0.72	0.214	6%
15	23.40	1.18	0.63	0.400			0.9	22.70	24.20	1.50	0.55	0.400	0.360	0.83	0.297	8%
16	25.00	1.18	0.65	0.320			0.9	24.20	25.50	1.30	0.53	0.320	0.288	0.69	0.198	6%
17	26.00	1.05	0.60	0.390			0.9	25.50	26.60	1.10	0.45	0.390	0.351	0.50	0.174	5%
18	27.20	0.99	0.65	0.430			0.9	26.60	27.75	1.15	0.34	0.430	0.387	0.39	0.151	4%
19	28.30	1.00	0.62	0.310			0.9	27.75	29.10	1.35	0.38	0.310	0.279	0.51	0.143	4%
20	29.90	0.90	0.55	0.200			0.9	29.10	30.30	1.20	0.35	0.200	0.180	0.42	0.076	2%
21	30.70	0.90	0.63	0.130			0.9	30.30	31.25	0.95	0.27	0.130	0.117	0.26	0.030	1%
22	31.80	0.82	0.64	0.010			0.9	31.25	32.35	1.10	0.18	0.010	0.009	0.20	0.002	0%
23	32.90	1.00	0.65	0.060			0.9	32.35	33.35	1.00	0.35	0.060	0.054	0.35	0.019	1%
24	33.80	1.10	0.62	0.060			0.9	33.35	34.40	1.05	0.48	0.060	0.054	0.50	0.027	1%
25	35.00	1.10	0.45	0.010			0.9	34.40	35.50	1.10	0.65	0.010	0.009	0.72	0.006	0%
LB	36.00	0.00	0.00	0.000	0.000	0.000	1.0	35.50	36.00	0.50	0.00	0.003	0.003	0.00	0.000	0%

**Total Flow 3.580**

## Measurement Details:

Start Time (MST):	9:15
End Time (MST):	10:15
Equipment:	Marsh
Method:	Ice
River Condition:	Full ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -8

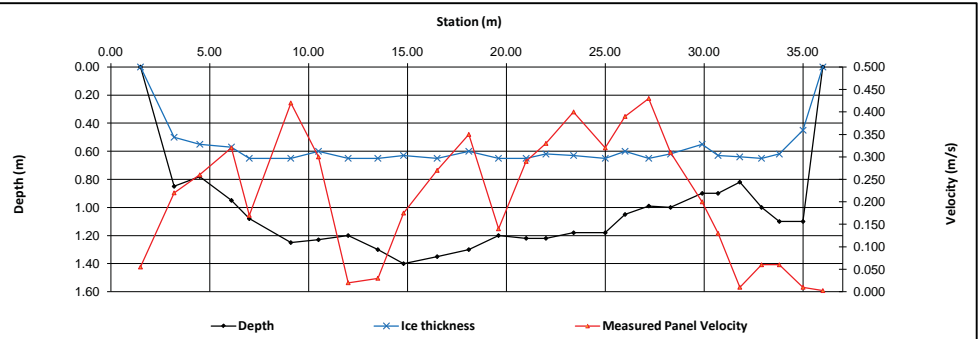
## Flow characteristics:

Total Flow:	3.58	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	16.70	(m <sup>2</sup> )
Wetted Width:	34.50	(m)
Hydraulic Depth:	0.484	(m)
Mean Velocity:	0.214	(m/s)
Froude Number:	0.098	

## Datalogger Details:

	Before	After
Transducer Reading (m):		0.939
Water (°C):	0.3	
Rainfall (mm):	-	-
Battery (Main):	13.9	
Datalogger Clock:	9:26	
Laptop Clock:	9:25	
Dessicant:	good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.111	101.381		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.267	100.114	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.054	99.327		
Water Level:			2.082	99.299		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.102	100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.258	101.372		100.114	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.045	99.327		
Water Level:			2.071	99.301		
Other:						

Closing Error	0.000	Average WL	99.300
WL Check	0.002	Transducer Elevation	98.361

## General Notes:

Field Personnel:	SM, DW	Trip Date:	17-Feb-12
Data Entry Personnel:	CJ	Date:	19-Mar-12
Data Check Personnel:	XP	Date:	24-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

March 2, 2012



## Flow Measurement:

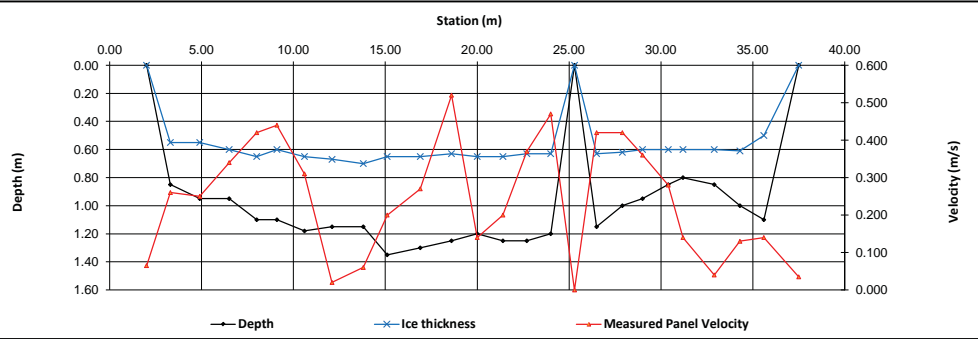
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	0.9	2.00	2.65	0.65	0.08	0.065	0.059	0.05	0.003	0%
1	3.30	0.85	0.55	0.260			0.9	2.65	4.10	1.45	0.30	0.260	0.234	0.44	0.102	3%
2	4.90	0.95	0.55	0.250			0.9	4.10	5.70	1.60	0.40	0.250	0.225	0.64	0.144	4%
3	6.50	0.95	0.60	0.340			0.9	5.70	7.25	1.55	0.35	0.340	0.306	0.54	0.166	4%
4	8.00	1.10	0.65	0.420			0.9	7.25	8.55	1.30	0.45	0.420	0.378	0.59	0.221	6%
5	9.10	1.10	0.60	0.440			0.9	8.55	9.85	1.30	0.50	0.440	0.396	0.65	0.257	7%
6	10.60	1.18	0.65	0.310			0.9	9.85	11.35	1.50	0.53	0.310	0.279	0.80	0.222	6%
7	12.10	1.15	0.67	0.020			0.9	11.35	12.95	1.60	0.48	0.020	0.018	0.77	0.014	0%
8	13.80	1.15	0.70	0.060			0.9	12.95	14.45	1.50	0.45	0.060	0.054	0.68	0.036	1%
9	15.10	1.35	0.65	0.200			0.9	14.45	16.00	1.55	0.70	0.200	0.180	1.09	0.195	5%
10	16.90	1.30	0.65	0.270			0.9	16.00	17.75	1.75	0.65	0.270	0.243	1.14	0.276	7%
11	18.60	1.25	0.63	0.520			0.9	17.75	19.30	1.55	0.62	0.520	0.468	0.96	0.450	12%
12	20.00	1.20	0.65	0.140			0.9	19.30	20.70	1.40	0.55	0.140	0.126	0.77	0.097	3%
13	21.40	1.25	0.65	0.200			0.9	20.70	22.05	1.35	0.60	0.200	0.180	0.81	0.146	4%
14	22.70	1.25	0.63	0.370			0.9	22.05	23.35	1.30	0.62	0.370	0.333	0.81	0.268	7%
15	24.00	1.20	0.63	0.470			0.9	23.35	24.65	1.30	0.57	0.470	0.423	0.74	0.313	8%
16	25.30	0.00	0.00	0.000			1.0	24.65	25.90	1.25	0.14	0.000	0.000	0.18	0.000	0%
17	26.50	1.15	0.63	0.420			0.9	25.90	27.20	1.30	0.52	0.420	0.378	0.68	0.256	7%
18	27.90	1.00	0.62	0.420			0.9	27.20	28.45	1.25	0.38	0.420	0.378	0.48	0.180	5%
19	29.00	0.95	0.60	0.360			0.9	28.45	29.70	1.25	0.35	0.360	0.324	0.44	0.142	4%
20	30.40	0.85	0.60	0.280			0.9	29.70	30.80	1.10	0.25	0.280	0.252	0.27	0.069	2%
21	31.20	0.80	0.60	0.140			0.9	30.80	32.05	1.25	0.20	0.140	0.126	0.25	0.032	1%
22	32.90	0.85	0.60	0.040			0.9	32.05	33.60	1.55	0.25	0.040	0.036	0.39	0.014	0%
23	34.30	1.00	0.61	0.130			0.9	33.60	34.95	1.35	0.39	0.130	0.117	0.53	0.062	2%
24	35.60	1.10	0.50	0.140			0.9	34.95	36.55	1.60	0.60	0.140	0.126	0.96	0.121	3%
LB	37.50	0.00	0.00	0.000	0.000	0.000	1.0	36.55	37.50	0.95	0.15	0.035	0.035	0.14	0.005	0%
<b>Total Flow</b>															<b>3.790</b>	

Measurement Details:	
Start Time (MST):	15:40
End Time (MST):	16:57
Equipment:	Marsh
Method:	Ice
River Condition:	Snow cover
Quality/Error (see reverse):	Good
Weather:	- 8 C clean, breezy

Flow characteristics:	
Total Flow:	3.79 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	15.76 (m <sup>2</sup> )
Wetted Width:	35.50 (m)
Hydraulic Depth:	0.444 (m)
Mean Velocity:	0.241 (m/s)
Froude Number:	0.115

Datalogger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.3	-
Rainfall (mm)	-	-
Battery (Main):	15.1	-
Datalogger Clock:	15:43	-
Laptop Clock:	15:41	-
Dessicant:	good	-
Logger# (if Δ):	9976	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	
-log in stream around 25 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.113	101.383		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.269	100.114	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.051	99.332		
Water Level:			2.072	99.311		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.103	100.269	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.258	101.372		100.114	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.041	99.331		
Water Level:			2.061	99.311		
Other:						

Closing Error	0.001	Average WL	99.311
WL Check	0.000	Transducer Elevation	98.354

### General Notes:

-log in stream around 25 m

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Mar-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	26-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

March 30, 2012



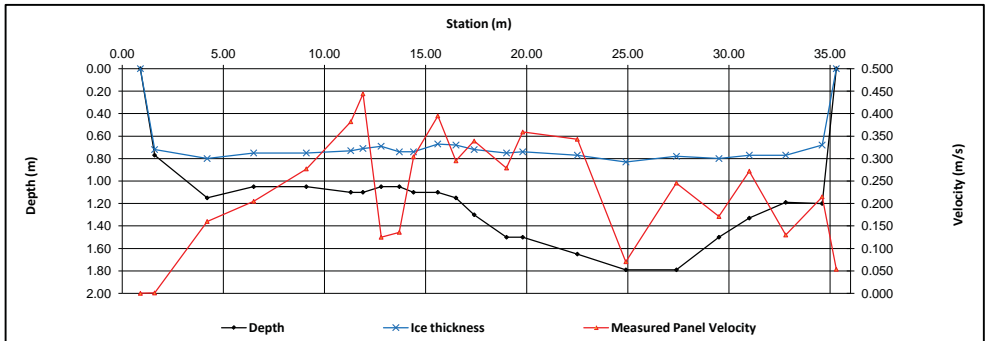
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.90	0.00	0.00	0.000	0.000	0.000	0.9	0.90	1.25	0.35	0.01	0.000	0.000	0.00	0.000	0%
1	1.60	0.77	0.72	0.001			0.9	1.25	2.90	1.65	0.05	0.001	0.001	0.08	0.000	0%
2	4.20	1.15	0.80	0.160			0.9	2.90	5.35	2.45	0.35	0.160	0.144	0.86	0.123	3%
3	6.50	1.05	0.75	0.205			0.9	5.35	7.80	2.45	0.30	0.205	0.185	0.74	0.136	3%
4	9.10	1.05	0.75	0.277			0.9	7.80	10.20	2.40	0.30	0.277	0.249	0.72	0.179	4%
5	11.30	1.10	0.73	0.382			0.9	10.20	11.60	1.40	0.37	0.382	0.344	0.52	0.178	4%
6	11.90	1.10	0.71	0.444			0.9	11.60	12.35	0.75	0.39	0.444	0.400	0.29	0.117	3%
7	12.80	1.05	0.69	0.125			0.9	12.35	13.25	0.90	0.36	0.125	0.113	0.32	0.036	1%
8	13.70	1.05	0.74	0.136			0.9	13.25	14.05	0.80	0.31	0.136	0.122	0.25	0.030	1%
9	14.40	1.10	0.74	0.304			0.9	14.05	15.00	0.95	0.36	0.304	0.274	0.34	0.094	2%
10	15.60	1.10	0.67	0.395			0.9	15.00	16.05	1.05	0.43	0.395	0.356	0.45	0.161	4%
11	16.50	1.15	0.68	0.295			0.9	16.05	16.95	0.90	0.47	0.295	0.266	0.42	0.112	3%
12	17.40	1.30	0.72	0.339			0.9	16.95	18.20	1.25	0.58	0.339	0.305	0.73	0.221	5%
13	19.00	1.50	0.75		0.230	0.328	1.0	18.20	19.40	1.20	0.75	0.279	0.279	0.90	0.251	6%
14	19.80	1.50	0.74		0.346	0.372	1.0	19.40	21.15	1.75	0.76	0.359	0.359	1.33	0.477	11%
15	22.50	1.65	0.77		0.314	0.372	1.0	21.15	23.70	2.55	0.88	0.343	0.343	2.24	0.770	18%
16	24.90	1.79	0.83		0.057	0.084	1.0	23.70	26.15	2.45	0.96	0.071	0.071	2.35	0.166	4%
17	27.40	1.79	0.78		0.159	0.332	1.0	26.15	28.45	2.30	1.01	0.246	0.246	2.32	0.570	13%
18	29.50	1.50	0.80	0.171			0.9	28.45	30.25	1.80	0.70	0.171	0.154	1.26	0.194	5%
19	31.00	1.33	0.77	0.272			0.9	30.25	31.90	1.65	0.56	0.272	0.245	0.92	0.226	5%
20	32.80	1.19	0.77	0.130			0.9	31.90	33.70	1.80	0.42	0.130	0.117	0.76	0.088	2%
21	34.60	1.20	0.68	0.215			0.9	33.70	34.95	1.25	0.52	0.215	0.194	0.65	0.126	3%
RB	35.30	0.00	0.00	0.000	0.000	0.000	1.0	34.95	35.30	0.35	0.13	0.054	0.054	0.05	0.002	0%
<b>Total Flow</b>															<b>4.260</b>	

Measurement Details:	
Start Time (MST):	12:40
End Time (MST):	15:05
Equipment:	ADV
Method:	Ice
River Condition:	slushy surface
Quality/Error (see reverse):	fair
Weather:	cloudy, calm, +6

Flow characteristics:	
Total Flow:	4.26 (m <sup>3</sup> /s)
Perceived Measurement Quality:	fair
Cross Section Area:	18.51 (m <sup>2</sup> )
Wetted Width:	34.40 (m)
Hydraulic Depth:	0.538 (m)
Mean Velocity:	0.230 (m/s)
Froude Number:	0.100

Datalogger Details:		
	Before	After
Transducer Reading (m):	-	1.123
Water (°C):	-	0.3
Rainfall (mm):	-	-
Battery (Main):	14.7	-
Datalogger Clock:	12:11	-
Laptop Clock:	12:10	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 -PLS is reading 23 cm higher than the beginning of March



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.245	101.515		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.101	100.414	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.037	99.478		
Water Level:			2.029	99.486		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.229	100.273	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.088	101.502		100.414	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			2.024	99.478		
Water Level:			2.016	99.486		
Other:						

Closing Error	-0.003	Average WL	99.486
WL Check	0.000	Transducer Elevation	98.363

**General Notes:**

-slushy surface  
 -up to 8" of slush on ice, TR,

<b>Field Personnel:</b>	DW, TR	Trip Date:	30-Mar-12
<b>Data Entry Personnel:</b>	CJ	Date:	11-Apr-12
<b>Data Check Personnel:</b>	XP	Date:	26-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

May 15, 2012



## 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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.25	0.25	0.07	0.083	0.083	0.02	0.001	0%
1	3.50	0.26		0.333			1.0	3.25	4.50	1.25	0.26	0.333	0.333	0.33	0.108	1%
2	5.50	0.64		0.487			1.0	4.50	6.50	2.00	0.64	0.487	0.487	1.28	0.623	3%
3	7.50	0.71		0.668			1.0	6.50	8.50	2.00	0.71	0.668	0.668	1.42	0.949	5%
4	9.50	0.76			0.545	0.799	1.0	8.50	10.50	2.00	0.76	0.672	0.672	1.52	1.021	6%
5	11.50	0.70		0.870			1.0	10.50	12.50	2.00	0.70	0.870	0.870	1.40	1.218	7%
6	13.50	0.73		0.824			1.0	12.50	14.50	2.00	0.73	0.824	0.824	1.46	1.203	7%
7	15.50	0.80			0.460	0.771	1.0	14.50	16.50	2.00	0.80	0.616	0.616	1.60	0.985	5%
8	17.50	0.81			0.524	0.748	1.0	16.50	18.00	1.50	0.81	0.636	0.636	1.22	0.773	4%
9	18.50	0.90			0.601	0.776	1.0	18.00	19.00	1.00	0.90	0.689	0.689	0.90	0.620	3%
10	19.50	0.98			0.492	0.690	1.0	19.00	20.50	1.50	0.98	0.591	0.591	1.47	0.869	5%
11	21.50	1.06			0.646	0.714	1.0	20.50	22.00	1.50	1.06	0.680	0.680	1.59	1.081	6%
12	22.50	1.08			0.614	0.775	1.0	22.00	23.00	1.00	1.08	0.695	0.695	1.08	0.750	4%
13	23.50	1.12			0.538	0.679	1.0	23.00	24.00	1.00	1.12	0.609	0.609	1.12	0.682	4%
14	24.50	1.20			0.540	0.702	1.0	24.00	25.00	1.00	1.20	0.621	0.621	1.20	0.745	4%
15	25.50	1.31			0.468	0.603	1.0	25.00	26.50	1.50	1.31	0.536	0.536	1.97	1.052	6%
16	27.50	1.35			0.472	0.592	1.0	26.50	28.00	1.50	1.35	0.532	0.532	2.03	1.077	6%
17	28.50	1.36			0.432	0.650	1.0	28.00	29.00	1.00	1.36	0.541	0.541	1.36	0.736	4%
18	29.50	1.31			0.450	0.589	1.0	29.00	30.50	1.50	1.31	0.520	0.520	1.97	1.021	6%
19	31.50	0.97			0.446	0.611	1.0	30.50	32.50	2.00	0.97	0.529	0.529	1.94	1.025	6%
20	33.50	0.86			0.364	0.544	1.0	32.50	34.50	2.00	0.86	0.454	0.454	1.72	0.781	4%
21	35.50	0.86			0.342	0.457	1.0	34.50	36.50	2.00	0.86	0.400	0.400	1.72	0.687	4%
22	37.50	0.75		0.330			1.0	36.50	37.75	1.25	0.75	0.330	0.330	0.94	0.309	2%
RB	38.00	0.00	0.00	0.000	0.000	0.000	1.0	37.75	38.00	0.25	0.19	0.083	0.083	0.05	0.004	0%
<b>Total Flow</b>															<b>18.300</b>	

## Measurement Details:

Start Time (MST):	12:40
End Time (MST):	15:22
Equipment:	ADV
Method:	Wading
River Condition:	open, high
Quality/Error (see reverse):	excellent
Weather:	sunny, light breeze, +22

## Flow Characteristics:

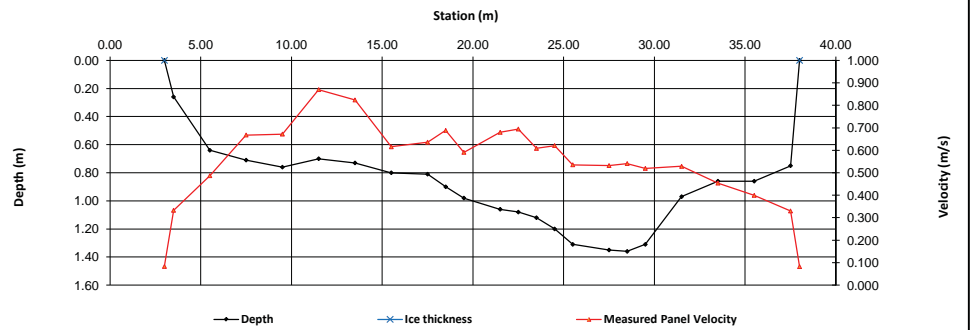
Total Flow:	18.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	31.28	(m <sup>2</sup> )
Wetted Width:	35.00	(m)
Hydraulic Depth:	0.894	(m)
Mean Velocity:	0.585	(m/s)
Froude Number:	0.198	

## Logger Details:

	Before	After
Transducer Reading (m):	0.88	-
Water (°C):	12.0	-
Rainfall (mm):	0	-
Battery (Main):	14.4	-
Datalogger Clock:	11:51	-
Laptop Clock:	11:49	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

-set up tipping bucket  
 -it is operational, ignore today's reading, it was a test.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	1.086	101.356		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:			1.243	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.122	99.234		
Other:						
Setup #2						
Bench Mark 1:			1.072	100.268	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.227	101.34		100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.105	99.235		
Other:						

Closing Error	0.002	Average WL	99.235
WL Check	0.001	Transducer Elevation	98.355

## General Notes:

-GOES azimuth 160 / elevation 16 is at tops of trees across stream.  
 -GOES azimuth 227 / elevation 21 is clear  
 -BM2 height=16.5 cm  
 -BM1 height=19.5 cm

Field Personnel:	DW, CJ	Trip Date:	15-May-12
Data Entry Personnel:	CJ	Date:	31-May-12
Data Check Personnel:	DW	Date:	5-Jun-12



# Hydrometric Measurement / Site Visit Record



UTM Location: 531528 E, 6354782 N

Site Visit Date:

June 15, 2012

## 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
LB	14.00	0.00	0.00	0.000	0.000	0.000	1.0	14.00	14.50	0.50	0.14	0.001	0.001	0.07	0.000	0%
1	15.00	0.54		0.005			1.0	14.50	15.50	1.00	0.54	0.005	0.005	0.54	0.003	0%
2	16.00	0.78			0.011	0.109	1.0	15.50	16.50	1.00	0.78	0.060	0.060	0.78	0.047	1%
3	17.00	0.70		0.173			1.0	16.50	17.50	1.00	0.70	0.173	0.173	0.70	0.121	1%
4	18.00	0.53		0.271			1.0	17.50	18.50	1.00	0.53	0.271	0.271	0.53	0.144	2%
5	19.00	0.50		0.332			1.0	18.50	19.50	1.00	0.50	0.332	0.332	0.50	0.166	2%
6	20.00	0.44		0.378			1.0	19.50	20.50	1.00	0.44	0.378	0.378	0.44	0.166	2%
7	21.00	0.52		0.416			1.0	20.50	21.50	1.00	0.52	0.416	0.416	0.52	0.216	2%
8	22.00	0.60		0.484			1.0	21.50	22.50	1.00	0.60	0.484	0.484	0.60	0.290	3%
9	23.00	0.72		0.433			1.0	22.50	23.50	1.00	0.72	0.433	0.433	0.72	0.312	4%
10	24.00	0.83			0.394	0.540	1.0	23.50	24.50	1.00	0.83	0.467	0.467	0.83	0.388	4%
11	25.00	0.88			0.361	0.490	1.0	24.50	25.50	1.00	0.88	0.426	0.426	0.88	0.374	4%
12	26.00	0.90			0.331	0.453	1.0	25.50	26.50	1.00	0.90	0.392	0.392	0.90	0.353	4%
13	27.00	0.90			0.295	0.429	1.0	26.50	27.50	1.00	0.90	0.362	0.362	0.90	0.326	4%
14	28.00	0.90			0.266	0.347	1.0	27.50	28.50	1.00	0.90	0.307	0.307	0.90	0.276	3%
15	29.00	0.93			0.245	0.337	1.0	28.50	29.50	1.00	0.93	0.291	0.291	0.93	0.271	3%
16	30.00	1.00			0.207	0.299	1.0	29.50	30.50	1.00	1.00	0.253	0.253	1.00	0.253	3%
17	31.00	0.98			0.178	0.395	1.0	30.50	31.50	1.00	0.98	0.287	0.287	0.98	0.281	3%
18	32.00	0.99			0.258	0.438	1.0	31.50	32.50	1.00	0.99	0.348	0.348	0.99	0.345	4%
19	33.00	1.08			0.292	0.406	1.0	32.50	33.75	1.25	1.08	0.349	0.349	1.35	0.471	5%
20	34.50	1.08			0.244	0.346	1.0	33.75	35.25	1.50	1.08	0.295	0.295	1.62	0.478	5%
21	36.00	1.18			0.252	0.442	1.0	35.25	36.75	1.50	1.18	0.347	0.347	1.77	0.614	7%
22	37.50	1.03			0.148	0.356	1.0	36.75	38.25	1.50	1.03	0.252	0.252	1.55	0.389	4%
23	39.00	0.94			0.202	0.391	1.0	38.25	40.00	1.75	0.94	0.297	0.297	1.65	0.488	6%
24	41.00	0.94			0.231	0.431	1.0	40.00	42.00	2.00	0.94	0.331	0.331	1.88	0.622	7%
25	43.00	0.85			0.297	0.444	1.0	42.00	44.00	2.00	0.85	0.371	0.371	1.70	0.630	7%
26	45.00	0.62		0.309			1.0	44.00	46.00	2.00	0.62	0.309	0.309	1.24	0.383	4%
27	47.00	0.60		0.217			1.0	46.00	48.40	2.40	0.60	0.217	0.217	1.44	0.312	4%
RB	49.80	0.00	0.00	0.000	0.000	0.000	1.0	48.40	49.80	1.40	0.15	0.054	0.054	0.21	0.011	0%
<b>Total Flow</b>															<b>8.730</b>	

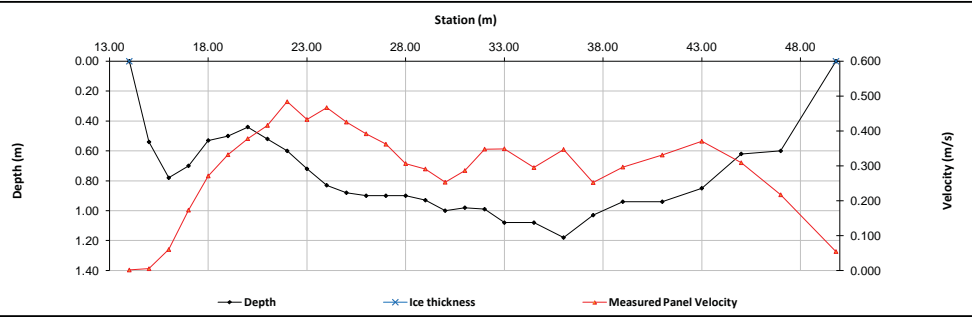
Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	11:10
Equipment:	ADV
Method:	Wading
River Condition:	open, good flow
Quality/Error (see reverse):	Excellent
Weather:	cloudy 15C

Flow characteristics:		
Total Flow:	8.73	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	28.11	(m <sup>2</sup> )
Wetted Width:	35.80	(m)
Hydraulic Depth:	0.785	(m)
Mean Velocity:	0.311	(m/s)
Froude Number:	0.112	

Logger Details:		
	Before	After
Transducer Reading (m):	0.691	
Water (°C):	14m	
Battery (Main):	14.34	
Datalogger Clock:	8:12	
Laptop Clock:	8:10	
Dessicant:	replaced	
Logger# (if Δ):	9976	
PTW (if Δ):	-	

Datalogger / Station Notes:	
-	PLS temp is reading in m!?

General Notes:	
-	BM3 needs to be finished, hit ice layer.
-	TSS taken @ 43 m offset



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.346	101.616		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			1.504	100.112	100.113	3/4" pipe 5 m N of data logger
Bench Mark 3:						
Water Level:			2.565	99.051		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.311	100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:						
Bench Mark 3:	1.469	101.581		100.112	100.113	3/4" pipe 5 m N of data logger
Water Level:			2.533	99.048		
Other:						
Closing Error	0.000				Average WL	99.050
WL Check	0.003				Transducer Elevation	98.359

Field Personnel:		TR, CJ	Trip Date:	15-Jun-12
Data Entry Personnel:	XP		Date:	27-Jun-12
Data Check Personnel:	MY		Date:	4-Jul-12

# Hydrometric Measurement Field Data Sheet

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

August 15, 2012



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	3.80	0.00	0.00	0.000	0.000	0.000	1.0	3.80	4.40	0.60	0.09	0.050	0.050	0.06	0.003	0%							
1	5.00	0.37		0.201			1.0	4.40	6.00	1.60	0.37	0.201	0.201	0.59	0.119	2%							
2	7.00	0.53		0.325			1.0	6.00	8.00	2.00	0.53	0.325	0.325	1.06	0.345	5%							
3	9.00	0.52		0.343			1.0	8.00	10.00	2.00	0.52	0.343	0.343	1.04	0.357	5%							
4	11.00	0.50		0.433			1.0	10.00	12.00	2.00	0.50	0.433	0.433	1.00	0.433	6%							
5	13.00	0.44		0.435			1.0	12.00	14.00	2.00	0.44	0.435	0.435	0.88	0.383	5%							
6	15.00	0.64		0.341			1.0	14.00	16.00	2.00	0.64	0.341	0.341	1.28	0.436	6%							
7	17.00	0.60		0.309			1.0	16.00	18.00	2.00	0.60	0.309	0.309	1.20	0.371	5%							
8	19.00	0.76			0.291	0.416	1.0	18.00	19.75	1.75	0.76	0.354	0.354	1.33	0.470	6%							
9	20.50	0.92			0.311	0.400	1.0	19.75	21.25	1.50	0.92	0.356	0.356	1.38	0.491	6%							
10	22.00	0.84			0.397	0.428	1.0	21.25	22.75	1.50	0.84	0.413	0.413	1.26	0.520	7%							
11	23.50	0.92			0.301	0.419	1.0	22.75	24.25	1.50	0.92	0.360	0.360	1.38	0.497	7%							
12	25.00	1.10			0.267	0.378	1.0	24.25	25.75	1.50	1.10	0.323	0.323	1.65	0.532	7%							
13	26.50	1.17			0.269	0.286	1.0	25.75	27.25	1.50	1.17	0.278	0.278	1.76	0.487	6%							
14	28.00	1.12			0.234	0.268	1.0	27.25	28.75	1.50	1.12	0.251	0.251	1.68	0.422	6%							
15	29.50	1.09			0.196	0.324	1.0	28.75	30.25	1.50	1.09	0.260	0.260	1.64	0.425	6%							
16	31.00	0.82			0.249	0.354	1.0	30.25	32.00	1.75	0.82	0.302	0.302	1.44	0.433	6%							
17	33.00	0.70		0.280			1.0	32.00	34.00	2.00	0.70	0.280	0.280	1.40	0.392	5%							
18	35.00	0.70		0.238			1.0	34.00	36.00	2.00	0.70	0.238	0.238	1.40	0.333	4%							
19	37.00	0.64		0.124			1.0	36.00	37.50	1.50	0.64	0.124	0.124	0.96	0.119	2%							
LB	38.00	0.00	0.00	0.00	0.00	0.00	1.0	37.50	38.00	0.50	0.16	0.031	0.031	0.08	0.002	0%							
<b>Total Flow</b>														<b>7.570</b>									

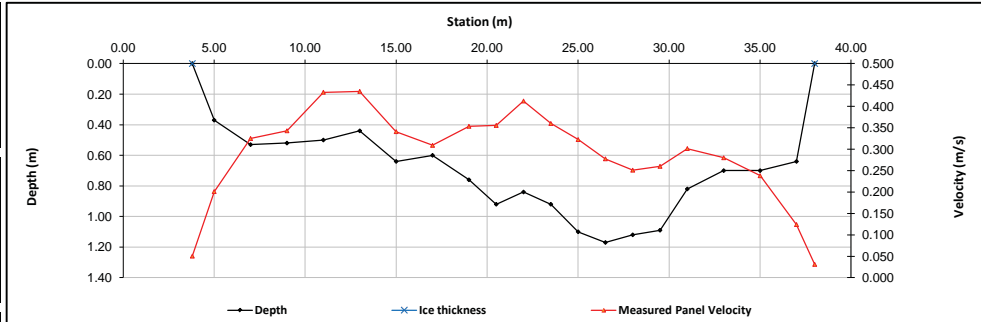
Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	12 deg, clear, calm

Flow characteristics:		
Total Flow:	7.57	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Excellent	
Cross Section Area:	24.45	(m <sup>2</sup> )
Wetted Width:	34.20	(m)
Hydraulic Depth:	0.715	(m)
Mean Velocity:	0.310	(m/s)
Froude Number:	0.117	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.729	14.1
Battery (Main):	14.5	
Datalogger Clock:	8:32	
Laptop Clock:	8:30	
Dessicant:	replaced	
Logger# (if Δ):	9976	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 For GOES: Bring 2" pipe-to mount antenna  
 Precip: 0.508 mm

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.297	101.567		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			1.228	100.339	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.454	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.483	99.084		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.272	100.272	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:	1.205	101.544		100.339	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.429	100.115	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.458	99.086		
Other:						
Closing Error	-0.002				Average WL	99.085
WL Check	0.002				Transducer Elevation	98.356

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	15-Aug-12
<b>Data Entry Personnel:</b>	CJ (Field)	<b>Date:</b>	15-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	10-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S43 - Firebag River Upstream of Suncor Firebag

UTM Location: 531528 E, 6354782 N

Site Visit Date:

September 13, 2012



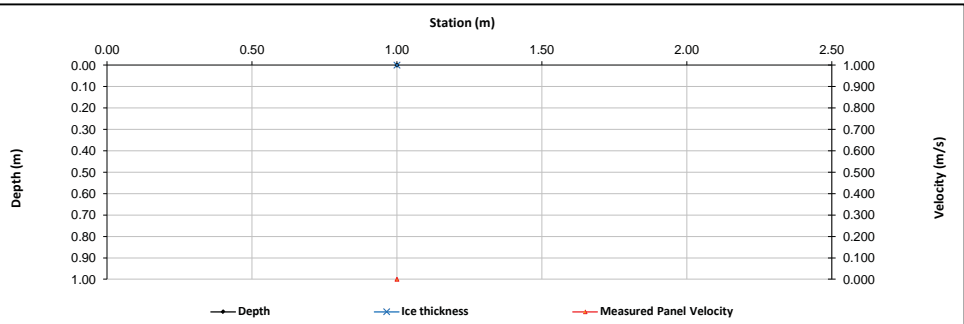
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective 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		0.00	0.00	0.000	0.000	0.000	0.0	0.00	#VALUE!	#VALUE!	0.00	0.000	0.000	#VALUE!	#VALUE!	#VALUE!
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30																
LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	9:55
Equipment:	-
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	-
Weather:	-

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):	1.464	
Water (°C):	8.6	
Battery (Main):	13.6	
Datalogger Clock:	8:29	
Laptop Clock:	8:27	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.948	101.218		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			0.880	100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.106	100.112	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			1.511	99.707		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.931	100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:	0.863	101.201		100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.088	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			1.497	99.704		
Other:						
Closing Error	0.000			Average WL	99.706	
WL Check	0.003			Transducer Elevation	98.242	

**General Notes:**

- Water level too high for topsetting wading rod, could not cross river due to safety concerns
- flow too fast for fishcat, need boat and ADC to measure
- flow measurement performed on Sept. 19 with a boat

Field Personnel:	DW, TR	Trip Date:	13-Sep-12
Data Entry Personnel:	DW (Field)	Date:	13-Sep-12
Data Check Personnel:	CJ	Date:	10-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S43 - Firebag River Upstream of Suncor Firebag

UTM Location: 531528 E, 6354782 N

Site Visit Date:

September 19, 2012



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	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	1.75	1.25	0.45	0.304	0.304	0.56	0.171	0%					
1	3.00	1.80			1.074	1.354	1.0	1.75	4.00	2.25	1.80	1.214	1.214	4.05	4.917	9%					
2	5.00	1.05		1.074			1.0	4.00	6.00	2.00	1.05	1.074	1.074	2.10	2.255	4%					
3	7.00	1.15		1.511			1.0	6.00	8.00	2.00	1.15	1.511	1.511	2.30	3.478	6%					
4	9.00	1.10		1.304			1.0	8.00	10.00	2.00	1.10	1.304	1.304	2.20	2.869	5%					
5	11.00	1.10		1.476			1.0	10.00	12.00	2.00	1.10	1.476	1.476	2.20	3.247	6%					
6	13.00	1.00		1.471			1.0	12.00	14.00	2.00	1.00	1.471	1.471	2.00	2.942	5%					
7	15.00	0.95		1.300			1.0	14.00	16.00	2.00	0.95	1.300	1.300	1.90	2.470	5%					
8	17.00	1.15		1.294			1.0	16.00	18.00	2.00	1.15	1.294	1.294	2.30	2.976	5%					
9	19.00	1.05		1.487			1.0	18.00	20.00	2.00	1.05	1.487	1.487	2.10	3.123	6%					
10	21.00	1.20		1.163			1.0	20.00	22.00	2.00	1.20	1.163	1.163	2.40	2.791	5%					
11	23.00	1.05		1.423			1.0	22.00	24.00	2.00	1.05	1.423	1.423	2.10	2.988	6%					
12	25.00	1.10		1.338			1.0	24.00	26.00	2.00	1.10	1.338	1.338	2.20	2.944	5%					
13	27.00	1.10		1.334			1.0	26.00	28.00	2.00	1.10	1.334	1.334	2.20	2.935	5%					
14	29.00	1.20		1.276			1.0	28.00	30.00	2.00	1.20	1.276	1.276	2.40	3.062	6%					
15	31.00	1.15		1.233			1.0	30.00	32.00	2.00	1.15	1.233	1.233	2.30	2.836	5%					
16	33.00	1.05		1.200			1.0	32.00	34.00	2.00	1.05	1.200	1.200	2.10	2.520	5%					
17	35.00	0.95		1.231			1.0	34.00	36.00	2.00	0.95	1.231	1.231	1.90	2.339	4%					
18	37.00	0.80		1.120			1.0	36.00	38.00	2.00	0.80	1.120	1.120	1.60	1.792	3%					
19	39.00	0.60		1.145			1.0	38.00	40.25	2.25	0.60	1.145	1.145	1.35	1.546	3%					
LB	41.50	0.00	0.00	0.00	0.00	0.00	1.0	40.25	41.50	1.25	0.15	0.286	0.286	0.19	0.054	0%					
														<b>Total Flow</b>	<b>54.300</b>						

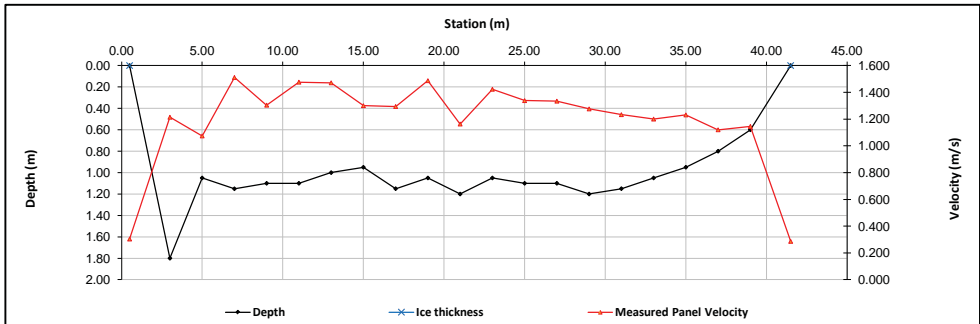
Measurement Details:	
Start Time (MST):	7:40
End Time (MST):	10:10
Equipment:	ADV
Method:	Boat
River Condition:	high flow
Quality/Error (see reverse):	Good
Weather:	-

Flow characteristics:	
Total Flow:	54.3 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	42.45 (m <sup>2</sup> )
Wetted Width:	41.00 (m)
Hydraulic Depth:	1.035 (m)
Mean Velocity:	1.279 (m/s)
Froude Number:	0.402

Logger Details:		Before	After
Transducer Reading (m):	-	-	-
Water (°C):	-	-	-
Battery (Main):	-	-	-
Datalogger Clock:	-	-	-
Laptop Clock:	-	-	-
Dessicant:	-	-	-
Logger# (if Δ):	-	-	-
PT# (if Δ):	-	-	-

Datalogger / Station Notes:	

General Notes:	
-flow measurement performed with boat because of high flow	
-flow meas quality Good	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.487	101.757		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			1.420	100.337	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.644	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			1.930	99.827		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.477	100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:	1.410	101.747		100.337	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.634	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			1.921	99.826		
Other:						
Closing Error	0.000	Average WL		99.827		
WL Check	0.001	Transducer Elevation		-		

Field Personnel:		SM, SG	Trip Date:	19-Sep-12
Data Entry Personnel:	SG (Field)		Date:	19-Sep-12
Data Check Personnel:	CJ		Date:	10-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date:

October 24, 2012



## 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	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	3.50	0.00	0.00	0.000	0.000	0.000	1.0	3.50	4.25	0.75	0.15	0.030	0.030	0.11	0.003	0%
1	5.00	0.58		0.119			1.0	4.25	6.00	1.75	0.58	0.119	0.119	1.02	0.121	0%
2	7.00	0.80			0.184	0.386	1.0	6.00	8.00	2.00	0.80	0.285	0.285	1.60	0.456	2%
3	9.00	0.90			0.231	0.788	1.0	8.00	10.00	2.00	0.90	0.510	0.510	1.80	0.917	4%
4	11.00	0.98			0.745	0.869	1.0	10.00	12.00	2.00	0.98	0.807	0.807	1.96	1.582	6%
5	13.00	1.10			0.662	0.797	1.0	12.00	13.75	1.75	1.10	0.730	0.730	1.93	1.404	6%
6	14.50	1.10			0.683	0.728	1.0	13.75	15.25	1.50	1.10	0.706	0.706	1.65	1.164	5%
7	16.00	1.20			0.443	0.777	1.0	15.25	16.75	1.50	1.20	0.610	0.610	1.80	1.098	4%
8	17.50	1.28			0.318	0.812	1.0	16.75	18.25	1.50	1.28	0.565	0.565	1.92	1.085	4%
9	19.00	1.38			0.347	0.847	1.0	18.25	20.00	1.75	1.38	0.597	0.597	2.42	1.442	6%
10	21.00	1.35			0.335	0.838	1.0	20.00	22.00	2.00	1.35	0.587	0.587	2.70	1.584	6%
11	23.00	1.22			0.480	0.951	1.0	22.00	24.00	2.00	1.22	0.716	0.716	2.44	1.746	7%
12	25.00	1.05			0.564	0.971	1.0	24.00	26.00	2.00	1.05	0.768	0.768	2.10	1.612	6%
13	27.00	0.88			0.849	0.166	1.0	26.00	28.00	2.00	0.88	0.508	0.508	1.76	0.893	4%
14	29.00	0.90			0.871	0.868	1.0	28.00	30.00	2.00	0.90	0.870	0.870	1.80	1.565	6%
15	31.00	0.96			1.043	0.808	1.0	30.00	32.00	2.00	0.96	0.926	0.926	1.92	1.777	7%
16	33.00	1.08			1.289	1.000	1.0	32.00	34.00	2.00	1.08	1.145	1.145	2.16	2.472	10%
17	35.00	0.95			0.670	0.188	1.0	34.00	36.00	2.00	0.95	0.429	0.429	1.90	0.815	3%
18	37.00	0.88			0.492	0.860	1.0	36.00	38.00	2.00	0.88	0.676	0.676	1.76	1.190	5%
19	39.00	0.74		0.704			1.0	38.00	40.00	2.00	0.74	0.704	0.704	1.48	1.042	4%
20	41.00	0.75		0.698			1.0	40.00	41.90	1.90	0.75	0.698	0.698	1.43	0.995	4%
RB	42.80	0.00	0.00	0.00	0.00	0.00	1.0	41.90	42.80	0.90	0.19	0.175	0.175	0.17	0.029	0%
<b>Total Flow</b>															<b>25.000</b>	

## Measurement Details:

Start Time (MST):	8:40
End Time (MST):	12:15
Equipment:	ADV
Method:	Fishcat
River Condition:	Fast Flow
Quality/Error (see reverse):	Good
Weather:	Overcast, -1 C

## Flow characteristics:

Total Flow:	25	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	37.81	(m <sup>2</sup> )
Wetted Width:	39.30	(m)
Hydraulic Depth:	0.962	(m)
Mean Velocity:	0.661	(m/s)
Froude Number:	0.215	

## Logger Details:

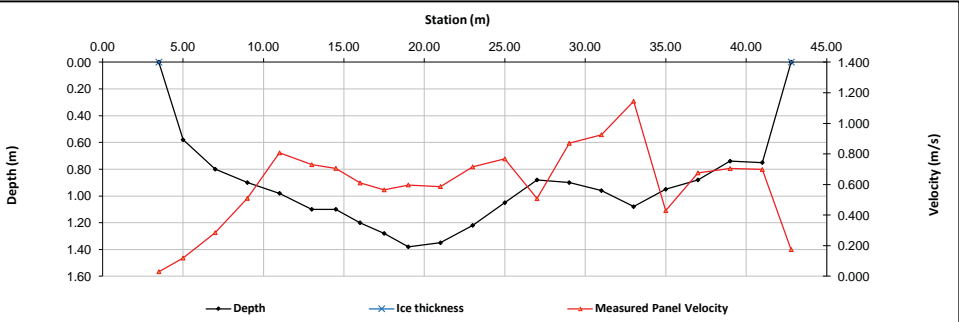
	Before	After
Transducer Reading (m):	1.053	1.048
Water (°C):	0.3	0.3
Battery (Main):	13.4	13.6
Datalogger Clock:	9:00	9:40
Laptop Clock:	8:58	9:42
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

Rain: 0 mm  
 Rain: 4.2 & 3.2 mm after checks

## General Notes:

-moved tipping bucket to a new mast  
 -Tipping bucket is frozen  
 -Plate ice is beginning to form along the banks and float down stream  
 -TSS sampled at 41 m



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.299	101.569		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			1.231	100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.456	100.113	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.151	99.418		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.288	100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:	1.220	101.558		100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.446	100.112	100.113	3/4" pipe 5 m N of data logger
Ice/PT:						
Water Level:			2.141	99.417		
Other:						

Closing Error	0.000	Average WL	99.418
WL Check	0.001	Transducer Elevation	98.365

## Field Personnel:

Field Personnel:	DW, TR	Trip Date:	24-Oct-12
Data Entry Personnel:	DW	Date:	24-Oct-12
Data Check Personnel:	DW	Date:	6-Nov-12
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: December 9, 2012



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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.50	0.50	0.20	0.056	0.056	0.10	0.006	0%							
1	4.00	1.10	0.30	0.180	0.266		1.0	3.50	5.00	1.50	0.80	0.223	0.223	1.20	0.268	3%							
2	6.00	1.20	0.30	0.314	0.248		1.0	5.00	6.90	1.90	0.90	0.281	0.281	1.71	0.481	6%							
3	7.80	1.20	0.35	0.336	0.381		1.0	6.90	8.40	1.50	0.85	0.359	0.359	1.28	0.457	6%							
4	9.00	1.20	0.35	0.360	0.357		1.0	8.40	9.70	1.30	0.85	0.359	0.359	1.11	0.396	5%							
5	10.40	1.20	0.35	0.304	0.017		1.0	9.70	11.70	2.00	0.85	0.161	0.161	1.70	0.273	3%							
6	13.00	1.35	0.25	0.582	0.605		1.0	11.70	13.75	2.05	1.10	0.594	0.594	2.26	1.338	17%							
7	14.50	1.15	0.25	0.452	0.509		1.0	13.75	14.90	1.15	0.90	0.481	0.481	1.04	0.497	6%							
8	15.30	1.15	0.25	0.399	0.429		1.0	14.90	15.90	1.00	0.90	0.414	0.414	0.90	0.373	5%							
9	16.50	1.20	0.25	0.351	0.384		1.0	15.90	17.25	1.35	0.95	0.368	0.368	1.28	0.471	6%							
10	18.00	1.30	0.25	0.215	0.269		1.0	17.25	18.75	1.50	1.05	0.242	0.242	1.58	0.381	5%							
11	19.50	1.50	0.25	0.232	0.351		1.0	18.75	20.25	1.50	1.25	0.292	0.292	1.88	0.547	7%							
12	21.00	1.65	0.25	0.218	0.185		1.0	20.25	22.00	1.75	1.40	0.202	0.202	2.45	0.494	6%							
13	23.00	1.70	0.23	0.246	0.249		1.0	22.00	23.75	1.75	1.47	0.248	0.248	2.57	0.637	8%							
14	24.50	1.95	0.23	0.165	0.172		1.0	23.75	25.50	1.75	1.72	0.169	0.169	3.01	0.507	6%							
15	26.50	2.05	0.25	0.106	0.170		1.0	25.50	27.25	1.75	1.80	0.138	0.138	3.15	0.435	5%							
16	28.00	2.00	0.23	0.071	0.069		1.0	27.25	28.90	1.65	1.77	0.070	0.070	2.92	0.204	3%							
17	29.80	1.70	0.35	0.046	0.000		1.0	28.90	30.55	1.65	1.35	0.023	0.023	2.23	0.051	1%							
18	31.30	1.60	0.30	0.066	0.002		1.0	30.55	32.15	1.60	1.30	0.034	0.034	2.08	0.071	1%							
19	33.00	1.50	0.35	0.066	0.072		1.0	32.15	33.50	1.35	1.15	0.069	0.069	1.55	0.107	1%							
RB	34.00	0.00	0.00	0.00	0.00	0.00	1.0	33.50	34.00	0.50	0.29	0.017	0.017	0.14	0.002	0%							
<b>Total Flow</b>															<b>8.000</b>								

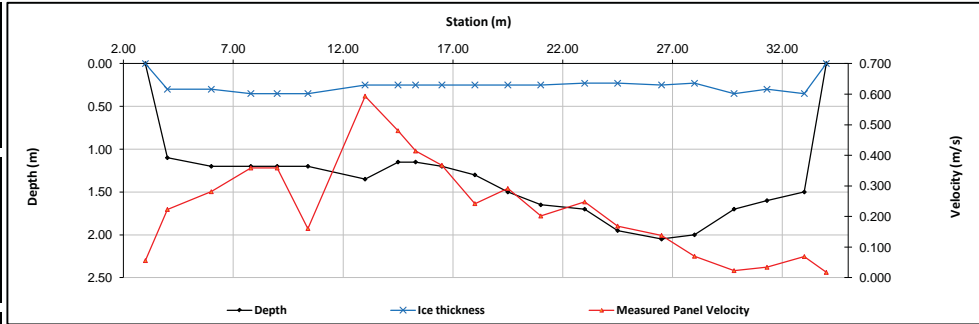
Measurement Details:	
Start Time (MST):	9:30
End Time (MST):	11:00
Equipment:	ADV
Method:	Ice
River Condition:	Slush On Ice
Quality/Error (see reverse):	Good
Weather:	Overcast

Flow characteristics:		
Total Flow:	8	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	36.12	(m <sup>2</sup> )
Wetted Width:	31.00	(m)
Hydraulic Depth:	1.165	(m)
Mean Velocity:	0.221	(m/s)
Froude Number:	0.066	

Logger Details:		
	Before	After
Transducer Reading (m):	1.328	
Water (°C):	0.3	
Battery (Main):	12.3	
Datalogger Clock:	9:35	
Laptop Clock:	9:33	
Dessicant:	replaced	
Logger# (if Δ):	9976	
PT# (if Δ):	-	

**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>						
Bench Mark 1:	1.283	101.553		100.270	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:			1.215	100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.442	100.111	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			1.819	99.734		
Water Level:			1.866	99.687		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.296	100.269	100.270	3/4" pipe 1 m S of data logger
Bench Mark 2:	1.227	101.565		100.338	100.338	3/4" pipe 1m E of data logger
Bench Mark 3:			1.453	100.112	100.113	3/4" pipe 5 m N of data logger
Ice/PT:			1.835	99.730		
Water Level:			1.877	99.688		
Other:						

Closing Error	0.001	Average WL	99.688
WL Check	0.001	Transducer Elevation	98.360

**General Notes:**

- Water and slush on top of ice

<b>Field Personnel:</b>	SM, CJ	Trip Date:	9-Dec-12
<b>Data Entry Personnel:</b>	SM	Date:	9-Dec-12
<b>Data Check Personnel:</b>	DW	Date:	11-Dec-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date:

April 25, 2012



## 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
LB	3.50	0.00	0.00	0.000	0.000	0.000	1.0	3.50	3.65	0.15	0.06	0.019	0.019	0.01	0.000	0%
1	3.80	0.25		0.074			1.0	3.65	3.95	0.30	0.25	0.074	0.074	0.08	0.006	2%
2	4.10	0.26		0.183			1.0	3.95	4.25	0.30	0.26	0.183	0.183	0.08	0.014	5%
3	4.40	0.25		0.193			1.0	4.25	4.50	0.25	0.25	0.193	0.193	0.06	0.012	4%
4	4.60	0.26		0.232			1.0	4.50	4.70	0.20	0.26	0.232	0.232	0.05	0.012	4%
5	4.80	0.27		0.244			1.0	4.70	4.90	0.20	0.27	0.244	0.244	0.05	0.013	4%
6	5.00	0.27		0.277			1.0	4.90	5.10	0.20	0.27	0.277	0.277	0.05	0.015	5%
7	5.20	0.32		0.266			1.0	5.10	5.30	0.20	0.32	0.266	0.266	0.06	0.017	6%
8	5.40	0.52		0.108			1.0	5.30	5.50	0.20	0.52	0.108	0.108	0.10	0.011	4%
9	5.60	0.52		0.092			1.0	5.50	5.70	0.20	0.52	0.092	0.092	0.10	0.010	3%
10	5.80	0.49		0.158			1.0	5.70	5.90	0.20	0.49	0.158	0.158	0.10	0.015	5%
11	6.00	0.50		0.181			1.0	5.90	6.10	0.20	0.50	0.181	0.181	0.10	0.018	6%
12	6.20	0.50		0.313			1.0	6.10	6.30	0.20	0.50	0.313	0.313	0.10	0.031	10%
13	6.40	0.50		0.387			1.0	6.30	6.50	0.20	0.50	0.387	0.387	0.10	0.039	13%
14	6.60	0.48		0.307			1.0	6.50	6.70	0.20	0.48	0.307	0.307	0.10	0.029	10%
15	6.80	0.50		0.291			1.0	6.70	6.90	0.20	0.50	0.291	0.291	0.10	0.029	10%
16	7.00	0.50		0.167			1.0	6.90	7.10	0.20	0.50	0.167	0.167	0.10	0.017	6%
17	7.20	0.42		0.048			1.0	7.10	7.35	0.25	0.42	0.048	0.048	0.11	0.005	2%
18	7.50	0.38		0.029			1.0	7.35	7.65	0.30	0.38	0.029	0.029	0.11	0.003	1%
19	7.80	0.30		0.028			1.0	7.65	7.95	0.30	0.30	0.028	0.028	0.09	0.003	1%
20	8.10	0.16		0.044			1.0	7.95	8.30	0.35	0.16	0.044	0.044	0.06	0.002	1%
RB	8.50	0.00	0.00	0.000	0.000	0.000	1.0	8.30	8.50	0.20	0.04	0.011	0.011	0.01	0.000	0%
<b>Total Flow</b>															<b>0.302</b>	

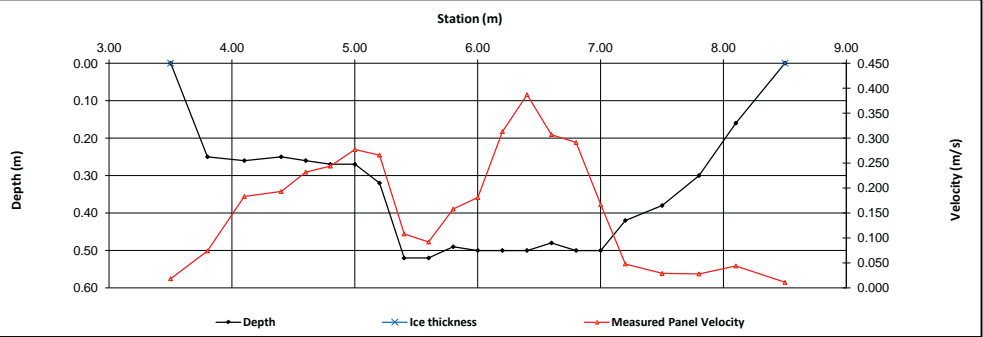
Measurement Details:	
Start Time (MST):	9:30
End Time (MST):	11:00
Equipment:	ADV
Method:	Wading
River Condition:	lots of ice, but open
Quality/Error (see reverse):	good
Weather:	overcast, +5

Flow characteristics:	
Total Flow:	0.302 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	1.72 (m <sup>2</sup> )
Wetted Width:	5.00 (m)
Hydraulic Depth:	0.345 (m)
Mean Velocity:	0.175 (m/s)
Froude Number:	0.095

Logger Details:		
Transducer Reading (m):	Before	After
	0.3	0.319
Water (°C):	1.1	1.1
Battery (Main):	13.03	-
Datalogger Clock:	9:46	-
Laptop Clock:	9:46	-
Dessicant:	replaced	-
Logger# (if Δ):	16117	-
PT# (if Δ):	284728	-

### Datalogger / Station Notes:

- PT installed on ice
- Installed PLS and logger



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.898	100.776		99.878	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.286	98.490		
Other:			0.773	100.003	99.996	Nail on data logger tree
<b>Setup #2</b>						
Bench Mark 1:			0.873	99.880	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.265	98.488		
Other:	0.75	100.753		100.003	99.996	Nail on data logger tree

Closing Error	-0.002	Average WL	98.489
WL Check	0.002	Transducer Elevation	98.189

### General Notes:

- Water on top of ice, channel not clear

Field Personnel:	SM, SG	Trip Date:	25-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date:

June 21, 2012



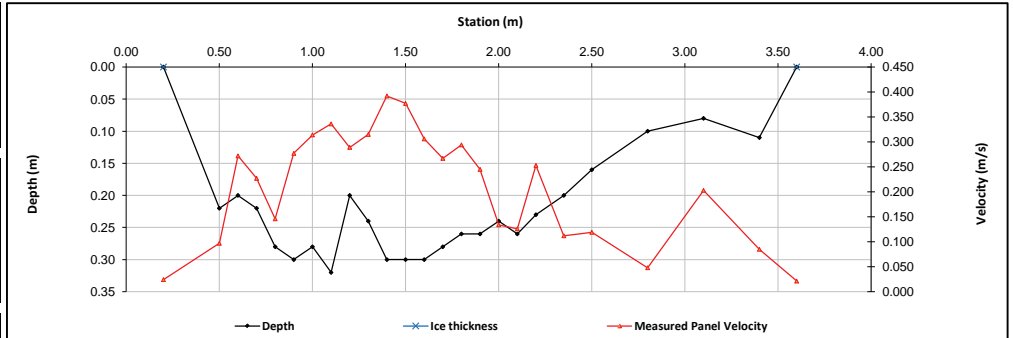
Flow Measurement:							Measured Data										Calculated Data				
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	0.20	0.00	0.00	0.000	0.000	0.000	1.0	0.20	0.35	0.15	0.06	0.024	0.024	0.01	0.000	0%					
1	0.50	0.22		0.097			1.0	0.35	0.55	0.20	0.22	0.097	0.097	0.04	0.004	3%					
2	0.60	0.20		0.272			1.0	0.55	0.65	0.10	0.20	0.272	0.272	0.02	0.005	4%					
3	0.70	0.22		0.227			1.0	0.65	0.75	0.10	0.22	0.227	0.227	0.02	0.005	3%					
4	0.80	0.28		0.146			1.0	0.75	0.85	0.10	0.28	0.146	0.146	0.03	0.004	3%					
5	0.90	0.30		0.277			1.0	0.85	0.95	0.10	0.30	0.277	0.277	0.03	0.008	6%					
6	1.00	0.28		0.314			1.0	0.95	1.05	0.10	0.28	0.314	0.314	0.03	0.009	6%					
7	1.10	0.32		0.336			1.0	1.05	1.15	0.10	0.32	0.336	0.336	0.03	0.011	7%					
8	1.20	0.20		0.289			1.0	1.15	1.25	0.10	0.20	0.289	0.289	0.02	0.006	4%					
9	1.30	0.24		0.315			1.0	1.25	1.35	0.10	0.24	0.315	0.315	0.02	0.008	5%					
10	1.40	0.30		0.392			1.0	1.35	1.45	0.10	0.30	0.392	0.392	0.03	0.012	8%					
11	1.50	0.30		0.377			1.0	1.45	1.55	0.10	0.30	0.377	0.377	0.03	0.011	8%					
12	1.60	0.30		0.306			1.0	1.55	1.65	0.10	0.30	0.306	0.306	0.03	0.009	6%					
13	1.70	0.28		0.267			1.0	1.65	1.75	0.10	0.28	0.267	0.267	0.03	0.007	5%					
14	1.80	0.26		0.294			1.0	1.75	1.85	0.10	0.26	0.294	0.294	0.03	0.008	5%					
15	1.90	0.26		0.245			1.0	1.85	1.95	0.10	0.26	0.245	0.245	0.03	0.006	4%					
16	2.00	0.24		0.134			1.0	1.95	2.05	0.10	0.24	0.134	0.134	0.02	0.003	2%					
17	2.10	0.26		0.126			1.0	2.05	2.15	0.10	0.26	0.126	0.126	0.03	0.003	2%					
18	2.20	0.23		0.253			1.0	2.15	2.28	0.13	0.23	0.253	0.253	0.03	0.007	5%					
19	2.35	0.20		0.112			1.0	2.28	2.43	0.15	0.20	0.112	0.112	0.03	0.003	2%					
20	2.50	0.16		0.119			1.0	2.43	2.65	0.23	0.16	0.119	0.119	0.04	0.004	3%					
21	2.80	0.10		0.048			1.0	2.65	2.95	0.30	0.10	0.048	0.048	0.03	0.001	1%					
22	3.10	0.08		0.203			1.0	2.95	3.25	0.30	0.08	0.203	0.203	0.02	0.005	3%					
23	3.40	0.11		0.085			1.0	3.25	3.50	0.25	0.11	0.085	0.085	0.03	0.002	2%					
RB	3.60	0.00	0.00	0.000	0.000	0.000	1.0	3.50	3.60	0.10	0.03	0.021	0.021	0.00	0.000	0%					
<b>Total Flow</b>														<b>0.144</b>							

Measurement Details:	
Start Time (MST):	13:40
End Time (MST):	15:10
Equipment:	ADV
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	excellent
Weather:	-

Flow characteristics:	
Total Flow:	0.144 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	excellent
Cross Section Area:	0.66 (m <sup>2</sup> )
Wetted Width:	3.40 (m)
Hydraulic Depth:	0.193 (m)
Mean Velocity:	0.220 (m/s)
Froude Number:	0.160

Logger Details:		
	Before	After
Transducer Reading (m):	0.056	0.490
Water (°C):	18.6	19.0
Battery (Main):	13.6	14.0
Datalogger Clock:	13:37	14:13
Laptop Clock:	13:39	14:14
Dessicant:	replaced	-
Logger# (if Δ):	16117	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 - Moved PLS to deeper water, ~0.5 m  
 - Telemetry installed, modem s/n: 1211684258, phone #: 604-347-7193, RSSI unknown-software not installed on Panasonic laptop.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.944	100.822		99.878	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.152	97.670		
Other:			0.831	99.991	99.996	Nail on data logger tree
<b>Setup #2</b>						
Bench Mark 1:			0.933	99.877	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.139	97.671		
Other:	0.819	100.81			99.991	Nail on data logger tree

Closing Error	0.001
WL Check	0.001

Average WL	97.671
Transducer Elevation	97.615

**General Notes:**

Field Personnel:		SM, GB	Trip Date:	21-Jun-12
Data Entry Personnel:		CJ	Date:	4-Jul-12
Data Check Personnel:		MY	Date:	4-Jul-12



# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date:

August 17, 2012



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	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	1.0	0.15	0.28	0.13	0.02	0.005	0.005	0.00	0.000	0%					
1	0.40	0.08		0.021			1.0	0.28	0.43	0.15	0.08	0.021	0.021	0.01	0.000	0%					
2	0.45	0.39		0.012			1.0	0.43	0.53	0.10	0.39	0.012	0.012	0.04	0.000	1%					
3	0.60	0.42		0.057			1.0	0.53	0.68	0.15	0.42	0.057	0.057	0.06	0.004	4%					
4	0.75	0.41		0.054			1.0	0.68	0.85	0.18	0.41	0.054	0.054	0.07	0.004	4%					
5	0.95	0.41		0.066			1.0	0.85	1.03	0.18	0.41	0.066	0.066	0.07	0.005	5%					
6	1.10	0.40		0.078			1.0	1.03	1.18	0.15	0.40	0.078	0.078	0.06	0.005	5%					
7	1.25	0.42		0.090			1.0	1.18	1.33	0.15	0.42	0.090	0.090	0.06	0.006	6%					
8	1.40	0.38		0.085			1.0	1.33	1.48	0.15	0.38	0.085	0.085	0.06	0.005	5%					
9	1.55	0.34		0.042			1.0	1.48	1.63	0.15	0.34	0.042	0.042	0.05	0.002	2%					
10	1.70	0.32		0.124			1.0	1.63	1.78	0.15	0.32	0.124	0.124	0.05	0.006	7%					
11	1.85	0.30		0.118			1.0	1.78	1.93	0.15	0.30	0.118	0.118	0.05	0.005	6%					
12	2.00	0.30		0.123			1.0	1.93	2.08	0.15	0.30	0.123	0.123	0.05	0.006	6%					
13	2.15	0.30		0.144			1.0	2.08	2.23	0.15	0.30	0.144	0.144	0.04	0.006	7%					
14	2.30	0.28		0.122			1.0	2.23	2.38	0.15	0.28	0.122	0.122	0.04	0.005	6%					
15	2.45	0.24		0.151			1.0	2.38	2.53	0.15	0.24	0.151	0.151	0.04	0.005	6%					
16	2.60	0.24		0.166			1.0	2.53	2.68	0.15	0.24	0.166	0.166	0.04	0.006	7%					
17	2.75	0.22		0.149			1.0	2.68	2.83	0.15	0.22	0.149	0.149	0.03	0.005	6%					
18	2.90	0.19		0.127			1.0	2.83	2.98	0.15	0.19	0.127	0.127	0.03	0.004	4%					
19	3.05	0.18		0.134			1.0	2.98	3.13	0.15	0.18	0.134	0.134	0.03	0.004	4%					
20	3.20	0.18		0.115			1.0	3.13	3.28	0.15	0.18	0.115	0.115	0.03	0.003	3%					
21	3.35	0.14		0.090			1.0	3.28	3.43	0.15	0.14	0.090	0.090	0.02	0.002	2%					
22	3.50	0.10		0.060			1.0	3.43	3.68	0.25	0.10	0.060	0.060	0.03	0.002	2%					
LB	3.85	0.00	0.00	0.00	0.00	0.00	1.0	3.68	3.85	0.18	0.03	0.015	0.015	0.00	0.000	0%					

**Total Flow 0.089**

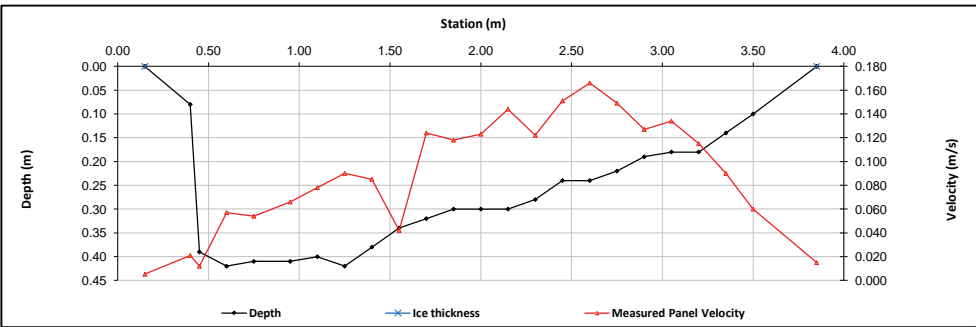
Measurement Details:	
Start Time (MST):	12:35
End Time (MST):	14:05
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 20

Flow characteristics:	
Total Flow:	0.0888 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.95 (m <sup>2</sup> )
Wetted Width:	3.70 (m)
Hydraulic Depth:	0.258 (m)
Mean Velocity:	0.093 (m/s)
Froude Number:	0.059

Logger Details:		
	Before	After
Transducer Reading (m):	0.465	
Water (°C):	16.3	
Battery (Main):	14.5	
Datalogger Clock:	11:57	
Laptop Clock:	11:58	
Dessicant:	replaced	
Logger# (if Δ):	16117	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:	
- Added 3/4" Pipe BM	
- need one more BM	
- TSS sampled at offset 2 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.991	100.869		99.878	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:				99.784	99.784	3/4" Pipe 2 m W of logger
Bench Mark 3:			1.085	99.784	99.784	3/4" Pipe 2 m W of logger
Water Level:			3.212	97.657		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.978	99.879	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:				99.784	99.784	3/4" Pipe 2 m W of logger
Bench Mark 3:	1.073	100.857		99.784	99.784	3/4" Pipe 2 m W of logger
Water Level:			3.201	97.656		
Other:						

Closing Error	-0.001	Average WL	97.657
WL Check	0.001	Transducer Elevation	97.192

Field Personnel:		Trip Date:	
Data Entry Personnel:	TR, CJ	Date:	17-Aug-12
Data Check Personnel:	CJ (Field)	Date:	17-Aug-12
	CJ	Date:	3-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: September 18, 2012



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	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	1.33	0.13	0.02	-0.004	-0.004	0.00	0.000	0%							
1	1.45	0.07		-0.015			1.0	1.33	1.55	0.23	0.07	-0.015	-0.015	0.02	0.000	0%							
2	1.65	0.12		0.144			1.0	1.55	1.75	0.20	0.12	0.144	0.144	0.02	0.003	1%							
3	1.85	0.15		0.144			1.0	1.75	1.95	0.20	0.15	0.144	0.144	0.03	0.004	1%							
4	2.05	0.12		0.328			1.0	1.95	2.15	0.20	0.12	0.328	0.328	0.02	0.008	2%							
5	2.25	0.18		0.445			1.0	2.15	2.35	0.20	0.18	0.445	0.445	0.04	0.016	4%							
6	2.45	0.16		0.380			1.0	2.35	2.55	0.20	0.16	0.380	0.380	0.03	0.012	3%							
7	2.65	0.20		0.465			1.0	2.55	2.75	0.20	0.20	0.465	0.465	0.04	0.019	4%							
8	2.85	0.23		0.465			1.0	2.75	2.93	0.18	0.23	0.465	0.465	0.04	0.019	4%							
9	3.00	0.28		0.413			1.0	2.93	3.08	0.15	0.28	0.413	0.413	0.04	0.017	4%							
10	3.15	0.32		0.514			1.0	3.08	3.23	0.15	0.32	0.514	0.514	0.05	0.025	6%							
11	3.30	0.34		0.511			1.0	3.23	3.38	0.15	0.34	0.511	0.511	0.05	0.026	6%							
12	3.45	0.37		0.405			1.0	3.38	3.53	0.15	0.37	0.405	0.405	0.06	0.022	5%							
13	3.60	0.38		0.623			1.0	3.53	3.68	0.15	0.38	0.623	0.623	0.06	0.036	8%							
14	3.75	0.40		0.664			1.0	3.68	3.83	0.15	0.40	0.664	0.664	0.06	0.040	9%							
15	3.90	0.45		0.752			1.0	3.83	3.94	0.11	0.45	0.752	0.752	0.05	0.038	9%							
16	3.98	0.42		0.757			1.0	3.94	4.01	0.08	0.42	0.757	0.757	0.03	0.024	6%							
17	4.05	0.41		0.762			1.0	4.01	4.13	0.11	0.41	0.762	0.762	0.05	0.035	8%							
18	4.20	0.39		0.552			1.0	4.13	4.28	0.15	0.39	0.552	0.552	0.06	0.032	8%							
19	4.35	0.34		0.455			1.0	4.28	4.43	0.15	0.34	0.455	0.455	0.05	0.023	6%							
20	4.50	0.32		0.282			1.0	4.43	4.65	0.23	0.32	0.282	0.282	0.07	0.020	5%							
LB	4.80	0.00	0.00	0.00	0.00	0.00	1.0	4.65	4.80	0.15	0.08	0.071	0.071	0.01	0.001	0%							

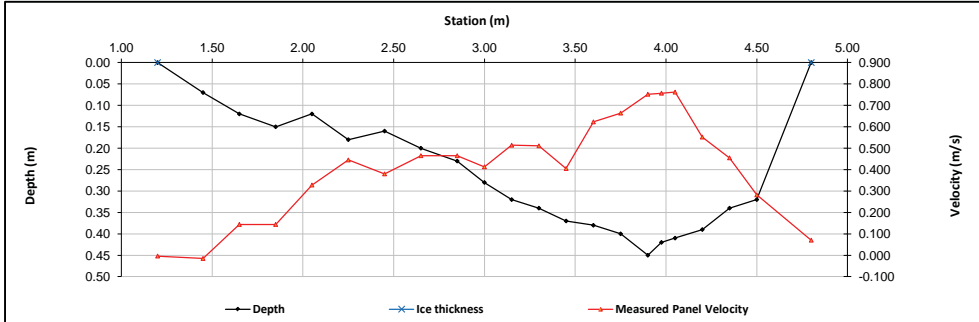
**Total Flow 0.421**

Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	13:05
Equipment:	ADV
Method:	Wading
River Condition:	Medium
Quality/Error (see reverse):	Excellent
Weather:	Windy, partly cloudy

Flow characteristics:	
Total Flow:	0.421 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	0.88 (m <sup>2</sup> )
Wetted Width:	3.60 (m)
Hydraulic Depth:	0.244 (m)
Mean Velocity:	0.479 (m/s)
Froude Number:	0.309

Logger Details:		
	Before	After
Transducer Reading (m):	0.568	
Water (°C):	10.2	
Battery (Main):	13.1	
Datalogger Clock:	12:06	
Laptop Clock:	12:07	
Dessicant:	changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.894	100.772		99.878	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:			0.687	100.085	100.086	3/4" Pipe 6 m E of logger
Bench Mark 3:			0.988	99.784	99.784	3/4" Pipe 2 m W of logger
Ice/PT:						
Water Level:			3.021	97.751		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.867	99.876	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:			0.658	100.085	100.086	3/4" Pipe 6 m E of logger
Bench Mark 3:	0.959	100.743		99.784	99.784	3/4" Pipe 2 m W of logger
Ice/PT:						
Water Level:			2.989	97.754		
Other:						

Closing Error	0.002	Average WL	97.753
WL Check	0.003	Transducer Elevation	97.185

**General Notes:**

<b>Field Personnel:</b>	DW, SG	<b>Trip Date:</b>	18-Sep-12
<b>Data Entry Personnel:</b>	DW (Field)	<b>Date:</b>	18-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: November 2, 2012



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	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	1.60	0.00	0.00	0.000	0.000	0.000	1.0	1.60	1.70	0.10	0.02	-0.003	-0.003	0.00	0.000	0%
1	1.80	0.08		-0.011			1.0	1.70	1.95	0.25	0.08	-0.011	-0.011	0.02	0.000	0%
2	2.10	0.14		0.005			1.0	1.95	2.25	0.30	0.14	0.005	0.005	0.04	0.000	0%
3	2.40	0.14		0.135			1.0	2.25	2.55	0.30	0.14	0.135	0.135	0.04	0.006	4%
4	2.70	0.14		0.227			1.0	2.55	2.85	0.30	0.14	0.227	0.227	0.04	0.010	6%
5	3.00	0.16		0.403			1.0	2.85	3.08	0.23	0.16	0.403	0.403	0.04	0.015	10%
6	3.15	0.17		0.334			1.0	3.08	3.23	0.15	0.17	0.334	0.334	0.03	0.009	6%
7	3.30	0.19		0.363			1.0	3.23	3.35	0.13	0.19	0.363	0.363	0.02	0.009	6%
8	3.40	0.21		0.485			1.0	3.35	3.45	0.10	0.21	0.485	0.485	0.02	0.010	7%
9	3.50	0.22		0.280			1.0	3.45	3.55	0.10	0.22	0.280	0.280	0.02	0.006	4%
10	3.60	0.20		0.083			1.0	3.55	3.65	0.10	0.20	0.083	0.083	0.02	0.002	1%
11	3.70	0.24		0.020			1.0	3.65	3.75	0.10	0.24	0.020	0.020	0.02	0.000	0%
12	3.80	0.26		0.333			1.0	3.75	3.85	0.10	0.26	0.333	0.333	0.03	0.009	6%
13	3.90	0.29		0.435			1.0	3.85	3.95	0.10	0.29	0.435	0.435	0.03	0.013	9%
14	4.00	0.28		0.477			1.0	3.95	4.05	0.10	0.28	0.477	0.477	0.03	0.013	9%
15	4.10	0.25		0.358			1.0	4.05	4.15	0.10	0.25	0.358	0.358	0.03	0.009	6%
16	4.20	0.30		0.252			1.0	4.15	4.25	0.10	0.30	0.252	0.252	0.03	0.008	5%
17	4.30	0.28		0.240			1.0	4.25	4.35	0.10	0.28	0.240	0.240	0.03	0.007	5%
18	4.40	0.27		0.325			1.0	4.35	4.48	0.13	0.27	0.325	0.325	0.03	0.011	7%
19	4.55	0.29		0.184			1.0	4.48	4.63	0.15	0.29	0.184	0.184	0.04	0.008	5%
20	4.70	0.28		0.052			1.0	4.63	4.85	0.23	0.28	0.052	0.052	0.06	0.003	2%
21	5.00	0.30		0.030			1.0	4.85	5.15	0.30	0.30	0.030	0.030	0.09	0.003	2%
22	5.30	0.26		-0.005			1.0	5.15	5.45	0.30	0.26	-0.005	-0.005	0.08	0.000	0%
LB	5.60	0.00	0.00	0.000	0.000	0.000	1.0	5.45	5.60	0.15	0.07	-0.001	-0.001	0.01	0.000	0%
<b>Total Flow</b>															<b>0.148</b>	

Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	15:40
Equipment:	ADV
Method:	Wading
River Condition:	High flow, Partial ice
Quality/Error (see reverse):	Fair
Weather:	Overcast, calm, -5C

Flow characteristics:	
Total Flow:	0.148 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	0.80 (m <sup>2</sup> )
Wetted Width:	4.00 (m)
Hydraulic Depth:	0.201 (m)
Mean Velocity:	0.184 (m/s)
Froude Number:	0.131

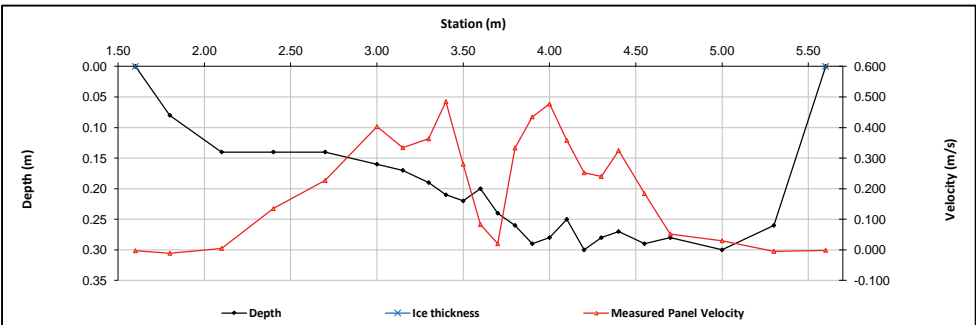
Logger Details:	Before	After
Transducer Reading (m):	0.537	
Water (°C):	0.1	
Battery (Main):	12.3	
Datalogger Clock:	14:51	
Laptop Clock:	14:52	
Dessicant:	replaced	
Logger# (if Δ):	16117	
PT# (if Δ):	284729	

**Datalogger / Station Notes:**

- Removed PLS for winter
- Anchor cable and weight left at BM 3

**General Notes:**

- Opened channel for flow measurement



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.092	100.97		99.878	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:			0.884	100.086	100.086	3/4" Pipe 6 m E of logger
Bench Mark 3:			1.185	99.785	99.784	3/4" Pipe 2 m W of logger
Water Level:			3.255	97.715		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.077	99.877	99.878	3/4" Pipe 8 m E of logger
Bench Mark 2:	0.868	100.954		100.086	100.086	3/4" Pipe 6 m E of logger
Bench Mark 3:			1.169	99.785	99.784	3/4" Pipe 2 m W of logger
Water Level:			3.237	97.717		
Other:						

Closing Error	0.001	Average WL	97.716
WL Check	0.002	Transducer Elevation	97.179

<b>Field Personnel:</b>	DW, TR	Trip Date:	2-Nov-12
<b>Data Entry Personnel:</b>	DW	Date:	2-Nov-12
<b>Data Check Personnel:</b>	DW	Date:	12-Dec-12
<b>Entered Digitally in the Field:</b>	<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: January 19, 2012



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	1.00	0.00	0.00	0.000	0.000	0.000	0.9	1.00	1.25	0.25	0.00	0.003	0.002	0.000	0.00	0.00%
1	1.50	0.47	0.40	0.010			0.9	1.25	2.25	1.00	0.07	0.010	0.009	0.070	0.00	0.04%
2	3.00	0.50	0.45	0.011			0.9	2.25	3.40	1.15	0.05	0.011	0.010	0.058	0.00	0.04%
3	3.80	0.60	0.55	0.050			0.9	3.40	4.15	0.75	0.05	0.050	0.045	0.038	0.00	0.11%
4	4.50	0.65	0.45	0.070			0.9	4.15	5.00	0.85	0.20	0.070	0.063	0.170	0.01	0.70%
5	5.50	0.70	0.43	0.150			0.9	5.00	5.90	0.90	0.27	0.150	0.135	0.243	0.03	2.14%
6	6.30	0.75	0.43	0.150			0.9	5.90	6.80	0.90	0.32	0.150	0.135	0.288	0.04	2.54%
7	7.30	0.82	0.40	0.180			0.9	6.80	7.85	1.05	0.42	0.180	0.162	0.441	0.07	4.67%
8	8.40	0.82	0.40	0.170			0.9	7.85	8.95	1.10	0.42	0.170	0.153	0.462	0.07	4.62%
9	9.50	0.95	0.39	0.130			0.9	8.95	10.10	1.15	0.56	0.130	0.117	0.644	0.08	4.92%
10	10.70	1.10	0.37	0.200			0.9	10.10	11.30	1.20	0.73	0.200	0.180	0.876	0.16	10.31%
11	11.90	1.25	0.40		0.240	0.240	1.0	11.30	12.25	0.95	0.85	0.240	0.240	0.807	0.19	12.67%
12	12.60	1.30	0.40		0.250	0.240	1.0	12.25	13.05	0.80	0.90	0.245	0.245	0.720	0.18	11.53%
13	13.50	1.45	0.43		0.270	0.250	1.0	13.05	14.00	0.95	1.02	0.260	0.260	0.969	0.25	16.47%
14	14.50	1.55	0.48		0.120	0.210	1.0	14.00	15.05	1.05	1.07	0.165	0.165	1.124	0.19	12.12%
15	15.60	1.30	0.50		0.160	0.160	1.0	15.05	16.00	0.95	0.80	0.160	0.160	0.760	0.12	7.95%
16	16.40	1.00	0.50	0.120			0.9	16.00	16.85	0.85	0.50	0.120	0.108	0.425	0.05	3.00%
17	17.30	0.90	0.50	0.080			0.9	16.85	17.70	0.85	0.40	0.080	0.072	0.340	0.02	1.60%
18	18.10	0.85	0.50	0.100			0.9	17.70	18.50	0.80	0.35	0.100	0.090	0.280	0.03	1.65%
19	18.90	0.82	0.50	0.100			0.9	18.50	19.35	0.85	0.32	0.100	0.090	0.272	0.02	1.60%
20	19.80	0.75	0.47	0.060			0.9	19.35	20.10	0.75	0.28	0.060	0.054	0.210	0.01	0.74%
21	20.40	0.70	0.45	0.050			0.9	20.10	20.80	0.70	0.25	0.050	0.045	0.175	0.01	0.51%
22	21.20	0.65	0.50	0.030			0.9	20.80	21.65	0.85	0.15	0.030	0.027	0.128	0.00	0.23%
RB	22.10	0.00	0.00	0.000	0.000	0.000	1.0	21.65	22.10	0.45	0.00	0.015	0.015	0.000	0.000	0.00%
<b>Total Flow</b>														<b>1.530</b>		

**Measurement Details:**

Start Time (MST):	13:00
End Time (MST):	14:06
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -20

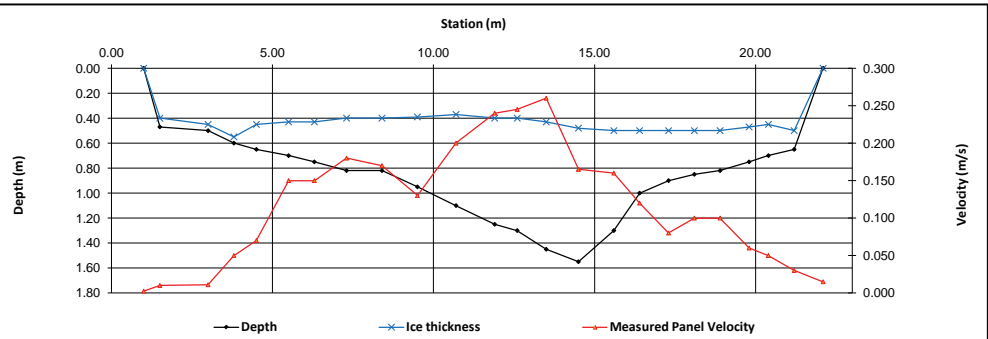
**Flow characteristics:**

Total Flow:	1.53	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.50	(m <sup>2</sup> )
Wetted Width:	21.10	(m)
Hydraulic Depth:	0.450	(m)
Mean Velocity:	0.161	(m/s)
Froude Number:	0.077	

**Datalogger Details:**

	Before	After
Transducer Reading (m):	0.823	
Water (°C):	0.2	
Battery (Main):	15.4	
Datalogger Clock:	13:06	
Laptop Clock:	13:07	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.763	100.763		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.926	97.837		
Water Level:			2.968	97.795		
Other:			0.713	100.050	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.751	100.001	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.913	97.839		
Water Level:			2.956	97.796		
Other:	0.702	100.752		100.050	100.049	Nail in tree
<b>Closing Error</b>						
			-0.001			
<b>Average WL</b>						
				97.796		
<b>WL Check</b>						
			0.001			
				96.973		

**General Notes:**

**Field Personnel:**

SM, GB	Trip Date:	19-Jan-12
CJ	Date:	13-Feb-12
DW	Date:	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: February 11, 2012



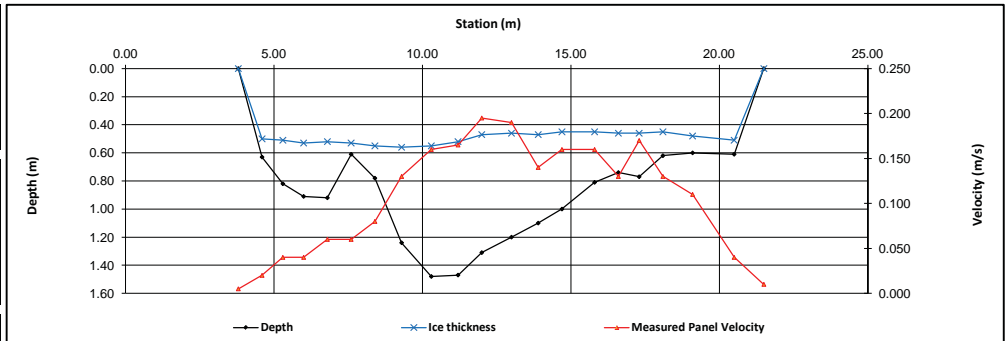
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1	3.80	0.00	0.00	0.000	0.000	0.000	0.9	3.80	4.20	0.40	0.03	0.005	0.005	0.01	0.000	0%
2	4.60	0.63	0.50	0.020			0.9	4.20	4.95	0.75	0.13	0.020	0.018	0.10	0.002	0%
3	5.30	0.82	0.51	0.040			0.9	4.95	5.65	0.70	0.31	0.040	0.036	0.22	0.008	1%
4	6.00	0.91	0.53	0.040			0.9	5.65	6.40	0.75	0.38	0.040	0.036	0.29	0.010	1%
5	6.80	0.92	0.52	0.060			0.9	6.40	7.20	0.80	0.40	0.060	0.054	0.32	0.017	2%
6	7.60	0.61	0.53	0.060			0.9	7.20	8.00	0.80	0.08	0.060	0.054	0.06	0.003	0%
7	8.40	0.78	0.55	0.080			0.9	8.00	8.85	0.85	0.23	0.080	0.072	0.20	0.014	1%
8	9.30	1.24	0.56	0.130			0.9	8.85	9.80	0.95	0.68	0.130	0.117	0.65	0.076	8%
9	10.30	1.48	0.55		0.140	0.180	1.0	9.80	10.75	0.95	0.93	0.160	0.160	0.88	0.141	15%
10	11.20	1.47	0.52		0.190	0.140	1.0	10.75	11.60	0.85	0.95	0.165	0.165	0.81	0.133	14%
11	12.00	1.31	0.47		0.200	0.190	1.0	11.60	12.50	0.90	0.84	0.195	0.195	0.76	0.147	15%
12	13.00	1.20	0.46	0.190			0.9	12.50	13.45	0.95	0.74	0.190	0.171	0.70	0.120	13%
13	13.90	1.10	0.47	0.140			0.9	13.45	14.30	0.85	0.63	0.140	0.126	0.54	0.067	7%
14	14.70	1.00	0.45	0.160			0.9	14.30	15.25	0.95	0.55	0.160	0.144	0.52	0.075	8%
15	15.80	0.81	0.45	0.160			0.9	15.25	16.20	0.95	0.36	0.160	0.144	0.34	0.049	5%
16	16.60	0.74	0.46	0.130			0.9	16.20	16.95	0.75	0.28	0.130	0.117	0.21	0.025	3%
17	17.30	0.77	0.46	0.170			0.9	16.95	17.70	0.75	0.31	0.170	0.153	0.23	0.036	4%
18	18.10	0.62	0.45	0.130			0.9	17.70	18.60	0.90	0.17	0.130	0.117	0.15	0.018	2%
19	19.10	0.60	0.48	0.110			0.9	18.60	19.80	1.20	0.12	0.110	0.099	0.14	0.014	1%
20	20.50	0.61	0.51	0.040			0.9	19.80	21.00	1.20	0.10	0.040	0.036	0.12	0.004	0%
21	21.50	0.00	0.00	0.000	0.000	0.000	1.0	21.00	21.50	0.50	0.03	0.010	0.010	0.01	0.000	0%
<b>Total Flow</b>														<b>0.961</b>		

Measurement Details:	
Start Time (MST):	12:00
End Time (MST):	13:00
Equipment:	Marsh
Method:	Ice
River Condition:	frozen
Quality/Error (see reverse):	good
Weather:	sunny, -10

Flow characteristics:	
Total Flow:	0.961 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	7.26 (m <sup>2</sup> )
Wetted Width:	17.70 (m)
Hydraulic Depth:	0.410 (m)
Mean Velocity:	0.132 (m/s)
Froude Number:	0.066

Logger Details:		
	Before	After
Transducer Reading (m):	0.794	
Water (°C):	0.2	-
Battery (Main):	15.2	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	Ok	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.754	100.754		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.944	97.810		
Water Level:			2.999	97.755		
Other:			0.705	100.049	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.746	100.001	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.934	97.813		
Water Level:			2.987	97.760		
Other:	0.698	100.747		100.049	100.049	Nail in tree

Closing Error	-0.001	Average WL	97.758
WL Check	0.005	Transducer Elevation	96.964

**General Notes:**

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	11-Feb-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	20-Mar-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	25-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

February 28, 2012



## 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
LB	5.00	0.00	0.00	0.000	0.000	0.000	0.9	5.00	5.43	0.43	0.05	0.023	0.020	0.02	0.000	0%
1	5.85	0.75	0.55	0.090			0.9	5.43	6.43	1.00	0.20	0.090	0.081	0.20	0.016	2%
2	7.00	0.80	0.55	0.130			0.9	6.43	7.40	0.98	0.25	0.130	0.117	0.24	0.029	4%
3	7.80	0.90	0.55	0.080			0.9	7.40	8.20	0.80	0.35	0.080	0.072	0.28	0.020	3%
4	8.60	0.95	0.53	0.120			0.9	8.20	8.98	0.78	0.42	0.120	0.108	0.33	0.035	4%
5	9.35	0.95	0.53	0.140			0.9	8.98	9.73	0.75	0.42	0.140	0.126	0.32	0.040	5%
6	10.10	1.00	0.55	0.140			0.9	9.73	10.40	0.67	0.45	0.140	0.126	0.30	0.038	5%
7	10.70	1.05	0.55	0.130			0.9	10.40	11.03	0.63	0.50	0.130	0.117	0.31	0.037	5%
8	11.35	1.15	0.55	0.130			0.9	11.03	11.68	0.65	0.60	0.130	0.117	0.39	0.046	6%
9	12.00	1.30	0.55		0.130	0.150	1.0	11.68	12.30	0.63	0.75	0.140	0.140	0.47	0.066	8%
10	12.60	1.40	0.55		0.160	0.160	1.0	12.30	12.93	0.63	0.85	0.160	0.160	0.53	0.085	11%
11	13.25	1.50	0.55		0.150	0.160	1.0	12.93	13.63	0.70	0.95	0.155	0.155	0.66	0.103	13%
12	14.00	1.78	0.61		0.060	0.140	1.0	13.63	14.38	0.75	1.17	0.100	0.100	0.88	0.088	11%
13	14.75	1.82	0.63		0.080	0.120	1.0	14.38	15.10	0.73	1.19	0.100	0.100	0.86	0.086	11%
14	15.45	1.75	0.65		0.070	0.060	1.0	15.10	15.78	0.68	1.10	0.065	0.065	0.74	0.048	6%
15	16.10	1.62	0.65		0.040	0.060	1.0	15.78	16.45	0.68	0.97	0.050	0.050	0.65	0.033	4%
16	16.80	1.45	0.60		0.020	0.020	1.0	16.45	17.08	0.63	0.85	0.020	0.020	0.53	0.011	1%
17	17.35	1.15	0.65	0.020			0.9	17.08	17.63	0.55	0.50	0.020	0.018	0.27	0.005	1%
18	17.90	1.20	0.60	0.010			0.9	17.63	18.20	0.57	0.60	0.010	0.009	0.35	0.003	0%
19	18.50	1.15	0.60	0.010			0.9	18.20	18.85	0.65	0.55	0.010	0.009	0.36	0.003	0%
20	19.20	1.10	0.57	0.010			0.9	18.85	19.53	0.67	0.53	0.010	0.009	0.36	0.003	0%
21	19.85	0.85	0.55	0.000			1.0	19.53	19.93	0.40	0.30	0.000	0.000	0.12	0.000	0%
RB	20.00	0.00	0.00	0.000	0.000	0.000	1.0	19.93	20.00	0.07	0.08	0.000	0.000	0.01	0.000	0%
<b>Total Flow</b>															<b>0.794</b>	

### Measurement Details:

Start Time (MST):	14:55
End Time (MST):	16:25
Equipment:	Marsh
Method:	Ice
River Condition:	low flow
Quality/Error (see reverse):	Good
Weather:	0 C clear, calm

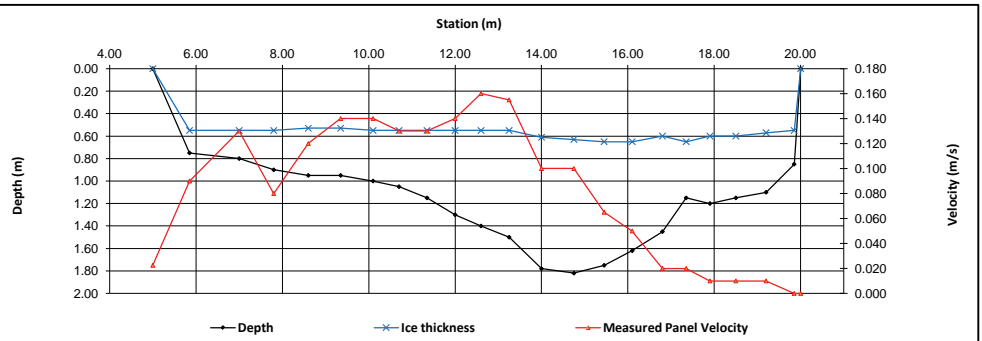
### Flow characteristics:

Total Flow:	0.794	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.19	(m <sup>2</sup> )
Wetted Width:	15.00	(m)
Hydraulic Depth:	0.612	(m)
Mean Velocity:	0.086	(m/s)
Froude Number:	0.035	

### Datalogger Details:

	Before	After
Transducer Reading (m):	0.835	
Water (°C):	0.2	-
Battery (Main):	14.8	-
Datalogger Clock:	13:55	-
Laptop Clock:	14:09	-
Dessicant:	good	-
Logger# (if Δ):	9630	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.844	100.844		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			3.003	97.841		
Water Level:			3.036	97.808		
Other:			0.795	100.049	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.834	99.999	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.992	97.841		
Water Level:			3.028	97.805		
Other:	0.784	100.833		100.049	100.049	Nail in tree

Closing Error	0.001	Average WL	97.807
WL Check	0.003	Transducer Elevation	96.972

### General Notes:

- BM1: 0.595 m

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	28-Feb-12
<b>Data Entry Personnel:</b>	MY	<b>Date:</b>	26-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

March 29, 2012



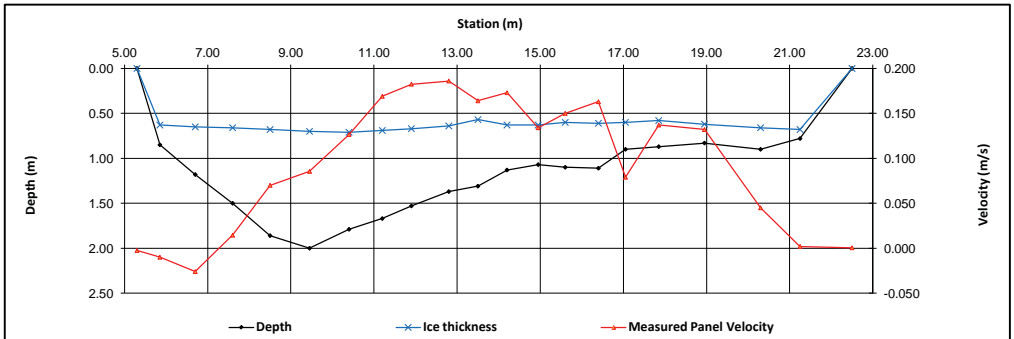
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	5.30	0.00	0.00	0.000	0.000	0.000	0.9	5.30	5.58	0.27	0.06	-0.003	-0.002	0.02	0.000	0%
1	5.85	0.85	0.63	-0.010			0.9	5.58	6.28	0.70	0.22	-0.010	-0.009	0.15	-0.001	0%
2	6.70	1.18	0.65	-0.026			0.9	6.28	7.15	0.88	0.53	-0.026	-0.023	0.46	-0.011	-1%
3	7.60	1.50	0.66		0.043	-0.014	1.0	7.15	8.05	0.90	0.84	0.015	0.015	0.76	0.011	1%
4	8.50	1.86	0.68		0.063	0.077	1.0	8.05	8.98	0.92	1.18	0.070	0.070	1.09	0.076	8%
5	9.45	2.00	0.70		0.073	0.098	1.0	8.98	9.93	0.95	1.30	0.086	0.086	1.24	0.106	10%
6	10.40	1.79	0.71		0.120	0.133	1.0	9.93	10.80	0.88	1.08	0.127	0.127	0.95	0.120	12%
7	11.20	1.67	0.69		0.162	0.176	1.0	10.80	11.55	0.75	0.98	0.169	0.169	0.74	0.124	12%
8	11.90	1.53	0.67		0.183	0.182	1.0	11.55	12.35	0.80	0.86	0.183	0.183	0.69	0.126	12%
9	12.80	1.37	0.64	0.186			0.9	12.35	13.15	0.80	0.73	0.186	0.167	0.58	0.098	10%
10	13.50	1.31	0.57	0.164			0.9	13.15	13.85	0.70	0.74	0.164	0.148	0.52	0.076	8%
11	14.20	1.13	0.63	0.173			0.9	13.85	14.58	0.73	0.50	0.173	0.156	0.36	0.056	6%
12	14.95	1.07	0.63	0.134			0.9	14.58	15.28	0.70	0.44	0.134	0.121	0.31	0.037	4%
13	15.60	1.10	0.60	0.150			0.9	15.28	16.00	0.73	0.50	0.150	0.135	0.36	0.049	5%
14	16.40	1.11	0.61	0.163			0.9	16.00	16.73	0.73	0.50	0.163	0.147	0.36	0.053	5%
15	17.05	0.90	0.60	0.079			0.9	16.73	17.45	0.73	0.30	0.079	0.071	0.22	0.015	2%
16	17.85	0.87	0.58	0.137			0.9	17.45	18.40	0.95	0.29	0.137	0.123	0.28	0.034	3%
17	18.95	0.83	0.62	0.132			0.9	18.40	19.63	1.23	0.21	0.132	0.119	0.26	0.031	3%
18	20.30	0.90	0.66	0.045			0.9	19.63	20.78	1.15	0.24	0.045	0.041	0.28	0.011	1%
19	21.25	0.78	0.68	0.002			0.9	20.78	21.88	1.10	0.10	0.002	0.002	0.11	0.000	0%
LB	22.50	0.00	0.00	0.000	0.000	0.000	1.0	21.88	22.50	0.63	0.03	0.001	0.001	0.02	0.000	0%
<b>Total Flow</b>														<b>1.01</b>		

Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	15:17
Equipment:	ADV
Method:	Ice
River Condition:	open in areas
Quality/Error (see reverse):	good
Weather:	cloudy, calm, +6

Flow characteristics:	
Total Flow:	1.01 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	9.73 (m <sup>2</sup> )
Wetted Width:	17.20 (m)
Hydraulic Depth:	0.566 (m)
Mean Velocity:	0.104 (m/s)
Froude Number:	0.044

Datalogger Details:		Before	After
Transducer Reading (m):		0.909	
Water (°C):		0.2	-
Battery (Main):		14.7	-
Datalogger Clock:		12:58	-
Laptop Clock:		12:59	-
Dessicant:		replaced	-
Logger# (if Δ):		-	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**  
 -dessicant was very pink



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.793	100.793		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.915	97.878		
Water Level:			2.888	97.905		
Other:			0.741	100.052	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.787	100.002	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:			2.908	97.881		
Water Level:			2.884	97.905		
Other:	0.737	100.789		100.052	100.049	Nail in tree

Closing Error	-0.002	Average WL	97.905
WL Check	0.000	Transducer Elevation	96.996

**General Notes:**

- some small opens spots upstream
- approximately 6" of slush on top of ice

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	29-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	11-Apr-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	30-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - ELLS River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

May 17, 2012



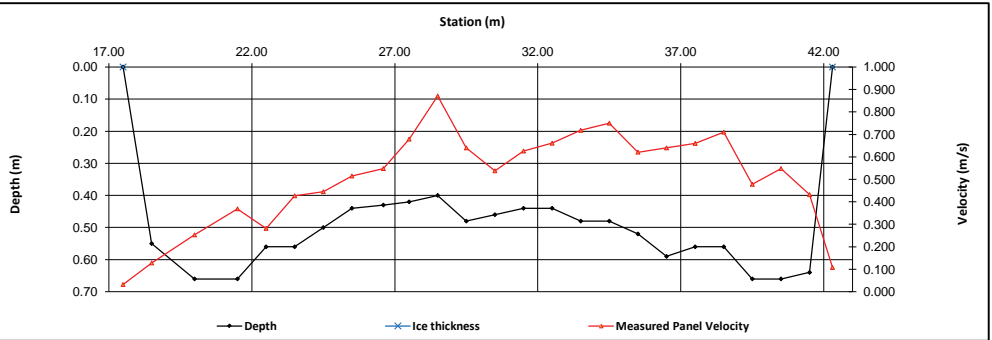
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	17.50	0.00	0.00	0.000	0.000	0.000	1.0	17.50	18.00	0.50	0.14	0.032	0.032	0.07	0.002	0%
1	18.50	0.55		0.128			1.0	18.00	19.25	1.25	0.55	0.128	0.128	0.69	0.088	1%
2	20.00	0.66		0.253			1.0	19.25	20.75	1.50	0.66	0.253	0.253	0.99	0.250	4%
3	21.50	0.66		0.369			1.0	20.75	22.00	1.25	0.66	0.369	0.369	0.83	0.304	5%
4	22.50	0.56		0.282			1.0	22.00	23.00	1.00	0.56	0.282	0.282	0.56	0.158	2%
5	23.50	0.56		0.427			1.0	23.00	24.00	1.00	0.56	0.427	0.427	0.56	0.239	4%
6	24.50	0.50		0.445			1.0	24.00	25.00	1.00	0.50	0.445	0.445	0.50	0.223	3%
7	25.50	0.44		0.515			1.0	25.00	26.05	1.05	0.44	0.515	0.515	0.46	0.238	4%
8	26.60	0.43		0.548			1.0	26.05	27.05	1.00	0.43	0.548	0.548	0.43	0.236	4%
9	27.50	0.42		0.679			1.0	27.05	28.00	0.95	0.42	0.679	0.679	0.40	0.271	4%
10	28.50	0.40		0.871			1.0	28.00	29.00	1.00	0.40	0.871	0.871	0.40	0.348	5%
11	29.50	0.48		0.640			1.0	29.00	30.00	1.00	0.48	0.640	0.640	0.48	0.307	5%
12	30.50	0.46		0.538			1.0	30.00	31.00	1.00	0.46	0.538	0.538	0.46	0.247	4%
13	31.50	0.44		0.626			1.0	31.00	32.00	1.00	0.44	0.626	0.626	0.44	0.275	4%
14	32.50	0.44		0.661			1.0	32.00	33.00	1.00	0.44	0.661	0.661	0.44	0.291	4%
15	33.50	0.48		0.718			1.0	33.00	34.00	1.00	0.48	0.718	0.718	0.48	0.345	5%
16	34.50	0.48		0.750			1.0	34.00	35.00	1.00	0.48	0.750	0.750	0.48	0.360	5%
17	35.50	0.52		0.621			1.0	35.00	36.00	1.00	0.52	0.621	0.621	0.52	0.323	5%
18	36.50	0.59		0.640			1.0	36.00	37.00	1.00	0.59	0.640	0.640	0.59	0.378	6%
19	37.50	0.56		0.660			1.0	37.00	38.00	1.00	0.56	0.660	0.660	0.56	0.370	6%
20	38.50	0.56		0.710			1.0	38.00	39.00	1.00	0.56	0.710	0.710	0.56	0.398	6%
21	39.50	0.66		0.478			1.0	39.00	40.00	1.00	0.66	0.478	0.478	0.60	0.315	5%
22	40.50	0.66		0.548			1.0	40.00	41.00	1.00	0.66	0.548	0.548	0.66	0.362	5%
23	41.50	0.64		0.432			1.0	41.00	41.90	0.90	0.64	0.432	0.432	0.58	0.249	4%
RB	42.30	0.00	0.00	0.000	0.000	0.000	1.0	41.90	42.30	0.40	0.16	0.108	0.108	0.06	0.007	0%
<b>Total Flow</b>														<b>6.58</b>		

Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	16:40
Equipment:	ADV
Method:	Wading
River Condition:	medium flow, no ice
Quality/Error (see reverse):	excellent
Weather:	clear, calm, +17

Flow characteristics:	
Total Flow:	6.58 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	12.85 (m <sup>2</sup> )
Wetted Width:	24.80 (m)
Hydraulic Depth:	0.518 (m)
Mean Velocity:	0.512 (m/s)
Froude Number:	0.227

Logger Details:		Before	After
Transducer Reading (m):		0.694	-
Water (°C):		14.6	-
Battery (Main):		14.3	-
Datalogger Clock:		14:16	-
Laptop Clock:		14:17	-
Dessicant:		replaced	-
Logger# (if Δ):		9630	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.710	100.710		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.974	97.736		
Other:			0.663	100.047	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.700	99.999	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.963	97.736		
Other:	0.652	100.699		100.047	100.049	Nail in tree

Closing Error	0.001	Average WL	97.736
WL Check	0.000	Transducer Elevation	97.042

**General Notes:**

- logger enclosure needs to be replaced-leaks
- installed one 3/4" Pipe benchmark NE of logger
- left one length of 3/4" pipe at logger station for future benchmark installation.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	17-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	31-May-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	5-Jun-12



# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

June 22, 2012



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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.50	0.50	0.17	0.035	0.035	0.08	0.003	0%
1	3.00	0.67		0.138			1.0	2.50	3.50	1.00	0.67	0.138	0.138	0.67	0.092	2%
2	4.00	0.69		0.374			1.0	3.50	4.50	1.00	0.69	0.374	0.374	0.69	0.258	4%
3	5.00	0.76			0.370	0.801	1.0	4.50	5.50	1.00	0.76	0.586	0.586	0.76	0.445	8%
4	6.00	0.78			0.320	0.792	1.0	5.50	6.50	1.00	0.78	0.556	0.556	0.78	0.434	8%
5	7.00	0.76			0.396	0.833	1.0	6.50	7.50	1.00	0.76	0.615	0.615	0.76	0.467	8%
6	8.00	0.72		0.340			1.0	7.50	8.50	1.00	0.72	0.340	0.340	0.72	0.245	4%
7	9.00	0.75			0.348	0.882	1.0	8.50	9.50	1.00	0.75	0.615	0.615	0.75	0.461	8%
8	10.00	0.68		0.534			1.0	9.50	10.50	1.00	0.68	0.534	0.534	0.68	0.363	6%
9	11.00	0.54		0.585			1.0	10.50	11.50	1.00	0.54	0.585	0.585	0.54	0.316	5%
10	12.00	0.46		0.566			1.0	11.50	12.50	1.00	0.46	0.566	0.566	0.46	0.260	5%
11	13.00	0.44		0.499			1.0	12.50	13.50	1.00	0.44	0.499	0.499	0.44	0.220	4%
12	14.00	0.46		0.565			1.0	13.50	14.50	1.00	0.46	0.565	0.565	0.46	0.260	5%
13	15.00	0.50		0.623			1.0	14.50	15.50	1.00	0.50	0.623	0.623	0.50	0.312	5%
14	16.00	0.46		0.627			1.0	15.50	16.50	1.00	0.46	0.627	0.627	0.46	0.288	5%
15	17.00	0.50		0.493			1.0	16.50	17.50	1.00	0.50	0.493	0.493	0.50	0.247	4%
16	18.00	0.44		0.474			1.0	17.50	18.50	1.00	0.44	0.474	0.474	0.44	0.209	4%
17	19.00	0.48		0.517			1.0	18.50	19.50	1.00	0.48	0.517	0.517	0.48	0.248	4%
18	20.00	0.55		0.422			1.0	19.50	20.75	1.25	0.55	0.422	0.422	0.55	0.290	5%
19	21.50	0.58		0.194			1.0	20.75	22.25	1.50	0.58	0.194	0.194	0.58	0.169	3%
20	23.00	0.68		-0.064			1.0	22.25	23.75	1.50	0.68	-0.064	-0.064	1.02	-0.065	-1%
21	24.50	0.62		0.140			1.0	23.75	25.25	1.50	0.62	0.140	0.140	0.93	0.130	2%
22	26.00	0.51		0.185			1.0	25.25	26.50	1.25	0.51	0.185	0.185	0.64	0.118	2%
LB	27.00	0.00	0.00	0.000	0.000	0.000	1.0	26.50	27.00	0.50	0.13	0.046	0.046	0.06	0.003	0%
<b>Total Flow</b>															<b>5.77</b>	

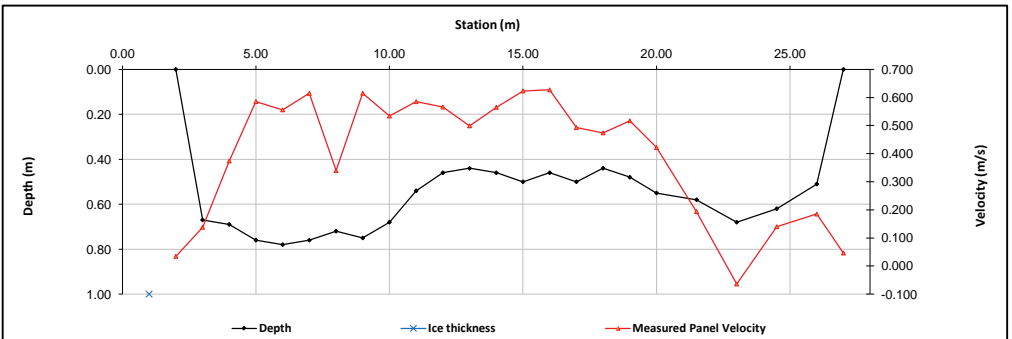
Measurement Details:	
Start Time (MST):	11:20
End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	Slight riffle
Quality/Error (see reverse):	excellent
Weather:	Partly cloudy, 20°C

Flow characteristics:	
Total Flow:	5.77 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	14.38 (m <sup>2</sup> )
Wetted Width:	25.00 (m)
Hydraulic Depth:	0.575 (m)
Mean Velocity:	0.401 (m/s)
Froude Number:	0.169

Logger Details:		
	Before	After
Transducer Reading (m):	0.697	-
Water (°C):	19.3	-
Battery (Main):	14.0	-
Datalogger Clock:	11:26	-
Laptop Clock:	11:27	-
Dessicant:	replaced	-
Logger# (if Δ):	9630	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	

General Notes:	
-TSS sampled at offset 17.0 m	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.547	100.547		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:			0.667	99.880	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.803	97.744		
Other:			0.500	100.047	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.533	99.998	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:						
Bench Mark 3:			0.654	99.877	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.788	97.743		
Other:	0.484	100.531		100.047	100.049	Nail in tree

Closing Error	0.002	Average WL	97.744
WL Check	0.001	Transducer Elevation	97.047

Field Personnel:		SM, GB	Trip Date:	22-Jun-12
Data Entry Personnel:		CJ	Date:	27-Jun-12
Data Check Personnel:		DW	Date:	12-Dec-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Elys River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

August 17, 2012



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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.50	0.50	0.08	0.002	0.002	0.04	0.000	0%
1	4.00	0.32		0.009			1.0	3.50	4.50	1.00	0.32	0.009	0.009	0.32	0.003	0%
2	5.00	0.46		0.237			1.0	4.50	5.50	1.00	0.46	0.237	0.237	0.46	0.109	2%
3	6.00	0.56		0.240			1.0	5.50	6.50	1.00	0.56	0.240	0.240	0.56	0.134	2%
4	7.00	0.65		0.258			1.0	6.50	7.50	1.00	0.65	0.258	0.258	0.65	0.168	3%
5	8.00	0.64		0.310			1.0	7.50	8.50	1.00	0.64	0.310	0.310	0.64	0.198	3%
6	9.00	0.66		0.350			1.0	8.50	9.50	1.00	0.66	0.350	0.350	0.66	0.231	4%
7	10.00	0.66		0.457			1.0	9.50	10.50	1.00	0.66	0.457	0.457	0.66	0.302	5%
8	11.00	0.64		0.422			1.0	10.50	11.50	1.00	0.64	0.422	0.422	0.64	0.270	4%
9	12.00	0.70		0.580			1.0	11.50	12.50	1.00	0.70	0.580	0.580	0.70	0.406	7%
10	13.00	0.55		0.560			1.0	12.50	13.50	1.00	0.55	0.560	0.560	0.55	0.308	5%
11	14.00	0.68		0.463			1.0	13.50	14.50	1.00	0.68	0.463	0.463	0.68	0.315	5%
12	15.00	0.67		0.577			1.0	14.50	15.50	1.00	0.67	0.577	0.577	0.67	0.387	6%
13	16.00	0.66		0.696			1.0	15.50	16.50	1.00	0.66	0.696	0.696	0.66	0.459	7%
14	17.00	0.70		0.626			1.0	16.50	17.50	1.00	0.70	0.626	0.626	0.70	0.438	7%
15	18.00	0.65		0.022			1.0	17.50	18.50	1.00	0.65	0.022	0.022	0.65	0.014	0%
16	19.00	0.82			0.359	0.626	1.0	18.50	19.50	1.00	0.82	0.493	0.493	0.82	0.404	6%
17	20.00	0.88			0.477	0.758	1.0	19.50	20.50	1.00	0.88	0.618	0.618	0.88	0.543	9%
18	21.00	0.93			0.484	0.768	1.0	20.50	21.50	1.00	0.93	0.626	0.626	0.93	0.582	9%
19	22.00	1.00			0.504	0.714	1.0	21.50	22.50	1.00	1.00	0.609	0.609	1.00	0.609	10%
20	23.00	0.75			0.286	0.598	1.0	22.50	23.50	1.00	0.75	0.442	0.442	0.75	0.332	5%
RB	24.00	0.00	0.00	0.00	0.00	0.00	1.0	23.50	24.00	0.50	0.19	0.111	0.111	0.09	0.010	0%

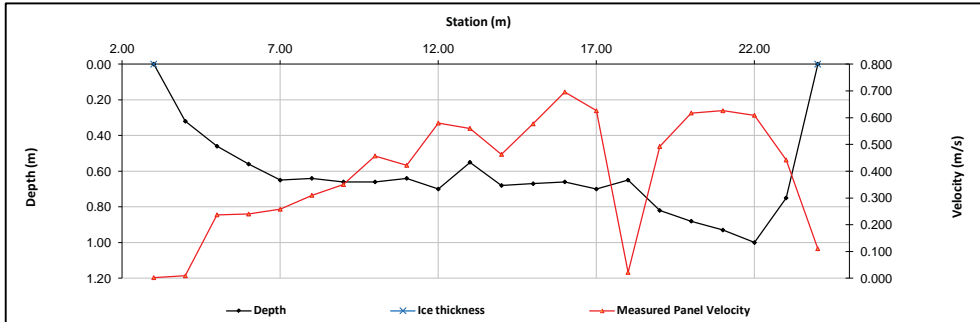
**Total Flow 6.220**

Measurement Details:	
Start Time (MST):	14:40
End Time (MST):	16:00
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	Partial cloud, 25

Flow characteristics:	
Total Flow:	6.22 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	13.71 (m <sup>2</sup> )
Wetted Width:	21.00 (m)
Hydraulic Depth:	0.653 (m)
Mean Velocity:	0.454 (m/s)
Froude Number:	0.179

Logger Details:		
	Before	After
Transducer Reading (m):	0.724	
Water (°C):	19.1	
Battery (Main):	14.1	
Datalogger Clock:	13:49	
Laptop Clock:	13:50	
Dessicant:	replaced	
Logger# (if Δ):	9630	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.555	100.555		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:			0.078	100.477	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.675	99.880	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.778	97.777		
Other:			0.505	100.050	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.544	100.001	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:	0.068	100.545		100.477	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.665	99.880	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.767	97.778		
Other:			0.495	100.050	100.049	Nail in tree

Closing Error	-0.001
WL Check	0.001

Average WL	97.778
Transducer Elevation	97.054

**General Notes:**

-A rock interfered with flow at offset 18 m  
 -TSS sampled at offset 13.25 m

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	17-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	3-Oct-12
<b>Data Check Personnel:</b>	MY	<b>Date:</b>	5-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion

UTM Location: 440605 E, 6342459 N

Site Visit Date:

August 31, 2012



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																
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

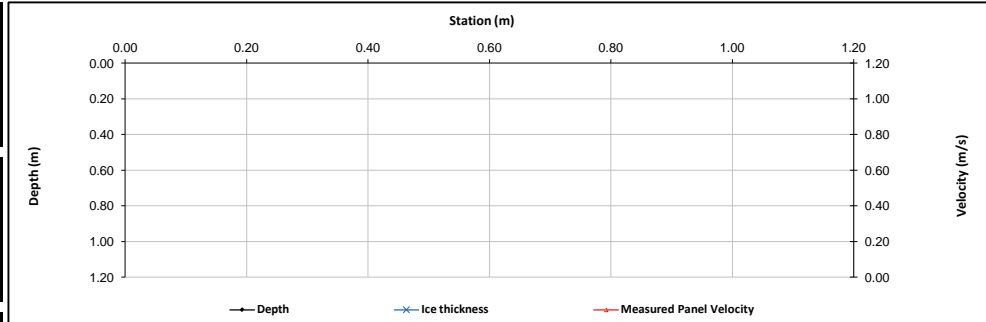
Total Flow

Measurement Details:	
Start Time (MST):	14:45
End Time (MST):	16:00
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	0.636	
Water (°C):	17.3	
Battery (Main):	14.2	
Datalogger Clock:	15:53	
Laptop Clock:	15:54	
Dessicant:	replaced	
Logger# (if Δ):	9630	
PT# (if Δ):	-	

Datalogger / Station Notes:	
-installed Campbell enclosure	
-Modem ph#: 604-347-7960	
-RSSI: -107	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:					99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:					99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:						
Other:					100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:					99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:					99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:						
Other:					100.049	Nail in tree

Closing Error		Average WL	
WL Check		Transducer Elevation	

General Notes:

Field Personnel:	SM, TR	Trip Date:	31-Aug-12
Data Entry Personnel:	CJ	Date:	4-Oct-12
Data Check Personnel:	MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6324259 N

Site Visit Date: September 20, 2012



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	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	3.10	0.00	0.00	0.000	0.000	0.000	1.0	3.10	3.55	0.45	0.13	0.011	0.011	0.06	0.001	0%
1	4.00	0.53		0.042			1.0	3.55	4.50	0.95	0.53	0.042	0.042	0.50	0.021	0%
2	5.00	0.58		0.616			1.0	4.50	5.50	1.00	0.58	0.616	0.616	0.58	0.357	8%
3	6.00	0.64		0.682			1.0	5.50	6.50	1.00	0.64	0.682	0.682	0.64	0.436	10%
4	7.00	0.51		0.511			1.0	6.50	7.50	1.00	0.51	0.511	0.511	0.51	0.261	6%
5	8.00	0.66		0.691			1.0	7.50	8.25	0.75	0.66	0.691	0.691	0.50	0.342	8%
6	8.50	0.62		0.552			1.0	8.25	8.75	0.50	0.62	0.552	0.552	0.31	0.171	4%
7	9.00	0.54		0.534			1.0	8.75	9.50	0.75	0.54	0.534	0.534	0.41	0.216	5%
8	10.00	0.50		0.520			1.0	9.50	10.50	1.00	0.50	0.520	0.520	0.50	0.260	6%
9	11.00	0.42		0.534			1.0	10.50	11.50	1.00	0.42	0.534	0.534	0.42	0.224	5%
10	12.00	0.37		0.454			1.0	11.50	12.50	1.00	0.37	0.454	0.454	0.37	0.168	4%
11	13.00	0.30		0.455			1.0	12.50	13.50	1.00	0.30	0.455	0.455	0.30	0.137	3%
12	14.00	0.29		0.485			1.0	13.50	14.50	1.00	0.29	0.485	0.485	0.29	0.141	3%
13	15.00	0.27		0.525			1.0	14.50	15.50	1.00	0.27	0.525	0.525	0.27	0.142	3%
14	16.00	0.26		0.421			1.0	15.50	16.50	1.00	0.26	0.421	0.421	0.26	0.109	3%
15	17.00	0.26		0.563			1.0	16.50	17.50	1.00	0.26	0.563	0.563	0.26	0.146	3%
16	18.00	0.22		0.604			1.0	17.50	18.50	1.00	0.22	0.604	0.604	0.22	0.133	3%
17	19.00	0.20		0.610			1.0	18.50	19.50	1.00	0.20	0.610	0.610	0.20	0.122	3%
18	20.00	0.27		0.725			1.0	19.50	20.50	1.00	0.27	0.725	0.725	0.27	0.196	5%
19	21.00	0.26		0.777			1.0	20.50	21.50	1.00	0.26	0.777	0.777	0.26	0.202	5%
20	22.00	0.27		0.546			1.0	21.50	22.50	1.00	0.27	0.546	0.546	0.27	0.147	3%
21	23.00	0.26		0.352			1.0	22.50	23.50	1.00	0.26	0.352	0.352	0.26	0.092	2%
22	24.00	0.20		0.567			1.0	23.50	24.50	1.00	0.20	0.567	0.567	0.20	0.113	3%
23	25.00	0.24		0.208			1.0	24.50	26.00	1.50	0.24	0.208	0.208	0.36	0.075	2%
24	27.00	0.26		0.120			1.0	26.00	28.25	2.25	0.26	0.120	0.120	0.59	0.070	2%
LB	28.50	0.00	0.00	0.00	0.00	0.00	1.0	28.25	29.50	1.25	0.07	0.030	0.030	0.08	0.002	0%
<b>Total Flow</b>															<b>4.29</b>	

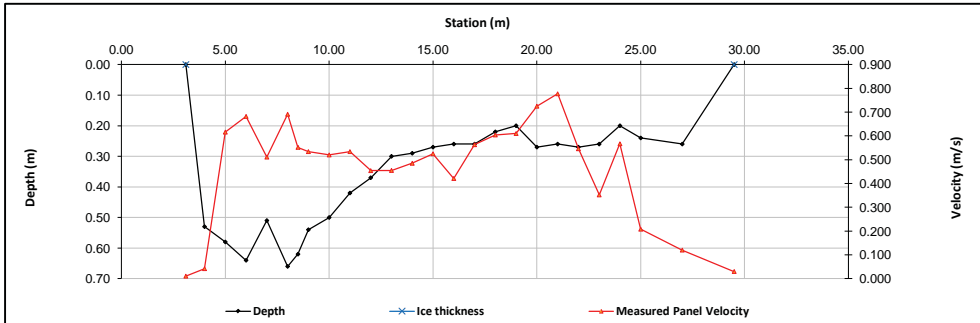
Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	9:30
Equipment:	ADV
Method:	Wading
River Condition:	Low-Medium
Quality/Error (see reverse):	Good
Weather:	sunny 10deg

Flow characteristics:	
Total Flow:	4.29 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	8.88 (m <sup>2</sup> )
Wetted Width:	26.40 (m)
Hydraulic Depth:	0.336 (m)
Mean Velocity:	0.483 (m/s)
Froude Number:	0.266

Logger Details:		
	Before	After
Transducer Reading (m):	0.609	
Water (°C):	9.6	
Battery (Main):	13.7	
Datalogger Clock:	8:01	
Laptop Clock:	8:02	
Dessicant:	CHANGED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:	
-TSS at 10.5 m	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.612	100.612		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:			0.828	99.784	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.734	99.878	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.948	97.664		
Other:			0.563	100.049	100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.602	99.999	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:			0.818	99.783	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:	0.723	100.601		99.878	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.939	97.662		
Other:					100.049	Nail in tree

Closing Error	0.001	Average WL	97.663
WL Check	0.002	Transducer Elevation	97.054

Field Personnel:		Trip Date:	20-Sep-12
Data Entry Personnel:	SG (Field)	Date:	20-Sep-12
Data Check Personnel:	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S45 - Elys River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:

October 18, 2012



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	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	8.00	0.00	0.00	0.000	0.000	0.000	1.0	8.00	8.25	0.25	0.10	0.002	0.002	0.02	0.000	0%
1	8.50	0.39		0.006			1.0	8.25	9.13	0.88	0.39	0.006	0.006	0.34	0.002	0%
2	9.75	0.65		0.618			1.0	9.13	10.38	1.25	0.65	0.618	0.618	0.81	0.502	9%
3	11.00	0.65		0.653			1.0	10.38	11.63	1.25	0.65	0.653	0.653	0.81	0.531	9%
4	12.25	0.40		0.872			1.0	11.63	12.88	1.25	0.40	0.872	0.872	0.50	0.436	8%
5	13.50	0.53		0.747			1.0	12.88	14.13	1.25	0.53	0.747	0.747	0.66	0.495	9%
6	14.75	0.48		0.767			1.0	14.13	15.38	1.25	0.48	0.767	0.767	0.60	0.460	8%
7	16.00	0.48		0.715			1.0	15.38	16.63	1.25	0.48	0.715	0.715	0.60	0.429	8%
8	17.25	0.45		0.604			1.0	16.63	17.88	1.25	0.45	0.604	0.604	0.56	0.340	6%
9	18.50	0.36		0.690			1.0	17.88	19.13	1.25	0.36	0.690	0.690	0.45	0.311	5%
10	19.75	0.29		0.450			1.0	19.13	20.38	1.25	0.29	0.450	0.450	0.36	0.163	3%
11	21.00	0.38		0.602			1.0	20.38	21.63	1.25	0.38	0.602	0.602	0.48	0.286	5%
12	22.25	0.43		0.448			1.0	21.63	22.88	1.25	0.43	0.448	0.448	0.54	0.241	4%
13	23.50	0.32		0.761			1.0	22.88	24.13	1.25	0.32	0.761	0.761	0.40	0.304	5%
14	24.75	0.30		0.798			1.0	24.13	25.38	1.25	0.30	0.798	0.798	0.38	0.299	5%
15	26.00	0.32		0.558			1.0	25.38	26.63	1.25	0.32	0.558	0.558	0.40	0.223	4%
16	27.25	0.28		0.565			1.0	26.63	27.88	1.25	0.28	0.565	0.565	0.35	0.198	4%
17	28.50	0.37		0.263			1.0	27.88	29.13	1.25	0.37	0.263	0.263	0.46	0.122	2%
18	29.75	0.36		0.287			1.0	29.13	30.38	1.25	0.36	0.287	0.287	0.45	0.129	2%
19	31.00	0.40		0.152			1.0	30.38	31.63	1.25	0.40	0.152	0.152	0.50	0.076	1%
20	32.25	0.39		0.175			1.0	31.63	32.88	1.25	0.39	0.175	0.175	0.49	0.085	2%
21	33.50	0.14		0.084			1.0	32.88	34.13	1.25	0.14	0.084	0.084	0.18	0.015	0%
22	34.75	0.11		0.008			1.0	34.13	34.88	0.75	0.11	0.008	0.008	0.08	0.001	0%
LB	35.00	0.00	0.00	0.00	0.00	0.00	1.0	34.88	35.00	0.13	0.03	0.002	0.002	0.00	0.000	0%

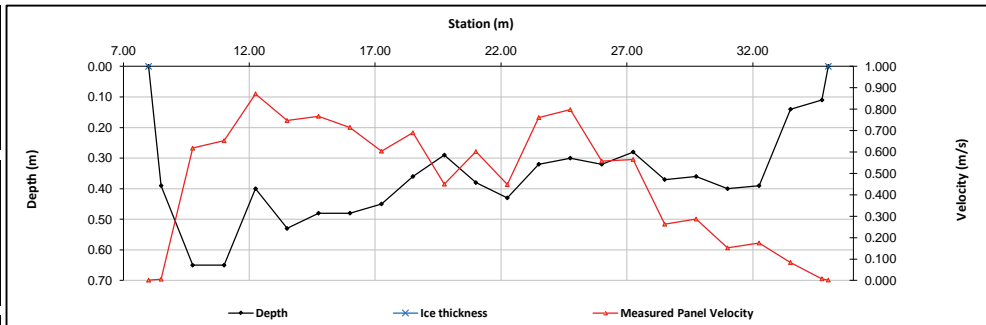
**Total Flow 5.65**

Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	11:45
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	Good
Weather:	-

Flow characteristics:	
Total Flow:	5.65 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	10.43 (m <sup>2</sup> )
Wetted Width:	27.00 (m)
Hydraulic Depth:	0.386 (m)
Mean Velocity:	0.542 (m/s)
Froude Number:	0.279

Logger Details:		
	Before	After
Transducer Reading (m):	0.684	
Water (°C):	0.1	
Battery (Main):	14.8	
Datalogger Clock:	10:35	
Laptop Clock:	10:36	
Dessicant:	Changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.531	100.531		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:			0.748	99.783	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.653	99.878	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.797	97.734		
Other:					100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.488	100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:	0.705	100.488		99.783	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.611	99.877	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:						
Water Level:			2.755	97.733		
Other:					100.049	Nail in tree

Closing Error	0.000	Average WL	97.734
WL Check	0.001	Transducer Elevation	97.050

General Notes:	

<b>Field Personnel:</b>	TR & DW	<b>Trip Date:</b>	18-Oct-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	18-Oct-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	13-Nov-12
<b>Entered Digitally in the Field:</b>	<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:

December 8, 2012



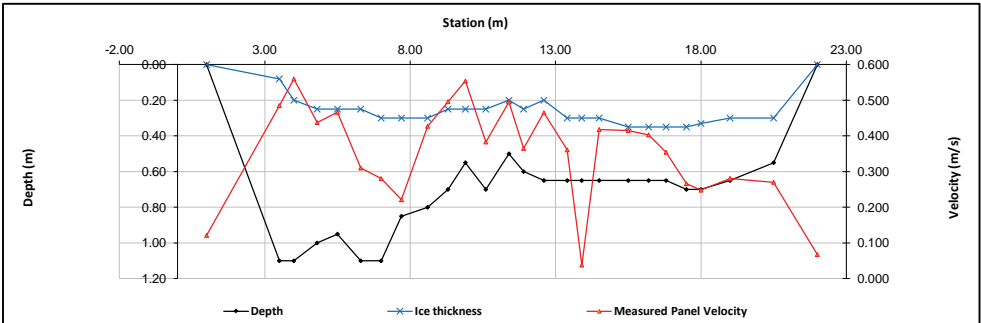
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	2.25	1.25	0.26	0.121	0.121	0.32	0.039	1%
1	3.50	1.10	0.08	0.262	0.708		1.0	2.25	3.75	1.50	1.02	0.485	0.485	1.53	0.742	21%
2	4.00	1.10	0.20	0.494	0.625		1.0	3.75	4.40	0.65	0.90	0.560	0.560	0.59	0.327	9%
3	4.80	1.00	0.25	0.427	0.448		1.0	4.40	5.15	0.75	0.75	0.438	0.438	0.56	0.246	7%
4	5.50	0.95	0.25	0.426	0.506		1.0	5.15	5.90	0.75	0.70	0.466	0.466	0.53	0.245	7%
5	6.30	1.10	0.25	0.300	0.320		1.0	5.90	6.65	0.75	0.85	0.310	0.310	0.64	0.198	6%
6	7.00	1.10	0.30		0.198	0.363	1.0	6.65	7.35	0.70	0.80	0.281	0.281	0.56	0.157	4%
7	7.70	0.85	0.30	0.221			0.9	7.35	8.15	0.80	0.55	0.221	0.199	0.44	0.088	2%
8	8.60	0.80	0.30	0.427			0.9	8.15	8.95	0.80	0.50	0.384	0.384	0.40	0.154	4%
9	9.30	0.70	0.25	0.496			0.9	8.95	9.60	0.65	0.45	0.496	0.446	0.29	0.131	4%
10	9.90	0.55	0.25	0.554			0.9	9.60	10.25	0.65	0.30	0.554	0.499	0.20	0.097	3%
11	10.60	0.70	0.25	0.383			0.9	10.25	11.00	0.75	0.45	0.383	0.345	0.34	0.116	3%
12	11.40	0.50	0.20	0.495			0.9	11.00	11.65	0.65	0.30	0.495	0.446	0.20	0.087	2%
13	11.90	0.60	0.25	0.365			0.9	11.65	12.25	0.60	0.35	0.365	0.329	0.21	0.069	2%
14	12.60	0.65	0.20	0.465			0.9	12.25	13.00	0.75	0.45	0.465	0.419	0.34	0.141	4%
15	13.40	0.65	0.30	0.361			0.9	13.00	13.65	0.65	0.35	0.361	0.325	0.23	0.074	2%
16	13.90	0.65	0.30	0.038			0.9	13.65	14.20	0.55	0.35	0.038	0.034	0.19	0.007	0%
17	14.50	0.65	0.30	0.418			0.9	14.20	15.00	0.80	0.35	0.418	0.376	0.28	0.105	3%
18	15.50	0.65	0.35	0.415			0.9	15.00	15.85	0.85	0.30	0.415	0.374	0.26	0.095	3%
19	16.20	0.65	0.35	0.403			0.9	15.85	16.50	0.65	0.30	0.403	0.363	0.20	0.071	2%
20	16.80	0.65	0.35	0.354			0.9	16.50	17.15	0.65	0.30	0.354	0.319	0.20	0.062	2%
21	17.50	0.70	0.35	0.266			0.9	17.15	17.75	0.60	0.35	0.266	0.239	0.21	0.050	1%
22	18.00	0.70	0.33	0.248			0.9	17.75	18.50	0.75	0.37	0.248	0.223	0.28	0.062	2%
23	19.00	0.65	0.30	0.281			0.9	18.50	19.75	1.25	0.35	0.281	0.253	0.44	0.111	3%
24	20.50	0.55	0.30	0.270			0.9	19.75	21.25	1.50	0.25	0.270	0.243	0.38	0.091	3%
LB	22.00	0.00	0.00	0.00	0.00	0.00	1.0	21.25	22.00	0.75	0.06	0.068	0.068	0.05	0.003	0%
<b>Total Flow</b>														<b>3.570</b>		

Measurement Details:	
Start Time (MST):	9:20
End Time (MST):	11:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen with top slush
Quality/Error (see reverse):	Good
Weather:	Partial sun, calm, -25C

Flow characteristics:	
Total Flow:	3.57 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	9.82 (m <sup>2</sup> )
Wetted Width:	21.00 (m)
Hydraulic Depth:	0.468 (m)
Mean Velocity:	0.364 (m/s)
Froude Number:	0.170

Logger Details:		
	Before	After
Transducer Reading (m):	0.863	
Water (°C):	0.2	
Battery (Main):	12.5	
Datalogger Clock:	9:46	
Laptop Clock:	9:46	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 - station was damaged by wildlife again. The solar panel was broken off the mast so the mounts are broken but the panel itself remains intact. Temporarily re-installed it to the mast with zip ties. Also installed the replacement enclosure but did not transfer the electronics to it.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.715	100.715		100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:			0.929	99.786	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.834	99.881	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:			2.875	97.840		
Water Level:			2.800	97.915		
Other:					100.049	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.700	100.000	100.000	3/4" Pipe 12 m W of data logger
Bench Mark 2:	0.914	100.700		99.786	99.784	3/4" Pipe 6 m W of data logger
Bench Mark 3:			0.818	99.882	99.880	3/4" Pipe 3 m N of data logger
Ice/PT:			2.859	97.841		
Water Level:			2.787	97.913		
Other:					100.049	Nail in tree

Closing Error	0.000	Average WL	97.914
WL Check	0.002	Transducer Elevation	97.051

**General Notes:**

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	8-Dec-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	8-Dec-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Dec-12
<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:

January 18, 2012



## 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	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	7.40	4.40	0.59	0.088	0.088	2.59	0.228	0.11%
1	11.80	2.70	0.35	0.350	0.350	0.350	1.0	7.40	16.15	8.75	2.35	0.350	0.350	20.56	7.197	3.58%
2	20.50	3.35	0.35	0.440	0.580	0.580	1.0	16.15	26.75	10.60	3.00	0.510	0.510	31.80	16.218	8.07%
3	33.00	2.80	0.40	0.500	0.560	0.560	1.0	26.75	39.15	12.40	2.40	0.530	0.530	29.76	15.773	7.85%
4	45.30	3.05	0.50	0.570	0.670	0.670	1.0	39.15	52.15	13.00	2.55	0.620	0.620	33.15	20.553	10.23%
5	59.00	3.10	0.47	0.540	0.440	0.440	1.0	52.15	64.50	12.35	2.63	0.490	0.490	32.48	15.915	7.92%
6	70.00	3.10	0.45	0.560	0.050	0.050	1.0	64.50	79.20	14.70	2.65	0.305	0.305	38.96	11.881	5.91%
7	88.40	3.30	0.40	0.550	0.010	0.010	1.0	79.20	92.80	13.60	2.90	0.280	0.280	39.44	11.043	5.49%
8	97.20	3.60	0.40	0.470	-0.010	-0.010	1.0	92.80	102.60	9.80	3.20	0.230	0.230	31.36	7.213	3.59%
9	108.00	3.60	0.40	0.400	-0.010	-0.010	1.0	102.60	114.60	12.00	3.20	0.195	0.195	38.40	7.488	3.73%
10	121.20	3.60	0.35	0.450	0.370	0.370	1.0	114.60	128.65	14.05	3.25	0.410	0.410	45.66	18.722	9.31%
11	136.10	3.60	0.35	0.330	0.380	0.380	1.0	128.65	138.05	9.40	3.25	0.355	0.355	30.55	10.845	5.40%
12	140.00	3.00	0.35	0.260	0.240	0.240	1.0	138.05	156.00	17.95	2.65	0.250	0.250	47.57	11.892	5.92%
13	172.00	2.30	0.37	0.150	0.160	0.160	1.0	156.00	181.00	25.00	1.93	0.155	0.155	48.25	7.479	3.72%
14	190.00	1.40	0.35	0.080	0.080	0.080	1.0	181.00	197.00	16.00	1.05	0.080	0.080	16.80	1.344	0.67%
15	204.00	0.90	0.35	0.050	0.050	0.050	0.9	197.00	207.75	10.75	0.55	0.045	0.045	5.91	0.266	0.13%
16	211.50	0.40	0.40	0.000	0.000	0.000	1.0	207.75	226.60	18.85	0.00	0.000	0.000	0.00	0.000	0.00%
17	241.70	0.55	0.40	0.210	0.210	0.210	0.9	226.60	251.50	24.90	0.15	0.210	0.189	3.74	0.706	0.35%
18	261.30	0.58	0.35	0.260	0.260	0.260	0.9	251.50	271.65	20.15	0.23	0.260	0.234	4.63	1.084	0.54%
19	282.00	0.75	0.35	0.350	0.350	0.350	0.9	271.65	288.70	17.05	0.40	0.350	0.315	6.82	2.148	1.07%
20	295.40	0.80	0.40	0.310	0.310	0.310	0.9	288.70	305.95	17.25	0.40	0.310	0.279	6.90	1.925	0.96%
21	316.50	1.30	0.40	0.360	0.350	0.350	1.0	305.95	329.25	23.30	0.90	0.355	0.355	20.97	7.444	3.70%
22	342.00	1.30	0.35	0.310	0.300	0.300	1.0	329.25	352.50	23.25	0.95	0.305	0.305	22.09	6.737	3.35%
23	363.00	1.50	0.35	0.410	0.410	0.410	1.0	352.50	370.75	18.25	1.15	0.410	0.410	20.99	8.605	4.28%
24	378.50	1.50	0.35	0.410	0.460	0.460	1.0	370.75	385.25	14.50	1.15	0.435	0.435	16.68	7.254	3.61%
25	392.00	0.70	0.40	0.290	0.290	0.290	0.9	385.25	392.50	7.25	0.30	0.290	0.261	2.18	0.568	0.28%
LB	393.00		0.00	0.000	0.000	0.000	1.0	392.50	393.00	0.50	0.08	0.000	0.000	0.04	0.000	0.00%
<b>Total Flow</b>															<b>201</b>	

## Measurement Details:

Start Time (MST):	10:30
End Time (MST):	14:00
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	fog, windy, -25

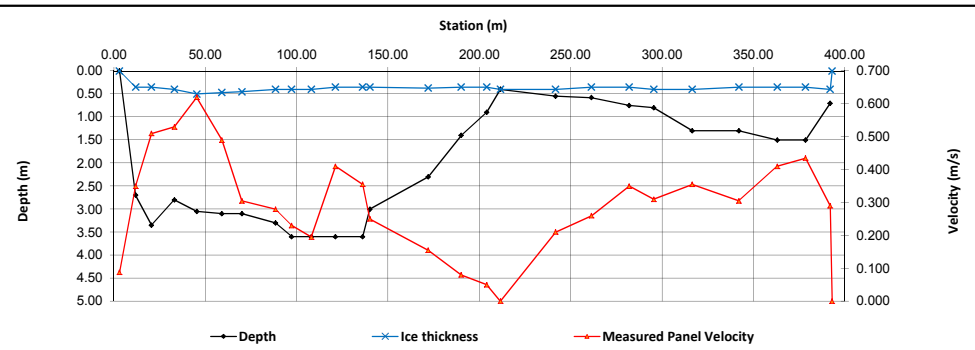
## Flow Characteristics:

Total Flow:	201	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	598.26	(m <sup>2</sup> )
Wetted Width:	390.00	(m)
Hydraulic Depth:	1.534	(m)
Mean Velocity:	0.336	(m/s)
Froude Number:	0.087	

## Datalogger Details:

	Before	After
Transducer Reading (m):	0.772	
Water (°C):	0.1	
Battery (Main):	14.1	
Datalogger Clock:	10:50	
Laptop Clock:	10:51	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.207	100.207		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:			1.714	98.493	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.170	95.037		
Water Level:			5.175	95.032		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.200	99.999	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:	1.706	100.199		98.493	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.163	95.036		
Water Level:			5.170	95.029		
Other:						
Closing Error	0.001				Average WL	95.031
WL Check	0.003				Transducer Elevation	94.259

## General Notes:

Field Personnel:	SM, GB	Trip Date:	18-Jan-12
Data Entry Personnel:	DW	Date:	2-Mar-12
Data Check Personnel:	CJ	Date:	2-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date:

February 9, 2012



## 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)	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	3.70	3.20	0.55	0.066	0.066	1.76	0.117	0%
1	6.90	2.60	0.40		0.250	0.280	1.0	3.70	7.90	4.20	2.20	0.265	0.265	9.24	2.449	1%
2	8.90	2.20	0.53		0.150	0.180	1.0	7.90	9.15	1.25	1.67	0.165	0.165	2.09	0.344	0%
3	9.40	2.70	0.40		0.350	0.360	1.0	9.15	10.70	1.55	2.30	0.355	0.355	3.57	1.266	1%
4	12.00	2.90	0.40		0.450	0.540	1.0	10.70	13.60	2.90	2.50	0.495	0.495	7.25	3.589	2%
5	15.20	3.00	0.30		0.480	0.490	1.0	13.60	17.10	3.50	2.70	0.485	0.485	9.45	4.583	3%
6	19.00	3.15	0.40		0.510	0.540	1.0	17.10	22.00	4.90	2.75	0.525	0.525	13.48	7.074	4%
7	25.00	2.90	0.40		0.660	0.650	1.0	22.00	27.45	5.45	2.50	0.655	0.655	13.63	8.924	5%
8	29.90	3.20	0.41		0.370	0.570	1.0	27.45	32.65	5.20	2.79	0.470	0.470	14.51	6.819	4%
9	35.40	3.10	0.42		0.450	0.650	1.0	32.65	41.05	8.40	2.68	0.550	0.550	22.51	12.382	7%
10	46.70	3.10	0.45		0.510	0.640	1.0	41.05	53.65	12.60	2.65	0.575	0.575	33.39	19.199	11%
11	60.60	3.10	0.50		0.520	0.530	1.0	53.65	69.25	15.60	2.60	0.525	0.525	40.56	21.294	12%
12	77.90	3.30	0.50		0.480	0.440	1.0	69.25	83.85	14.60	2.80	0.460	0.460	40.88	18.805	11%
13	89.80	3.50	0.45		0.410	0.000	1.0	83.85	97.10	13.25	3.05	0.205	0.205	40.41	8.285	5%
14	104.40	3.70	0.45		0.350	0.310	1.0	97.10	110.90	13.80	3.25	0.330	0.330	44.85	14.801	8%
15	117.40	3.60	0.40		0.250	0.240	1.0	110.90	125.20	14.30	3.20	0.245	0.245	45.76	11.211	6%
16	133.00	3.45	0.45		0.230	0.290	1.0	125.20	138.95	13.75	3.00	0.260	0.260	41.25	10.725	6%
17	144.90	3.20	0.43		0.190	0.160	1.0	138.95	152.75	13.80	2.77	0.175	0.175	38.23	6.690	4%
18	160.60	2.50	0.45		0.080	0.080	1.0	152.75	167.80	15.05	2.05	0.080	0.080	30.85	2.468	1%
19	175.00	1.90	0.45		0.050	0.020	1.0	167.80	182.90	15.10	1.45	0.035	0.035	21.90	0.766	0%
20	190.80	1.10	0.45	0.010				182.90	200.55	17.65	0.65	0.010	0.010	11.47	0.000	0%
21	210.30	0.55	0.45	0.000			1.0	200.55	230.45	29.90	0.10	0.000	0.000	2.99	0.000	0%
22	250.60	0.50	0.40	0.010			0.9	230.45	277.40	46.95	0.10	0.010	0.009	4.70	0.042	0%
23	304.20	0.85	0.51	0.250			0.9	277.40	321.40	44.00	0.34	0.250	0.225	14.96	3.366	2%
24	338.60	1.20	0.45		0.310	0.390		321.40	354.75	33.35	0.75	0.350	0.000	25.01	0.000	0%
25	370.90	1.30	0.45		0.310	0.340	1.0	354.75	384.50	29.75	0.85	0.325	0.325	25.29	8.218	5%
26	398.10	1.30	0.55		0.120	0.150	1.0	384.50	399.00	14.50	0.75	0.135	0.135	10.88	1.468	1%
LB	399.90	0.00	0.00	0.000	0.000	0.000	1.0	399.00	399.90	0.90	0.19	0.034	0.034	0.17	0.006	0%
<b>Total Flow</b>															<b>175</b>	

## Measurement Details:

Start Time (MST):	9:30
End Time (MST):	12:30
Equipment:	MARSH
Method:	Ice
River Condition:	ice covered
Quality/Error (see reverse):	Good
Weather:	clear, calm -25

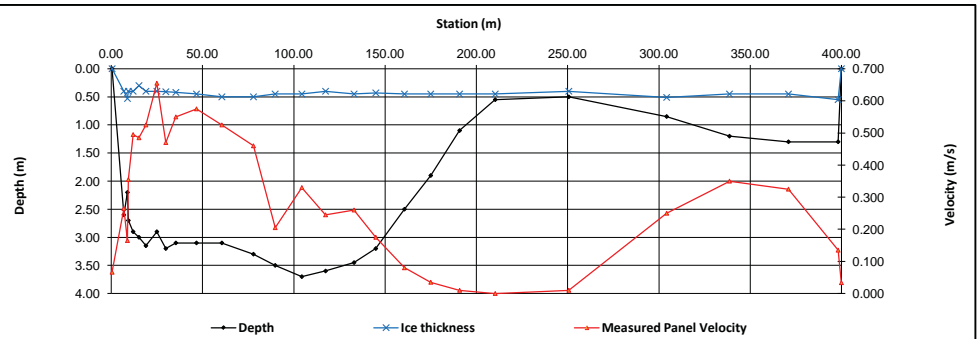
## Flow characteristics:

Total Flow:	175	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	571.01	(m <sup>2</sup> )
Wetted Width:	399.40	(m)
Hydraulic Depth:	1.430	(m)
Mean Velocity:	0.306	(m/s)
Froude Number:	0.082	

## Datalogger Details:

	Before	After
Transducer Reading (m):	0.662	
Water (°C):	0.1	
Battery (Main):	14.7	
Datalogger Clock:	9:43	
Laptop Clock:	9:43	
Dessicant:	good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.033	101.033		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:			2.528	98.505	98.508	3/4" Pipe on Lower Bench
Ice/PT:			6.135	94.898		
Water Level:			6.135	94.898		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.025	100.002	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:	2.522	101.027		98.505	98.508	3/4" Pipe on Lower Bench
Ice/PT:			6.130	94.897		
Water Level:			6.130	94.897		
Other:						

Closing Error	-0.002	Average WL	94.898
WL Check	0.001	Transducer Elevation	94.236

## General Notes:

-Water flowing out of hole during WL survey

<b>Field Personnel:</b>	SM & TR	<b>Trip Date:</b>	9-Feb-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	20-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date:

March 2, 2012



## Flow Measurement:

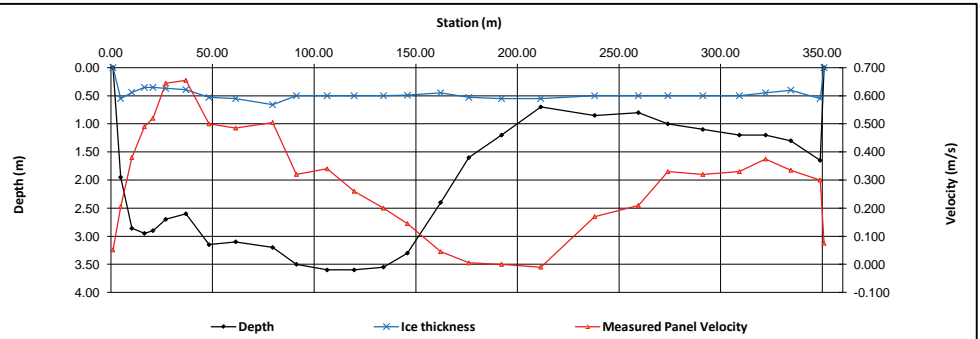
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	2.90	1.90	0.35	0.051	0.051	0.67	0.034	0%
1	4.80	1.95	0.55	0.190	0.220	0.190	1.0	2.90	7.55	4.65	1.40	0.205	0.205	6.51	1.335	1%
2	10.30	2.86	0.44	0.380	0.380	0.380	1.0	7.55	13.40	5.85	2.42	0.380	0.380	14.16	5.380	3%
3	16.50	2.95	0.35	0.470	0.510	0.470	1.0	13.40	18.60	5.20	2.60	0.490	0.490	13.52	6.625	4%
4	20.70	2.90	0.35	0.430	0.610	0.430	1.0	18.60	23.85	5.25	2.55	0.520	0.520	13.39	6.962	4%
5	27.00	2.70	0.37	0.640	0.650	0.640	1.0	23.85	31.95	8.10	2.33	0.645	0.645	18.87	12.173	7%
6	36.90	2.60	0.39	0.650	0.660	0.650	1.0	31.95	42.60	10.65	2.21	0.655	0.655	23.54	15.416	9%
7	48.30	3.15	0.53	0.490	0.510	0.490	1.0	42.60	54.85	12.25	2.62	0.500	0.500	32.10	16.048	9%
8	61.40	3.10	0.55	0.480	0.490	0.480	1.0	54.85	70.50	15.65	2.55	0.485	0.485	39.91	19.355	11%
9	79.60	3.20	0.66	0.530	0.480	0.530	1.0	70.50	85.45	14.95	2.54	0.505	0.505	37.97	19.176	11%
10	91.30	3.50	0.50	0.350	0.290	0.350	1.0	85.45	98.85	13.40	3.00	0.320	0.320	40.20	12.864	7%
11	106.40	3.60	0.50	0.380	0.300	0.380	1.0	98.85	113.05	14.20	3.10	0.340	0.340	44.02	14.967	8%
12	119.70	3.60	0.50	0.280	0.240	0.280	1.0	113.05	126.90	13.85	3.10	0.260	0.260	42.94	11.163	6%
13	134.10	3.55	0.50	0.220	0.180	0.220	1.0	126.90	140.00	13.10	3.05	0.200	0.200	39.96	7.991	4%
14	145.90	3.30	0.49	0.130	0.160	0.130	1.0	140.00	154.05	14.05	2.81	0.145	0.145	39.48	5.725	3%
15	162.20	2.40	0.45	0.060	0.030	0.060	1.0	154.05	169.15	15.10	1.95	0.045	0.045	29.44	1.325	1%
16	176.10	1.60	0.53	0.010	0.000	0.010	1.0	169.15	184.15	15.00	1.07	0.005	0.005	16.05	0.080	0%
17	192.20	1.20	0.55	0.000	0.000	0.000	1.0	184.15	201.85	17.70	0.65	0.000	0.000	11.51	0.000	0%
18	211.50	0.70	0.55	-0.010	0.000	-0.010	0.9	201.85	224.75	22.90	0.15	-0.010	-0.009	3.44	-0.031	0%
19	238.00	0.85	0.50	0.170	0.000	0.170	0.9	224.75	248.75	24.00	0.35	0.153	0.153	8.40	1.285	1%
20	259.50	0.80	0.50	0.210	0.000	0.210	0.9	248.75	266.75	18.00	0.30	0.210	0.189	5.40	1.021	1%
21	274.00	1.00	0.50	0.330	0.000	0.330	0.9	266.75	282.60	15.85	0.50	0.330	0.297	7.93	2.354	1%
22	291.20	1.10	0.50	0.320	0.000	0.320	0.9	282.60	300.20	17.60	0.60	0.320	0.288	10.56	3.041	2%
23	309.20	1.20	0.50	0.330	0.000	0.330	0.9	300.20	315.65	15.45	0.70	0.330	0.297	10.82	3.212	2%
24	322.10	1.20	0.45	0.360	0.390	0.360	1.0	315.65	328.30	12.65	0.75	0.375	0.375	9.49	3.558	2%
25	334.50	1.30	0.40	0.320	0.350	0.320	1.0	328.30	341.70	13.40	0.90	0.335	0.335	12.06	4.040	2%
26	348.90	1.65	0.55	0.300	0.300	0.300	1.0	341.70	349.85	8.15	1.10	0.300	0.300	8.97	2.690	2%
LB	350.80	0.00	0.00	0.000	0.000	0.000	1.0	349.85	350.80	0.95	0.28	0.075	0.075	0.26	0.020	0%
<b>Total Flow</b>															<b>178</b>	

Measurement Details:	
Start Time (MST):	10:25
End Time (MST):	14:00
Equipment:	Marsh McBirney
Method:	Ice
River Condition:	Complete Ice cover
Quality/Error (see reverse):	Good
Weather:	Clear, Calm -11°

Flow characteristics:	
Total Flow:	178 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	541.52 (m <sup>2</sup> )
Wetted Width:	349.80 (m)
Hydraulic Depth:	1.548 (m)
Mean Velocity:	0.329 (m/s)
Froude Number:	0.084

Datalogger Details:		
	Before	After
Transducer Reading (m):	0.626	
Water (°C):	0.1	
Battery (Main):	14.7	
Datalogger Clock:	10:27	
Laptop Clock:	10:26	
Dessicant:	good	
Logger# (if Δ):	21256	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.037	101.037		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:			2.535	98.502	98.508	3/4" Pipe on Lower Bench
Ice/PT:			6.150	94.887		
Water Level:			6.150	94.887		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.026	100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:	2.524	101.026		98.502	98.508	3/4" Pipe on Lower Bench
Ice/PT:			6.135	94.891		
Water Level:			6.135	94.891		
Other:						

Closing Error	0.000	Average WL	94.889
WL Check	0.004	Transducer Elevation	94.263

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Mar-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	29-Mar-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date:

March 30, 2012



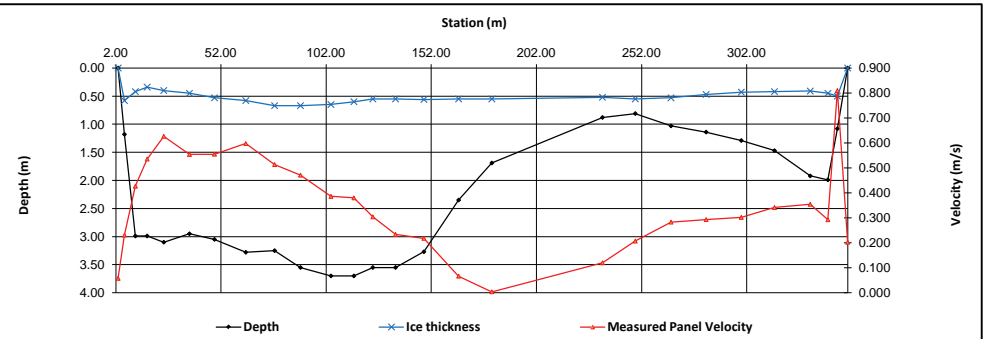
Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	3.10	0.00	0.00	0.000	0.000	0.000	0.9	3.10	4.60	1.50	0.15	0.058	0.052	0.23	0.012	0%
1	6.10	1.18	0.58	0.231			0.9	4.60	8.70	4.10	0.60	0.231	0.208	2.46	0.511	0%
2	11.30	2.99	0.42		0.422	0.432	1.0	8.70	14.10	5.40	2.57	0.427	0.427	13.88	5.926	3%
3	16.90	2.99	0.34		0.478	0.593	1.0	14.10	20.85	6.75	2.85	0.536	0.536	17.89	9.579	5%
4	24.80	3.10	0.40		0.563	0.690	1.0	20.85	30.90	10.05	2.70	0.627	0.627	27.14	17.000	8%
5	37.00	2.95	0.45		0.504	0.604	1.0	30.90	42.95	12.05	2.50	0.554	0.554	30.13	16.889	8%
6	48.90	3.05	0.53		0.536	0.574	1.0	42.95	56.35	13.40	2.52	0.555	0.555	33.77	18.741	9%
7	63.80	3.28	0.58		0.590	0.605	1.0	56.35	70.65	14.30	2.70	0.598	0.598	38.61	23.069	11%
8	77.50	3.25	0.67		0.510	0.517	1.0	70.65	83.65	13.00	2.58	0.514	0.514	33.54	17.223	8%
9	89.80	3.55	0.67		0.449	0.493	1.0	83.65	97.05	13.40	2.88	0.471	0.471	38.59	18.177	9%
10	104.30	3.70	0.65		0.354	0.418	1.0	97.05	109.75	12.70	3.05	0.386	0.386	38.74	14.952	7%
11	115.20	3.70	0.60		0.366	0.394	1.0	109.75	119.70	9.95	3.10	0.380	0.380	30.85	11.721	6%
12	124.20	3.55	0.55		0.279	0.329	1.0	119.70	129.60	9.90	3.00	0.304	0.304	29.70	9.029	4%
13	135.00	3.55	0.55		0.216	0.251	1.0	129.60	141.75	12.15	3.00	0.234	0.234	36.45	8.511	4%
14	148.50	3.27	0.56		0.226	0.210	1.0	141.75	156.75	15.00	2.71	0.218	0.218	40.65	8.862	4%
15	165.00	2.35	0.55		0.080	0.053	1.0	156.75	172.90	16.15	1.80	0.067	0.067	29.07	1.933	1%
16	180.80	1.69	0.55		0.006	0.002	1.0	172.90	207.10	34.20	1.14	0.004	0.004	38.99	0.156	0%
18	233.40	0.88	0.52	0.120			0.9	207.10	241.20	34.10	0.36	0.120	0.108	12.28	1.326	1%
19	249.00	0.81	0.55	0.207			0.9	241.20	257.50	16.30	0.26	0.207	0.186	4.24	0.790	0%
20	266.00	1.03	0.53	0.283			0.9	257.50	274.35	16.85	0.50	0.283	0.255	8.43	2.146	1%
21	282.70	1.14	0.47	0.293			0.9	274.35	291.05	16.70	0.67	0.293	0.264	11.19	2.951	1%
22	299.40	1.29	0.43		0.266	0.338	1.0	291.05	307.30	16.25	0.86	0.302	0.302	13.98	4.220	2%
23	315.20	1.47	0.42		0.327	0.356	1.0	307.30	323.70	16.40	1.05	0.342	0.342	17.22	5.881	3%
24	332.20	1.92	0.41		0.354	0.355	1.0	323.70	336.40	12.70	1.51	0.355	0.355	19.18	6.798	3%
25	340.60	1.99	0.45		0.276	0.309	1.0	336.40	342.85	6.45	1.54	0.293	0.293	9.93	2.905	1%
26	345.10	1.08	0.50	0.810			0.9	342.85	347.55	4.70	0.58	0.810	0.729	2.73	1.987	1%
LB	350.00	0.00	0.00	0.000	0.000	0.000	1.0	347.55	350.00	2.45	0.15	0.203	0.203	0.36	0.072	0%
<b>Total Flow</b>															<b>211</b>	

<b>Measurement Details:</b>	
Start Time (MST):	8:30
End Time (MST):	11:21
Equipment:	ADV
Method:	ICE
River Condition:	Ice degrading
Quality/Error (see reverse):	good
Weather:	cloudy, +4

<b>Flow characteristics:</b>	
Total Flow:	211 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	580.17 (m <sup>2</sup> )
Wetted Width:	346.90 (m)
Hydraulic Depth:	1.672 (m)
Mean Velocity:	0.364 (m/s)
Froude Number:	0.090

<b>Datalogger Details:</b>		
Transducer Reading (m):	Before	After
Water (°C):	0.735	
Battery (Main):	0.1	
Datalogger Clock:	13.9	
Laptop Clock:	7:46	
Dessicant:	7:46	
Logger# (if Δ):	replaced	
PT# (if Δ):	-	
	-	

**Datalogger / Station Notes:**



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.551	100.551		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:			2.043	98.508	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.619	94.932		
Water Level:			5.538	95.013		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.544	100.001	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:						
Bench Mark 3:	2.037	100.545		98.508	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.613	94.932		
Water Level:			5.533	95.012		
Other:						
Closing Error		-0.001		Average WL	95.013	
WL Check		0.001		Transducer Elevation	94.278	

**General Notes:**

- lots of slush and water on ice surface near right bank.
- ice condition thinning, approximately 4" slush ice.
- frozen to depth in 4 holes around 200m offset.

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	30-Mar-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	10-Apr-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	23-Apr-12



# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date:

June 21, 2012



## 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	5.00	0.00	0.00	0.000	0.000	0.000	1.0	5.00	6.50	1.50	1.24	0.236	0.236	1.86	0.439	0%
1	8.00	4.96		0.800	1.090		1.0	6.50	16.00	9.50	4.96	0.945	0.945	47.12	44.528	2%
2	24.00	6.54		0.850	1.310		1.0	16.00	34.50	18.50	6.54	1.080	1.080	120.99	130.669	7%
3	45.00	6.26		0.980	1.460		1.0	34.50	55.50	21.00	6.26	1.220	1.220	131.46	160.381	8%
4	66.00	6.03		1.090	1.630		1.0	55.50	74.50	19.00	6.03	1.360	1.360	114.57	155.815	8%
5	83.00	5.87		0.940	1.500		1.0	74.50	94.00	19.50	5.87	1.220	1.220	114.47	139.647	7%
6	105.00	5.51		0.920	1.480		1.0	94.00	114.00	20.00	5.51	1.200	1.200	110.20	132.240	7%
7	123.00	5.19		0.820	1.370		1.0	114.00	134.00	20.00	5.19	1.095	1.095	103.80	113.661	6%
8	145.00	4.87		0.730	1.190		1.0	134.00	155.50	21.50	4.87	0.960	0.960	104.71	100.517	5%
9	166.00	4.63		0.780	1.240		1.0	155.50	175.50	20.00	4.63	1.010	1.010	92.60	93.526	5%
10	185.00	3.80		0.780	1.130		1.0	175.50	195.50	20.00	3.80	0.955	0.955	76.00	72.580	4%
11	206.00	3.29		0.860	1.130		1.0	195.50	216.50	21.00	3.29	0.995	0.995	69.09	68.745	4%
12	227.00	3.30		0.840	1.170		1.0	216.50	237.00	20.50	3.30	1.005	1.005	67.65	67.988	4%
13	247.00	3.29		0.820	1.150		1.0	237.00	257.50	20.50	3.29	0.985	0.985	67.45	66.433	3%
14	268.00	3.44		0.710	1.150		1.0	257.50	276.00	18.50	3.44	0.930	0.930	63.64	59.185	3%
15	284.00	3.96		0.930	1.160		1.0	276.00	294.50	18.50	3.96	1.045	1.045	73.26	76.557	4%
16	305.00	3.67		0.930	1.220		1.0	294.50	315.50	21.00	3.67	1.075	1.075	77.07	82.850	4%
17	326.00	3.51		0.930	1.210		1.0	315.50	335.50	20.00	3.51	1.070	1.070	70.20	75.114	4%
18	345.00	3.37		1.070	1.170		1.0	335.50	355.00	19.50	3.37	1.120	1.120	65.72	73.601	4%
19	365.00	3.61		0.820	1.220		1.0	355.00	375.00	20.00	3.61	1.020	1.020	72.20	73.644	4%
20	385.00	3.78		1.050	1.180		1.0	375.00	395.00	20.00	3.78	1.115	1.115	75.60	84.294	4%
21	405.00	3.68		0.820	1.150		1.0	395.00	406.50	11.50	3.68	0.985	0.985	42.32	41.685	2%
LB	408.00	0.00	0.00	0.000	0.000	0.000	1.0	406.50	408.00	1.50	0.92	0.246	0.246	1.38	0.340	0%
<b>Total Flow</b>															<b>1910</b>	

## Measurement Details:

Start Time (MST):	9:10
End Time (MST):	12:40
Equipment:	ADC
Method:	Boat
River Condition:	High Flow
Quality/Error (see reverse):	Excellent
Weather:	20° clear, calm

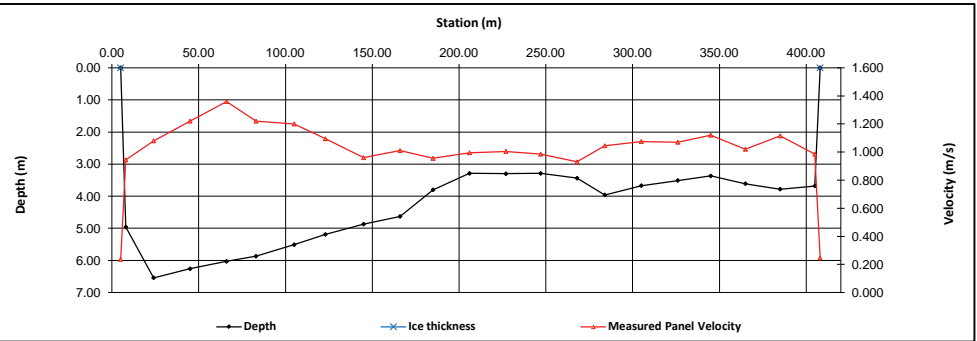
## Flow characteristics:

Total Flow:	1910	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1763.34	(m <sup>2</sup> )
Wetted Width:	403.00	(m)
Hydraulic Depth:	4.376	(m)
Mean Velocity:	1.083	(m/s)
Froude Number:	0.165	

## Logger Details:

	Before	After
Transducer Reading (m):	3.514	
Water (°C):	16.1	
Battery (Main):	13.93	
Datalogger Clock:	9:15	
Laptop Clock:	9:16	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.847	100.847		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.076	99.771	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.338	98.509	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			3.196	97.651		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.837	100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.066	99.771	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:	2.328	100.837		98.509	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			3.190	97.647		
Other:						
Closing Error	0.000				Average WL	97.649
WL Check	0.004				Transducer Elevation	94.135

## General Notes:

Field Personnel:	GB, SM	Trip Date:	21-Jun-12
Data Entry Personnel:	SG	Date:	28-Jun-12
Data Check Personnel:	SM	Date:	13-Dec-12

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date:

August 6, 2012



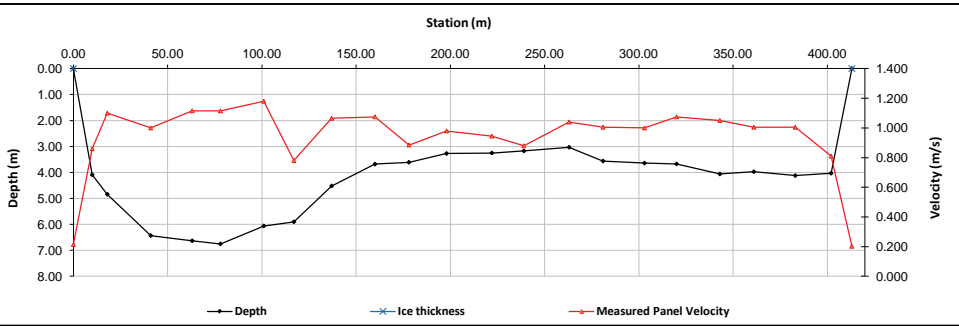
Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	5.00	5.00	1.02	0.215	0.215	5.11	1.099	0%					
1	10.00	4.09		0.660	1.060		1.0	5.00	14.00	9.00	4.09	0.860	0.860	36.81	31.657	2%					
2	18.00	4.84		1.010	1.190		1.0	14.00	29.50	15.50	4.84	1.100	1.100	75.02	82.522	5%					
3	41.00	6.43		0.740	1.260		1.0	29.50	52.00	22.50	6.43	1.000	1.000	144.68	144.675	8%					
4	63.00	6.63		0.800	1.430		1.0	52.00	70.50	18.50	6.63	1.115	1.115	122.66	136.760	8%					
5	78.00	6.75		0.810	1.420		1.0	70.50	89.50	19.00	6.75	1.115	1.115	128.25	142.999	8%					
6	101.00	6.06		1.020	1.340		1.0	89.50	109.00	19.50	6.06	1.180	1.180	118.17	139.441	8%					
7	117.00	5.90		0.610	0.950		1.0	109.00	127.00	18.00	5.90	0.780	0.780	106.20	82.836	5%					
8	137.00	4.52		0.860	1.270		1.0	127.00	148.50	21.50	4.52	1.065	1.065	97.18	103.497	6%					
9	160.00	3.68		0.910	1.240		1.0	148.50	169.00	20.50	3.68	1.075	1.075	75.44	81.098	5%					
10	178.00	3.61		0.700	1.070		1.0	169.00	188.00	19.00	3.61	0.885	0.885	68.59	60.702	3%					
11	198.00	3.27		0.900	1.060		1.0	188.00	210.00	22.00	3.27	0.980	0.980	71.94	70.501	4%					
12	222.00	3.25		0.780	1.110		1.0	210.00	230.50	20.50	3.25	0.945	0.945	66.63	62.961	4%					
13	239.00	3.17		0.720	1.040		1.0	230.50	251.00	20.50	3.17	0.880	0.880	64.99	57.187	3%					
14	263.00	3.03		0.950	1.130		1.0	251.00	272.00	21.00	3.03	1.040	1.040	63.63	66.175	4%					
15	281.00	3.56		0.790	1.220		1.0	272.00	292.00	20.00	3.56	1.005	1.005	71.20	71.556	4%					
16	303.00	3.64		0.850	1.150		1.0	292.00	311.50	19.50	3.64	1.000	1.000	70.98	70.980	4%					
17	320.00	3.67		0.950	1.200		1.0	311.50	331.50	20.00	3.67	1.075	1.075	73.40	78.905	4%					
18	343.00	4.06		0.830	1.270		1.0	331.50	352.00	20.50	4.06	1.050	1.050	83.23	87.392	5%					
19	361.00	3.97		0.910	1.100		1.0	352.00	372.00	20.00	3.97	1.005	1.005	79.40	79.797	4%					
20	383.00	4.12		0.850	1.160		1.0	372.00	392.50	20.50	4.12	1.005	1.005	84.46	84.882	5%					
21	402.00	4.03		0.740	0.880		1.0	392.50	407.50	15.00	4.03	0.810	0.810	60.45	48.965	3%					
LB	413.00	0.00	0.00	0.00	0.00	0.00	1.0	407.50	413.00	5.50	1.01	0.203	0.203	5.54	1.122	0%					
<b>Total Flow</b>															<b>1790</b>						

Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	17:00
Equipment:	ADC
Method:	Boat
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	clear, calm, 22

Flow characteristics:	
Total Flow:	1790 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	1773.94 (m <sup>2</sup> )
Wetted Width:	413.00 (m)
Hydraulic Depth:	4.295 (m)
Mean Velocity:	1.009 (m/s)
Froude Number:	0.156

Logger Details:		
	Before	After
Transducer Reading (m):	3.576	-
Water (°C):	19.5	-
Battery (Main):	13.9	-
Datalogger Clock:	10:05	-
Laptop Clock:	10:05	-
Dessiccant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	298678

**Datalogger / Station Notes:**  
 -installed 45 m PLS - out of range  
 -s/n: 298678  
 -TSS sampled at right bank



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.917	100.917		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.148	99.769	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.410	98.507	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			3.185	97.732		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.907	100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.138	99.769	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:	2.400	100.907		98.507	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			3.175	97.732		
Other:						
Closing Error	0.000					
WL Check	0.000					
Average WL				97.732		
Transducer Elevation				94.156		

**General Notes:**  
 -installed chain lock for Jon boat.  
 -Jon boat was slung to station by helicopter.  
 -left boat chained up at station.

Field Personnel:		SM, TR	Trip Date:	6-Aug-12
Data Entry Personnel:		CJ	Date:	3-Oct-12
Data Check Personnel:		MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: September 12, 2012



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	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	4.00	4.00	1.12	0.216	0.216	4.46	0.964	0%					
1	8.00	4.46		0.790	0.940		1.0	4.00	14.50	10.50	4.46	0.865	0.865	46.83	40.508	5%					
2	21.00	4.46		1.000	1.150		1.0	14.50	30.00	15.50	4.46	1.075	1.075	69.13	74.315	9%					
3	39.00	4.89		0.960	1.130		1.0	30.00	44.50	14.50	4.89	1.045	1.045	70.91	74.096	9%					
4	50.00	5.01		0.870	1.190		1.0	44.50	55.50	11.00	5.01	1.030	1.030	55.11	56.763	7%					
5	61.00	5.33		0.880	1.190		1.0	55.50	67.00	11.50	5.33	1.035	1.035	61.30	63.440	8%					
6	73.00	5.15		0.860	1.010		1.0	67.00	77.50	10.50	5.15	0.935	0.935	54.08	50.560	6%					
7	82.00	5.07		0.740	0.960		1.0	77.50	92.50	15.00	5.07	0.850	0.850	76.05	64.643	8%					
8	103.00	4.22		0.620	0.740		1.0	92.50	112.00	19.50	4.22	0.680	0.680	82.29	55.957	7%					
9	121.00	3.27		0.530	0.620		1.0	112.00	131.00	19.00	3.27	0.575	0.575	62.13	35.725	4%					
10	141.00	2.22		0.550	0.690		1.0	131.00	151.00	20.00	2.22	0.620	0.620	44.40	27.528	3%					
11	161.00	1.85		0.530	0.590		1.0	151.00	171.50	20.50	1.85	0.560	0.560	37.93	21.238	3%					
12	182.00	1.72		0.500	0.600		1.0	171.50	191.00	19.50	1.72	0.550	0.550	33.54	18.447	2%					
13	200.00	1.65		0.440	0.600		1.0	191.00	211.00	20.00	1.65	0.520	0.520	33.00	17.160	2%					
14	222.00	1.51		0.460	0.730		1.0	211.00	233.00	22.00	1.51	0.595	0.595	33.22	19.766	2%					
15	244.00	1.59		0.650	0.660		1.0	233.00	253.50	20.50	1.59	0.655	0.655	32.60	21.350	3%					
16	263.00	1.58		0.590	0.790		1.0	253.50	272.50	19.00	1.58	0.690	0.690	30.02	20.714	3%					
17	282.00	1.05		0.570	0.760		1.0	272.50	295.00	22.50	1.05	0.665	0.665	23.63	15.711	2%					
18	308.00	1.90		0.590	0.840		1.0	295.00	316.50	21.50	1.90	0.715	0.715	40.85	29.208	4%					
19	325.00	1.90		0.570	0.840		1.0	316.50	334.50	18.00	1.90	0.705	0.705	34.20	24.111	3%					
20	344.00	2.16		0.660	0.730		1.0	334.50	352.50	18.00	2.16	0.695	0.695	38.88	27.022	3%					
21	361.00	2.24		0.670	0.830		1.0	352.50	373.50	21.00	2.24	0.750	0.750	47.04	35.280	4%					
22	386.00	2.56		0.560	0.700		1.0	373.50	390.50	17.00	2.56	0.630	0.630	43.52	27.418	3%					
LB	395.00	0.00	0.00	0.00	0.00	0.00	1.0	390.50	395.00	4.50	0.64	0.158	0.158	2.88	0.454	0%					

**Total Flow 822**

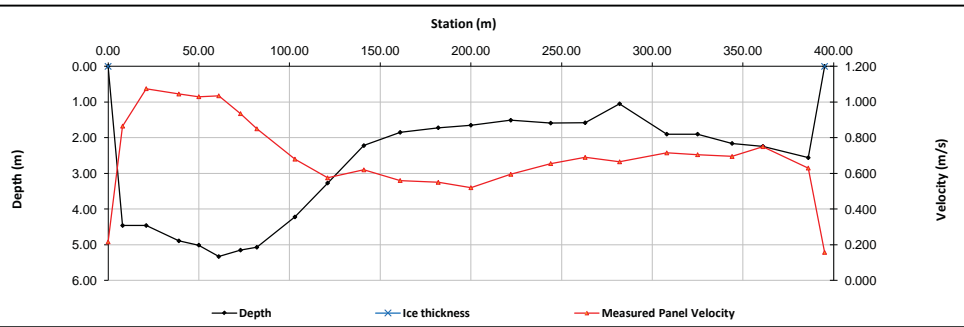
Measurement Details:	
Start Time (MST):	10:00
End Time (MST):	13:50
Equipment:	ADC
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	10 deg. clear, windy

Flow characteristics:	
Total Flow:	822 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	1057.97 (m <sup>2</sup> )
Wetted Width:	395.00 (m)
Hydraulic Depth:	2.678 (m)
Mean Velocity:	0.777 (m/s)
Froude Number:	0.152

Logger Details:		
	Before	After
1. Transducer Reading (m):	1.893	
1. Water (°C):	13.3	
2. Transducer Reading (m):	4.531	
2. Water (°C):	13.4	
Battery (Main):	14.0	
Datalogger Clock:	1:04	
Laptop Clock:	1:04	
Dessicant:	replaced	
Logger# (if Δ):	-	
1. PT# (if Δ):	-	
2. PT# (if Δ):	-	

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>						
Bench Mark 1:	0.545	100.545		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			0.774	99.771	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.037	98.508	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			4.580	95.965		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.562	99.999	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			0.791	99.770	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:	2.053	100.561		98.508	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			4.593	95.968		
Other:						

Closing Error	0.001	Average WL	95.967
WL Check	0.003	Transducer Elevation	94.074

Field Personnel:		SM, DW	Trip Date:	12-Sep-12
Data Entry Personnel:	DW (Field)		Date:	12-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: October 19, 2012



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	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	5.50	5.50	0.39	0.129	0.129	2.13	0.274	0%					
1	11.00	1.55		0.428	0.600		1.0	5.50	15.50	10.00	1.55	0.514	0.514	15.50	7.967	1%					
2	20.00	5.00		0.936	1.089		1.0	15.50	26.00	10.50	5.00	1.013	1.013	52.50	53.156	9%					
3	32.00	5.19		1.076	1.347		1.0	26.00	38.00	12.00	5.19	1.212	1.212	62.28	75.452	13%					
4	44.00	5.00		1.057	1.115		1.0	38.00	50.00	12.00	5.00	1.086	1.086	60.00	65.160	11%					
5	56.00	5.00		0.706	0.818		1.0	50.00	67.00	17.00	5.00	0.762	0.762	85.00	64.770	11%					
6	78.00	4.30		0.563	0.556		1.0	67.00	87.50	20.50	4.30	0.560	0.560	88.15	49.320	9%					
7	97.00	3.90		0.352	0.400		1.0	87.50	106.00	18.50	3.90	0.376	0.376	72.15	27.128	5%					
8	115.00	3.10		0.379	0.398		1.0	106.00	122.00	16.00	3.10	0.389	0.389	49.60	19.270	3%					
9	129.00	2.50			0.088	0.163	1.0	122.00	141.00	19.00	2.50	0.126	0.126	47.50	5.961	1%					
10	153.00	0.75		0.651			1.0	141.00	162.00	21.00	0.75	0.651	0.651	15.75	10.253	2%					
11	171.00	0.65		0.713			1.0	162.00	182.00	20.00	0.65	0.713	0.713	13.00	9.269	2%					
12	193.00	0.70		0.693			1.0	182.00	203.00	21.00	0.70	0.693	0.693	14.70	10.187	2%					
13	213.00	0.70		0.714			1.0	203.00	222.50	19.50	0.70	0.714	0.714	13.65	9.746	2%					
14	232.00	0.80			0.571	0.496	1.0	222.50	243.50	21.00	0.80	0.534	0.534	16.80	8.963	2%					
15	255.00	1.05		0.610	0.549		1.0	243.50	266.00	22.50	1.05	0.580	0.580	23.63	13.691	2%					
16	277.00	1.10		0.599	0.699		1.0	266.00	288.50	22.50	1.10	0.649	0.649	24.75	16.063	3%					
17	300.00	1.25		0.586	0.751		1.0	288.50	308.50	20.00	1.25	0.669	0.669	25.00	16.713	3%					
18	317.00	1.20		0.749	0.718		1.0	308.50	329.50	21.00	1.20	0.734	0.734	25.20	18.484	3%					
19	342.00	1.50		0.689	0.789		1.0	329.50	355.50	26.00	1.50	0.739	0.739	39.00	28.821	5%					
20	369.00	1.90		0.724	0.816		1.0	355.50	373.50	18.00	1.90	0.770	0.770	34.20	26.334	5%					
21	378.00	2.00		0.659	0.836		1.0	373.50	387.50	14.00	2.00	0.748	0.748	28.00	20.930	4%					
22	397.00	2.00		0.512	0.527		1.0	387.50	400.00	12.50	2.00	0.520	0.520	25.00	12.988	2%					
LB	403.00	0.00	0.00	0.00	0.00	0.00	1.0	400.00	403.00	3.00	0.50	0.130	0.130	1.50	0.195	0%					

**Total Flow 571**

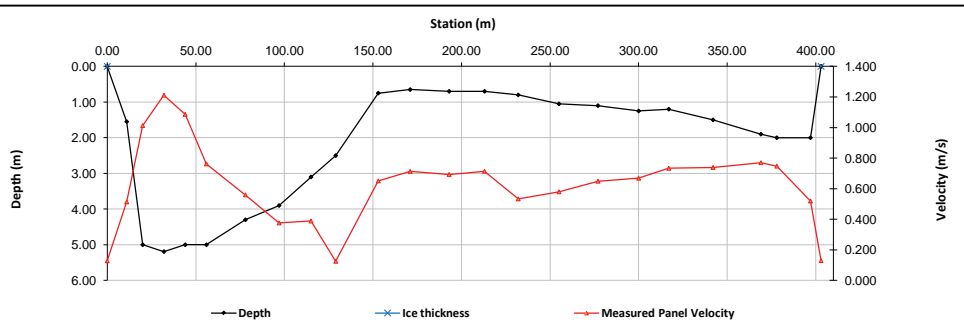
Measurement Details:	
Start Time (MST):	11:43
End Time (MST):	14:20
Equipment:	ADV
Method:	Boat
River Condition:	med flow
Quality/Error (see reverse):	Good
Weather:	4 deg, overcast, calm

Flow characteristics:	
Total Flow:	571 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	834.99 (m <sup>2</sup> )
Wetted Width:	403.00 (m)
Hydraulic Depth:	2.072 (m)
Mean Velocity:	0.684 (m/s)
Froude Number:	0.152

Logger Details:		
	Before	After
1. Transducer Reading (m):	1.270	
1. Water (°C):	4.6	
2. Transducer Reading (m):	5.449	
2. Water (°C):	5.0	
Battery (Main):	14.2	
Datalogger Clock:	13:27	
Laptop Clock:	13:27	
Dessicant:	replaced	
Logger# (if Δ):	-	
1. PT# (if Δ):	-	
2. PT# (if Δ):	304013	

**Datalogger / Station Notes:**  
 installed PLS S/N: 304013  
 BM plates need to be installed

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.772	100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.001	99.771	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:	2.264	100.772		98.508	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			5.440	95.332		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.763	100.763		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			0.990	99.773	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.254	98.509	98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:			5.429	95.334		
Other:						

Closing Error	-0.001	Average WL	95.333
WL Check	0.002	Transducer Elevation	94.063

<b>Field Personnel:</b>	SM, DW	<b>Trip Date:</b>	19-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	19-Oct-12
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	16-Nov-12
<b>Entered Digitally in the Field:</b>	yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta

UTM Location: 470235 E, 6463205 N

Site Visit Date:

December 6, 2012



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																
1																
2																
3																
4																
5																
6																
7																
LB																
No Measurement Conducted																
<b>Total Flow</b> -																

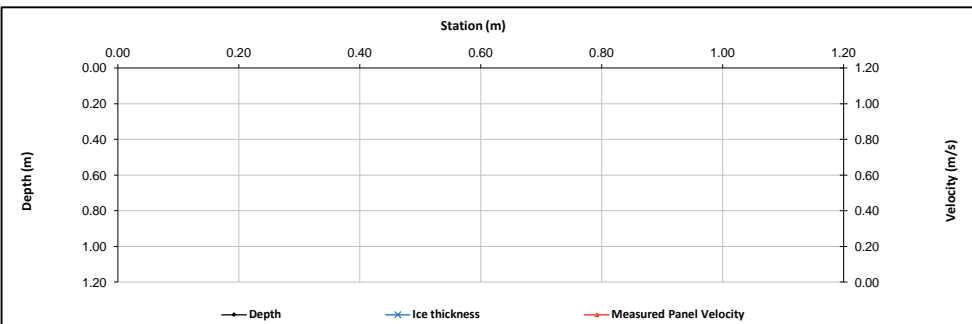
Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	2:40
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	
Weather:	SUNNY, -17C

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
1. Transducer Reading (m):	1.374	
1. Water (°C):	0.1	
2. Transducer Reading (m):	5.562	
2. Water (°C):	1.4	
Battery (Main):	13.1	
Datalogger Clock:	12:44	
Laptop Clock:	12:44	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
1. PT# (if Δ):	-	
2. PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 Changed battery.  
 Tablet could not connect to datalogger via Loggernet  
 Laptop connected and downloaded - no problem.

**General Notes:**  
 - Tag line was moved at 50 m intervals.  
 - Crew could not finish the flow measurement due to time constraints.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.869	100.869		100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:			1.097	99.772	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.360	98.509	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.403	95.466		
Water Level:			5.428	95.441		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.887	100.000	100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:	1.115	100.887		99.772	99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:			2.378	98.509	98.508	3/4" Pipe on Lower Bench
Ice/PT:			5.423	95.464		
Water Level:			5.450	95.437		
Other:						

Closing Error	0.000	Average WL	95.439
WL Check	0.004	Transducer Elevation	94.065

<b>Field Personnel:</b>	DW, CJ	Trip Date:	6-Dec-12
<b>Data Entry Personnel:</b>	DW	Date:	6-Dec-12
<b>Data Check Personnel:</b>	SM	Date:	14-Dec-12
<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:

December 15, 2012



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	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	4.25	2.25	0.71	0.070	0.070	1.60	0.111	0%					
1	6.50	3.26	0.42	0.179	0.377		1.0	4.25	12.25	8.00	2.84	0.278	0.278	22.72	6.316	3%					
2	18.00	3.09	0.47	0.823	0.816		1.0	12.25	27.50	15.25	2.62	0.820	0.820	39.96	32.743	15%					
3	37.00	3.69	0.48	0.709	0.872		1.0	27.50	46.00	18.50	3.21	0.791	0.791	59.39	46.944	22%					
4	55.00	3.97	0.50	0.581	0.630		1.0	46.00	63.00	17.00	3.47	0.606	0.606	58.99	35.718	17%					
5	71.00	4.41	0.52	0.175	0.375		1.0	63.00	81.00	18.00	3.89	0.275	0.275	70.02	19.256	9%					
6	91.00	4.19	0.56	0.290	0.278		1.0	81.00	99.50	18.50	3.63	0.284	0.284	67.16	19.072	9%					
7	108.00	3.24	0.50	0.049	0.083		1.0	99.50	115.50	16.00	2.74	0.066	0.066	43.84	2.893	1%					
8	123.00	4.27	0.50	0.026	0.009		1.0	115.50	132.50	17.00	3.77	0.018	0.018	64.09	1.122	1%					
9	142.00	0.95	0.31				0.9	132.50	150.50	18.00	0.64	0.142	0.128	11.52	1.472	1%					
10	159.00	0.99	0.40	-0.032			0.9	150.50	168.00	17.50	0.59	-0.032	-0.029	10.33	-0.297	0%					
11	177.00	1.25	0.43		0.011	-0.017	1.0	168.00	187.00	19.00	0.82	-0.003	-0.003	15.58	-0.047	0%					
12	197.00	1.14	0.48	0.037			0.9	187.00	200.50	13.50	0.66	0.037	0.033	8.91	0.297	0%					
13	204.00	0.98	0.51	0.029			0.9	200.50	218.50	18.00	0.48	0.029	0.026	8.64	0.226	0%					
14	233.00	1.12	0.48	0.147			0.9	218.50	242.50	24.00	0.64	0.147	0.132	15.36	2.032	1%					
15	252.00	1.17	0.49	0.189			0.9	242.50	261.00	18.50	0.68	0.189	0.170	12.58	2.140	1%					
16	270.00	1.10	0.40		0.135	0.268	1.0	261.00	278.00	17.00	0.70	0.202	0.202	11.90	2.998	1%					
17	286.00	1.27	0.50		0.157	0.255	1.0	278.00	296.00	18.00	0.77	0.206	0.206	13.86	2.855	1%					
18	306.00	1.59	0.47		0.231	0.357	1.0	296.00	316.00	20.00	1.12	0.294	0.294	22.40	6.586	3%					
19	326.00	1.61	0.40		0.202	0.376	1.0	316.00	334.50	18.50	1.21	0.289	0.289	22.39	6.469	3%					
20	343.00	1.58	0.40		0.324	0.388	1.0	334.50	351.50	17.00	1.18	0.356	0.356	20.06	7.141	3%					
21	360.00	1.87	0.38		0.294	0.417	1.0	351.50	368.00	16.50	1.49	0.356	0.356	24.59	8.740	4%					
22	376.00	2.19	0.50		0.378	0.443	1.0	368.00	382.00	14.00	1.69	0.411	0.411	23.66	9.712	5%					
LB	388.00	0.00	0.00	0.00	0.00	0.00	1.0	382.00	388.00	6.00	0.42	0.103	0.103	2.54	0.260	0%					

**Total Flow 214**

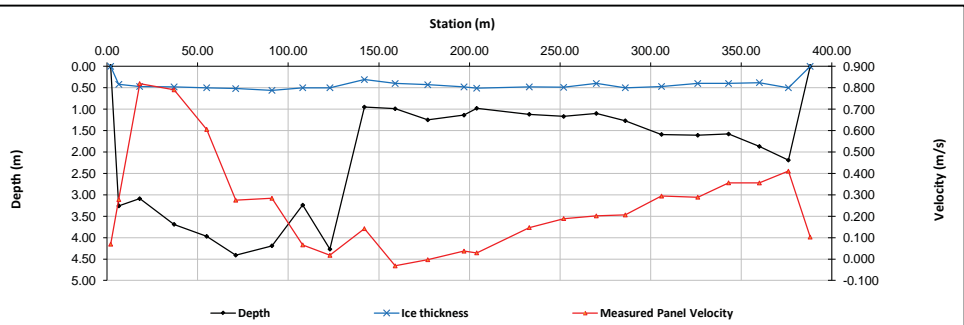
Measurement Details:	
Start Time (MST):	12:03
End Time (MST):	13:40
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	clear, -10

Flow Characteristics:	
Total Flow:	214 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	652.05 (m <sup>2</sup> )
Wetted Width:	386.00 (m)
Hydraulic Depth:	1.689 (m)
Mean Velocity:	0.328 (m/s)
Froude Number:	0.081

Logger Details:	Before	After
1. Transducer Reading (m):	-	-
1. Water (°C):	-	-
2. Transducer Reading (m):	-	-
2. Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
1. P1# (if Δ):	-	-
2. P1# (if Δ):	-	-

Datalogger / Station Notes:

General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:					100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:					99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:					98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:					100.000	3/4" Pipe 2 m S of logger
Bench Mark 2:					99.771	3/4" Pipe 6 m S of logger
Bench Mark 3:					98.508	3/4" Pipe on Lower Bench
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

Field Personnel:	SM, TR	Trip Date:	15-Dec-12
Data Entry Personnel:	SM	Date:	15-Dec-12
Data Check Personnel:	SM	Date:	25-Jan-13
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

January 19, 2012



## 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	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	3.90	3.90	0.02	0.000	0.000	0.07	0.000	0%
1	7.80	0.57	0.50	0.000			1.0	3.90	8.80	4.90	0.07	0.000	0.000	0.34	0.000	0%
2	9.80	0.62	0.50	0.040			1.0	8.80	10.80	2.00	0.12	0.040	0.040	0.24	0.010	0%
3	11.80	0.65	0.51	0.070			1.0	10.80	13.05	2.25	0.14	0.070	0.070	0.32	0.022	0%
4	14.30	0.70	0.50	0.130			1.0	13.05	15.30	2.25	0.20	0.130	0.130	0.45	0.059	1%
5	16.30	0.85	0.43	0.220			1.0	15.30	17.65	2.35	0.42	0.220	0.220	0.99	0.217	2%
6	19.00	0.85	0.47	0.260			1.0	17.65	20.50	2.85	0.38	0.260	0.260	1.08	0.282	3%
7	22.00	0.95	0.45	0.310			1.0	20.50	23.25	2.75	0.50	0.310	0.310	1.38	0.426	4%
8	24.50	1.02	0.45	0.340			1.0	23.25	25.60	2.35	0.57	0.340	0.340	1.34	0.455	4%
9	26.70	1.05	0.45	0.440			1.0	25.60	27.75	2.15	0.60	0.440	0.440	1.29	0.568	5%
10	28.80	1.10	0.43	0.400			1.0	27.75	30.05	2.30	0.67	0.400	0.400	1.54	0.616	6%
11	31.30	1.15	0.50	0.430			1.0	30.05	32.65	2.60	0.65	0.430	0.430	1.69	0.727	7%
12	34.00	1.15	0.35		0.550	0.660	1.0	32.65	35.25	2.60	0.80	0.605	0.605	2.08	1.258	12%
13	36.50	1.25	0.35		0.480	0.590	1.0	35.25	37.85	2.60	0.90	0.535	0.535	2.34	1.252	12%
14	39.20	1.25	0.40		0.200	0.470	1.0	37.85	40.35	2.50	0.85	0.335	0.335	2.13	0.712	7%
15	41.50	1.20	0.40		0.420	0.590	1.0	40.35	42.65	2.30	0.80	0.505	0.505	1.84	0.929	9%
16	43.80	1.15	0.45	0.470			1.0	42.65	44.60	1.95	0.70	0.470	0.470	1.37	0.642	6%
17	45.40	1.12	0.40	0.470			1.0	44.60	46.35	1.75	0.72	0.470	0.470	1.26	0.592	6%
18	47.30	1.05	0.40	0.380			1.0	46.35	48.50	2.15	0.65	0.380	0.380	1.40	0.531	5%
19	49.70	1.10	0.45	0.260			1.0	48.50	50.55	2.05	0.65	0.260	0.260	1.33	0.346	3%
20	51.40	1.00	0.45	0.080			1.0	50.55	52.20	1.65	0.55	0.080	0.080	0.91	0.073	1%
21	53.00	0.90	0.45	0.100			1.0	52.20	53.85	1.65	0.45	0.100	0.100	0.74	0.074	1%
22	54.70	0.90	0.41	0.330			1.0	53.85	55.55	1.70	0.49	0.330	0.330	0.83	0.275	3%
23	56.40	0.85	0.37	0.270			1.0	55.55	57.05	1.50	0.48	0.270	0.270	0.72	0.194	2%
24	57.70	0.70	0.40	0.160			1.0	57.05	58.40	1.35	0.30	0.160	0.160	0.41	0.065	1%
25	59.10	0.50	0.35	0.100			1.0	58.40	61.05	2.65	0.15	0.100	0.100	0.40	0.040	0%
LB	63.00	0.00	0.00	0.000	0.000	0.000	1.0	61.05	63.00	1.95	0.04	0.025	0.025	0.07	0.002	1%
<b>Total Flow</b>															<b>10.4</b>	

## Measurement Details:

Start Time (MST):	15:00
End Time (MST):	16:10
Equipment:	Marsh
Method:	Ice
River Condition:	Ice cover
Quality/Error (see reverse):	Good
Weather:	clear, calm, -18 deg.

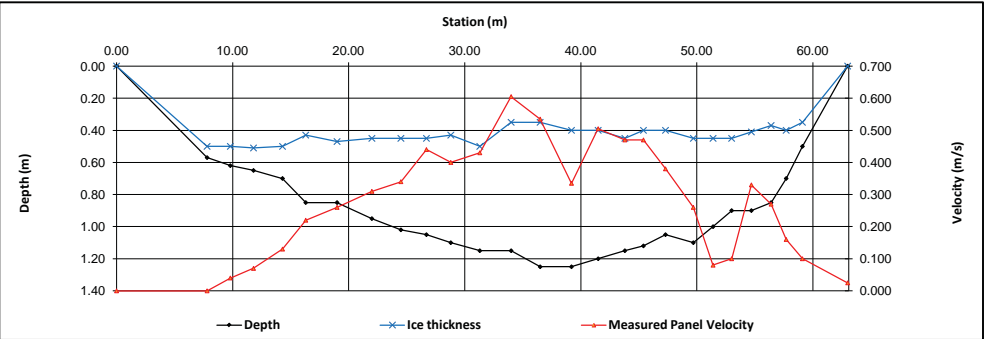
## Flow characteristics:

Total Flow:	10.4	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	28.54	(m <sup>2</sup> )
Wetted Width:	63.00	(m)
Hydraulic Depth:	0.453	(m)
Mean Velocity:	0.364	(m/s)
Froude Number:	0.173	

## Datalogger Details:

	Before	After
Transducer Reading (m):		0.537
Water (°C):	0.0	
Battery (Main):	14.8	
Datalogger Clock:	15:47	
Laptop Clock:	15:46	
Dessicant:	replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.338	100.160	100.159	Nail in logger tree
Bench Mark 2:	0.498	100.498		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.785	96.713		
Water Level:			3.868	96.630		
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.159	Nail in logger tree
Bench Mark 2:	0.486	100.486		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.773	96.713		
Water Level:			3.858	96.628		
Other:						

Closing Error	0.000	Average WL	96.629
WL Check	0.002	Transducer Elevation	96.092

**General Notes:**

<b>Field Personnel:</b>	SM, GB	<b>Trip Date:</b>	19-Jan-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	13-Feb-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Feb-13

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

February 10, 2012



## 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	4.80	0.00	0.00	0.000	0.000	0.000										
1	7.40	0.80	0.65	0.040			0.9	4.80	6.10	1.30	0.04	0.010	0.009	0.05	0.000	0%
2	9.90	0.84	0.51	0.160			0.9	6.10	8.65	2.55	0.15	0.040	0.036	0.38	0.014	0%
3	12.10	0.92	0.55	0.210			0.9	8.65	11.00	2.35	0.33	0.160	0.144	0.78	0.112	1%
4	15.40	1.00	0.45	0.250			0.9	11.00	13.75	2.75	0.37	0.210	0.189	1.02	0.192	2%
5	18.70	1.05	0.50	0.240			0.9	13.75	17.05	3.30	0.55	0.250	0.225	1.82	0.408	5%
6	22.20	1.10	0.47	0.320			0.9	17.05	19.30	2.25	0.55	0.240	0.216	1.24	0.267	3%
7	24.30	1.15	0.57	0.390			0.9	19.30	21.05	1.75	0.49	0.310	0.279	0.86	0.239	3%
8	27.10	1.25	0.45		0.340	0.460	1.0	21.05	23.25	2.20	0.63	0.320	0.288	1.39	0.399	5%
9	24.30	1.15	0.57	0.390			0.9	23.25	25.70	2.45	0.58	0.390	0.351	1.42	0.499	6%
10	30.30	1.28	0.40		0.210	0.470	1.0	25.70	28.70	3.00	0.80	0.400	0.400	2.40	0.960	12%
11	32.90	1.25	0.45		0.390	0.490	1.0	28.70	31.60	2.90	0.88	0.340	0.340	2.55	0.868	11%
12	35.40	1.25	0.45		0.340	0.490	1.0	31.60	34.15	2.55	0.80	0.440	0.440	2.04	0.898	11%
13	38.10	1.35	0.35		0.300	0.420	1.0	34.15	36.75	2.60	0.80	0.415	0.415	2.08	0.863	11%
14	40.90	0.95	0.45	0.300			0.9	36.75	39.50	2.75	1.00	0.360	0.360	2.75	0.990	13%
15	43.50	0.55	0.45	0.390			0.9	39.50	42.20	2.70	0.50	0.300	0.270	1.35	0.365	5%
16	45.70	0.89	0.45	0.340			0.9	42.20	44.60	2.40	0.10	0.390	0.351	0.24	0.084	1%
17	48.50	0.80	0.40	0.280			0.9	44.60	47.10	2.50	0.44	0.340	0.306	1.10	0.337	4%
18	50.80	0.60	0.35	0.230			0.9	47.10	49.65	2.55	0.40	0.280	0.252	1.02	0.257	3%
19	53.20	0.45	0.30	0.090			0.9	49.65	52.00	2.35	0.25	0.230	0.207	0.59	0.122	2%
LB	54.40	0.00	0.00	0.000	0.000	0.000	1.0	52.00	53.80	1.80	0.15	0.090	0.081	0.27	0.022	0%
<b>Total Flow</b>															<b>7.90</b>	

## Measurement Details:

Start Time (MST):	13:50
End Time (MST):	17:05
Equipment:	Marsh
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, -15 deg.

## Flow characteristics:

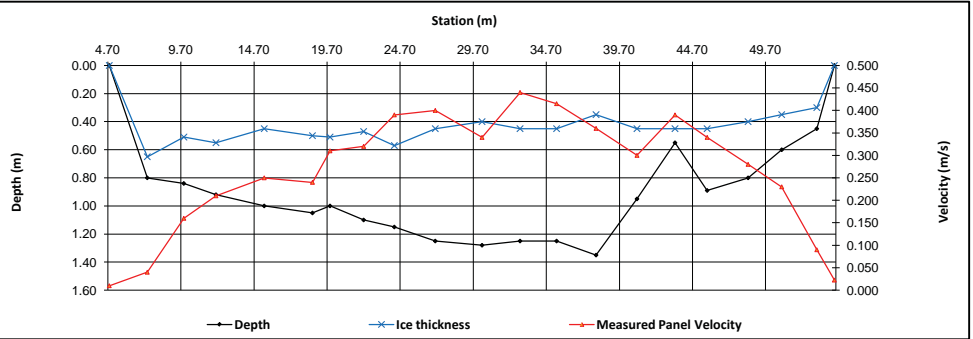
Total Flow:	7.90	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	25.35	(m <sup>2</sup> )
Wetted Width:	49.60	(m)
Hydraulic Depth:	0.511	(m)
Mean Velocity:	0.312	(m/s)
Froude Number:	0.139	

## Datalogger Details:

	Before	After
Transducer Reading (m):	0.773	
Water (°C):	0.0	-
Battery (Main):	14.7	-
Datalogger Clock:	16:31	-
Laptop Clock:	16:30	-
Dessicant:	good	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

PLS may be frozen.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.352	100.511	0.508	100.159	100.159	Nail in logger tree
Bench Mark 2:			0.508	100.003	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.866	96.645		
Water Level:			3.9	96.611		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.342	100.158	100.159	Nail in logger tree
Bench Mark 2:	0.497	100.5		100.003	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.855	96.645		
Water Level:			3.89	96.610		
Other:						

Closing Error	0.001	Average WL	96.611
WL Check	0.001	Transducer Elevation	95.838

## General Notes:

Field Personnel:	SM & TR	Trip Date:	10-Feb-12
Data Entry Personnel:	TR	Date:	20-Mar-12
Data Check Personnel:	CJ	Date:	13-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

February 28, 2012



## Flow Measurement:

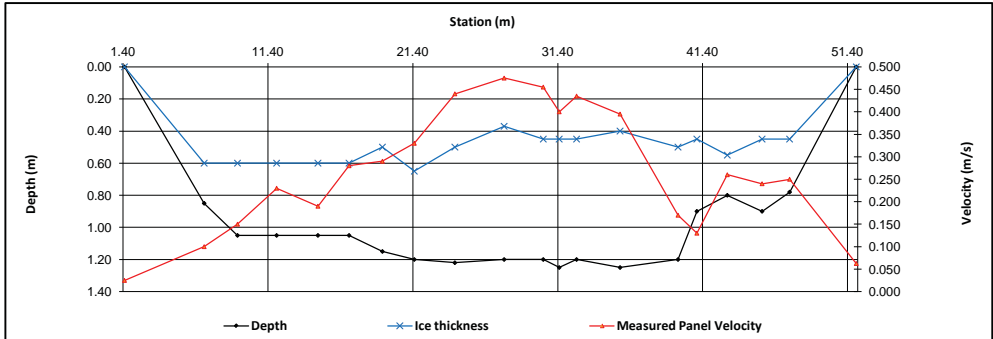
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.50	0.00	0.00	0.000	0.000	0.000	1.0	1.50	4.25	2.75	0.06	0.025	0.025	0.17	0.004	0%
1	7.00	0.85	0.60	0.100			1.0	4.25	8.15	3.90	0.25	0.100	0.100	0.98	0.098	1%
2	9.30	1.05	0.60	0.150			1.0	8.15	10.65	2.50	0.45	0.150	0.150	1.13	0.169	2%
3	12.00	1.05	0.60	0.230			1.0	10.65	13.43	2.78	0.45	0.230	0.230	1.25	0.287	4%
4	14.85	1.05	0.60	0.190			1.0	13.43	15.93	2.50	0.45	0.190	0.190	1.13	0.214	3%
5	17.00	1.05	0.60	0.280			1.0	15.93	18.15	2.23	0.45	0.280	0.280	1.00	0.280	3%
6	19.30	1.15	0.50	0.290			1.0	18.15	20.40	2.25	0.65	0.290	0.290	1.46	0.424	5%
7	21.50	1.20	0.65	0.330			1.0	20.40	22.90	2.50	0.55	0.330	0.330	1.38	0.454	6%
8	24.30	1.22	0.50	0.440			1.0	22.90	26.00	3.10	0.72	0.440	0.440	2.23	0.982	12%
9	27.70	1.20	0.37		0.440	0.510	1.0	26.00	29.05	3.05	0.83	0.475	0.475	2.53	1.202	15%
10	30.40	1.20	0.45		0.410	0.500	1.0	29.05	30.95	1.90	0.75	0.455	0.455	1.43	0.648	8%
11	31.50	1.25	0.45		0.350	0.450	1.0	30.95	32.10	1.15	0.80	0.400	0.400	0.92	0.368	5%
12	32.70	1.20	0.45		0.410	0.460	1.0	32.10	34.20	2.10	0.75	0.435	0.435	1.58	0.685	9%
13	35.70	1.25	0.40		0.360	0.430	1.0	34.20	37.70	3.50	0.85	0.395	0.395	2.98	1.175	15%
14	39.70	1.20	0.50	0.170			1.0	37.70	40.35	2.65	0.70	0.170	0.170	1.86	0.315	4%
15	41.00	0.90	0.45	0.130			1.0	40.35	42.05	1.70	0.45	0.130	0.130	0.76	0.099	1%
16	43.10	0.80	0.55	0.260			1.0	42.05	44.30	2.25	0.25	0.260	0.260	0.56	0.146	2%
17	45.50	0.90	0.45	0.240			1.0	44.30	46.45	2.15	0.45	0.240	0.240	0.97	0.232	3%
18	47.40	0.78	0.45	0.250			1.0	46.45	49.70	3.25	0.33	0.250	0.250	1.07	0.268	3%
LB	52.00	0.00	0.00	0.000	0.000	0.000	1.0	49.70	52.00	2.30	0.08	0.063	0.063	0.19	0.012	0%
<b>Total Flow</b>															<b>8.06</b>	

Measurement Details:	
Start Time (MST):	17:15
End Time (MST):	17:50
Equipment:	Marsh
Method:	Frozen
River Condition:	Low flow, overflow
Quality/Error (see reverse):	Fair
Weather:	clear, light breeze, -2 deg

Flow characteristics:		
Total Flow:	8.06	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	25.56	(m <sup>2</sup> )
Wetted Width:	50.50	(m)
Hydraulic Depth:	0.506	(m)
Mean Velocity:	0.315	(m/s)
Froude Number:	0.142	

Datalogger Details:		
	Before	After
Transducer Reading (m):		NAN
Water (°C):	-0.2	-
Battery (Main):	14.7	-
Datalogger Clock:	8:40	-
Laptop Clock:	8:39	-
Dessicant:	good	-
Logger# (if Δ):	16116	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.391	100.55		100.159	100.159	Nail in logger tree
Bench Mark 2:			0.547	100.003	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.93	96.620		
Water Level:			3.93	96.620		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.379	100.159	100.159	Nail in logger tree
Bench Mark 2:	0.535	100.538		100.003	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.92	96.618		
Water Level:			3.92	96.618		
Other:						

Closing Error	0.000	Average WL	96.619
WL Check	0.002	Transducer Elevation	-

### General Notes:

PT frozen.

Field Personnel:	SM, GB	Trip Date:	28-Feb-12
Data Entry Personnel:	MY	Date:	26-Mar-12
Data Check Personnel:	TR	Date:	14-Feb-13

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

March 29, 2012



## 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
LB	0.30	0.00	0.00	0.000	0.000	0.000	0.9	0.30	1.20	0.90	0.07	0.024	0.021	0.07	0.001	0%
1	2.10	0.82	0.53	0.094			0.9	1.20	3.70	2.50	0.29	0.094	0.085	0.73	0.061	1%
2	5.30	1.00	0.55	0.174			0.9	3.70	7.55	3.85	0.45	0.174	0.157	1.73	0.271	3%
3	9.80	1.35	0.55		0.227	0.227	1.0	7.55	12.60	5.05	0.80	0.227	0.227	4.04	0.917	11%
4	15.40	1.70	0.63		0.169	0.174	1.0	12.60	18.40	5.80	1.07	0.172	0.172	6.21	1.064	13%
5	21.40	1.30	0.63	0.144			0.9	18.40	23.35	4.95	0.67	0.144	0.130	3.32	0.430	5%
6	25.30	1.05	0.55	0.178			0.9	23.35	27.40	4.05	0.50	0.178	0.160	2.03	0.324	4%
7	29.50	1.08	0.55	0.263			0.9	27.40	31.20	3.80	0.53	0.263	0.237	2.01	0.477	6%
8	32.90	1.10	0.55	0.285			0.9	31.20	34.70	3.50	0.55	0.285	0.257	1.93	0.494	6%
9	36.50	1.08	0.55	0.249			0.9	34.70	37.60	2.90	0.53	0.249	0.224	1.54	0.344	4%
10	38.70	1.04	0.67	0.251			0.9	37.60	39.90	2.30	0.37	0.251	0.226	0.85	0.192	2%
11	41.10	1.10	0.65	0.300			0.9	39.90	42.30	2.40	0.45	0.300	0.270	1.08	0.292	4%
12	43.50	1.05	0.59	0.325			0.9	42.30	44.15	1.85	0.46	0.325	0.293	0.85	0.249	3%
13	44.80	1.10	0.58	0.295			0.9	44.15	45.50	1.35	0.52	0.295	0.266	0.70	0.186	2%
14	46.20	0.95	0.55	0.418			0.9	45.50	47.05	1.55	0.40	0.418	0.376	0.62	0.233	3%
15	47.90	1.05	0.55	0.361			0.9	47.05	48.40	1.35	0.50	0.361	0.325	0.68	0.219	3%
16	48.90	1.05	0.55	0.350			0.9	48.40	49.55	1.15	0.50	0.350	0.315	0.57	0.181	2%
17	50.20	1.17	0.59	0.318			0.9	49.55	51.30	1.75	0.58	0.318	0.286	1.02	0.290	4%
18	52.40	1.22	0.60	0.255			0.9	51.30	54.80	3.50	0.62	0.255	0.230	2.17	0.498	6%
19	57.20	1.24	0.63	0.222			0.9	54.80	59.30	4.50	0.61	0.222	0.200	2.75	0.548	7%
20	61.40	1.20	0.65	0.375			0.9	59.30	63.55	4.25	0.55	0.375	0.338	2.34	0.789	10%
21	65.70	1.10	0.74	0.038			0.9	63.55	67.15	3.60	0.36	0.038	0.034	1.30	0.044	1%
RB	68.60	0.00	0.00	0.000	0.000	0.000	1.0	67.15	68.60	1.45	0.09	0.010	0.010	0.13	0.001	0%
<b>Total Flow</b>															<b>8.11</b>	

## Measurement Details:

Start Time (MST):	16:50
End Time (MST):	19:05
Equipment:	ADV
Method:	Ice
River Condition:	Frozen with slush
Quality/Error (see reverse):	Good
Weather:	Cloudy, 5 deg.

## Flow characteristics:

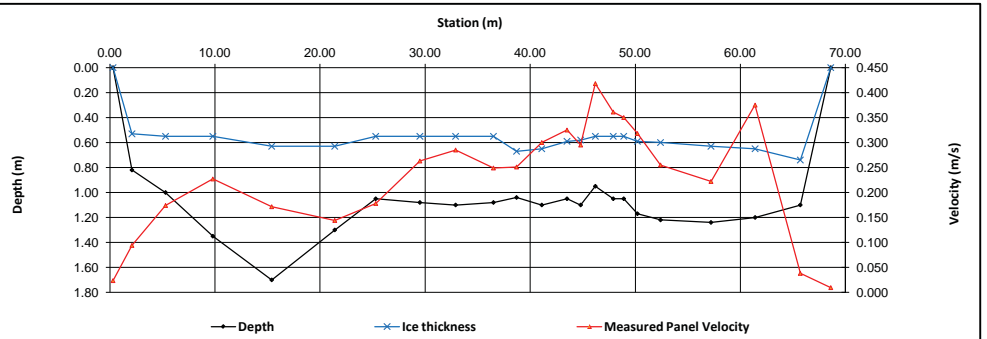
Total Flow:	8.11	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	38.63	(m <sup>2</sup> )
Wetted Width:	68.30	(m)
Hydraulic Depth:	0.566	(m)
Mean Velocity:	0.210	(m/s)
Froude Number:	0.089	

## Datalogger Details:

	Before	After
Transducer Reading (m):	NAN	
Water (°C):	-0.2	-
Battery (Main):	14.4	-
Datalogger Clock:	4:05	-
Laptop Clock:	4:05	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

PLS reading "NAN" since Feb. 25, 2012.  
PLS possibly frozen.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:			0.174	100.159	100.159	Nail in logger tree
Bench Mark 2:	0.333	100.333		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.628	96.705		
Water Level:			3.621	96.712		
Other:						
Setup #2						
Bench Mark 1:	0.151	100.31		100.159	100.159	Nail in logger tree
Bench Mark 2:			0.309	100.001	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:			3.607	96.703		
Water Level:			3.601	96.709		
Other:						
Closing Error	-0.001		Average WL	96.711		
WL Check	0.003		Transducer Elevation	-		

## General Notes:

A lot of slush present on top of ice.

Field Personnel:	DW, TR	Trip Date:	29-Mar-12
Data Entry Personnel:	CJ	Date:	11-Apr-12
Data Check Personnel:	XP	Date:	30-Apr-12

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

May 31, 2012



## 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	5.00	0.00	0.00	0.000	0.000	0.000	1.0	5.00	5.50	0.50	0.08	0.133	0.133	0.04	0.005	0%
1	6.00	0.30		0.532			1.0	5.50	6.75	1.25	0.30	0.532	0.38	0.200	0%	
2	7.50	0.41		0.720			1.0	6.75	8.25	1.50	0.41	0.720	0.62	0.443	1%	
3	9.00	0.45		0.680			1.0	8.25	9.75	1.50	0.45	0.680	0.68	0.459	1%	
4	10.50	0.52		0.712			1.0	9.75	11.25	1.50	0.52	0.712	0.78	0.555	1%	
5	12.00	0.46		0.755			1.0	11.25	12.75	1.50	0.46	0.755	0.69	0.521	1%	
6	13.50	0.50		0.735			1.0	12.75	14.25	1.50	0.50	0.735	0.75	0.551	1%	
7	15.00	0.55		0.834			1.0	14.25	15.75	1.50	0.55	0.834	0.83	0.688	1%	
8	16.50	0.57		0.699			1.0	15.75	17.25	1.50	0.57	0.699	0.699	0.88	0.598	1%
9	18.00	0.53		0.725			1.0	17.25	18.75	1.50	0.53	0.725	0.80	0.576	1%	
10	19.50	0.57		0.696			1.0	18.75	21.25	2.50	0.57	0.696	1.43	0.992	2%	
11	23.00	0.62		0.797			1.0	21.25	24.50	3.25	0.62	0.797	2.02	1.606	3%	
12	26.00	0.84		0.822			1.0	24.50	27.50	3.00	0.84	0.822	2.52	2.071	3%	
13	29.00	0.72		0.845			1.0	27.50	30.50	3.00	0.72	0.845	2.16	1.825	3%	
14	32.00	0.80			0.731	1.015	1.0	30.50	33.50	3.00	0.80	0.873	2.40	2.095	3%	
15	35.00	0.88			0.796	1.104	1.0	33.50	36.50	3.00	0.88	0.950	2.64	2.508	4%	
16	38.00	1.00			0.744	1.141	1.0	36.50	39.50	3.00	1.00	0.943	3.00	2.828	5%	
17	41.00	1.30			0.893	1.213	1.0	39.50	42.50	3.00	1.30	1.053	3.90	4.107	7%	
18	44.00	1.15			0.875	1.270	1.0	42.50	45.50	3.00	1.15	1.073	3.45	3.700	6%	
19	47.00	1.20			0.909	1.314	1.0	45.50	48.50	3.00	1.20	1.112	3.60	4.001	6%	
20	50.00	1.28			1.125	1.508	1.0	48.50	51.50	3.00	1.28	1.317	3.84	5.055	8%	
21	53.00	1.35			1.056	1.525	1.0	51.50	54.50	3.00	1.35	1.291	4.05	5.227	8%	
22	56.00	1.36			0.917	1.646	1.0	54.50	57.50	3.00	1.36	1.282	4.08	5.229	8%	
23	59.00	1.36			1.459	1.327	1.0	57.50	60.50	3.00	1.36	1.393	4.08	5.683	9%	
24	62.00	0.90			0.763	1.435	1.0	60.50	63.50	3.00	0.90	1.099	2.70	2.967	5%	
25	65.00	1.16			0.979	1.527	1.0	63.50	66.50	3.00	1.16	1.253	3.48	4.360	7%	
26	68.00	0.90			0.709	1.151	1.0	66.50	70.00	3.50	0.90	0.930	3.15	2.930	5%	
LB	72.00	0.00	0.00	0.000	0.000	0.000	1.0	70.00	72.00	2.00	0.23	0.233	0.45	0.105	0%	
<b>Total Flow</b>															<b>61.9</b>	

<b>Measurement Details:</b>	
Start Time (MST):	15:00
End Time (MST):	18:00
Equipment:	ADV
Method:	Boat
River Condition:	open
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 20 deg.

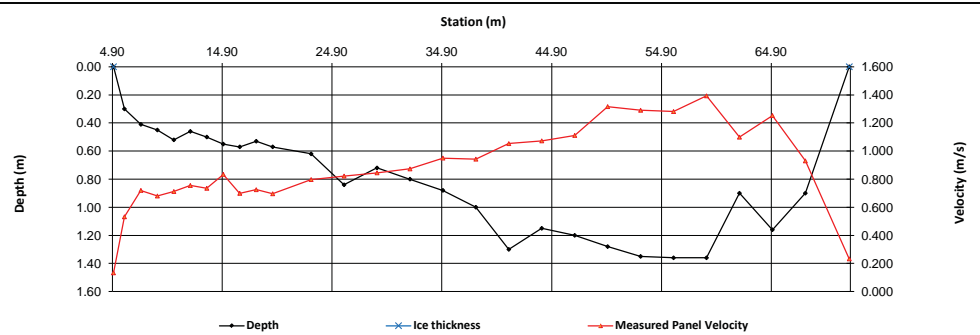
<b>Flow characteristics:</b>	
Total Flow:	61.9 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	59.34 (m <sup>2</sup> )
Wetted Width:	67.00 (m)
Hydraulic Depth:	0.886 (m)
Mean Velocity:	1.043 (m/s)
Froude Number:	0.354

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
	0.030	0.695
Water (°C):	18.7	18.7
Battery (Main):	13.7	-
Datalogger Clock:	15:10	-
Laptop Clock:	15:09	-
Dessicant:	replaced	-
Logger# (if Δ):	16116	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

PLS was moved by ice, sensor not damaged, but conduit damaged.

PLS was repositioned.



<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.098	100.157	100.159	Nail in logger tree
Bench Mark 2:	0.255	100.255		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.351	96.904		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.087	100.244		100.157	100.159	Nail in logger tree
Bench Mark 2:			0.244	100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.341	96.903		
Other:						
Closing Error	0.000					
WL Check	0.001					
Average WL				96.904		
Transducer Elevation				96.874		

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	31-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	7-Jun-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

June 21, 2012



## 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	0.00	0.00	0.00	0.000	0.000	0.000	1.0	0.00	2.00	2.00	0.20	0.068	0.068	0.40	0.027	0%
1	4.00	0.80		0.023	0.523		1.0	2.00	6.00	4.00	0.80	0.273	0.273	3.20	0.873	2%
2	8.00	0.90		0.334	0.531		1.0	6.00	10.00	4.00	0.90	0.433	0.433	3.60	1.557	3%
3	12.00	0.96		0.380	0.619		1.0	10.00	14.00	4.00	0.96	0.500	0.500	3.84	1.918	3%
4	16.00	0.99		0.432	0.781		1.0	14.00	18.00	4.00	0.99	0.607	0.607	3.96	2.402	4%
5	20.00	1.18		0.481	0.827		1.0	18.00	22.00	4.00	1.18	0.654	0.654	4.72	3.087	6%
6	24.00	1.05		0.667	0.997		1.0	22.00	26.00	4.00	1.05	0.832	0.832	4.20	3.494	6%
7	28.00	1.15		0.694	1.047		1.0	26.00	30.00	4.00	1.15	0.871	0.871	4.60	4.004	7%
8	32.00	1.20		0.800	1.015		1.0	30.00	34.00	4.00	1.20	0.908	0.908	4.80	4.356	8%
9	36.00	1.20		0.659	1.106		1.0	34.00	38.00	4.00	1.20	0.883	0.883	4.80	4.236	8%
10	40.00	1.15		0.779	1.125		1.0	38.00	42.00	4.00	1.15	0.952	0.952	4.60	4.379	8%
11	44.00	1.05		0.789	1.048		1.0	42.00	46.00	4.00	1.05	0.919	0.919	4.20	3.858	7%
12	48.00	1.15		0.798	1.108		1.0	46.00	50.00	4.00	1.15	0.953	0.953	4.60	4.384	8%
13	52.00	1.10		0.640	0.955		1.0	50.00	54.00	4.00	1.10	0.798	0.798	4.40	3.509	6%
14	56.00	1.03		0.709	0.938		1.0	54.00	58.00	4.00	1.03	0.824	0.824	4.12	3.393	6%
15	60.00	0.98		0.563	0.965		1.0	58.00	62.00	4.00	0.98	0.764	0.764	3.92	2.995	5%
16	64.00	0.89		0.640	0.804		1.0	62.00	66.00	4.00	0.89	0.722	0.722	3.56	2.570	5%
17	68.00	0.80			0.556	0.760	1.0	66.00	70.00	4.00	0.80	0.658	0.658	3.20	2.106	4%
18	72.00	0.65		0.591			1.0	70.00	74.00	4.00	0.65	0.591	0.591	2.60	1.537	3%
19	76.00	0.62		0.493			1.0	74.00	78.00	4.00	0.62	0.493	0.493	2.48	1.223	2%
LB	80.00	0.00	0.00	0.000	0.000	0.000	1.0	78.00	80.00	2.00	0.16	0.123	0.123	0.31	0.038	0%
<b>Total Flow</b>														<b>55.9</b>		

## Measurement Details:

Start Time (MST):	8:40
End Time (MST):	11:20
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 12 deg

## Flow characteristics:

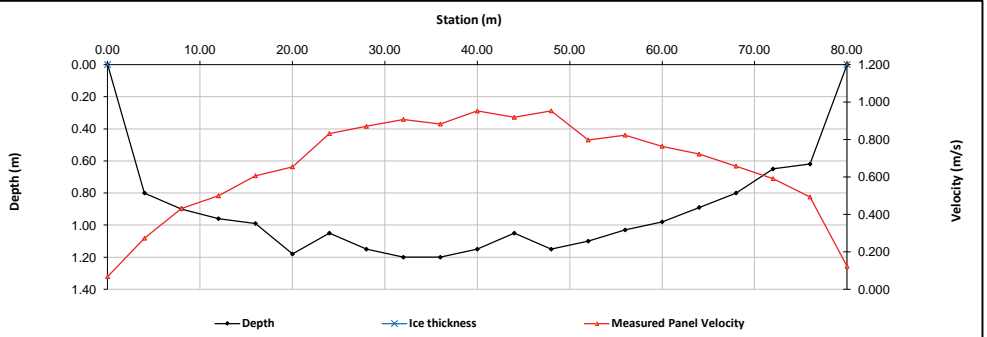
Total Flow:	55.9	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	76.11	(m <sup>2</sup> )
Wetted Width:	80.00	(m)
Hydraulic Depth:	0.951	(m)
Mean Velocity:	0.734	(m/s)
Froude Number:	0.241	

## Logger Details:

	Before	After
Transducer Reading (m):	0.586	0.586
Water (°C):	17	17.2
Battery (Main):	14.0	14.0
Datalogger Clock:	11:06	11:22
Laptop Clock:	11:05	11:21
Dessicant:	Replaced	-
Logger# (if Δ):	16116	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:

Uploaded new logger program.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.202	100.159	100.159	Nail in logger tree
Bench Mark 2:	0.361	100.361		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.562	96.799		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.184	100.343		100.159	100.159	Nail in logger tree
Bench Mark 2:			0.345	99.998	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.544	96.799		
Other:						

Closing Error	0.002	Average WL	96.799
WL Check	0.000	Transducer Elevation	96.213

## General Notes:

TSS Sampled @ 12.0 m.

<b>Field Personnel:</b>	SM & GB	<b>Trip Date:</b>	20-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	21-Jun-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Feb-13

# Hydrometric Measurement Field Data Sheet

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

August 30, 2012



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	
LB	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	5.25	1.25	0.10	0.037	0.037	0.13	0.005	0%	
1	6.50	0.41		0.148			1.0	5.25	8.25	3.00	0.41	0.148	0.148	1.23	0.182	1%	
2	10.00	0.68		0.364			1.0	8.25	11.75	3.50	0.68	0.364	0.364	2.38	0.866	3%	
3	13.50	0.68		0.362			1.0	11.75	15.25	3.50	0.68	0.362	0.362	2.38	0.862	3%	
4	17.00	0.73		0.456			1.0	15.25	18.75	3.50	0.73	0.456	0.456	2.56	1.165	4%	
5	20.50	0.76			0.347	0.559	1.0	18.75	22.25	3.50	0.76	0.453	0.453	2.66	1.205	5%	
6	24.00	0.92			0.334	0.577	1.0	22.25	25.75	3.50	0.92	0.456	0.456	3.22	1.467	6%	
7	27.50	0.96			0.419	0.672	1.0	25.75	29.25	3.50	0.96	0.546	0.546	3.36	1.833	7%	
8	31.00	1.00			0.501	0.711	1.0	29.25	32.75	3.50	1.00	0.606	0.606	3.50	2.121	8%	
9	34.50	0.98			0.457	0.739	1.0	32.75	36.25	3.50	0.98	0.598	0.598	3.43	2.051	8%	
10	38.00	0.92			0.445	0.778	1.0	36.25	39.75	3.50	0.92	0.612	0.612	3.22	1.969	8%	
11	41.50	0.92			0.597	0.813	1.0	39.75	43.25	3.50	0.92	0.705	0.705	3.22	2.270	9%	
12	45.00	0.91			0.440	0.777	1.0	43.25	46.75	3.50	0.91	0.609	0.609	3.19	1.938	7%	
13	48.50	0.88			0.410	0.566	1.0	46.75	50.25	3.50	0.88	0.488	0.488	3.08	1.503	6%	
14	52.00	0.84			0.462	0.629	1.0	50.25	53.75	3.50	0.84	0.546	0.546	2.94	1.604	6%	
15	55.50	0.80			0.430	0.627	1.0	53.75	57.25	3.50	0.80	0.529	0.529	2.80	1.480	6%	
16	59.00	0.72		0.494			1.0	57.25	60.75	3.50	0.72	0.494	0.494	2.52	1.245	5%	
17	62.50	0.70		0.485			1.0	60.75	64.25	3.50	0.70	0.485	0.485	2.45	1.188	5%	
18	66.00	0.51		0.362			1.0	64.25	67.75	3.50	0.51	0.362	0.362	1.79	0.646	2%	
19	69.50	0.42		0.270			1.0	67.75	70.75	3.00	0.42	0.270	0.270	1.26	0.340	1%	
20	72.00	0.30		0.264			1.0	70.75	72.95	2.20	0.30	0.264	0.264	0.66	0.174	1%	
RB	73.90	0.00	0.00	0.00	0.00	0.00	1.0	72.95	73.90	0.95	0.08	0.066	0.066	0.07	0.005	0%	

**Total Flow 26.100**

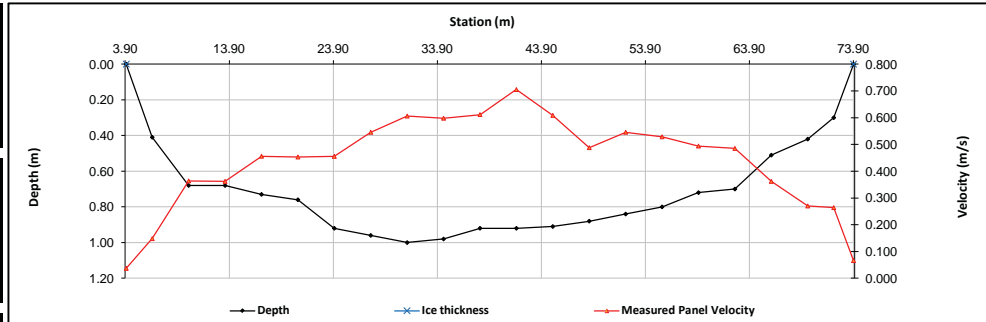
Measurement Details:	
Start Time (MST):	8:30
End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	Excellent
Weather:	P. cloud, 12 deg.

Flow characteristics:	
Total Flow:	26.1 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	52.03 (m <sup>2</sup> )
Wetted Width:	69.90 (m)
Hydraulic Depth:	0.744 (m)
Mean Velocity:	0.502 (m/s)
Froude Number:	0.186

Logger Details:		
	Before	After
Transducer Reading (m):	0.294	
Water (°C):	15.8	
Battery (Main):	14.2	
Datalogger Clock:	10:15	
Laptop Clock:	10:14	
Dessicant:	replaced	
Logger# (if Δ):	16116	
PT# (if Δ):	-	

**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>						
Bench Mark 1:			0.369	100.157	100.159	Nail in logger tree
Bench Mark 2:	0.526	100.526		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.021	96.505		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	0.361	100.518		100.157	100.159	Nail in logger tree
Bench Mark 2:			0.517	100.001	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			4.012	96.506		
Other:						

Closing Error	-0.001
WL Check	0.001

Average WL	96.506
Transducer Elevation	96.212

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	30-Aug-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	14-Feb-13



# Hydrometric Measurement Field Data Sheet

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

September 12, 2012



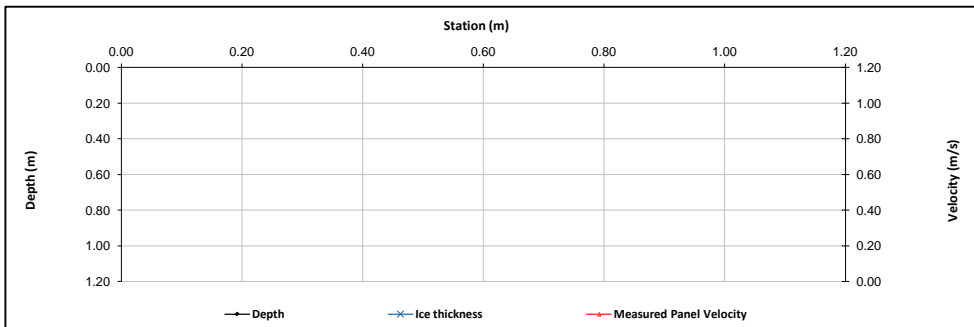
Measured Data				Calculated Data												
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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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19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																
<b>No Flow Measurement Conducted</b>																
															<b>Total Flow</b>	-

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	16:20
Equipment:	-
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	-
Weather:	12 deg, clear, calm

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):	0.846	
Water (°C):	11.0	
Battery (Main):	14.1	
Datalogger Clock:	16:04	
Laptop Clock:	16:05	
Dessicant:	replaced	
Logger# (if Δ):	16116	
PT# (if Δ):	-	

Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.203	100.362		100.159	100.159	Nail in logger tree
Bench Mark 2:			0.361	100.001	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.298	97.064		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.187	100.159	100.159	Nail in logger tree
Bench Mark 2:	0.345	100.346		100.001	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.282	97.064		
Other:						

Closing Error	0.000	Average WL	97.064
WL Check	0.000	Transducer Elevation	96.218

General Notes:

Went to flow location, water level was too high to conduct flow measurement. Flow measurement completed on Sept. 19 see S47A for details.

<u>Field Personnel:</u>	SM, DW	Trip Date:	12-Sep-12
<u>Data Entry Personnel:</u>	SM (Field)	Date:	12-Sep-12
<u>Data Check Personnel:</u>	TR	Date:	14-Feb-13

# Hydrometric Measurement Field Data Sheet

Site: S47 Christina at Mouth

UTM Location:

499621N, 6277162E (Flow) 500672N, 6276404E (Station)

Site Visit Date:

October 25, 2012



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			
Discharge Measurement Conducted on October 19, 2012. See S47A field sheet for data.																			
															<b>Total Flow</b>		-		

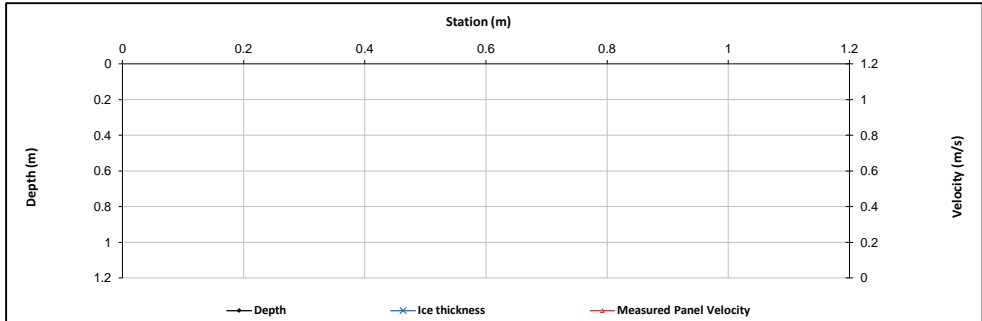
Measurement Details:	
Start Time (MST):	3:50
End Time (MST):	4:45
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	vercast, light breeze, 1 de

Flow characteristics:		
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	0.00	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

Logger Details:		
	Before	After
Transducer Reading (m):	0.465	
Water (°C):	0.7	
Battery (Main):	14.2	
Datalogger Clock:	4:06	
Laptop Clock:	4:05	
Dessicant:	Good	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
Decommissioned station, logger tree had been knocked down by wildlife.

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.159	Nail in logger tree
Bench Mark 2:	0.445	100.445		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.767	96.678		
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.159	Nail in logger tree
Bench Mark 2:	0.403	100.403		100.000	100.000	3/4" Pipe 3 m W of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			3.724	96.679		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	96.679
Transducer Elevation	96.214

<b>Field Personnel:</b>	DW, TR	Trip Date:	25-Oct-12
<b>Data Entry Personnel:</b>	DW	Date:	25-Oct-12
<b>Data Check Personnel:</b>	TR	Date:	14-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement Field Data Sheet

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

August 14, 2012



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																	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
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26																	
27																	
28																	
29																	
30																	
LB																	
<b>No Flow Measurement Conducted</b>																	
															<b>Total Flow</b>		-

Measurement Details:	
Start Time (MST):	16:30
End Time (MST):	17:15
Equipment:	
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	-
Weather:	Overcast, windy, 20 deg.

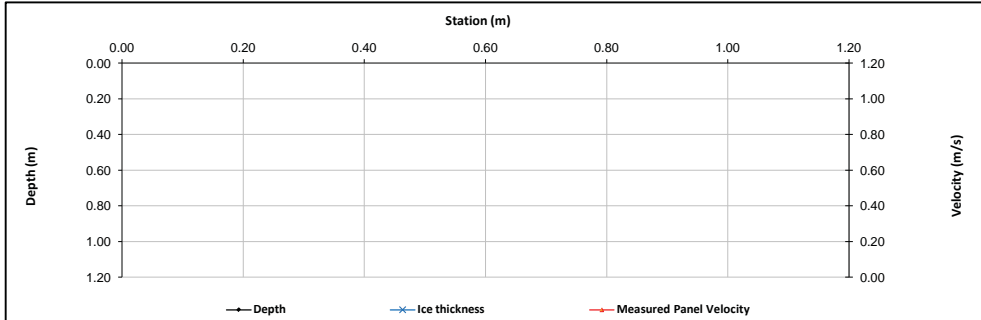
Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	- (m <sup>2</sup> )
Wetted Width:	- (m)
Hydraulic Depth:	- (m)
Mean Velocity:	- (m/s)
Froude Number:	-

Logger Details:	Before	After
Transducer Reading (m):	0.632	
Water (°C):	17.4	
Battery (Main):	12.6	
Datalogger Clock:	16:23	
Laptop Clock:	16:23	
Dessicant:	new	
Logger# (if Δ):	21898	
PT# (if Δ):	304015	

**Datalogger / Station Notes:**

-Installed station & BMs, no telemetry

-WL and data DL to be performed within next few days



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Field Personnel:	SM, CJ	Trip Date:	14-Aug-12
Data Entry Personnel:	CJ (Field)	Date:	14-Aug-12
Data Check Personnel:	CJ	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

August 21, 2012



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																
1																
2																
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4																
5																
6																
7																
8																
9																
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LB																
<b>No Flow Measurement Conducted</b>																
<b>Total Flow</b> -																

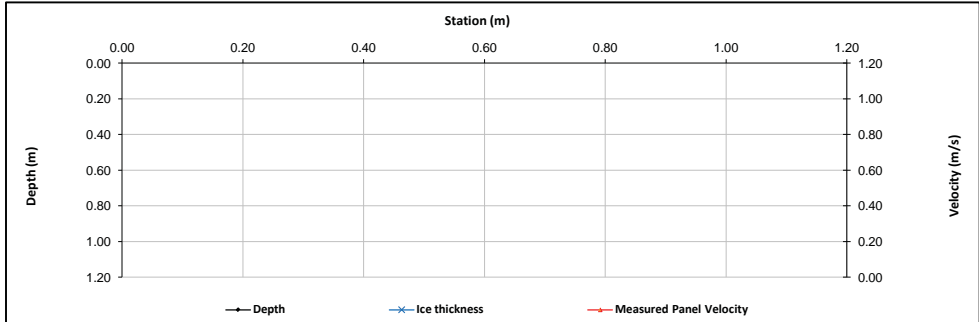
Measurement Details:	
Start Time (MST):	8:20
End Time (MST):	10:20
Equipment:	
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	-
Weather:	Clear, calm, 20 deg.

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):	0.470	
Water (°C):	19.6	
Battery (Main):	12.5	
Datalogger Clock:	8:27	
Laptop Clock:	8:27	
Dessicant:	good	
Logger# (if Δ):	21898	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

-Installed GOES West



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Field Personnel:		Trip Date:	21-Aug-12
Data Entry Personnel:	SM (Field)	Date:	21-Aug-12
Data Check Personnel:	CJ	Date:	4-Oct-12

# 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 31, 2012



## 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																
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																
<b>No Flow Measurement Conducted (Flow Data Collected on August 30)</b>																
															<b>Total Flow</b>	-

### Measurement Details:

Start Time (MST):	10:45
End Time (MST):	11:00
Equipment:	
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	-
Weather:	-

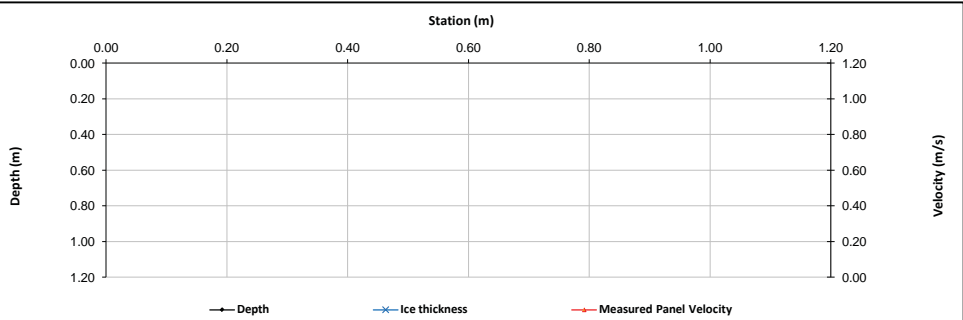
### Flow characteristics:

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):	0.394	
Water (°C):	16.0	
Battery (Main):	13.8	
Datalogger Clock:	10:44	
Laptop Clock:	10:44	
Dessicant:	replaced	
Logger# (if Δ):	21898	
PT# (if Δ):	-	

### Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			0.925	100.096	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			1.136	99.885	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:	1.442	101.021		99.579	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			4.524	96.497		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.913	100.096	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:	1.124	101.009		99.885	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.429	99.580	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			4.512	96.497		
Other:						

Closing Error	-0.001
WL Check	0.000

Average WL	96.497
Transducer Elevation	96.103

### General Notes:

-Flow measurement performed on Aug. 30 (previous day)

Field Personnel:	SM, TR	Trip Date:	31-Aug-12
Data Entry Personnel:	CJ	Date:	4-Oct-12
Data Check Personnel:	MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

September 12, 2012



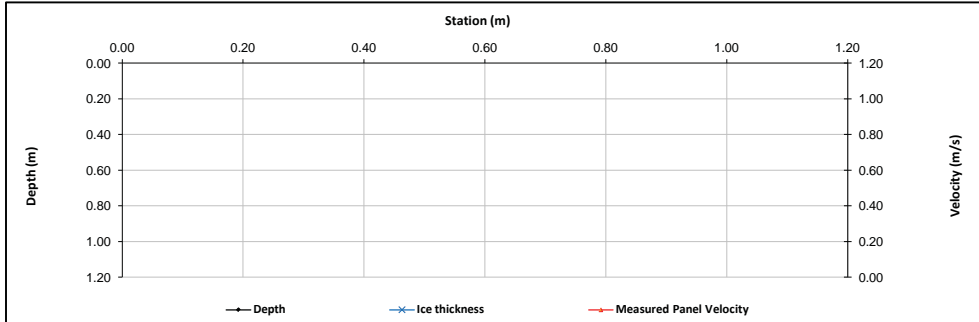
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective 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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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24																
25																
26																
27																
28																
29																
30																
LB																
No Flow Measurement Conducted																
Total Flow -																

Measurement Details:	
Start Time (MST):	16:30
End Time (MST):	17:00
Equipment:	
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	-
Weather:	Clear, calm, 12 deg.

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):	0.831	
Water (°C):	11.3	
Battery (Main):	13.4	
Datalogger Clock:	16:36	
Laptop Clock:	16:36	
Dessicant:	replaced	
Logger# (if Δ):	21898	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	0.745	100.840		100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			0.955	99.885	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.261	99.579	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			3.806	97.034		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.721	100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			0.932	99.884	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:	1.237	100.816		99.579	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			3.782	97.034		
Other:						

Closing Error	0.000
WL Check	0.000

Average WL	97.034
Transducer Elevation	96.203

**General Notes:**

-Went to flow location, water level too high to conduct flow measurement. Flow measurement completed on Sept. 19

Field Personnel:		SM, DW	Trip Date:	12-Sep-12
Data Entry Personnel:	DW (Field)		Date:	12-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

September 19, 2012



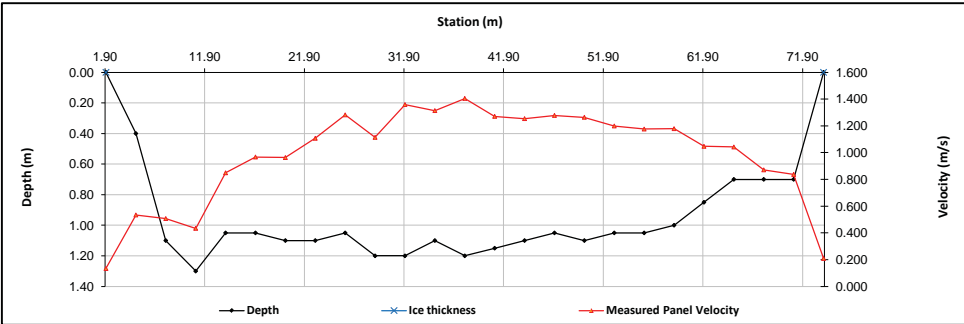
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	3.50	1.50	0.10	0.134	0.134	0.15	0.020	0%
1	5.00	0.40		0.534			1.0	3.50	6.50	3.00	0.40	0.534	0.534	1.20	0.641	1%
2	8.00	1.10		0.507			1.0	6.50	9.50	3.00	1.10	0.507	0.507	3.30	1.673	2%
3	11.00	1.30		0.434			1.0	9.50	12.50	3.00	1.30	0.434	0.434	3.90	1.693	2%
4	14.00	1.05		0.849			1.0	12.50	15.50	3.00	1.05	0.849	0.849	3.15	2.674	4%
5	17.00	1.05		0.967			1.0	15.50	18.50	3.00	1.05	0.967	0.967	3.15	3.046	4%
6	20.00	1.10		0.963			1.0	18.50	21.50	3.00	1.10	0.963	0.963	3.30	3.178	4%
7	23.00	1.10		1.107			1.0	21.50	24.50	3.00	1.10	1.107	1.107	3.30	3.653	5%
8	26.00	1.05		1.282			1.0	24.50	27.50	3.00	1.05	1.282	1.282	3.15	4.038	5%
9	29.00	1.20		1.114			1.0	27.50	30.50	3.00	1.20	1.114	1.114	3.60	4.010	5%
10	32.00	1.20		1.359			1.0	30.50	33.50	3.00	1.20	1.359	1.359	3.60	4.892	7%
11	35.00	1.10		1.314			1.0	33.50	36.50	3.00	1.10	1.314	1.314	3.30	4.336	6%
12	38.00	1.20		1.405			1.0	36.50	39.50	3.00	1.20	1.405	1.405	3.60	5.058	7%
13	41.00	1.15		1.271			1.0	39.50	42.50	3.00	1.15	1.271	1.271	3.45	4.385	6%
14	44.00	1.10		1.254			1.0	42.50	45.50	3.00	1.10	1.254	1.254	3.30	4.138	6%
15	47.00	1.05		1.278			1.0	45.50	48.50	3.00	1.05	1.278	1.278	3.15	4.026	5%
16	50.00	1.10		1.264			1.0	48.50	51.50	3.00	1.10	1.264	1.264	3.30	4.171	6%
17	53.00	1.05		1.199			1.0	51.50	54.50	3.00	1.05	1.199	1.199	3.15	3.777	5%
18	56.00	1.05		1.176			1.0	54.50	57.50	3.00	1.05	1.176	1.176	3.15	3.704	5%
19	59.00	1.00		1.179			1.0	57.50	60.50	3.00	1.00	1.179	1.179	3.00	3.537	5%
20	62.00	0.85		1.047			1.0	60.50	63.50	3.00	0.85	1.047	1.047	2.55	2.670	4%
21	65.00	0.70		1.042			1.0	63.50	66.50	3.00	0.70	1.042	1.042	2.10	2.188	3%
22	68.00	0.70		0.871			1.0	66.50	69.50	3.00	0.70	0.871	0.871	2.10	1.829	2%
23	71.00	0.70		0.837			1.0	69.50	72.50	3.00	0.70	0.837	0.837	2.10	1.758	2%
LB	74.00	0.00	0.00	0.00	0.00	0.00	1.0	72.50	74.00	1.50	0.18	0.209	0.209	0.26	0.055	0%
<b>Total Flow</b>														<b>75.2</b>		

Measurement Details:	
Start Time (MST):	11:45
End Time (MST):	14:00
Equipment:	ADV
Method:	Boat
River Condition:	Elevated flow
Quality/Error (see reverse):	Good
Weather:	P. cloudy

Flow characteristics:	
Total Flow:	75.2 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	70.31 (m <sup>2</sup> )
Wetted Width:	72.00 (m)
Hydraulic Depth:	0.977 (m)
Mean Velocity:	1.070 (m/s)
Froude Number:	0.346

Logger Details:		
	Before	After
Transducer Reading (m):	0.784	
Water (°C):	10.9	
Battery (Main):	13.8	
Datalogger Clock:	13:16	
Laptop Clock:	13:15	
Dessicant:	good	
Logger# (if Δ):	21898	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.697	100.792		100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			0.908	99.884	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.214	99.578	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			3.812	96.980		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.682	100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:	0.893	100.777		99.884	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.198	99.579	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			3.795	96.982		
Other:						

Closing Error	0.000	Average WL	96.981
WL Check	0.002	Transducer Elevation	96.197

**General Notes:**

<b>Field Personnel:</b>	SM, SG	Trip Date:	19-Sep-12
Data Entry Personnel:	SM (Field)	Date:	19-Sep-12
Data Check Personnel:	TR	Date:	14-Feb-13

# 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 19, 2012



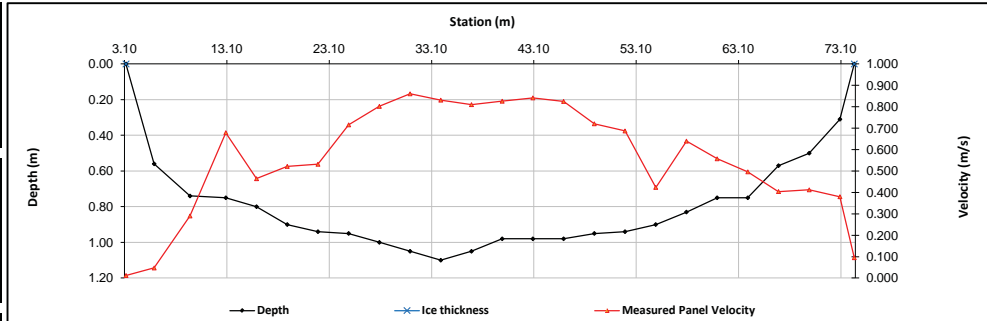
Flow Measurement:										Measured Data						Calculated Data					
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	3.25	0.00	0.00	0.000	0.000	0.000	1.0	3.25	4.63	1.38	0.14	0.012	0.012	0.19	0.002	0%					
1	6.00	0.56		0.047			1.0	4.63	7.75	3.13	0.56	0.047	0.047	1.75	0.082	0%					
2	9.50	0.74		0.290			1.0	7.75	11.25	3.50	0.74	0.290	0.290	2.59	0.751	2%					
3	13.00	0.75		0.679			1.0	11.25	14.50	3.25	0.75	0.679	0.679	2.44	1.655	4%					
4	16.00	0.80			0.473	0.455	1.0	14.50	17.50	3.00	0.80	0.464	0.464	2.40	1.114	3%					
5	19.00	0.90			0.499	0.544	1.0	17.50	20.50	3.00	0.90	0.522	0.522	2.70	1.408	4%					
6	22.00	0.94			0.476	0.587	1.0	20.50	23.50	3.00	0.94	0.532	0.532	2.82	1.499	4%					
7	25.00	0.95			0.580	0.851	1.0	23.50	26.50	3.00	0.95	0.716	0.716	2.85	2.039	6%					
8	28.00	1.00			0.720	0.884	1.0	26.50	29.50	3.00	1.00	0.802	0.802	3.00	2.406	7%					
9	31.00	1.05			0.786	0.935	1.0	29.50	32.50	3.00	1.05	0.861	0.861	3.15	2.711	7%					
10	34.00	1.10			0.685	0.977	1.0	32.50	35.50	3.00	1.10	0.831	0.831	3.30	2.742	7%					
11	37.00	1.05			0.642	0.978	1.0	35.50	38.50	3.00	1.05	0.810	0.810	3.15	2.552	7%					
12	40.00	0.98			0.704	0.948	1.0	38.50	41.50	3.00	0.98	0.826	0.826	2.94	2.428	7%					
13	43.00	0.98			0.705	0.978	1.0	41.50	44.50	3.00	0.98	0.842	0.842	2.94	2.474	7%					
14	46.00	0.98			0.730	0.920	1.0	44.50	47.50	3.00	0.98	0.825	0.825	2.94	2.426	7%					
15	49.00	0.95			0.649	0.792	1.0	47.50	50.50	3.00	0.95	0.721	0.721	2.85	2.053	6%					
16	52.00	0.94			0.561	0.813	1.0	50.50	53.50	3.00	0.94	0.687	0.687	2.82	1.937	5%					
17	55.00	0.90			0.039	0.808	1.0	53.50	56.50	3.00	0.90	0.424	0.424	2.70	1.143	3%					
18	58.00	0.83			0.547	0.732	1.0	56.50	59.50	3.00	0.83	0.640	0.640	2.49	1.592	4%					
19	61.00	0.75		0.557			1.0	59.50	62.50	3.00	0.75	0.557	0.557	2.25	1.253	3%					
20	64.00	0.75		0.496			1.0	62.50	65.50	3.00	0.75	0.496	0.496	2.25	1.116	3%					
21	67.00	0.57		0.404			1.0	65.50	68.50	3.00	0.57	0.404	0.404	1.71	0.691	2%					
22	70.00	0.50		0.412			1.0	68.50	71.50	3.00	0.50	0.412	0.412	1.50	0.618	2%					
23	73.00	0.31		0.380			1.0	71.50	73.70	2.20	0.31	0.380	0.380	0.68	0.259	1%					
RB	74.40	0.00	0.00	0.00	0.00	0.00	1.0	73.70	74.40	0.70	0.08	0.095	0.095	0.05	0.005	0%					
<b>Total Flow</b>														<b>37.0</b>							

Measurement Details:	
Start Time (MST):	7:18
End Time (MST):	8:15
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, +1

Flow characteristics:	
Total Flow:	37.0 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	58.47 (m <sup>2</sup> )
Wetted Width:	71.15 (m)
Hydraulic Depth:	0.822 (m)
Mean Velocity:	0.633 (m/s)
Froude Number:	0.223

Logger Details:		Before	After
Transducer Reading (m):		0.446	
Water (°C):		3.9	
Battery (Main):		13.0	
Datalogger Clock:		15:57	
Laptop Clock:		15:57	
Dessicant:		replaced	
Logger# (if Δ):		21898	
PT# (if Δ):		-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.751	100.846		100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			0.963	99.883	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.267	99.579	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			4.223	96.623		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.731	100.096	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:	0.944	100.827		99.883	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			1.247	99.580	99.579	3/4" Pipe 7 m S of station
Ice/PT:						
Water Level:			4.205	96.622		
Other:						

Closing Error	-0.001	Average WL	96.623
WL Check	0.001	Transducer Elevation	96.177

**General Notes:**

<b>Field Personnel:</b>	TR and DW	Trip Date:	19-Oct-12
Data Entry Personnel:	DW	Date:	19-Oct-12
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: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

December 7, 2012



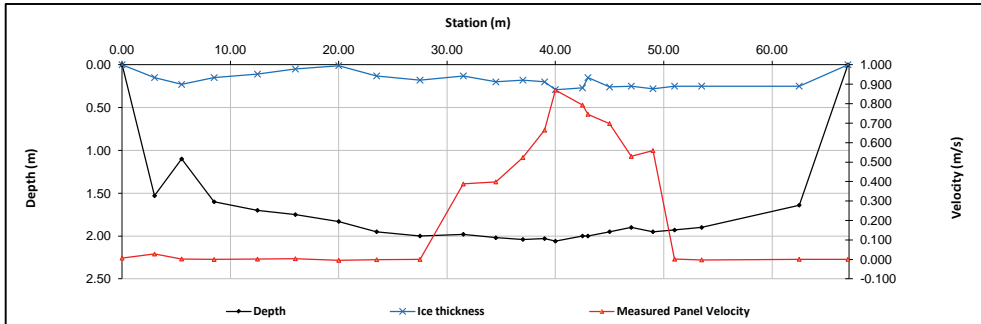
Flow Measurement:													Measured Data				Calculated Data			
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	1.50	1.50	0.35	0.007	0.007	0.52	0.004	0%				
1	3.00	1.53	0.15	0.056	-0.001		1.0	1.50	4.25	2.75	1.38	0.028	0.028	3.80	0.104	0%				
2	5.50	1.10	0.23	0.002	0.002		1.0	4.25	7.00	2.75	0.87	0.002	0.002	2.39	0.005	0%				
3	8.50	1.60	0.15	0.002	-0.003		1.0	7.00	10.50	3.50	1.45	-0.001	-0.001	5.08	-0.003	0%				
4	12.50	1.70	0.11	0.000	0.003		1.0	10.50	14.25	3.75	1.59	0.002	0.002	5.96	0.009	0%				
5	16.00	1.75	0.05	0.005	0.002		1.0	14.25	18.00	3.75	1.70	0.004	0.004	6.38	0.022	0%				
6	20.00	1.83	0.01	-0.011	0.001		1.0	18.00	21.75	3.75	1.82	-0.005	-0.005	6.83	-0.034	0%				
7	23.50	1.95	0.13	-0.001	-0.002		1.0	21.75	25.50	3.75	1.82	-0.002	-0.002	6.83	-0.010	0%				
8	27.50	2.00	0.18	0.001	-0.001		1.0	25.50	29.50	4.00	1.82	0.000	0.000	7.28	0.000	0%				
9	31.50	1.98	0.13	0.623	0.152		1.0	29.50	33.00	3.50	1.85	0.388	0.388	6.48	2.509	12%				
10	34.50	2.02	0.20	0.787	0.009		1.0	33.00	35.75	2.75	1.82	0.398	0.398	5.01	1.992	9%				
11	37.00	2.04	0.18	0.870	0.177		1.0	35.75	38.00	2.25	1.86	0.524	0.524	4.19	2.191	10%				
12	39.00	2.03	0.20	0.977	0.351		1.0	38.00	39.50	1.50	1.83	0.664	0.664	2.75	1.823	9%				
13	40.00	2.06	0.29	0.996	0.743		1.0	39.50	41.25	1.75	1.77	0.870	0.870	3.10	2.693	13%				
14	42.50	2.00	0.27	0.838	0.748		1.0	41.25	42.75	1.50	1.73	0.793	0.793	2.60	2.058	10%				
15	43.00	2.00	0.15	0.846	0.645		1.0	42.75	44.00	1.25	1.85	0.746	0.746	2.31	1.724	8%				
16	45.00	1.95	0.26	0.805	0.591		1.0	44.00	46.00	2.00	1.69	0.698	0.698	3.38	2.359	11%				
17	47.00	1.90	0.25	0.795	0.263		1.0	46.00	48.00	2.00	1.65	0.529	0.529	3.30	1.746	8%				
18	49.00	1.95	0.28	0.554	0.564		1.0	48.00	50.00	2.00	1.67	0.559	0.559	3.34	1.867	9%				
19	51.00	1.93	0.25	0.002	0.000		1.0	50.00	52.25	2.25	1.68	0.001	0.001	3.78	0.004	0%				
20	53.50	1.90	0.25	-0.003	-0.002		1.0	52.25	58.00	5.75	1.65	-0.003	-0.003	9.49	-0.024	0%				
21	62.50	1.64	0.25	-0.001	0.002		1.0	58.00	64.75	6.75	1.39	0.001	0.001	9.38	0.005	0%				
LB	67.00	0.00	0.00	0.00	0.00	0.00	1.0	64.75	67.00	2.25	0.35	0.000	0.000	0.78	0.000	0%				
<b>Total Flow</b>														<b>21.0</b>						

Measurement Details:	
Start Time (MST):	8:35
End Time (MST):	12:15
Equipment:	ADV
Method:	
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Overcast, calm, -10 deg.

Flow characteristics:	
Total Flow:	21.0 (m <sup>3</sup> /s)
Perceived Measuremt Quality:	Poor
Cross Section Area:	104.91 (m <sup>2</sup> )
Wetted Width:	67.00 (m)
Hydraulic Depth:	1.566 (m)
Mean Velocity:	0.200 (m/s)
Froude Number:	0.051

Logger Details:		
	Before	After
Transducer Reading (m):	1.191	1.193
Water (°C):	0.1	0.1
Battery (Main):	12.1	13
Datalogger Clock:	11:13	11:30
Laptop Clock:	11:13	11:30
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**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>						
Bench Mark 1:	0.056	100.151		100.095	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:			0.270	99.881	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			0.576	99.575	99.579	3/4" Pipe 7 m S of station
Ice/PT:			2.768	97.383		
Water Level:			2.797	97.354		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.065	100.094	100.095	3/4" Pipe 6 m SE of station
Bench Mark 2:	0.278	100.159		99.881	99.884	3/4" Pipe 5 m S of station
Bench Mark 3:			0.586	99.573	99.579	3/4" Pipe 7 m S of station
Ice/PT:			2.779	97.380		
Water Level:			2.809	97.350		
Other:						
Closing Error	0.001	Average WL		97.352		
WL Check	0.004	Transducer Elevation		96.161		

**General Notes:**  
At station river is about half open water  
  
At flow location channel ice has been pushed up on banks and the majority of flow within channel is heavily affected by slush, except between offsets 31- 49 m

<b>Field Personnel:</b>	DW and CJ	Trip Date:	7-Dec-12
<b>Data Entry Personnel:</b>	DW	Date:	7-Dec-12
<b>Data Check Personnel:</b>	TR	Date:	14-Feb-13
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

February 11, 2012



## 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
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

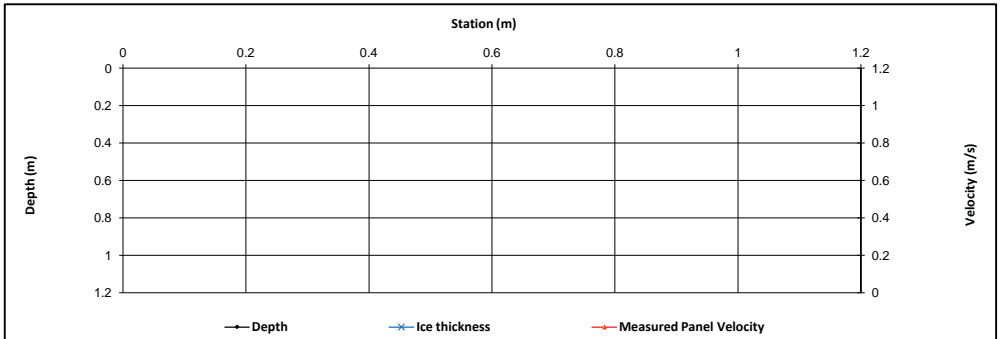
Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	10:10
Equipment:	-
Method:	-
River Condition:	Complete Ice Cover
Quality/Error (see reverse):	-
Weather:	Windy -20°

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:	-

Datalogger Details:		
	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- No Datalogger installed in Winter



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:					99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:					99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

### General Notes:

- No water found. Signs of glaciation in area of station, suggests freezing to bottom.
- Two holes augered in likely areas in cross section, both were frozen to depth.

Field Personnel:		Trip Date:	
TR, SG		11-Feb-12	
Data Entry Personnel:		Date:	
SG		17-Feb-12	
Data Check Personnel:		Date:	
DW		1-Mar-12	

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

April 26, 2012



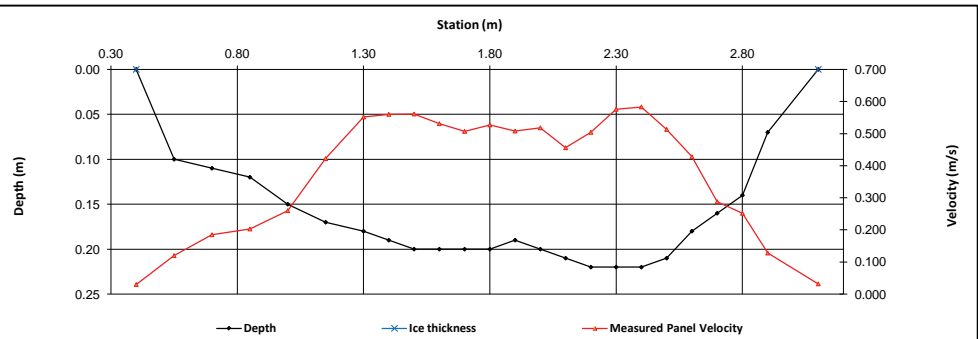
## Flow Measurement:

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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.48	0.08	0.03	0.030	0.030	0.00	0.000	0%
1	0.55	0.10		0.120			1.0	0.48	0.63	0.15	0.10	0.120	0.120	0.02	0.002	1%
2	0.70	0.11		0.185			1.0	0.63	0.78	0.15	0.11	0.185	0.185	0.02	0.003	2%
3	0.85	0.12		0.203			1.0	0.78	0.93	0.15	0.12	0.203	0.203	0.02	0.004	2%
4	1.00	0.15		0.260			1.0	0.93	1.08	0.15	0.15	0.260	0.260	0.02	0.006	3%
5	1.15	0.17		0.422			1.0	1.08	1.23	0.15	0.17	0.422	0.422	0.03	0.011	6%
6	1.30	0.18		0.552			1.0	1.23	1.35	0.13	0.18	0.552	0.552	0.02	0.012	7%
7	1.40	0.19		0.560			1.0	1.35	1.45	0.10	0.19	0.560	0.560	0.02	0.011	6%
8	1.50	0.20		0.561			1.0	1.45	1.55	0.10	0.20	0.561	0.561	0.02	0.011	6%
9	1.60	0.20		0.531			1.0	1.55	1.65	0.10	0.20	0.531	0.531	0.02	0.011	6%
10	1.70	0.20		0.507			1.0	1.65	1.75	0.10	0.20	0.507	0.507	0.02	0.010	5%
11	1.80	0.20		0.527			1.0	1.75	1.85	0.10	0.20	0.527	0.527	0.02	0.011	6%
12	1.90	0.19		0.508			1.0	1.85	1.95	0.10	0.19	0.508	0.508	0.02	0.010	5%
13	2.00	0.20		0.518			1.0	1.95	2.05	0.10	0.20	0.518	0.518	0.02	0.010	6%
14	2.10	0.21		0.456			1.0	2.05	2.15	0.10	0.21	0.456	0.456	0.02	0.010	5%
15	2.20	0.22		0.504			1.0	2.15	2.25	0.10	0.22	0.504	0.504	0.02	0.011	6%
16	2.30	0.22		0.576			1.0	2.25	2.35	0.10	0.22	0.576	0.576	0.02	0.013	7%
17	2.40	0.22		0.583			1.0	2.35	2.45	0.10	0.22	0.583	0.583	0.02	0.013	7%
18	2.50	0.21		0.513			1.0	2.45	2.55	0.10	0.21	0.513	0.513	0.02	0.011	6%
19	2.60	0.18		0.428			1.0	2.55	2.65	0.10	0.18	0.428	0.428	0.02	0.008	4%
20	2.70	0.16		0.288			1.0	2.65	2.75	0.10	0.16	0.288	0.288	0.02	0.005	2%
21	2.80	0.14		0.252			1.0	2.75	2.85	0.10	0.14	0.252	0.252	0.01	0.004	2%
22	2.90	0.07		0.128			1.0	2.85	3.00	0.15	0.07	0.128	0.128	0.01	0.001	1%
LB	3.10	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.10	0.10	0.02	0.032	0.032	0.00	0.000	0%
<b>Total Flow</b>															<b>0.185</b>	

Measurement Details:	
Start Time (MST):	10:15
End Time (MST):	11:30
Equipment:	ADV
Method:	Wading
River Condition:	open, bed ice
Quality/Error (see reverse):	excellent
Weather:	overcast, +5

Flow characteristics:		
Total Flow:	0.185	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	0.43	(m <sup>2</sup> )
Wetted Width:	2.70	(m)
Hydraulic Depth:	0.159	(m)
Mean Velocity:	0.432	(m/s)
Froude Number:	0.347	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	11.6	0.9
Battery (Main):	14.71	-
Datalogger Clock:	10:45	-
Laptop Clock:	10:46	-
Dessicant:	replaced	-
Logger# (if Δ):	16118	-
PT# (if Δ):	284718	-



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	0.998	100.998		100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:			1.140	99.858	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.253	98.745		
Other:						
Setup #2						
Bench Mark 1:			0.980	100.001	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:	1.123	100.981		99.858	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.236	98.745		
Other:						
Closing Error	-0.001		Average WL	98.745		
WL Check	0.000		Transducer Elevation	98.607		

**General Notes:**

- Bed ice, PT installed on top of ice
- Some cell service

Field Personnel:		Trip Date:	26-Apr-12
Data Entry Personnel:	CJ	Date:	1-May-12
Data Check Personnel:	XP	Date:	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

June 21, 2012



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	0.40	0.10	0.03	0.060	0.060	0.00	0.000	0%
1	0.50	0.11		0.240			1.0	0.40	0.60	0.20	0.11	0.240	0.240	0.02	0.005	3%
2	0.70	0.17		0.204			1.0	0.60	0.80	0.20	0.17	0.204	0.204	0.03	0.007	4%
3	0.90	0.17		0.237			1.0	0.80	1.00	0.20	0.17	0.237	0.237	0.03	0.008	5%
4	1.10	0.20		0.166			1.0	1.00	1.20	0.20	0.20	0.166	0.166	0.04	0.007	4%
5	1.30	0.28		0.185			1.0	1.20	1.40	0.20	0.28	0.185	0.185	0.06	0.010	6%
6	1.50	0.29		0.195			1.0	1.40	1.60	0.20	0.29	0.195	0.195	0.06	0.011	7%
7	1.70	0.32		0.165			1.0	1.60	1.80	0.20	0.32	0.165	0.165	0.06	0.011	6%
8	1.90	0.30		0.242			1.0	1.80	2.00	0.20	0.30	0.242	0.242	0.06	0.015	9%
9	2.10	0.24		0.216			1.0	2.00	2.20	0.20	0.24	0.216	0.216	0.05	0.010	6%
10	2.30	0.20		0.264			1.0	2.20	2.40	0.20	0.20	0.264	0.264	0.04	0.011	6%
11	2.50	0.17		0.286			1.0	2.40	2.60	0.20	0.17	0.286	0.286	0.03	0.010	6%
12	2.70	0.16		0.281			1.0	2.60	2.80	0.20	0.16	0.281	0.281	0.03	0.009	6%
13	2.90	0.29		0.225			1.0	2.80	3.00	0.20	0.29	0.225	0.225	0.06	0.013	8%
14	3.10	0.17		0.208			1.0	3.00	3.20	0.20	0.17	0.208	0.208	0.03	0.007	4%
15	3.30	0.18		0.166			1.0	3.20	3.40	0.20	0.18	0.166	0.166	0.04	0.006	4%
16	3.50	0.22		0.152			1.0	3.40	3.60	0.20	0.22	0.152	0.152	0.04	0.007	4%
17	3.70	0.23		0.122			1.0	3.60	3.80	0.20	0.23	0.122	0.122	0.05	0.006	3%
18	3.90	0.23		0.123			1.0	3.80	4.00	0.20	0.23	0.123	0.123	0.05	0.006	3%
19	4.10	0.19		0.108			1.0	4.00	4.20	0.20	0.19	0.108	0.108	0.04	0.004	3%
20	4.30	0.13		0.062			1.0	4.20	4.35	0.15	0.13	0.062	0.062	0.02	0.001	1%
LB	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.35	4.40	0.05	0.03	0.016	0.016	0.00	0.000	0%

**Total Flow 0.163**

Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	excellent
Weather:	clear, calm, 24°C

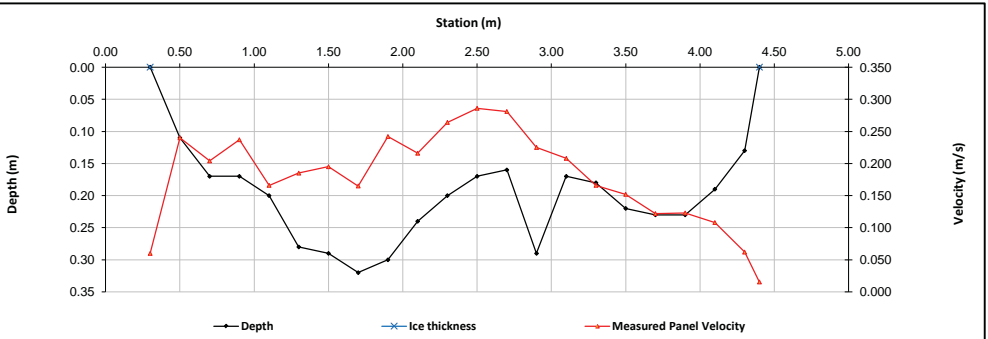
Flow characteristics:	
Total Flow:	0.163 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	0.85 (m <sup>2</sup> )
Wetted Width:	4.10 (m)
Hydraulic Depth:	0.207 (m)
Mean Velocity:	0.192 (m/s)
Froude Number:	0.135

Logger Details:		
	Before	After
Transducer Reading (m):	0.205	
Water (°C):	12.6	
Battery (Main):	13.7	
Datalogger Clock:	1:34	
Laptop Clock:	1:35	
Dessicant:	replaced	
Logger# (if Δ):	16118	
PT# (if Δ):	-	

Datalogger / Station Notes:	

**General Notes:**

- Beaver dam formation 25 m upstream of station
- More root clumps washed in since last visit
- TSS sampled at offset 3.4 m



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.880	100.880		100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:			1.095	99.785	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.666	98.214		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.870	100.001	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:	1.086	100.871		99.785	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.656	98.215		
Other:						

Closing Error	-0.001	Average WL	98.215
WL Check	0.001	Transducer Elevation	98.010

Field Personnel:		SM, GB	Trip Date:	21-Jun-12
Data Entry Personnel:	CJ		Date:	4-Jul-12
Data Check Personnel:	MY		Date:	4-Jul-12

# Hydrometric Measurement Field Data Sheet

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

August 15, 2012



## Flow Measurement:

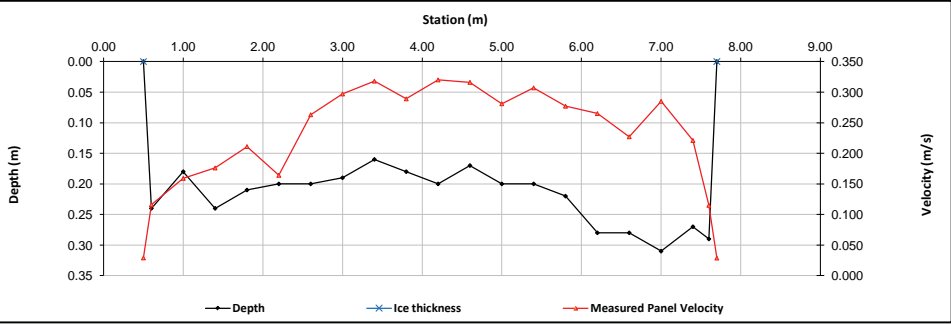
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.50	0.00	0.00	0.000	0.000	0.000	1.0	0.50	0.55	0.05	0.06	0.029	0.029	0.00	0.000	0%
1	0.60	0.24		0.116			1.0	0.55	0.80	0.25	0.24	0.116	0.116	0.06	0.007	2%
2	1.00	0.18		0.159			1.0	0.80	1.20	0.40	0.18	0.159	0.159	0.07	0.011	3%
3	1.40	0.24		0.176			1.0	1.20	1.60	0.40	0.24	0.176	0.176	0.10	0.017	4%
4	1.80	0.21		0.211			1.0	1.60	2.00	0.40	0.21	0.211	0.211	0.08	0.018	5%
5	2.20	0.20		0.164			1.0	2.00	2.40	0.40	0.20	0.164	0.164	0.08	0.013	3%
6	2.60	0.20		0.263			1.0	2.40	2.80	0.40	0.20	0.263	0.263	0.08	0.021	5%
7	3.00	0.19		0.297			1.0	2.80	3.20	0.40	0.19	0.297	0.297	0.08	0.023	6%
8	3.40	0.16		0.318			1.0	3.20	3.60	0.40	0.16	0.318	0.318	0.06	0.020	5%
9	3.80	0.18		0.289			1.0	3.60	4.00	0.40	0.18	0.289	0.289	0.07	0.021	5%
10	4.20	0.20		0.320			1.0	4.00	4.40	0.40	0.20	0.320	0.320	0.08	0.026	7%
11	4.60	0.17		0.316			1.0	4.40	4.80	0.40	0.17	0.316	0.316	0.07	0.021	6%
12	5.00	0.20		0.281			1.0	4.80	5.20	0.40	0.20	0.281	0.281	0.08	0.022	6%
13	5.40	0.20		0.307			1.0	5.20	5.60	0.40	0.20	0.307	0.307	0.08	0.025	6%
14	5.80	0.22		0.277			1.0	5.60	6.00	0.40	0.22	0.277	0.277	0.09	0.024	6%
15	6.20	0.28		0.265			1.0	6.00	6.40	0.40	0.28	0.265	0.265	0.11	0.030	8%
16	6.60	0.28		0.227			1.0	6.40	6.80	0.40	0.28	0.227	0.227	0.11	0.025	7%
17	7.00	0.31		0.285			1.0	6.80	7.20	0.40	0.31	0.285	0.285	0.12	0.035	9%
18	7.40	0.27		0.221			1.0	7.20	7.50	0.30	0.27	0.221	0.221	0.08	0.018	5%
19	7.60	0.29		0.115			1.0	7.50	7.65	0.15	0.29	0.115	0.115	0.04	0.005	1%
LB	7.70	0.00	0.00	0.00	0.00	0.00	1.0	7.65	7.70	0.05	0.07	0.029	0.029	0.00	0.000	0%
<b>Total Flow</b>														<b>0.383</b>		

Measurement Details:	
Start Time (MST):	12:50
End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	good flow, lots of debris.
Quality/Error (see reverse):	Good
Weather:	20 deg. clear, calm

Flow characteristics:		
Total Flow:	0.383	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.56	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.217	(m)
Mean Velocity:	0.246	(m/s)
Froude Number:	0.169	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.381	13.1
Battery (Main):	14.0	
Datalogger Clock:	12:51	
Laptop Clock:	12:51	
Dessicant:	replaced	
Logger# (if Δ):	16118	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.958	100.958		100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:			1.239	99.719	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.593	98.365		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.946	100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:	1.227	100.946		99.719	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datal ogger
Ice/PT:						
Water Level:			2.585	98.361		
Other:						
Closing Error	0.000				Average WL	98.363
WL Check	0.004				Transducer Elevation	97.982

**General Notes:**

- TSS taken at offset 5.5 m
- Lots of woody debris in stream, minor effects on flow-Good Measurement Quality

Field Personnel:		
Data Entry Personnel:	SM, CJ	Trip Date:
Data Check Personnel:	CJ (Field)	Date:
	CJ	Date:

# Hydrometric Measurement Field Data Sheet

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

September 13, 2012



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	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	0.30	0.20	0.06	0.000	0.000	0.01	0.000	0%							
1	0.50	0.25		0.001			1.0	0.30	0.70	0.40	0.25	0.001	0.001	0.10	0.000	0%							
2	0.90	0.42		0.070			1.0	0.70	1.10	0.40	0.42	0.070	0.070	0.17	0.012	2%							
3	1.30	0.44		0.172			1.0	1.10	1.50	0.40	0.44	0.172	0.172	0.18	0.030	5%							
4	1.70	0.43		0.181			1.0	1.50	1.90	0.40	0.43	0.181	0.181	0.17	0.031	5%							
5	2.10	0.43		0.188			1.0	1.90	2.30	0.40	0.43	0.188	0.188	0.17	0.032	5%							
6	2.50	0.40		0.179			1.0	2.30	2.70	0.40	0.40	0.179	0.179	0.16	0.029	5%							
7	2.90	0.36		0.292			1.0	2.70	3.10	0.40	0.36	0.292	0.292	0.14	0.042	7%							
8	3.30	0.34		0.323			1.0	3.10	3.50	0.40	0.34	0.323	0.323	0.14	0.044	7%							
9	3.70	0.34		0.323			1.0	3.50	3.90	0.40	0.34	0.323	0.323	0.14	0.044	7%							
10	4.10	0.32		0.344			1.0	3.90	4.30	0.40	0.32	0.344	0.344	0.13	0.044	7%							
11	4.50	0.32		0.363			1.0	4.30	4.70	0.40	0.32	0.363	0.363	0.13	0.046	7%							
12	4.90	0.30		0.336			1.0	4.70	5.10	0.40	0.30	0.336	0.336	0.12	0.040	6%							
13	5.30	0.29		0.354			1.0	5.10	5.50	0.40	0.29	0.354	0.354	0.12	0.041	7%							
14	5.70	0.33		0.294			1.0	5.50	5.90	0.40	0.33	0.294	0.294	0.13	0.039	6%							
15	6.10	0.35		0.321			1.0	5.90	6.30	0.40	0.35	0.321	0.321	0.14	0.045	7%							
16	6.50	0.48		0.280			1.0	6.30	6.70	0.40	0.48	0.280	0.280	0.19	0.054	9%							
17	6.90	0.40		0.206			1.0	6.70	7.10	0.40	0.40	0.206	0.206	0.16	0.033	5%							
18	7.30	0.36		0.129			1.0	7.10	7.50	0.40	0.36	0.129	0.129	0.14	0.019	3%							
19	7.70	0.32		0.074			1.0	7.50	7.85	0.35	0.32	0.074	0.074	0.11	0.008	1%							
20	8.00	0.30		-0.028			1.0	7.85	8.10	0.25	0.30	-0.028	-0.028	0.08	-0.002	0%							
LB	8.20	0.00	0.00	0.000	0.000	0.000	1.0	8.10	8.20	0.10	0.08	-0.007	-0.007	0.01	0.000	0%							

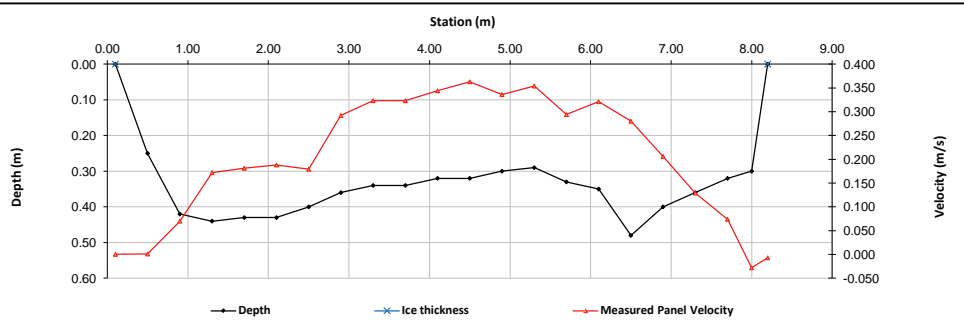
**Total Flow 0.631**

Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	16:25
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	-

Flow characteristics:	
Total Flow:	0.631 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	2.83 (m <sup>2</sup> )
Wetted Width:	8.10 (m)
Hydraulic Depth:	0.350 (m)
Mean Velocity:	0.223 (m/s)
Froude Number:	0.120

Logger Details:		
	Before	After
Transducer Reading (m):	0.513	
Water (°C):	9.5	
Battery (Main):	13.9	
Datalogger Clock:	2:07	
Laptop Clock:	2:08	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
-Large WL spike on September 9, 2012



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.867	100.867		100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:			1.150	99.717	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:			2.347	98.520		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.904	100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:	1.187	100.904		99.717	99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:			2.388	98.516		
Other:						

Closing Error	0.000	Average WL	98.518
WL Check	0.004	Transducer Elevation	98.005

**General Notes:**  
- Lots of woody debris up and down stream - Good Measurement Quality  
- TSS sampled at offset 4.5 m

<b>Field Personnel:</b>	TR, DW	<b>Trip Date:</b>	13-Sep-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	13-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	11-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

September 27, 2012



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																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
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18																
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21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
LB																
No Flow Measurement Conducted																
Total Flow -																

Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	12:50
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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:		

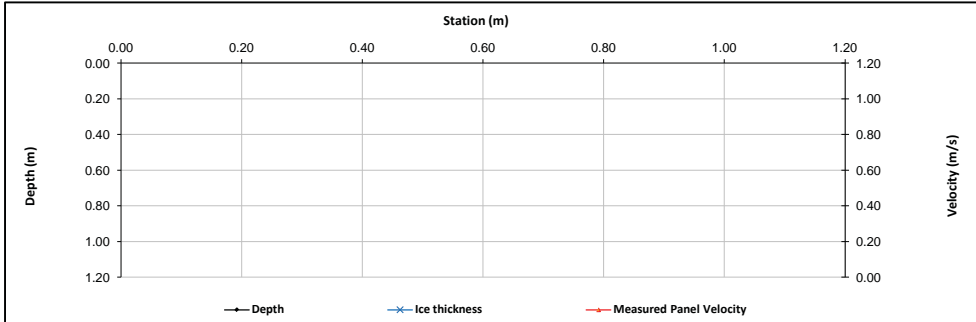
Logger Details:		
	Before	After
Transducer Reading (m):	0.378	
Water (°C):	8.2	
Battery (Main):	14.4	
Datalogger Clock:	8:15	
Laptop Clock:	8:15	
Dessicant:	good	
Logger# (if Δ):	16118	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Installed radio and antenna at station
- Installed repeater Station at: 470180 E, 6388460 N
- RSSI -78,

**General Notes:**

- Installed 1 3/4" Pipe BM. 1 more needed.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:					99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:					99.717	Nail in base of tree
Bench Mark 3:					99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:						
Other:						

Closing Error	-	Average WL	-
WL Check	-	Transducer Elevation	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	27-Sep-12
<b>Data Entry Personnel:</b>	SM (Field)	Date:	27-Sep-12
<b>Data Check Personnel:</b>	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

November 2, 2012



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	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	1.0	2.20	2.50	0.30	0.07	0.027	0.027	0.02	0.001	0%
1	2.80	0.28		0.109			1.0	2.50	3.05	0.55	0.28	0.109	0.109	0.15	0.017	4%
2	3.30	0.24		0.119			1.0	3.05	3.55	0.50	0.24	0.119	0.119	0.12	0.014	4%
3	3.80	0.22		0.129			1.0	3.55	4.05	0.50	0.22	0.129	0.129	0.11	0.014	4%
4	4.30	0.22		0.170			1.0	4.05	4.45	0.40	0.22	0.170	0.170	0.09	0.015	4%
5	4.60	0.24		0.197			1.0	4.45	4.75	0.30	0.24	0.197	0.197	0.07	0.014	4%
6	4.90	0.25		0.169			1.0	4.75	5.05	0.30	0.25	0.169	0.169	0.08	0.013	3%
7	5.20	0.29		0.200			1.0	5.05	5.35	0.30	0.29	0.200	0.200	0.09	0.017	5%
8	5.50	0.30		0.192			1.0	5.35	5.65	0.30	0.30	0.192	0.192	0.09	0.017	5%
9	5.80	0.30		0.198			1.0	5.65	5.95	0.30	0.30	0.198	0.198	0.09	0.018	5%
10	6.10	0.32		0.206			1.0	5.95	6.25	0.30	0.32	0.206	0.206	0.10	0.020	5%
11	6.40	0.34		0.175			1.0	6.25	6.55	0.30	0.34	0.175	0.175	0.10	0.018	5%
12	6.70	0.31		0.214			1.0	6.55	6.85	0.30	0.31	0.214	0.214	0.09	0.020	5%
13	7.00	0.31		0.213			1.0	6.85	7.15	0.30	0.31	0.213	0.213	0.09	0.020	5%
14	7.30	0.34		0.237			1.0	7.15	7.45	0.30	0.34	0.237	0.237	0.10	0.024	6%
15	7.60	0.34		0.233			1.0	7.45	7.75	0.30	0.34	0.233	0.233	0.10	0.024	6%
16	7.90	0.38		0.209			1.0	7.75	8.05	0.30	0.38	0.209	0.209	0.11	0.024	6%
17	8.20	0.40		0.046			1.0	8.05	8.45	0.40	0.40	0.046	0.046	0.16	0.007	2%
18	8.70	0.40		0.161			1.0	8.45	8.95	0.50	0.40	0.161	0.161	0.20	0.032	8%
19	9.20	0.39		0.169			1.0	8.95	9.45	0.50	0.39	0.169	0.169	0.20	0.033	9%
20	9.70	0.40		0.095			1.0	9.45	9.95	0.50	0.40	0.095	0.095	0.20	0.019	5%
21	10.20	0.24		0.015			1.0	9.95	10.40	0.45	0.24	0.015	0.015	0.11	0.002	0%
RB	10.60	0.00	0.00	0.00	0.00	0.00	1.0	10.40	10.60	0.20	0.06	0.004	0.004	0.01	0.000	0%
<b>Total Flow</b>														<b>0.382</b>		

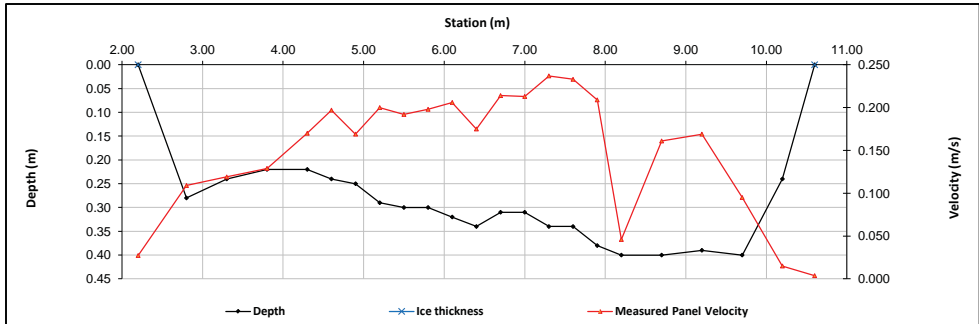
Measurement Details:	
Start Time (MST):	12:18
End Time (MST):	13:20
Equipment:	ADV
Method:	Wading
River Condition:	high, partial ice cover
Quality/Error (see reverse):	Excellent
Weather:	overcast, Calm, -5

Flow characteristics:		
Total Flow:	0.382	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.48	(m <sup>2</sup> )
Wetted Width:	8.40	(m)
Hydraulic Depth:	0.296	(m)
Mean Velocity:	0.154	(m/s)
Froude Number:	0.090	

Logger Details:		
	Before	After
Transducer Reading (m):	0.469	
Water (°C):	1.4	
Battery (Main):	14.4	
Datalogger Clock:	12:17	
Laptop Clock:	12:17	
Dessicant:	replaced	
Logger# (if Δ):	16118	
PT# (if Δ):	284718	

**Datalogger / Station Notes:**

- Removed PLS for Winter. Anchor cable and weight were left at base of logger tree



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.963	100.963		100.000	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:			1.246	99.717	99.717	Nail in base of tree
Bench Mark 3:			1.165	99.798	99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:			2.475	98.488		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.948	100.001	100.000	3/4" Pipe 2 m from data logger
Bench Mark 2:	1.232	100.949		99.717	99.717	Nail in base of tree
Bench Mark 3:			1.151	99.798	99.798	3/4" Pipe 5 m SE of datalogger
Ice/PT:						
Water Level:			2.462	98.487		
Other:						
Closing Error	-0.001					
WL Check	0.001					
Average WL				98.488		
Transducer Elevation				98.019		

**General Notes:**

- Removed some ice cover to open channel for flow measurement

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Nov-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	7-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		



# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson

UTM Location: 465524 E, 6372768 N

Site Visit Date:

February 11, 2012



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>

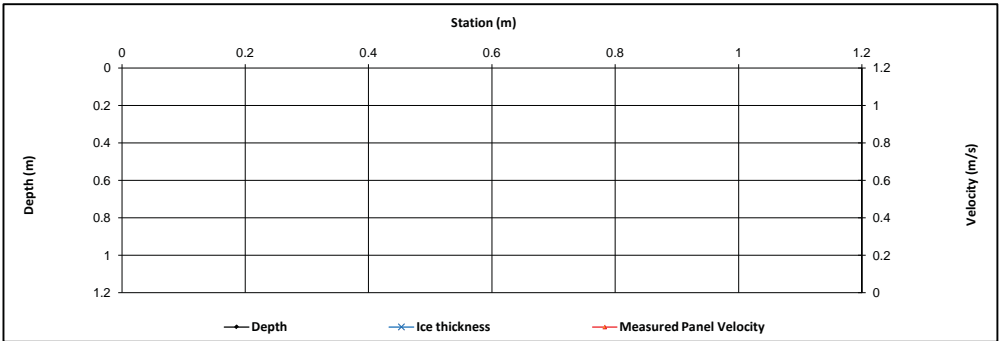
Measurement Details:	
Start Time (MST):	10:25
End Time (MST):	11:30
Equipment:	-
Method:	-
River Condition:	Completely Frozen
Quality/Error (see reverse):	-
Weather:	Windy -20°

Flow characteristics:	
Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	0.00 (m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number:	

Datalogger Details:	Before	After
Transducer Reading (m):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- No Datalogger installed in winter



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:					100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:					99.870	Nail in tree

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

- No water was found at site.
- Evidence of glaciation both upstream and downstream of station location, suggests freezing to bottom.
- Two holes augered in most likely spots to have water in cross section and frozen sand found both locations.

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	11-Feb-12
<b>Data Entry Personnel:</b>	SG	<b>Date:</b>	17-Feb-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	1-Mar-12

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson

UTM Location: 465524 E, 6372768 N

Site Visit Date:

April 26, 2012



## Flow Measurement:

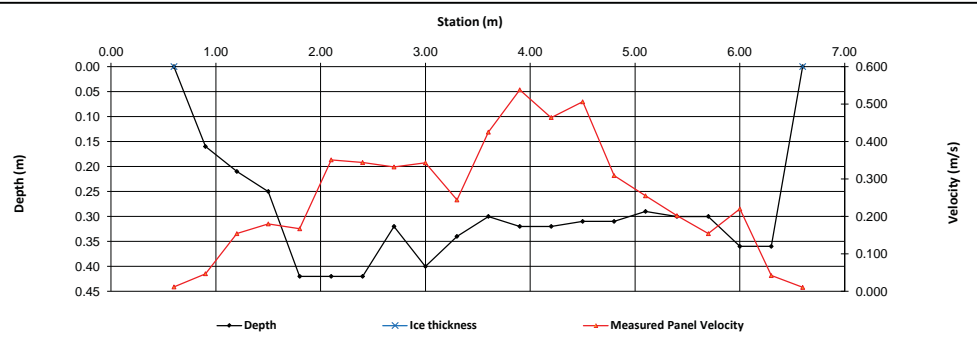
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	0.60	0.00	0.00	0.000	0.000	0.000	1.0	0.60	0.75	0.15	0.04	0.012	0.012	0.01	0.000	0%
1	0.90	0.16		0.047			1.0	0.75	1.05	0.30	0.16	0.047	0.047	0.05	0.002	0%
2	1.20	0.21		0.154			1.0	1.05	1.35	0.30	0.21	0.154	0.154	0.06	0.010	2%
3	1.50	0.25		0.180			1.0	1.35	1.65	0.30	0.25	0.180	0.180	0.08	0.014	3%
4	1.80	0.42		0.167			1.0	1.65	1.95	0.30	0.42	0.167	0.167	0.13	0.021	4%
5	2.10	0.42		0.351			1.0	1.95	2.25	0.30	0.42	0.351	0.351	0.13	0.044	8%
6	2.40	0.42		0.344			1.0	2.25	2.55	0.30	0.42	0.344	0.344	0.13	0.043	8%
7	2.70	0.32		0.332			1.0	2.55	2.85	0.30	0.32	0.332	0.332	0.10	0.032	6%
8	3.00	0.40		0.343			1.0	2.85	3.15	0.30	0.40	0.343	0.343	0.12	0.041	8%
9	3.30	0.34		0.244			1.0	3.15	3.45	0.30	0.34	0.244	0.244	0.10	0.025	5%
10	3.60	0.30		0.425			1.0	3.45	3.75	0.30	0.30	0.425	0.425	0.09	0.038	7%
11	3.90	0.32		0.538			1.0	3.75	4.05	0.30	0.32	0.538	0.538	0.10	0.052	10%
12	4.20	0.32		0.464			1.0	4.05	4.35	0.30	0.32	0.464	0.464	0.10	0.045	8%
13	4.50	0.31		0.506			1.0	4.35	4.65	0.30	0.31	0.506	0.506	0.09	0.047	9%
14	4.80	0.31		0.309			1.0	4.65	4.95	0.30	0.31	0.309	0.309	0.09	0.029	5%
15	5.10	0.29		0.255			1.0	4.95	5.25	0.30	0.29	0.255	0.255	0.09	0.022	4%
16	5.40	0.30		0.202			1.0	5.25	5.55	0.30	0.30	0.202	0.202	0.09	0.018	3%
17	5.70	0.30		0.154			1.0	5.55	5.85	0.30	0.30	0.154	0.154	0.09	0.014	3%
18	6.00	0.36		0.220			1.0	5.85	6.15	0.30	0.36	0.220	0.220	0.11	0.024	5%
19	6.30	0.36		0.042			1.0	6.15	6.45	0.30	0.36	0.042	0.042	0.11	0.005	1%
LB	6.60	0.00	0.00	0.000	0.000	0.000	1.0	6.45	6.60	0.15	0.09	0.011	0.011	0.01	0.000	0%
<b>Total Flow</b>														<b>0.525</b>		

Measurement Details:	
Start Time (MST):	8:00
End Time (MST):	9:45
Equipment:	ADV
Method:	Wading
River Condition:	Open, Bed ice
Quality/Error (see reverse):	good
Weather:	Overcast, +5

Flow characteristics:	
Total Flow:	0.525 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	1.85 (m <sup>2</sup> )
Wetted Width:	6.00 (m)
Hydraulic Depth:	0.309 (m)
Mean Velocity:	0.283 (m/s)
Froude Number:	0.163

Logger Details:		
	Before	After
Transducer Reading (m):	0.691	
Water (°C):	0.2	
Battery (Main):	12.65	
Datalogger Clock:	8:27	
Laptop Clock:	8:27	
Dessicant:	replaced	
Logger# (if Δ):	17937	
PT# (if Δ):	278515	

Datalogger / Station Notes:	
- Installed logger and PLS, Raven modem and yaggi	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.461	101.461		100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.256	98.205		
Other:			1.452	100.009	99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.456	100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.252	98.204		
Other:	1.447	101.456		100.009	99.870	Nail in tree

Closing Error	0.000	Average WL	98.205
WL Check	0.001	Transducer Elevation	97.514

**General Notes:**

<b>Field Personnel:</b>	SM, SG	<b>Trip Date:</b>	26-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson

UTM Location: 465524 E, 6372768 N

Site Visit Date:

June 14, 2012



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	4.70	0.00	0.00	0.000	0.000	0.000	1.0	4.70	4.95	0.25	0.04	0.024	0.024	0.01	0.000	0%
1	5.20	0.16		0.097			1.0	4.95	5.35	0.40	0.16	0.097	0.097	0.06	0.006	2%
2	5.50	0.22		0.069			1.0	5.35	5.65	0.30	0.22	0.069	0.069	0.07	0.005	2%
3	5.80	0.23		0.094			1.0	5.65	5.95	0.30	0.23	0.094	0.094	0.07	0.006	3%
4	6.10	0.25		0.132			1.0	5.95	6.25	0.30	0.25	0.132	0.132	0.08	0.010	4%
5	6.40	0.28		0.140			1.0	6.25	6.55	0.30	0.28	0.140	0.140	0.08	0.012	5%
6	6.70	0.24		0.153			1.0	6.55	6.85	0.30	0.24	0.153	0.153	0.07	0.011	4%
7	7.00	0.35		0.146			1.0	6.85	7.15	0.30	0.35	0.146	0.146	0.11	0.015	6%
8	7.30	0.39		0.159			1.0	7.15	7.45	0.30	0.39	0.159	0.159	0.12	0.019	7%
9	7.60	0.46		0.166			1.0	7.45	7.75	0.30	0.46	0.166	0.166	0.14	0.023	9%
10	7.90	0.48		0.180			1.0	7.75	7.98	0.23	0.48	0.180	0.180	0.11	0.019	8%
11	8.05	0.48		0.186			1.0	7.98	8.13	0.15	0.48	0.186	0.186	0.07	0.013	5%
12	8.20	0.48		0.182			1.0	8.13	8.28	0.15	0.48	0.182	0.182	0.07	0.013	5%
13	8.35	0.48		0.180			1.0	8.28	8.43	0.15	0.48	0.180	0.180	0.07	0.013	5%
14	8.50	0.49		0.170			1.0	8.43	8.65	0.23	0.49	0.170	0.170	0.11	0.019	7%
15	8.80	0.48		0.148			1.0	8.65	8.95	0.30	0.48	0.148	0.148	0.14	0.021	8%
16	9.10	0.49		0.135			1.0	8.95	9.25	0.30	0.49	0.135	0.135	0.15	0.020	8%
17	9.40	0.48		0.146			1.0	9.25	9.55	0.30	0.48	0.146	0.146	0.14	0.021	8%
18	9.70	0.49		0.094			1.0	9.55	9.85	0.30	0.49	0.094	0.094	0.15	0.014	5%
19	10.00	0.44		0.013			1.0	9.85	10.15	0.30	0.44	0.013	0.013	0.13	0.002	1%
20	10.30	0.38		-0.028			1.0	10.15	10.65	0.50	0.38	-0.028	-0.028	0.19	-0.005	-2%
LB	11.00	0.00	0.00	0.000	0.000	0.000	1.0	10.65	11.00	0.35	0.10	-0.007	-0.007	0.03	0.000	0%

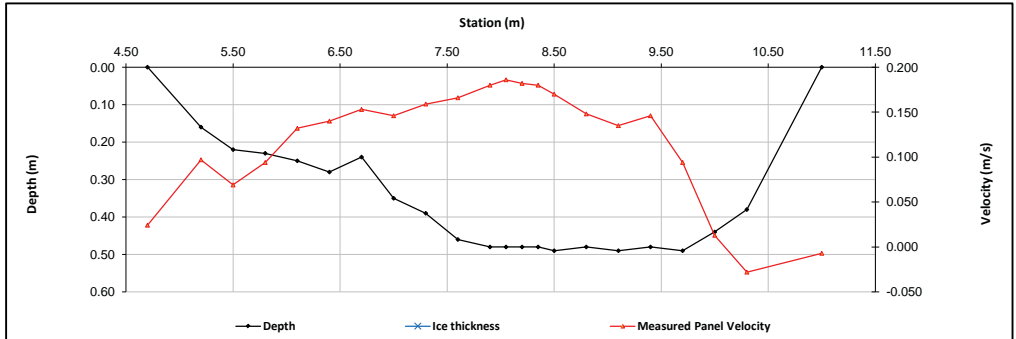
**Total Flow 0.257**

Measurement Details:	
Start Time (MST):	15:30
End Time (MST):	16:30
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	Excellent
Weather:	partly cloudy, breezy

Flow characteristics:	
Total Flow:	0.257 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	2.17 (m <sup>2</sup> )
Wetted Width:	6.30 (m)
Hydraulic Depth:	0.345 (m)
Mean Velocity:	0.118 (m/s)
Froude Number:	0.064

Logger Details:	
Transducer Reading (m):	Before 0.528 After
Water (°C):	15.7
Battery (Main):	14.4
Datalogger Clock:	15:36
Laptop Clock:	15:36
Dessicant:	replaced
Logger# (if Δ):	17937
PT# (if Δ):	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.109	101.109		100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.079	98.030		
Other:			1.234	99.875	99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.100	99.999	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.069	98.030		
Other:	1.224	101.099		99.875	99.870	Nail in tree

Closing Error	0.001	Average WL	98.030
WL Check	0.000	Transducer Elevation	97.502

**General Notes:**  
-TSS sampled at centre of flow

Field Personnel:		SM, CJ	Trip Date:	14-Jun-12
Data Entry Personnel:		CJ	Date:	27-Jun-12
Data Check Personnel:		DW	Date:	28-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: August 16, 2012



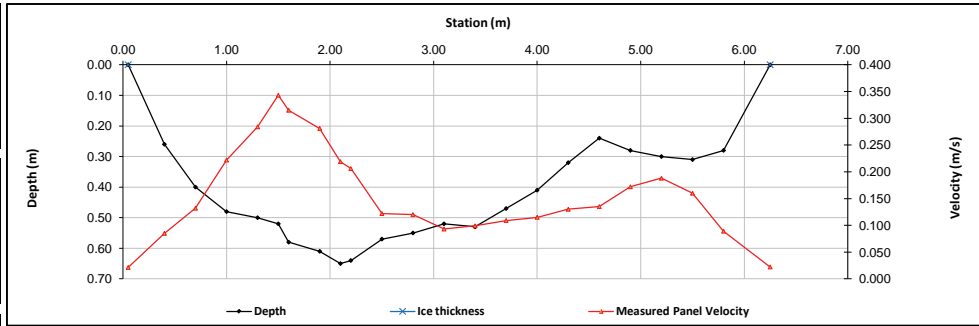
Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	0.05	0.00	0.00	0.000	0.000	0.000	1.0	0.05	0.23	0.18	0.07	0.021	0.021	0.01	0.000	0%							
1	0.40	0.26		0.085			1.0	0.23	0.55	0.33	0.26	0.085	0.085	0.08	0.007	2%							
2	0.70	0.40		0.132			1.0	0.55	0.85	0.30	0.40	0.132	0.132	0.12	0.016	4%							
3	1.00	0.48		0.222			1.0	0.85	1.15	0.30	0.48	0.222	0.222	0.14	0.032	8%							
4	1.30	0.50		0.284			1.0	1.15	1.40	0.25	0.50	0.284	0.284	0.13	0.036	8%							
5	1.50	0.52		0.343			1.0	1.40	1.55	0.15	0.52	0.343	0.343	0.08	0.027	6%							
6	1.60	0.58		0.315			1.0	1.55	1.75	0.20	0.58	0.315	0.315	0.12	0.037	9%							
7	1.90	0.61		0.281			1.0	1.75	2.00	0.25	0.61	0.281	0.281	0.15	0.043	10%							
8	2.10	0.65		0.219			1.0	2.00	2.15	0.15	0.65	0.219	0.219	0.10	0.021	5%							
9	2.20	0.64		0.206			1.0	2.15	2.35	0.20	0.64	0.206	0.206	0.13	0.026	6%							
10	2.50	0.57		0.122			1.0	2.35	2.65	0.30	0.57	0.122	0.122	0.17	0.021	5%							
11	2.80	0.55		0.120			1.0	2.65	2.95	0.30	0.55	0.120	0.120	0.17	0.020	5%							
12	3.10	0.52		0.093			1.0	2.95	3.25	0.30	0.52	0.093	0.093	0.16	0.015	3%							
13	3.40	0.53		0.099			1.0	3.25	3.55	0.30	0.53	0.099	0.099	0.16	0.016	4%							
14	3.70	0.47		0.109			1.0	3.55	3.85	0.30	0.47	0.109	0.109	0.14	0.015	4%							
15	4.00	0.41		0.115			1.0	3.85	4.15	0.30	0.41	0.115	0.115	0.12	0.014	3%							
16	4.30	0.32		0.130			1.0	4.15	4.45	0.30	0.32	0.130	0.130	0.10	0.012	3%							
17	4.60	0.24		0.135			1.0	4.45	4.75	0.30	0.24	0.135	0.135	0.07	0.010	2%							
18	4.90	0.28		0.172			1.0	4.75	5.05	0.30	0.28	0.172	0.172	0.08	0.014	3%							
19	5.20	0.30		0.188			1.0	5.05	5.35	0.30	0.30	0.188	0.188	0.09	0.017	4%							
20	5.50	0.31		0.160			1.0	5.35	5.65	0.30	0.31	0.160	0.160	0.09	0.015	4%							
21	5.80	0.28		0.089			1.0	5.65	6.03	0.38	0.28	0.089	0.089	0.11	0.009	2%							
RB	6.25	0.00	0.00	0.00	0.00	0.00	1.0	6.03	6.25	0.23	0.07	0.022	0.022	0.02	0.000	0%							
<b>Total Flow</b>														<b>0.423</b>									

Measurement Details:	
Start Time (MST):	12:05
End Time (MST):	15:10
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	good
Weather:	clear, calm, 30C

Flow characteristics:	
Total Flow:	0.423 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	2.53 (m <sup>2</sup> )
Wetted Width:	6.20 (m)
Hydraulic Depth:	0.408 (m)
Mean Velocity:	0.167 (m/s)
Froude Number:	0.084

Logger Details:		
	Before	After
Transducer Reading (m):	0.614	
Water (°C):	13.8	
Battery (Main):	13.7	
Datalogger Clock:	11:46	
Laptop Clock:	11:46	
Dessicant:	replaced	
Logger# (if Δ):	17937	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.097	101.097		100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:			1.179	99.918	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:			0.793	100.304	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.981	98.116		
Other:			1.227	99.870	99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.088	100.001	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:			1.170	99.919	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:	0.785	101.089		100.304	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.973	98.116		
Other:			1.218	99.871	99.870	Nail in tree
Closing Error	-0.001					
WL Check	0.000					
Average WL				98.116		
Transducer Elevation				97.502		

**General Notes:**

- TSS taken at offset 2 m
- Installed 2 BMs, one beside the Nail BM, the other 4 m W of the Nail BM
- New log across channel, however not in flow

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	16-Aug-12
<b>Data Entry Personnel:</b>	CJ (Field)	<b>Date:</b>	16-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	3-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: September 18, 2012



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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.50	0.50	0.01	-0.006	-0.006	0.01	0.000	0%
1	3.00	0.05		-0.023			1.0	2.50	3.50	1.00	0.05	-0.023	-0.023	0.05	-0.001	0%
2	4.00	0.40		-0.025			1.0	3.50	4.50	1.00	0.40	-0.025	-0.025	0.40	-0.010	-1%
3	5.00	0.48		0.005			1.0	4.50	5.38	0.88	0.48	0.005	0.005	0.42	0.002	0%
4	5.75	0.57		0.069			1.0	5.38	5.88	0.50	0.57	0.069	0.069	0.29	0.020	2%
5	6.00	0.59		0.078			1.0	5.88	6.10	0.23	0.59	0.078	0.078	0.13	0.010	1%
6	6.20	0.60		0.115			1.0	6.10	6.30	0.20	0.60	0.115	0.115	0.12	0.014	2%
7	6.40	0.60		0.149			1.0	6.30	6.50	0.20	0.60	0.149	0.149	0.12	0.018	2%
8	6.60	0.62		0.181			1.0	6.50	6.70	0.20	0.62	0.181	0.181	0.12	0.022	3%
9	6.80	0.63		0.278			1.0	6.70	6.95	0.25	0.63	0.278	0.278	0.16	0.044	5%
10	7.10	0.64		0.269			1.0	6.95	7.25	0.30	0.64	0.269	0.269	0.19	0.052	6%
11	7.40	0.64		0.267			1.0	7.25	7.55	0.30	0.64	0.267	0.267	0.19	0.051	6%
12	7.70	0.67		0.364			1.0	7.55	7.85	0.30	0.67	0.364	0.364	0.20	0.073	9%
13	8.00	0.74		0.458			1.0	7.85	8.06	0.21	0.74	0.458	0.458	0.16	0.071	9%
14	8.12	0.72		0.467			1.0	8.06	8.19	0.13	0.72	0.467	0.467	0.09	0.042	5%
15	8.25	0.74		0.452			1.0	8.19	8.31	0.13	0.74	0.452	0.452	0.09	0.042	5%
16	8.37	0.73		0.498			1.0	8.31	8.44	0.13	0.73	0.498	0.498	0.09	0.045	6%
17	8.50	0.69		0.553			1.0	8.44	8.63	0.19	0.69	0.553	0.553	0.13	0.072	9%
18	8.75	0.62		0.466			1.0	8.63	8.88	0.25	0.62	0.466	0.466	0.16	0.072	9%
19	9.00	0.60		0.419			1.0	8.88	9.13	0.25	0.60	0.419	0.419	0.15	0.063	8%
20	9.25	0.63		0.278			1.0	9.13	9.38	0.25	0.63	0.278	0.278	0.16	0.044	5%
21	9.50	0.55		0.238			1.0	9.38	9.63	0.25	0.55	0.238	0.238	0.14	0.033	4%
22	9.75	0.54		0.187			1.0	9.63	9.88	0.25	0.54	0.187	0.187	0.14	0.025	3%
LB	10.00	0.00	0.00	0.00	0.00	0.00	1.0	9.88	10.00	0.13	0.14	0.047	0.047	0.02	0.001	0%

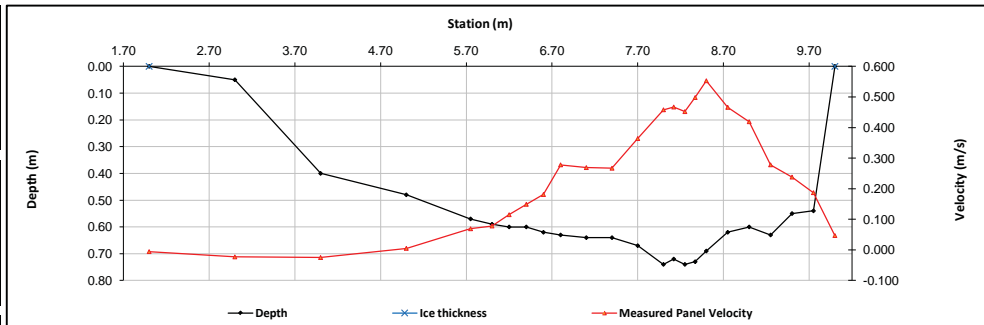
**Total Flow 0.805**

Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	12:37
Equipment:	ADV
Method:	Wading
River Condition:	medium-high
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 12C

Flow characteristics:		
Total Flow:	0.805	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.71	(m <sup>2</sup> )
Wetted Width:	8.00	(m)
Hydraulic Depth:	0.464	(m)
Mean Velocity:	0.217	(m/s)
Froude Number:	0.102	

Logger Details:		
	Before	After
Transducer Reading (m):	0.781	
Water (°C):	9.3	
Battery (Main):	13.7	
Datalogger Clock:	10:42	
Laptop Clock:	10:42	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.056	101.056		100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:			1.138	99.918	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:			0.753	100.303	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.775	98.281		
Other:			1.187	99.869	99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.046	100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:			1.128	99.918	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:	0.743	101.046		100.303	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.763	98.283		
Other:			1.177	99.869	99.870	Nail in tree

Closing Error	0.000	Average WL	98.282
WL Check	0.002	Transducer Elevation	97.501

General Notes:	

Field Personnel:		Trip Date:	
Data Entry Personnel:	DW, SG	Date:	18-Sep-12
Data Check Personnel:	SG (Field)	Date:	18-Sep-12
	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek

UTM Location: 465524 E, 6372768 N

Site Visit Date:

November 2, 2012



## 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
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

### Measurement Details:

Start Time (MST):	8:30
End Time (MST):	9:15
Equipment:	-
Method:	-
River Condition:	High flow, full ice cover
Quality/Error (see reverse):	-
Weather:	Overcast, -5

### Flow characteristics:

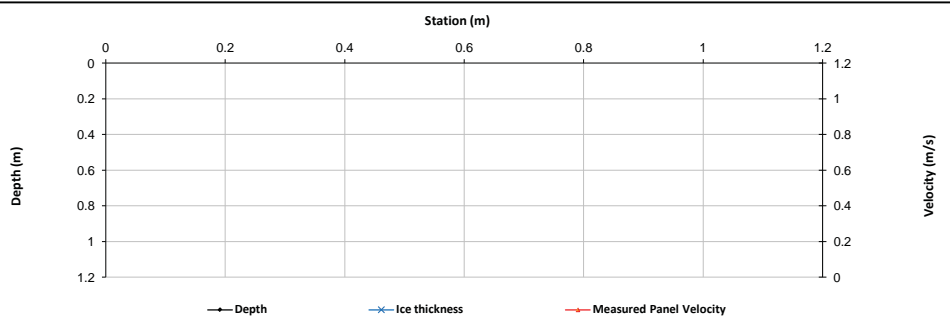
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	-	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

### Logger Details:

	Before	After
Transducer Reading (m):	0.672	
Water (°C):	0.5	
Battery (Main):	12.2	
Datalogger Clock:	8:34	
Laptop Clock:	8:34	
Dessicant:	replaced	
Logger# (if Δ):	17937	
PT# (if Δ):	278515	

### Datalogger / Station Notes:re

- Removed PLS for winter
- Anchor + cable left at base of logger



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.047	101.047		100.000	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:			1.128	99.919	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:			0.743	100.304	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.873	98.174		
Other:					99.870	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.994	100.002	100.000	3/4" Pipe 6 m N of data logger
Bench Mark 2:	1.077	100.996		99.919	99.918	3/4" Pipe 5 m NE of data logger
Bench Mark 3:			0.691	100.305	100.304	3/4" Pipe 7 m N of data logger
Ice/PT:						
Water Level:			2.821	98.175		
Other:					99.870	Nail in tree

Closing Error	-0.002
WL Check	0.001

Average WL	98.175
Transducer Elevation	97.503

### General Notes:

- no flow measurement was conducted, ice was too thick-to open channel in reasonable time

### Field Personnel:

Data Entry Personnel:	SM, TR	Trip Date:	2-Nov-12
Data Check Personnel:	DW	Date:	2-Nov-12
Entered Digitally in the Field:	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Date:	8-Nov-12

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay

UTM Location: 474872 E, 6400203 N

Site Visit Date:

April 26, 2012



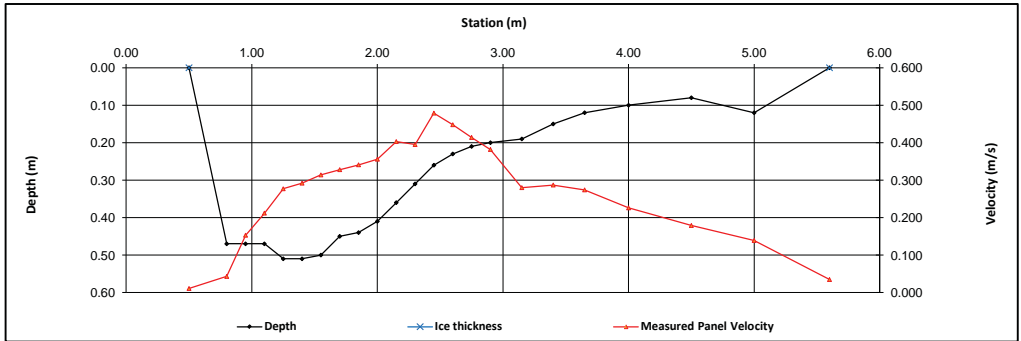
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Depth (m)	Measured Pannel Velocity (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	0.65	0.15	0.12	0.011	0.011	0.02	0.000	0%
1	0.80	0.47		0.043			1.0	0.65	0.88	0.23	0.47	0.043	0.043	0.11	0.005	1%
2	0.95	0.47		0.153			1.0	0.88	1.03	0.15	0.47	0.153	0.153	0.07	0.011	3%
3	1.10	0.47		0.212			1.0	1.03	1.18	0.15	0.47	0.212	0.212	0.07	0.015	5%
4	1.25	0.51		0.277			1.0	1.18	1.33	0.15	0.51	0.277	0.277	0.08	0.021	6%
5	1.40	0.51		0.292			1.0	1.33	1.48	0.15	0.51	0.292	0.292	0.08	0.022	7%
6	1.55	0.50		0.314			1.0	1.48	1.63	0.15	0.50	0.314	0.314	0.08	0.024	7%
7	1.70	0.45		0.328			1.0	1.63	1.78	0.15	0.45	0.328	0.328	0.07	0.022	7%
8	1.85	0.44		0.341			1.0	1.78	1.93	0.15	0.44	0.341	0.341	0.07	0.023	7%
9	2.00	0.41		0.356			1.0	1.93	2.08	0.15	0.41	0.356	0.356	0.06	0.022	7%
10	2.15	0.36		0.403			1.0	2.08	2.23	0.15	0.36	0.403	0.403	0.05	0.022	7%
11	2.30	0.31		0.395			1.0	2.23	2.38	0.15	0.31	0.395	0.395	0.05	0.018	6%
12	2.45	0.26		0.479			1.0	2.38	2.53	0.15	0.26	0.479	0.479	0.04	0.019	6%
13	2.60	0.23		0.448			1.0	2.53	2.68	0.15	0.23	0.448	0.448	0.03	0.015	5%
14	2.75	0.21		0.414			1.0	2.68	2.83	0.15	0.21	0.414	0.414	0.03	0.013	4%
15	2.90	0.20		0.382			1.0	2.83	3.03	0.20	0.20	0.382	0.382	0.04	0.015	5%
16	3.15	0.19		0.280			1.0	3.03	3.28	0.25	0.19	0.280	0.280	0.05	0.013	4%
17	3.40	0.15		0.287			1.0	3.28	3.53	0.25	0.15	0.287	0.287	0.04	0.011	3%
18	3.65	0.12		0.274			1.0	3.53	3.83	0.30	0.12	0.274	0.274	0.04	0.010	3%
19	4.00	0.10		0.226			1.0	3.83	4.25	0.43	0.10	0.226	0.226	0.04	0.010	3%
20	4.50	0.08		0.179			1.0	4.25	4.75	0.50	0.08	0.179	0.179	0.04	0.007	2%
21	5.00	0.12		0.139			1.0	4.75	5.30	0.55	0.12	0.139	0.139	0.07	0.009	3%
RB	5.60	0.00	0.00	0.000	0.000	0.000	1.0	5.30	5.60	0.30	0.03	0.035	0.035	0.01	0.000	0%
<b>Total Flow</b>														<b>0.327</b>		

Measurement Details:	
Start Time (MST):	13:20
End Time (MST):	15:10
Equipment:	ADV
Method:	Wading
River Condition:	open, ice along banks
Quality/Error (see reverse):	excellent
Weather:	clear, breezy, +8

Flow characteristics:		
Total Flow:	0.327	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	1.21	(m <sup>2</sup> )
Wetted Width:	5.10	(m)
Hydraulic Depth:	0.238	(m)
Mean Velocity:	0.270	(m/s)
Froude Number:	0.177	

Logger Details:		
	Before	After
Transducer Reading (m):	0.345	0.337
Water (°C):	9.6	3.8
Battery (Main):	14.6	13.49
Datalogger Clock:	13:19	-
Laptop Clock:	13:19	-
Dessicant:	replaced	-
Logger# (if Δ):	18203	-
PT# (if Δ):	273450	-

**Datalogger / Station Notes:**  
- Installed PLS and logger.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.916	98.296		
Other:	1.212	101.212		100.000	100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			2.896	98.298		
Other:	1.194	101.194		100.000	100.000	Nail in logger tree

Closing Error	0.000	Average WL	98.297
WL Check	0.002	Transducer Elevation	97.952

**General Notes:**  
- Station relocated upstream from S50 site at: 474923E, 6400150N.

<b>Field Personnel:</b>	SM, SG	<b>Trip Date:</b>	26-Apr-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	28-May-12

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay

UTM Location: 474872 E, 6400203 N

Site Visit Date:

June 14, 2012



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	2.90	0.00	0.00	0.000	0.000	0.000	1.0	2.90	2.95	0.05	0.04	-0.007	-0.007	0.00	0.000	0%
1	3.00	0.16		-0.028			1.0	2.95	3.10	0.15	0.16	-0.028	-0.028	0.02	-0.001	0%
2	3.20	0.36		0.000			1.0	3.10	3.30	0.20	0.36	0.000	0.000	0.07	0.000	0%
3	3.40	0.36		0.017			1.0	3.30	3.50	0.20	0.36	0.017	0.017	0.07	0.001	1%
4	3.60	0.38		0.124			1.0	3.50	3.70	0.20	0.38	0.124	0.124	0.08	0.009	5%
5	3.80	0.38		0.131			1.0	3.70	3.90	0.20	0.38	0.131	0.131	0.08	0.010	5%
6	4.00	0.36		0.240			1.0	3.90	4.10	0.20	0.36	0.240	0.240	0.07	0.017	9%
7	4.20	0.29		0.261			1.0	4.10	4.30	0.20	0.29	0.261	0.261	0.06	0.015	8%
8	4.40	0.29		0.271			1.0	4.30	4.45	0.15	0.29	0.271	0.271	0.04	0.012	6%
9	4.50	0.30		0.320			1.0	4.45	4.55	0.10	0.30	0.320	0.320	0.03	0.010	5%
10	4.60	0.27		0.364			1.0	4.55	4.65	0.10	0.27	0.364	0.364	0.03	0.010	5%
11	4.70	0.26		0.398			1.0	4.65	4.75	0.10	0.26	0.398	0.398	0.03	0.010	6%
12	4.80	0.27		0.401			1.0	4.75	4.85	0.10	0.27	0.401	0.401	0.03	0.011	6%
13	4.90	0.26		0.434			1.0	4.85	4.95	0.10	0.26	0.434	0.434	0.03	0.011	6%
14	5.00	0.23		0.344			1.0	4.95	5.10	0.15	0.23	0.344	0.344	0.03	0.012	6%
15	5.20	0.20		0.375			1.0	5.10	5.30	0.20	0.20	0.375	0.375	0.04	0.015	8%
16	5.40	0.17		0.374			1.0	5.30	5.50	0.20	0.17	0.374	0.374	0.03	0.013	7%
17	5.60	0.17		0.333			1.0	5.50	5.70	0.20	0.17	0.333	0.333	0.03	0.011	6%
18	5.80	0.16		0.256			1.0	5.70	5.90	0.20	0.16	0.256	0.256	0.03	0.008	4%
19	6.00	0.12		0.268			1.0	5.90	6.10	0.20	0.12	0.268	0.268	0.02	0.006	3%
20	6.20	0.09		0.240			1.0	6.10	6.30	0.20	0.09	0.240	0.240	0.02	0.004	2%
21	6.40	0.07		0.069			1.0	6.30	6.70	0.40	0.07	0.069	0.069	0.03	0.002	1%
RB	7.00	0.00	0.00	0.000	0.000	0.000	1.0	6.70	7.00	0.30	0.02	0.017	0.017	0.01	0.000	0%
<b>Total Flow</b>														<b>0.188</b>		

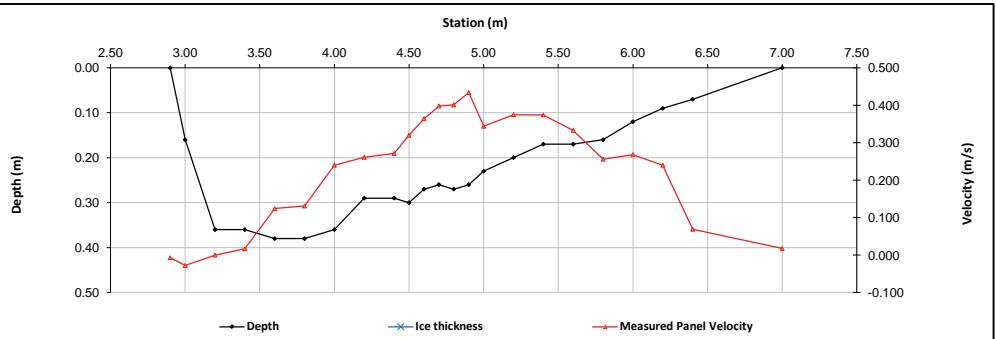
Measurement Details:	
Start Time (MST):	13:50
End Time (MST):	14:25
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	excellent
Weather:	overcast, breezy, 13°C

Flow characteristics:		
Total Flow:	0.188	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	0.88	(m <sup>2</sup> )
Wetted Width:	4.10	(m)
Hydraulic Depth:	0.215	(m)
Mean Velocity:	0.213	(m/s)
Froude Number:	0.147	

Logger Details:		
	Before	After
Transducer Reading (m):	0.294	-
Water (°C):	11.6	-
Battery (Main):	13.9	-
Datalogger Clock:	12:52	-
Laptop Clock:	12:52	-
Dessicant:	replaced	-
Logger# (if Δ):	18203	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- No reception for cell telemetry.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:						
Bench Mark 2:			0.974	100.160	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.166	99.968	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.907	98.227		
Other:	1.134	101.134		100.000	100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.963	101.123		100.160	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.156	99.967	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.898	98.225		
Other:			1.124	99.999	100.000	Nail in logger tree

Closing Error	0.001
WL Check	0.002

Average WL	98.226
Transducer Elevation	97.932

**General Notes:**

- 2 BMs installed, left 1 length of pipe at station for 3rd BM, bring another length next visit.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	14-Jun-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	27-Jun-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	28-Jun-12



# Hydrometric Measurement Field Data Sheet

Site: S50 Red Clay Creek

UTM Location: 474872 E, 6400203 N

Site Visit Date:

August 16, 2012



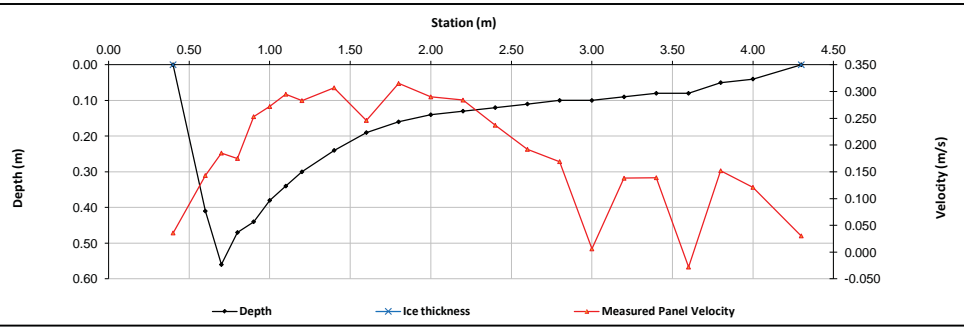
Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured 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	0.40	0.00	0.00	0.000	0.000	0.000	1.0	0.40	0.50	0.10	0.10	0.036	0.036	0.01	0.000	0%
1	0.60	0.41		0.143			1.0	0.50	0.65	0.15	0.41	0.143	0.143	0.06	0.009	6%
2	0.70	0.56		0.185			1.0	0.65	0.75	0.10	0.56	0.185	0.185	0.06	0.010	7%
3	0.80	0.47		0.175			1.0	0.75	0.85	0.10	0.47	0.175	0.175	0.05	0.008	6%
4	0.90	0.44		0.253			1.0	0.85	0.95	0.10	0.44	0.253	0.253	0.04	0.011	8%
5	1.00	0.38		0.272			1.0	0.95	1.05	0.10	0.38	0.272	0.272	0.04	0.010	7%
6	1.10	0.34		0.295			1.0	1.05	1.15	0.10	0.34	0.295	0.295	0.03	0.010	7%
7	1.20	0.30		0.283			1.0	1.15	1.30	0.15	0.30	0.283	0.283	0.05	0.013	9%
8	1.40	0.24		0.307			1.0	1.30	1.50	0.20	0.24	0.307	0.307	0.05	0.015	10%
9	1.60	0.19		0.246			1.0	1.50	1.70	0.20	0.19	0.246	0.246	0.04	0.009	7%
10	1.80	0.16		0.315			1.0	1.70	1.90	0.20	0.16	0.315	0.315	0.03	0.010	7%
11	2.00	0.14		0.290			1.0	1.90	2.10	0.20	0.14	0.290	0.290	0.03	0.008	6%
12	2.20	0.13		0.284			1.0	2.10	2.30	0.20	0.13	0.284	0.284	0.03	0.007	5%
13	2.40	0.12		0.237			1.0	2.30	2.50	0.20	0.12	0.237	0.237	0.02	0.006	4%
14	2.60	0.11		0.192			1.0	2.50	2.70	0.20	0.11	0.192	0.192	0.02	0.004	3%
15	2.80	0.10		0.169			1.0	2.70	2.90	0.20	0.10	0.169	0.169	0.02	0.003	2%
16	3.00	0.10		0.006			1.0	2.90	3.10	0.20	0.10	0.006	0.006	0.02	0.000	0%
17	3.20	0.09		0.138			1.0	3.10	3.30	0.20	0.09	0.138	0.138	0.02	0.002	2%
18	3.40	0.08		0.139			1.0	3.30	3.50	0.20	0.08	0.139	0.139	0.02	0.002	2%
19	3.60	0.08		-0.028			1.0	3.50	3.70	0.20	0.08	-0.028	-0.028	0.02	0.000	0%
20	3.80	0.05		0.152			1.0	3.70	3.90	0.20	0.05	0.152	0.152	0.01	0.002	1%
21	4.00	0.04		0.121			1.0	3.90	4.15	0.25	0.04	0.121	0.121	0.01	0.001	1%
RB	4.30	0.00	0.00	0.00	0.00	0.00	1.0	4.15	4.30	0.15	0.01	0.030	0.030	0.00	0.000	0%
<b>Total Flow</b>														<b>0.142</b>		

Measurement Details:	
Start Time (MST):	9:50
End Time (MST):	11:25
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 20

Flow characteristics:	
Total Flow:	0.142 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	0.67 (m <sup>2</sup> )
Wetted Width:	3.90 (m)
Hydraulic Depth:	0.171 (m)
Mean Velocity:	0.213 (m/s)
Froude Number:	0.165

Logger Details:		
	Before	After
Transducer Reading (m):	0.275	
Water (°C):	11.4	
Battery (Main):	13.4	
Datalogger Clock:	9:09	
Laptop Clock:	9:09	
Dessicant:	replaced	
Logger# (if Δ):	18203	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			1.039	100.161	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.231	99.969	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.983	98.217		
Other:	1.200	101.200		100.000	100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.985	100.162	100.160	Pipe 4 m N of logger
Bench Mark 3:	1.178	101.147		99.969	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.933	98.214		
Other:			1.147	100.000	100.000	Nail in logger tree
Closing Error	0.000					
WL Check	0.003					
Average WL				98.216		
Transducer Elevation				97.941		

**General Notes:**

- TSS taken at offset 1.5 m.
- Needs 1 BM, pipe already at station.

Field Personnel:		Trip Date:	16-Aug-12
Data Entry Personnel:	CJ (Field)	Date:	16-Aug-12
Data Check Personnel:	CJ	Date:	3-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek

UTM Location: 474872 E, 6400203 N

Site Visit Date:

September 13, 2012



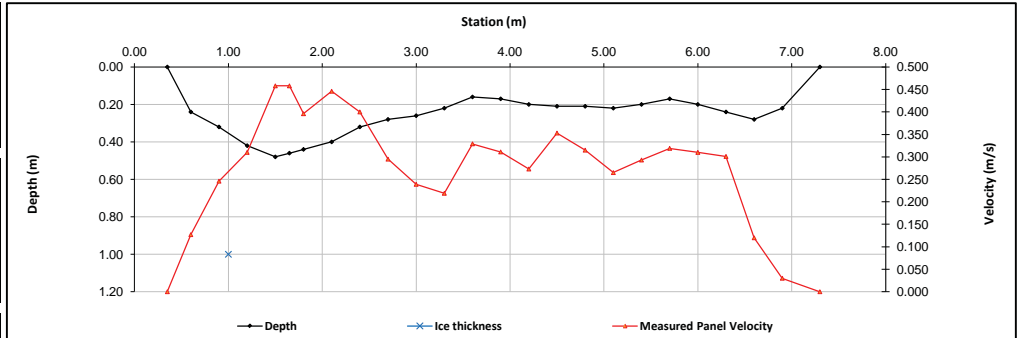
Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	0.35	0.00	0.00	0.000	0.000	0.000	1.0	0.35	0.48	0.13	0.06	0.032	0.032	0.01	0.000	0%							
1	0.60	0.24		0.127			1.0	0.48	0.75	0.28	0.24	0.127	0.127	0.07	0.008	2%							
2	0.90	0.32		0.246			1.0	0.75	1.05	0.30	0.32	0.246	0.246	0.10	0.024	4%							
3	1.20	0.42		0.310			1.0	1.05	1.35	0.30	0.42	0.310	0.310	0.13	0.039	7%							
4	1.50	0.48		0.458			1.0	1.35	1.58	0.23	0.48	0.458	0.458	0.11	0.049	9%							
5	1.65	0.46		0.458			1.0	1.58	1.73	0.15	0.46	0.458	0.458	0.07	0.032	6%							
6	1.80	0.44		0.396			1.0	1.73	1.95	0.23	0.44	0.396	0.396	0.10	0.039	7%							
7	2.10	0.40		0.446			1.0	1.95	2.25	0.30	0.40	0.446	0.446	0.12	0.054	10%							
8	2.40	0.32		0.400			1.0	2.25	2.55	0.30	0.32	0.400	0.400	0.10	0.038	7%							
9	2.70	0.28		0.295			1.0	2.55	2.85	0.30	0.28	0.295	0.295	0.08	0.025	5%							
10	3.00	0.26		0.239			1.0	2.85	3.15	0.30	0.26	0.239	0.239	0.08	0.019	3%							
11	3.30	0.22		0.219			1.0	3.15	3.45	0.30	0.22	0.219	0.219	0.07	0.014	3%							
12	3.60	0.16		0.329			1.0	3.45	3.75	0.30	0.16	0.329	0.329	0.05	0.016	3%							
13	3.90	0.17		0.311			1.0	3.75	4.05	0.30	0.17	0.311	0.311	0.05	0.016	3%							
14	4.20	0.20		0.273			1.0	4.05	4.35	0.30	0.20	0.273	0.273	0.06	0.016	3%							
15	4.50	0.21		0.353			1.0	4.35	4.65	0.30	0.21	0.353	0.353	0.06	0.022	4%							
16	4.80	0.21		0.315			1.0	4.65	4.95	0.30	0.21	0.315	0.315	0.06	0.020	4%							
17	5.10	0.22		0.265			1.0	4.95	5.25	0.30	0.22	0.265	0.265	0.07	0.017	3%							
18	5.40	0.20		0.293			1.0	5.25	5.55	0.30	0.20	0.293	0.293	0.06	0.018	3%							
19	5.70	0.17		0.319			1.0	5.55	5.85	0.30	0.17	0.319	0.319	0.05	0.016	3%							
20	6.00	0.20		0.310			1.0	5.85	6.15	0.30	0.20	0.310	0.310	0.06	0.019	3%							
21	6.30	0.24		0.301			1.0	6.15	6.45	0.30	0.24	0.301	0.301	0.07	0.022	4%							
22	6.60	0.28		0.120			1.0	6.45	6.75	0.30	0.28	0.120	0.120	0.08	0.010	2%							
23	6.90	0.22		0.030			1.0	6.75	7.10	0.35	0.22	0.030	0.030	0.08	0.002	0%							
RB	7.30	0.00	0.00	0.000	0.000	0.000	1.0	7.10	7.30	0.20	0.06	0.008	0.008	0.01	0.000	0%							
<b>Total Flow</b>														<b>0.536</b>									

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	14:35
Equipment:	ADV
Method:	Wading
River Condition:	Good, Bankfull Level
Quality/Error (see reverse):	Good
Weather:	SUNNY, 20 C

Flow characteristics:		
Total Flow:	0.536	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.78	(m <sup>2</sup> )
Wetted Width:	6.95	(m)
Hydraulic Depth:	0.256	(m)
Mean Velocity:	0.301	(m/s)
Froude Number:	0.190	

Logger Details:		
	Before	After
Transducer Reading (m):	0.447	
Water (°C):	9.1	
Battery (Main):	13.92	
Datalogger Clock:	12:11	
Laptop Clock:	12:11	
Dessicant:	REPLACED	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.987	100.157	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.178	99.966	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.753	98.391		
Other:	1.144	101.144		100.000	100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.948	100.157	100.160	Pipe 4 m N of logger
Bench Mark 3:	1.139	101.105		99.966	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.712	98.393		
Other:			1.103	100.002	100.000	Nail in logger tree

Closing Error	0.002
WL Check	0.002

Average WL	98.392
Transducer Depth	97.945

**General Notes:**

- Very large tree near the logger is broken and leaning. It is hung up in an adjacent tree and will likely damage the station if it falls.
- TSS @ 2.5 M.

Field Personnel:		DW, TR	Trip Date:	13-Sep-12
Data Entry Personnel:	DW (Field)		Date:	13-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek

UTM Location: 474872 E, 6400203 N

Site Visit Date:

September 27, 2012



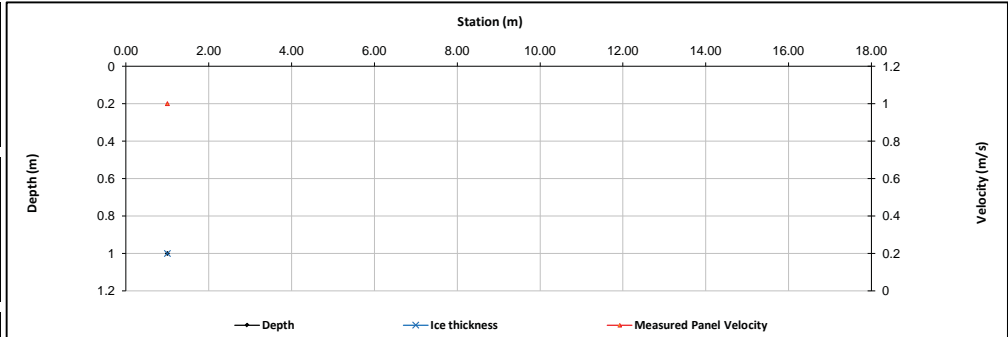
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
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25																
26																
27																
28																
29																
30																
No Flow Measurement Conducted																
<b>Total Flow</b>															-	

Measurement Details:	
Start Time (MST):	13:00
End Time (MST):	14:30
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.995	Pipe 5 m E of logger
Bench Mark 2:					100.160	Pipe 4 m N of logger
Bench Mark 3:					99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:						
Other:					100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:					100.995	Pipe 5 m E of logger
Bench Mark 2:					100.160	Pipe 4 m N of logger
Bench Mark 3:					99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:						
Other:					100.000	Nail in logger tree

Closing Error	
WL Check	

Average WL	
Transducer Depth	

**General Notes:**

- Installed 3rd BM (3/4" Pipe)

Field Personnel:	SM, TR	Trip Date:	27-Sep-12
Data Entry Personnel:	SM (Field)	Date:	27-Sep-12
Data Check Personnel:	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek

UTM Location: 474872 E, 6400203 N

Site Visit Date:

November 2, 2012



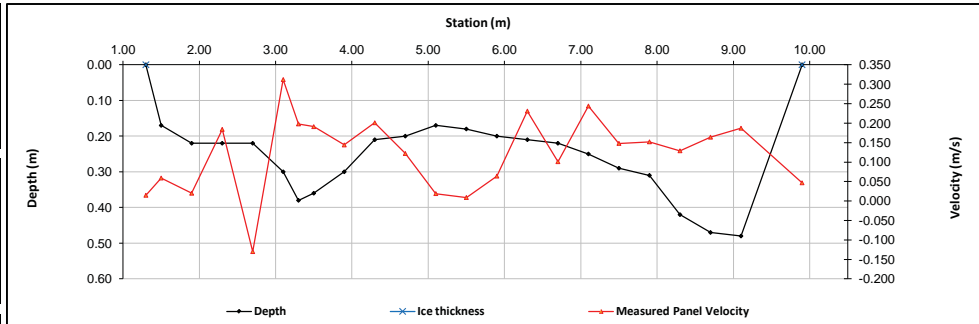
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	1.30	0.00	0.00	0.000	0.000	0.000	1.0	1.30	1.40	0.10	0.04	0.015	0.015	0.00	0.000	0%
1	1.50	0.17		0.059			1.0	1.40	1.70	0.30	0.17	0.059	0.059	0.05	0.003	1%
2	1.90	0.22		0.020			1.0	1.70	2.10	0.40	0.22	0.020	0.020	0.09	0.002	1%
3	2.30	0.22		0.184			1.0	2.10	2.50	0.40	0.22	0.184	0.184	0.09	0.016	5%
4	2.70	0.22		-0.130			1.0	2.50	2.90	0.40	0.22	-0.130	-0.130	0.09	-0.011	-4%
5	3.10	0.30		0.312			1.0	2.90	3.20	0.30	0.30	0.312	0.312	0.09	0.028	9%
6	3.30	0.38		0.198			1.0	3.20	3.40	0.20	0.38	0.198	0.198	0.08	0.015	5%
7	3.50	0.36		0.191			1.0	3.40	3.70	0.30	0.36	0.191	0.191	0.11	0.021	6%
8	3.90	0.30		0.144			1.0	3.70	4.10	0.40	0.30	0.144	0.144	0.12	0.017	5%
9	4.30	0.21		0.201			1.0	4.10	4.50	0.40	0.21	0.201	0.201	0.08	0.017	5%
10	4.70	0.20		0.122			1.0	4.50	4.90	0.40	0.20	0.122	0.122	0.08	0.010	3%
11	5.10	0.17		0.019			1.0	4.90	5.30	0.40	0.17	0.019	0.019	0.07	0.001	0%
12	5.50	0.18		0.009			1.0	5.30	5.70	0.40	0.18	0.009	0.009	0.07	0.001	0%
13	5.90	0.20		0.064			1.0	5.70	6.10	0.40	0.20	0.064	0.064	0.08	0.005	2%
14	6.30	0.21		0.231			1.0	6.10	6.50	0.40	0.21	0.231	0.231	0.08	0.019	6%
15	6.70	0.22		0.101			1.0	6.50	6.90	0.40	0.22	0.101	0.101	0.09	0.009	3%
16	7.10	0.25		0.244			1.0	6.90	7.30	0.40	0.25	0.244	0.244	0.10	0.024	8%
17	7.50	0.29		0.148			1.0	7.30	7.70	0.40	0.29	0.148	0.148	0.12	0.017	5%
18	7.90	0.31		0.152			1.0	7.70	8.10	0.40	0.31	0.152	0.152	0.12	0.019	6%
19	8.30	0.42		0.129			1.0	8.10	8.50	0.40	0.42	0.129	0.129	0.17	0.022	7%
20	8.70	0.47		0.164			1.0	8.50	8.90	0.40	0.47	0.164	0.164	0.19	0.031	10%
21	9.10	0.48		0.187			1.0	8.90	9.50	0.60	0.48	0.187	0.187	0.29	0.054	17%
LB	9.90	0.00	0.00	0.00	0.00	0.00	1.0	9.50	9.90	0.40	0.12	0.047	0.047	0.05	0.002	1%
<b>Total Flow</b>														<b>0.322</b>		

Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	11:40
Equipment:	ADV
Method:	Fair
River Condition:	high flow, full ice cover
Quality/Error (see reverse):	Fair
Weather:	Overcast, -8

Flow characteristics:		
Total Flow:	0.322	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	2.30	(m <sup>2</sup> )
Wetted Width:	8.60	(m)
Hydraulic Depth:	0.268	(m)
Mean Velocity:	0.140	(m/s)
Froude Number:	0.086	

Logger Details:		
	Before	After
Transducer Reading (m):	0.498	
Water (°C):	0.3	
Battery (Main):	12.9	
Datalogger Clock:	10:30	
Laptop Clock:	10:31	
Dessicant:	Replaced	
Logger# (if Δ):	18203	
PT# (if Δ):	273450	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.258	100.995	100.995	Pipe 5 m E of logger
Bench Mark 2:	1.093	101.253		100.160	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.284	99.969	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.883	98.370		
Other:					100.000	Nail in logger tree
<b>Setup #2</b>						
Bench Mark 1:	0.248	101.243		100.995	100.995	Pipe 5 m E of logger
Bench Mark 2:			1.084	100.159	100.160	Pipe 4 m N of logger
Bench Mark 3:			1.275	99.968	99.968	Pipe 6 m N of logger
Ice/PT:						
Water Level:			2.874	98.369		
Other:					100.000	Nail in logger tree

Closing Error	0.001	Average WL	98.370
WL Check	0.001	Transducer Elevation	97.872

**General Notes:**

- removed PLS for winter.
- anchor cable + weight left at base of logger tree.
- opened section of channel for flow meas.
- ADV test- good.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	2-Nov-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2-Nov-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	9-Nov-12
<b>Entered Digitally in the Field:</b>	<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:

May 20, 2012



## 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
LB	1.00	0.00	0.00	0.000	0.000	0.000	1.0	1.00	1.50	0.50	0.13	0.106	0.106	0.07	0.007	0%
1	2.00	0.52		0.422			1.0	1.50	2.50	1.00	0.52	0.422	0.52	0.219	2%	
2	3.00	0.74		0.414			1.0	2.50	3.50	1.00	0.74	0.414	0.74	0.306	3%	
3	4.00	0.80			0.390	1.020	1.0	3.50	4.38	0.88	0.80	0.705	0.705	0.70	0.494	5%
4	4.75	0.95		0.721	0.957		1.0	4.38	5.13	0.75	0.95	0.839	0.839	0.71	0.598	6%
5	5.50	0.95		0.879	1.078		1.0	5.13	5.88	0.75	0.95	0.979	0.979	0.71	0.697	7%
6	6.25	0.95		0.848	0.996		1.0	5.88	6.63	0.75	0.95	0.922	0.922	0.71	0.657	7%
7	7.00	0.95		0.831	0.973		1.0	6.63	7.38	0.75	0.95	0.902	0.902	0.71	0.643	7%
8	7.75	0.95		0.704	1.068		1.0	7.38	8.13	0.75	0.95	0.886	0.886	0.71	0.631	7%
9	8.50	0.90		0.873	1.011		1.0	8.13	8.88	0.75	0.90	0.942	0.942	0.68	0.636	7%
10	9.25	0.80		0.810	0.956		1.0	8.88	9.63	0.75	0.80	0.883	0.883	0.60	0.530	6%
11	10.00	0.80		0.783	0.975		1.0	9.63	10.38	0.75	0.80	0.879	0.879	0.60	0.527	5%
12	10.75	0.80		0.739	0.921		1.0	10.38	11.13	0.75	0.80	0.830	0.830	0.60	0.498	5%
13	11.50	0.72	0.794				1.0	11.13	11.88	0.75	0.72	0.794	0.794	0.54	0.429	4%
14	12.25	0.68	0.807				1.0	11.88	12.63	0.75	0.68	0.807	0.807	0.51	0.412	4%
15	13.00	0.68	0.774				1.0	12.63	13.38	0.75	0.68	0.774	0.774	0.51	0.395	4%
16	13.75	0.64	0.806				1.0	13.38	14.13	0.75	0.64	0.806	0.806	0.48	0.387	4%
17	14.50	0.57	0.743				1.0	14.13	14.88	0.75	0.57	0.743	0.743	0.43	0.318	3%
18	15.25	0.52	0.658				1.0	14.88	15.63	0.75	0.52	0.658	0.658	0.39	0.257	3%
19	16.00	0.46	0.744				1.0	15.63	16.50	0.88	0.46	0.744	0.744	0.40	0.299	3%
20	17.00	0.44	0.682				1.0	16.50	17.50	1.00	0.44	0.682	0.682	0.44	0.300	3%
21	18.00	0.42	0.630				1.0	17.50	18.50	1.00	0.42	0.630	0.630	0.42	0.265	3%
22	19.00	0.28	0.456				1.0	18.50	19.25	0.75	0.28	0.456	0.456	0.21	0.096	1%
RB	19.50	0.00	0.000	0.000	0.000	0.000	1.0	19.25	19.50	0.25	0.07	0.114	0.114	0.02	0.002	0%
<b>Total Flow</b>															<b>9.60</b>	

## Measurement Details:

Start Time (MST):	11:00
End Time (MST):	13:00
Equipment:	ADV
Method:	Fishcat
River Condition:	open, high flow
Quality/Error (see reverse):	Excellent
Weather:	sunny, light breeze, +15

## Flow characteristics:

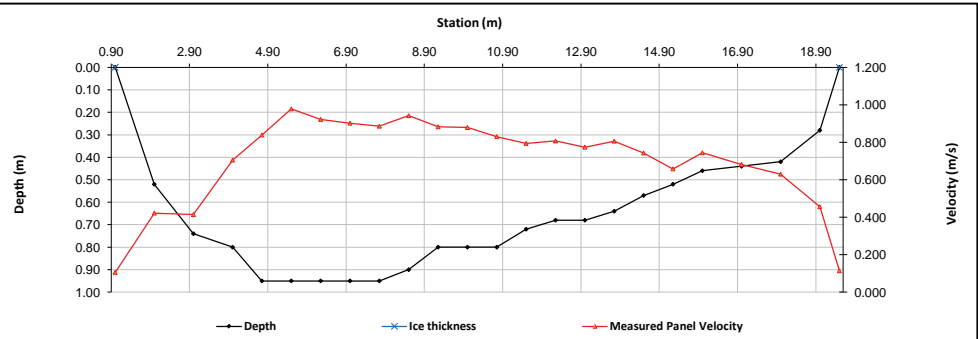
Total Flow:	9.60	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	12.41	(m <sup>2</sup> )
Wetted Width:	18.50	(m)
Hydraulic Depth:	0.671	(m)
Mean Velocity:	0.774	(m/s)
Froude Number:	0.302	

## Logger Details:

	Before	After
Transducer Reading (m):	0.390	
Water (°C):	9.2	
Battery (Main):	13.1	
Datalogger Clock:	12:53	
Laptop Clock:	12:53	
Dessicant:	new	
Logger# (if Δ):	20958	
PT# (if Δ):	298707	

## Datalogger / Station Notes:

Datalogger / Station Notes:		
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Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:	0.902	100.902		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			0.843	100.059	100.058	Pipe 3 m S of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.822	98.080		
Other:						
Setup #2						
Bench Mark 1:			0.886	100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:	0.827	100.886		100.059	100.058	Pipe 3 m S of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.805	98.081		
Other:						

Closing Error	0.000	Average WL	98.081
WL Check	0.001	Transducer Elevation	97.691

## General Notes:

- TSS sampled at right bank.
- 2 BM installed.
- No cell service.
- GOES 227 should work.

Field Personnel:	SM, CJ	Trip Date:	20-May-12
Data Entry Personnel:	CJ	Date:	31-May-12
Data Check Personnel:	DW	Date:	5-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

June 20, 2012



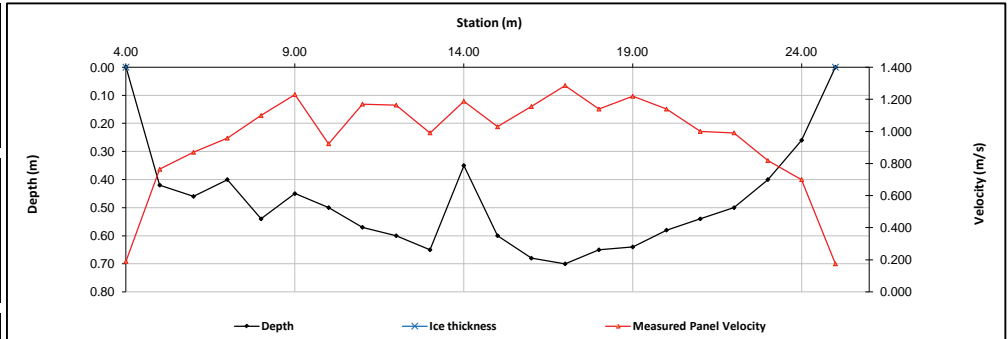
Flow Measurement: Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.50	0.50	0.11	0.191	0.191	0.05	0.010	0%
1	5.00	0.42		0.764			1.0	4.50	5.50	1.00	0.42	0.764	0.764	0.42	0.321	3%
2	6.00	0.46		0.870			1.0	5.50	6.50	1.00	0.46	0.870	0.870	0.46	0.400	4%
3	7.00	0.40		0.958			1.0	6.50	7.50	1.00	0.40	0.958	0.958	0.40	0.383	3%
4	8.00	0.54		1.099			1.0	7.50	8.50	1.00	0.54	1.099	1.099	0.54	0.593	5%
5	9.00	0.45		1.230			1.0	8.50	9.50	1.00	0.45	1.230	1.230	0.45	0.554	5%
6	10.00	0.50		0.923			1.0	9.50	10.50	1.00	0.50	0.923	0.923	0.50	0.462	4%
7	11.00	0.57		1.170			1.0	10.50	11.50	1.00	0.57	1.170	1.170	0.57	0.667	6%
8	12.00	0.60		1.164			1.0	11.50	12.50	1.00	0.60	1.164	1.164	0.60	0.698	6%
9	13.00	0.65		0.991			1.0	12.50	13.50	1.00	0.65	0.991	0.991	0.65	0.644	6%
10	14.00	0.35		1.188			1.0	13.50	14.50	1.00	0.35	1.188	1.188	0.35	0.416	4%
11	15.00	0.60		1.029			1.0	14.50	15.50	1.00	0.60	1.029	1.029	0.60	0.617	6%
12	16.00	0.68		1.155			1.0	15.50	16.50	1.00	0.68	1.155	1.155	0.68	0.785	7%
13	17.00	0.70		1.286			1.0	16.50	17.50	1.00	0.70	1.286	1.286	0.70	0.900	8%
14	18.00	0.65		1.139			1.0	17.50	18.50	1.00	0.65	1.139	1.139	0.65	0.740	7%
15	19.00	0.64		1.219			1.0	18.50	19.50	1.00	0.64	1.219	1.219	0.64	0.780	7%
16	20.00	0.58		1.139			1.0	19.50	20.50	1.00	0.58	1.139	1.139	0.58	0.661	6%
17	21.00	0.54		1.000			1.0	20.50	21.50	1.00	0.54	1.000	1.000	0.54	0.540	5%
18	22.00	0.50		0.991			1.0	21.50	22.50	1.00	0.50	0.991	0.991	0.50	0.496	4%
19	23.00	0.40		0.818			1.0	22.50	23.50	1.00	0.40	0.818	0.818	0.40	0.327	3%
20	24.00	0.26		0.700			1.0	23.50	24.50	1.00	0.26	0.700	0.700	0.26	0.182	2%
LB	25.00	0.00	0.00	0.000	0.000	0.000	1.0	24.50	25.00	0.50	0.07	0.175	0.175	0.03	0.006	0%
<b>Total Flow</b>															<b>11.2</b>	

Measurement Details:	
Start Time (MST):	12:30
End Time (MST):	14:15
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Quality/Error (see reverse):	Excellent
Weather:	20 deg., clear, calm

Flow characteristics:		
Total Flow:	11.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.58	(m <sup>2</sup> )
Wetted Width:	21.00	(m)
Hydraulic Depth:	0.504	(m)
Mean Velocity:	1.059	(m/s)
Froude Number:	0.477	

Logger Details:		
	Before	After
Transducer Reading (m):	0.425	
Water (°C):	14.0	
Battery (Main):	14.3	
Datalogger Clock:	12:41	
Laptop Clock:	12:41	
Dessicant:	Replaced	
Logger# (if Δ):	20958	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.957	100.957		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			0.900	100.057	100.058	Pipe 3 m S of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.836	98.121		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.948	99.999	100.000	Pipe 3 m SE of logger
Bench Mark 2:	0.890	100.947		100.057	100.058	Pipe 3 m S of logger
Bench Mark 3:						
Ice/PT:						
Water Level:			2.826	98.121		
Other:						

Closing Error	0.001	Average WL	98.121
WL Check	0.000	Transducer Elevation	97.696

**General Notes:**

- Waded across river to set up rope for fishcat.

<b>Field Personnel:</b>	SM & GB	<b>Trip Date:</b>	20-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	22-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	25-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

August 14, 2012



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	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	0.75	0.25	0.04	0.070	0.070	0.01	0.001	0%					
1	1.00	0.17		0.281			1.0	0.75	1.50	0.75	0.17	0.281	0.281	0.13	0.036	1%					
2	2.00	0.20		0.410			1.0	1.50	2.50	1.00	0.20	0.410	0.410	0.20	0.082	2%					
3	3.00	0.26		0.269			1.0	2.50	3.50	1.00	0.26	0.269	0.269	0.26	0.070	2%					
4	4.00	0.30		0.545			1.0	3.50	4.50	1.00	0.30	0.545	0.545	0.30	0.164	5%					
5	5.00	0.34		0.712			1.0	4.50	5.50	1.00	0.34	0.712	0.712	0.34	0.242	7%					
6	6.00	0.35		0.846			1.0	5.50	6.50	1.00	0.35	0.846	0.846	0.35	0.296	8%					
7	7.00	0.38		0.509			1.0	6.50	7.25	0.75	0.38	0.509	0.509	0.29	0.145	4%					
8	7.50	0.37		0.526			1.0	7.25	7.75	0.50	0.37	0.526	0.526	0.19	0.097	3%					
9	8.00	0.56		0.716			1.0	7.75	8.25	0.50	0.56	0.716	0.716	0.28	0.200	6%					
10	8.50	0.41		0.675			1.0	8.25	8.75	0.50	0.41	0.675	0.675	0.21	0.138	4%					
11	9.00	0.40		0.902			1.0	8.75	9.50	0.75	0.40	0.902	0.902	0.30	0.271	8%					
12	10.00	0.40		0.727			1.0	9.50	10.50	1.00	0.40	0.727	0.727	0.40	0.291	8%					
13	11.00	0.34		0.862			1.0	10.50	11.50	1.00	0.34	0.862	0.862	0.34	0.293	8%					
14	12.00	0.41		0.572			1.0	11.50	12.50	1.00	0.41	0.572	0.572	0.41	0.235	7%					
15	13.00	0.34		0.860			1.0	12.50	13.50	1.00	0.34	0.860	0.860	0.34	0.292	8%					
16	14.00	0.34		0.772			1.0	13.50	14.50	1.00	0.34	0.772	0.772	0.34	0.262	7%					
17	15.00	0.30		0.427			1.0	14.50	15.50	1.00	0.30	0.427	0.427	0.30	0.128	4%					
18	16.00	0.22		0.610			1.0	15.50	16.50	1.00	0.22	0.610	0.610	0.22	0.134	4%					
19	17.00	0.20		0.461			1.0	16.50	17.50	1.00	0.20	0.461	0.461	0.20	0.092	3%					
20	18.00	0.20		0.345			1.0	17.50	18.50	1.00	0.20	0.345	0.345	0.20	0.069	2%					
21	19.00	0.20		0.103			1.0	18.50	19.50	1.00	0.20	0.103	0.103	0.20	0.021	1%					
22	20.00	0.20		0.297			1.0	19.50	20.25	0.75	0.20	0.297	0.297	0.15	0.045	1%					
LB	20.50	0.00	0.00	0.00	0.00	0.00	1.0	20.25	20.50	0.25	0.05	0.074	0.074	0.01	0.001	0%					

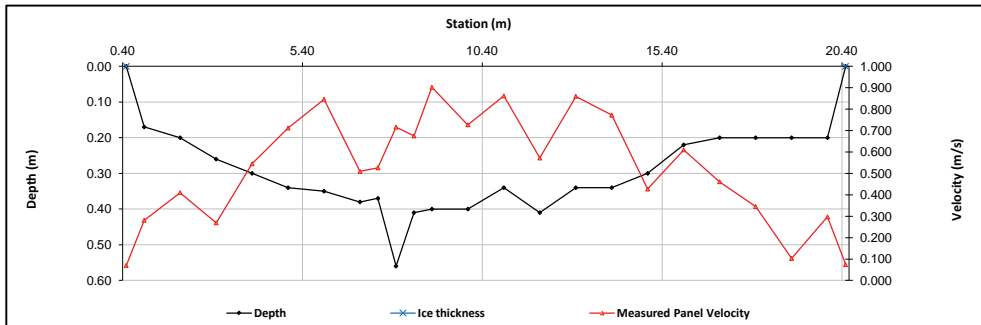
**Total Flow 3.6**

Measurement Details:	
Start Time (MST):	11:15
End Time (MST):	12:35
Equipment:	ADV
Method:	Wading
River Condition:	low flow
Quality/Error (see reverse):	Excellent
Weather:	15 deg, overcast, calm

Flow characteristics:	
Total Flow:	3.6 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	5.96 (m <sup>2</sup> )
Wetted Width:	20.00 (m)
Hydraulic Depth:	0.298 (m)
Mean Velocity:	0.604 (m/s)
Froude Number:	0.354

Logger Details:		
	Before	After
Transducer Reading (m):	0.153	0.369
Water (°C):	14.6	-
Battery (Main):	13.4	-
Datalogger Clock:	11:26	-
Laptop Clock:	12:25	-
Dessicant:	replaced	-
Logger# (if Δ):	20958	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 - Moved PLS deeper 0.369 m.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.999	100.999		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			0.940	100.059	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.524	100.475	100.474	Pipe 2 m W of logger
Water Level:			3.165	97.834		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.987	100.001	100.000	Pipe 3 m SE of logger
Bench Mark 2:	0.929	100.988		100.059	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.513	100.475	100.474	Pipe 2 m W of logger
Water Level:			3.152	97.836		
Other:						

Closing Error	-0.001	Average WL	97.835
WL Check	0.002	Transducer Elevation	97.882

**General Notes:**  
 - Installed 3rd BM.  
 - TSS sampled @ 8.0 m.

Field Personnel:		SM, CJ	Trip Date:	14-Aug-12
Data Entry Personnel:		SM (Field)	Date:	14-Aug-12
Data Check Personnel:		CJ	Date:	11-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

August 24, 2012



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																
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																
<b>No Flow Measurement Conducted</b>																
															<b>Total Flow</b>	-

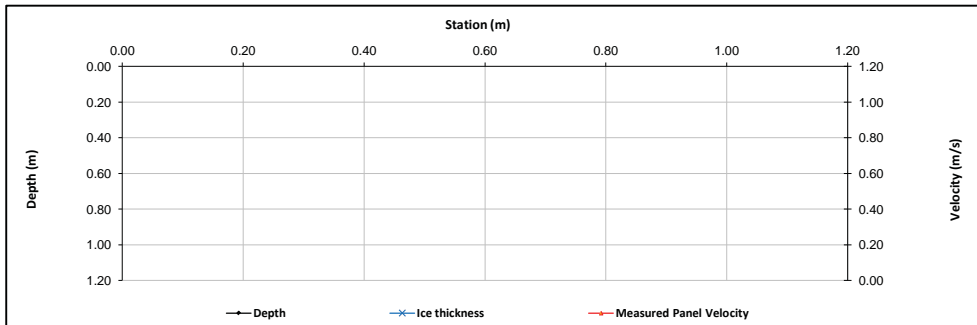
Measurement Details:	
Start Time (MST):	7:45
End Time (MST):	9:30
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	0.455	0.459
Water (°C):	13.9	13.9
Battery (Main):	12.9	12.84
Datalogger Clock:	7:50	8:52
Laptop Clock:	7:50	8:52
Dessicant:	Good	-
Logger# (if Δ):	-	20958
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

Installed GOES telemetry  
Ant. S/N: 2a67033  
TRAN. 444109



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					100.000	Pipe 3 m SE of logger
Bench Mark 2:					100.058	Pipe 3 m S of logger
Bench Mark 3:					100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:					100.000	Pipe 3 m SE of logger
Bench Mark 2:					100.058	Pipe 3 m S of logger
Bench Mark 3:					100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:						
Other:						

Closing Error	-	Average WL	-
WL Check	-	Transducer Elevation	-

**General Notes:**

Field Personnel:	SM, XP	Trip Date:	24-Aug-12
Data Entry Personnel:	SM (Field)	Date:	24-Aug-12
Data Check Personnel:	CJ	Date:	11-Oct-12



# Hydrometric Measurement Field Data Sheet

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

September 20, 2012



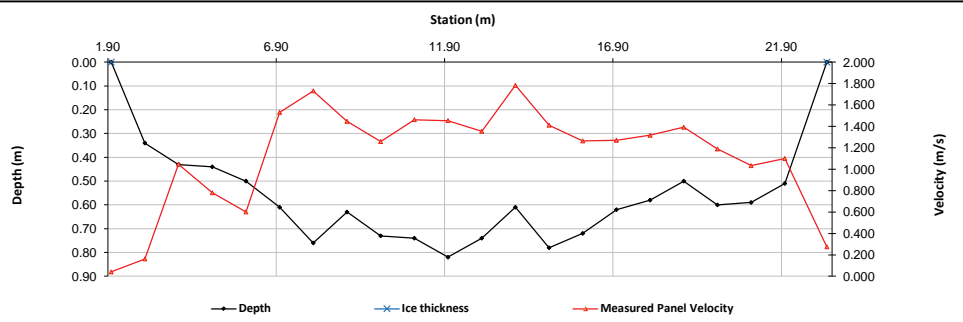
Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured 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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.50	0.50	0.09	0.041	0.041	0.04	0.002	0%
1	3.00	0.34		0.162			1.0	2.50	3.50	1.00	0.34	0.162	0.162	0.34	0.055	0%
2	4.00	0.43		1.047			1.0	3.50	4.50	1.00	0.43	1.047	1.047	0.43	0.450	3%
3	5.00	0.44		0.780			1.0	4.50	5.50	1.00	0.44	0.780	0.780	0.44	0.343	2%
4	6.00	0.50		0.601			1.0	5.50	6.50	1.00	0.50	0.601	0.601	0.50	0.301	2%
5	7.00	0.61		1.531			1.0	6.50	7.50	1.00	0.61	1.531	1.531	0.61	0.934	6%
6	8.00	0.76		1.732			1.0	7.50	8.50	1.00	0.76	1.732	1.732	0.76	1.316	8%
7	9.00	0.63		1.447			1.0	8.50	9.50	1.00	0.63	1.447	1.447	0.63	0.912	6%
8	10.00	0.73		1.258			1.0	9.50	10.50	1.00	0.73	1.258	1.258	0.73	0.918	6%
9	11.00	0.74		1.463			1.0	10.50	11.50	1.00	0.74	1.463	1.463	0.74	1.083	7%
10	12.00	0.82		1.454			1.0	11.50	12.50	1.00	0.82	1.454	1.454	0.82	1.192	8%
11	13.00	0.74		1.354			1.0	12.50	13.50	1.00	0.74	1.354	1.354	0.74	1.002	6%
12	14.00	0.61		1.783			1.0	13.50	14.50	1.00	0.61	1.783	1.783	0.61	1.088	7%
13	15.00	0.78		1.411			1.0	14.50	15.50	1.00	0.78	1.411	1.411	0.78	1.101	7%
14	16.00	0.72		1.264			1.0	15.50	16.50	1.00	0.72	1.264	1.264	0.72	0.910	6%
15	17.00	0.62		1.270			1.0	16.50	17.50	1.00	0.62	1.270	1.270	0.62	0.787	5%
16	18.00	0.58		1.317			1.0	17.50	18.50	1.00	0.58	1.317	1.317	0.58	0.764	5%
17	19.00	0.50		1.392			1.0	18.50	19.50	1.00	0.50	1.392	1.392	0.50	0.696	4%
18	20.00	0.60		1.189			1.0	19.50	20.50	1.00	0.60	1.189	1.189	0.60	0.713	5%
19	21.00	0.59		1.033			1.0	20.50	21.50	1.00	0.59	1.033	1.033	0.59	0.609	4%
20	22.00	0.51		1.100			1.0	21.50	22.63	1.13	0.51	1.100	1.100	0.57	0.631	4%
RB	23.25	0.00	0.00	0.000	0.000	0.000	1.0	22.63	23.25	0.63	0.13	0.275	0.275	0.08	0.022	0%
<b>Total Flow</b>															<b>15.8</b>	

Measurement Details:	
Start Time (MST):	14:15
End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	Fast flow
Quality/Error (see reverse):	Excellent
Weather:	clear, warm

Flow Characteristics:	
Total Flow:	15.8 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	12.44 (m <sup>2</sup> )
Wetted Width:	21.25 (m)
Hydraulic Depth:	0.585 (m)
Mean Velocity:	1.271 (m/s)
Froude Number:	0.531

Logger Details:		
	Before	After
Transducer Reading (m):	0.776	
Water (°C):	8.6	
Battery (Main):	14.2	
Datalogger Clock:	14:24	
Laptop Clock:	14:24	
Dessicant:	changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
 - GOES Antenna cable and GPS cable were damaged by wildlife, will require new cables to get station communicating.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.991	100.991		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			0.933	100.058	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.517	100.474	100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:			2.753	98.238		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.966	99.999	100.000	Pipe 3 m SE of logger
Bench Mark 2:	0.907	100.965		100.058	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.492	100.473	100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:			2.727	98.238		
Other:						

Closing Error	0.001	Average WL	98.238
WL Check	0.000	Transducer Elevation	97.462

**General Notes:**

<b>Field Personnel:</b>	TR, SG	<b>Trip Date:</b>	20-Sep-12
<b>Data Entry Personnel:</b>	SG (Field)	<b>Date:</b>	20-Sep-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	11-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date:

October 25, 2012



## 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	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	1.0	2.20	2.60	0.40	0.06	0.167	0.167	0.02	0.004	0%
1	3.00	0.22		0.667			1.0	2.60	3.50	0.90	0.22	0.667	0.667	0.20	0.132	2%
2	4.00	0.26		0.752			1.0	3.50	4.50	1.00	0.26	0.752	0.752	0.26	0.196	2%
3	5.00	0.28		0.724			1.0	4.50	5.50	1.00	0.28	0.724	0.724	0.28	0.203	2%
4	6.00	0.28		0.927			1.0	5.50	6.50	1.00	0.28	0.927	0.927	0.28	0.260	3%
5	7.00	0.38		0.838			1.0	6.50	7.50	1.00	0.38	0.838	0.838	0.38	0.318	4%
6	8.00	0.40		0.968			1.0	7.50	8.50	1.00	0.40	0.968	0.968	0.40	0.387	5%
7	9.00	0.42		1.041			1.0	8.50	9.50	1.00	0.42	1.041	1.041	0.42	0.437	5%
8	10.00	0.46		1.223			1.0	9.50	10.50	1.00	0.46	1.223	1.223	0.46	0.563	7%
9	11.00	0.40		1.409			1.0	10.50	11.50	1.00	0.40	1.409	1.409	0.40	0.564	7%
10	12.00	0.49		0.866			1.0	11.50	12.25	0.75	0.49	0.866	0.866	0.37	0.318	4%
11	12.50	0.52		1.078			1.0	12.25	12.75	0.50	0.52	1.078	1.078	0.26	0.280	3%
12	13.00	0.50		0.852			1.0	12.75	13.50	0.75	0.50	0.852	0.852	0.38	0.320	4%
13	14.00	0.56		0.789			1.0	13.50	14.50	1.00	0.56	0.789	0.789	0.56	0.442	5%
14	15.00	0.47		1.429			1.0	14.50	15.50	1.00	0.47	1.429	1.429	0.47	0.672	8%
15	16.00	0.42		1.075			1.0	15.50	16.50	1.00	0.42	1.075	1.075	0.42	0.452	5%
16	17.00	0.46		0.982			1.0	16.50	17.50	1.00	0.46	0.982	0.982	0.46	0.452	5%
17	18.00	0.48		1.070			1.0	17.50	18.50	1.00	0.48	1.070	1.070	0.48	0.514	6%
18	19.00	0.45		0.843			1.0	18.50	19.50	1.00	0.45	0.843	0.843	0.45	0.379	5%
19	20.00	0.43		1.066			1.0	19.50	20.50	1.00	0.43	1.066	1.066	0.43	0.458	5%
20	21.00	0.36		1.248			1.0	20.50	21.50	1.00	0.36	1.248	1.248	0.36	0.449	5%
21	22.00	0.38		1.056			1.0	21.50	22.50	1.00	0.38	1.056	1.056	0.38	0.401	5%
22	23.00	0.30		0.611			1.0	22.50	23.30	0.80	0.30	0.611	0.611	0.24	0.147	2%
RB	23.60	0.00	0.00	0.00	0.00	0.00	1.0	23.30	23.60	0.30	0.08	0.153	0.153	0.02	0.003	0%
<b>Total Flow</b>															<b>8.35</b>	

## Measurement Details:

Start Time (MST):	13:00
End Time (MST):	16:30
Equipment:	ADV
Method:	Wading
River Condition:	Normal
Quality/Error (see reverse):	Excellent
Weather:	overcast, -3 deg.

## Flow Characteristics:

Total Flow:	8.35	(m <sup>3</sup> /s)
2.898	Excellent	
Cross Section Area:	8.38	(m <sup>2</sup> )
Wetted Width:	21.40	(m)
Hydraulic Depth:	0.391	(m)
Mean Velocity:	0.997	(m/s)
Froude Number:	0.509	

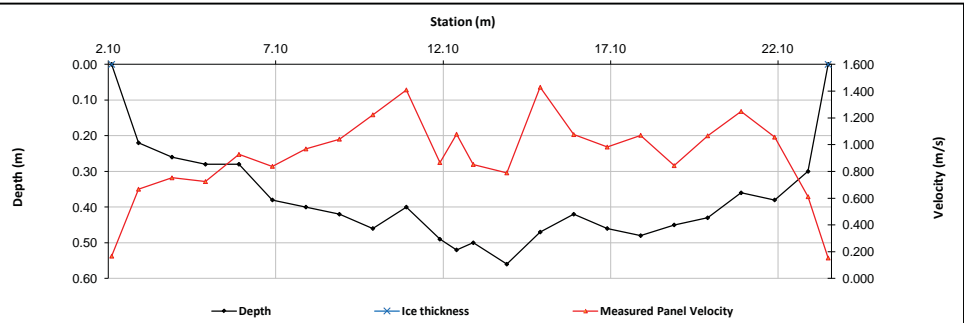
## Logger Details:

	Before	After
Transducer Reading (m):	0.589	
Water (°C):	1.0	
Battery (Main):	12.8	
Datalogger Clock:	1:51	
Laptop Clock:	1:51	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

## Datalogger / Station Notes:

- Battery enclosure was ripped off tree and #5 prong on antenna cable was broken by wildlife.
- All cables coming out of enclosures were ripped out and damaged, crew re-wired and repaired wiring.

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.906	100.906		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			0.848	100.058	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.432	100.474	100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:			2.883	98.023		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.919	100.001	100.000	Pipe 3 m SE of logger
Bench Mark 2:	0.862	100.920		100.058	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.445	100.475	100.474	Pipe 2 m W of logger
Ice/PT:						
Water Level:			2.898	98.022		
Other:						

Closing Error	-0.001	Average WL	98.023
WL Check	0.001	Transducer Elevation	97.434

<b>Field Personnel:</b>	TR, DW	Trip Date:	25-Oct-12
<b>Data Entry Personnel:</b>	DW	Date:	25-Oct-12
<b>Data Check Personnel:</b>	TR	Date:	14-Nov-12
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:

December 16, 2012



## 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	4.70	0.00	0.00	0.000	0.000	0.000	0.9	4.70	5.35	0.65	0.06	0.090	0.081	0.04	0.003	0%
1	6.00	0.68	0.45	0.358			0.9	5.35	6.80	1.45	0.23	0.358	0.322	0.33	0.107	4%
2	7.60	0.80	0.35	0.615			0.9	6.80	8.00	1.20	0.45	0.615	0.554	0.54	0.299	10%
3	8.40	0.80	0.35	0.670			0.9	8.00	8.85	0.85	0.45	0.670	0.603	0.38	0.231	8%
4	9.30	0.85	0.27	0.902			0.9	8.85	9.65	0.80	0.58	0.902	0.812	0.46	0.377	13%
5	10.00	0.85	0.25	0.798			0.9	9.65	10.40	0.75	0.60	0.798	0.718	0.45	0.323	11%
6	10.80	0.85	0.30	0.926			0.9	10.40	11.25	0.85	0.55	0.926	0.833	0.47	0.390	13%
7	11.70	0.85	0.25	0.816			0.9	11.25	12.10	0.85	0.60	0.816	0.734	0.51	0.375	13%
8	12.50	0.60	0.25	0.581			0.9	12.10	13.00	0.90	0.35	0.581	0.523	0.32	0.165	6%
9	13.50	0.50	0.25	-0.218			0.9	13.00	13.80	0.80	0.25	-0.218	-0.196	0.20	-0.039	-1%
10	14.10	0.60	0.20	0.422			0.9	13.80	14.40	0.60	0.40	0.422	0.380	0.24	0.091	3%
11	14.70	0.60	0.20	0.376			0.9	14.40	15.00	0.60	0.40	0.376	0.338	0.24	0.081	3%
12	15.30	0.55	0.20	0.113			0.9	15.00	15.80	0.80	0.35	0.113	0.102	0.28	0.028	1%
13	16.30	0.50	0.25	0.021			0.9	15.80	16.70	0.90	0.25	0.021	0.019	0.23	0.004	0%
14	17.10	0.50	0.30	0.001			0.9	16.70	17.55	0.85	0.20	0.001	0.019	0.17	0.000	0%
15	18.00	0.60	0.35	0.000			1.0	17.55	18.45	0.90	0.25	0.000	0.000	0.23	0.000	0%
16	18.90	0.65	0.35	-0.001			0.9	18.45	19.30	0.85	0.30	-0.001	-0.001	0.25	0.000	0%
17	19.70	0.60	0.40	0.070			0.9	19.30	20.30	1.00	0.20	0.070	0.063	0.20	0.013	0%
18	20.90	0.60	0.45	0.002			0.9	20.30	21.40	1.10	0.15	0.002	0.002	0.17	0.000	0%
19	21.90	0.60	0.35	0.746			0.9	21.40	22.35	0.95	0.25	0.746	0.671	0.24	0.159	5%
20	22.80	0.70	0.27	0.908			0.9	22.35	23.40	1.05	0.43	0.908	0.817	0.45	0.369	12%
RB	24.00	0.00	0.00	0.00	0.00	0.00	1.0	23.40	24.00	0.60	0.11	0.227	0.227	0.06	0.015	0%

**Total Flow 2.99**

## Measurement Details:

Start Time (MST):	9:10
End Time (MST):	10:55
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Fair
Weather:	P. cloud, -13 deg., calm

## Flow characteristics:

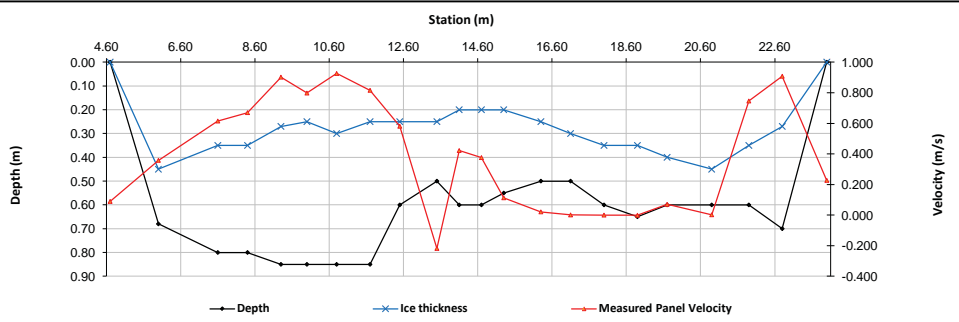
Total Flow:	2.99	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	6.45	(m <sup>2</sup> )
Wetted Width:	19.30	(m)
Hydraulic Depth:	0.334	(m)
Mean Velocity:	0.463	(m/s)
Froude Number:	0.256	

## Logger Details:

	Before	After
Transducer Reading (m):	0.578	
Water (°C):	0.2	
Battery (Main):	12.8	
Datalogger Clock:	9:43	
Laptop Clock:	9:43	
Dessicant:	replaced	
Logger# (if Δ):	20958	
PT# (if Δ):	-	

## Datalogger / Station Notes:

- Station was not functioning upon arrival, operation was restored.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.072	101.072		100.000	100.000	Pipe 3 m SE of logger
Bench Mark 2:			1.013	100.059	100.058	Pipe 3 m S of logger
Bench Mark 3:			0.597	100.475	100.474	Pipe 2 m W of logger
Ice/PT:			2.749	98.323		
Water Level:			2.895	98.177		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.061	100.001	100.000	Pipe 3 m SE of logger
Bench Mark 2:			1.002	100.060	100.058	Pipe 3 m S of logger
Bench Mark 3:	0.587	101.062		100.475	100.474	Pipe 2 m W of logger
Ice/PT:			2.738	98.324		
Water Level:			2.885	98.177		
Other:						

Closing Error	-0.001	Average WL	98.177
WL Check	0.000	Transducer Elevation	97.599

## General Notes:

- Low velocities attributed to slush in some spots on right side.
- Installed 2 new batteries.
- Solar Panel may need replacing.

## Field Personnel:

SM & TR	Trip Date:	16-Dec-12
Data Entry Personnel:	Date:	16-Dec-12
Data Check Personnel:	Date:	20-Dec-12
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 18, 2012



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	4.10	0.00	0.00	0.000	0.000	0.000	1.0	4.10	4.43	0.33	0.04	0.032	0.032	0.01	0.000	0%
1	4.75	0.16		0.128			1.0	4.43	5.13	0.70	0.16	0.128	0.11	0.014	0.014	1%
2	5.50	0.24		0.169			1.0	5.13	5.88	0.75	0.24	0.169	0.18	0.030	0.030	2%
3	6.25	0.30		0.252			1.0	5.88	6.63	0.75	0.30	0.252	0.23	0.057	0.057	4%
4	7.00	0.39		0.223			1.0	6.63	7.38	0.75	0.39	0.223	0.29	0.065	0.065	4%
5	7.75	0.50		0.165			1.0	7.38	8.13	0.75	0.50	0.165	0.165	0.38	0.062	4%
6	8.50	0.53		0.226			1.0	8.13	8.88	0.75	0.53	0.226	0.226	0.40	0.090	6%
7	9.25	0.60		0.199			1.0	8.88	9.63	0.75	0.60	0.199	0.199	0.45	0.090	6%
8	10.00	0.70		0.197			1.0	9.63	10.15	0.53	0.70	0.197	0.197	0.37	0.072	5%
9	10.30	0.68		0.257			1.0	10.15	10.53	0.38	0.68	0.257	0.257	0.26	0.066	5%
10	10.75	0.72		0.321			1.0	10.53	10.90	0.38	0.72	0.321	0.27	0.087	6%	
11	11.05	0.70		0.270			1.0	10.90	11.28	0.38	0.70	0.270	0.270	0.26	0.071	5%
12	11.50	0.70		0.283			1.0	11.28	11.65	0.38	0.70	0.283	0.283	0.26	0.074	5%
13	11.80	0.68		0.293			1.0	11.65	12.03	0.38	0.68	0.293	0.293	0.26	0.075	5%
14	12.25	0.70		0.290			1.0	12.03	12.63	0.60	0.70	0.290	0.290	0.42	0.122	8%
15	13.00	0.58		0.273			1.0	12.63	13.38	0.75	0.58	0.273	0.273	0.44	0.119	8%
16	13.75	0.59		0.271			1.0	13.38	14.13	0.75	0.59	0.271	0.271	0.44	0.120	8%
17	14.50	0.53		0.269			1.0	14.13	14.88	0.75	0.53	0.269	0.269	0.40	0.107	7%
18	15.25	0.42		0.183			1.0	14.88	15.63	0.75	0.42	0.183	0.183	0.32	0.058	4%
19	16.00	0.30		0.102			1.0	15.63	16.38	0.75	0.30	0.102	0.102	0.23	0.023	2%
20	16.75	0.30		0.163			1.0	16.38	17.38	1.00	0.30	0.163	0.163	0.30	0.049	3%
LB	18.00	0.00	0.00	0.000	0.000	0.000	1.0	17.38	18.00	0.63	0.08	0.041	0.041	0.05	0.002	0%
<b>Total Flow</b>															<b>1.45</b>	

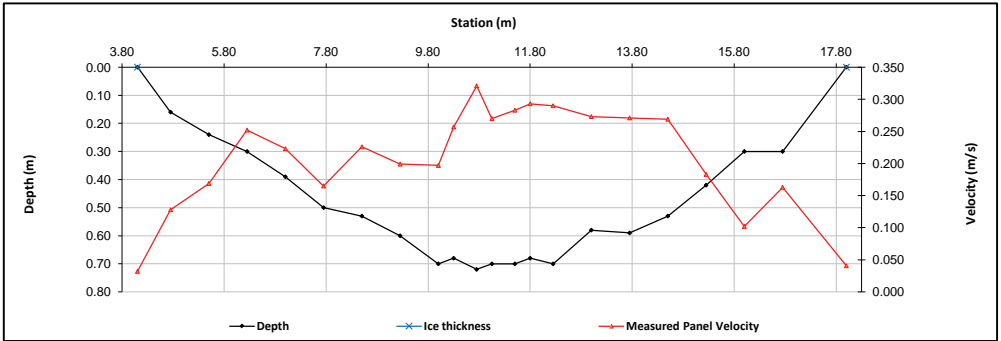
Measurement Details:	
Start Time (MST):	8:45
End Time (MST):	11:30
Equipment:	ADV
Method:	Wading
River Condition:	open
Quality/Error (see reverse):	excellent
Weather:	cloudy, calm, +10

Flow characteristics:	
Total Flow:	1.45 (m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent
Cross Section Area:	6.30 (m <sup>2</sup> )
Wetted Width:	13.90 (m)
Hydraulic Depth:	0.453 (m)
Mean Velocity:	0.230 (m/s)
Froude Number:	0.109

Logger Details:		
	Before	After
Transducer Reading (m):	0.450	
Water (°C):	12.5	
Battery (Main):	13.4	
Datalogger Clock:	11:02	
Laptop Clock:	11:02	
Dessicant:	New	
Logger# (if Δ):	16568	
PT# (if Δ):	298683	

**Datalogger / Station Notes:**

- Station installed, no telemetry, no cell service.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			1.002	100.146		Temporary Nail in Tree
Bench Mark 3:						
Ice/PT:						
Water Level:			3.448	97.700		
Other:	1.148	101.148		100.000	100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.989	101.135		100.146		Temporary Nail in Tree
Bench Mark 3:						
Ice/PT:						
Water Level:			3.435	97.700		
Other:			1.137	99.998	100.000	Bolt in logger tree

Closing Error	0.002	Average WL	97.700
WL Check	0.000	Transducer Elevation	97.250

**General Notes:**

- ADV Test = Good.
- 2 BM installed (bolts in trees).
- 3/4" pipe hit ice layer or bedrock. Pipe was left at the station for future installation of pipe benchmarks.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	18-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	31-May-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

June 22, 2012



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	3.60	0.00	0.00	0.000	0.000	0.000	1.0	3.60	3.80	0.20	0.06	0.048	0.048	0.01	0.001	0%
1	4.00	0.22		0.190			1.0	3.80	4.38	0.58	0.22	0.190	0.190	0.13	0.024	1%
2	4.75	0.27		0.265			1.0	4.38	5.13	0.75	0.27	0.265	0.265	0.20	0.054	2%
3	5.50	0.28		0.301			1.0	5.13	5.88	0.75	0.28	0.301	0.301	0.21	0.063	2%
4	6.25	0.43		0.341			1.0	5.88	6.63	0.75	0.43	0.341	0.341	0.32	0.110	4%
5	7.00	0.57		0.353			1.0	6.63	7.38	0.75	0.57	0.353	0.353	0.43	0.151	6%
6	7.75	0.61		0.388			1.0	7.38	8.13	0.75	0.61	0.388	0.388	0.46	0.178	7%
7	8.50	0.67		0.408			1.0	8.13	8.88	0.75	0.67	0.408	0.408	0.50	0.205	8%
8	9.25	0.74		0.391			1.0	8.88	9.63	0.75	0.74	0.391	0.391	0.56	0.217	8%
9	10.00	0.79			0.378	0.512	1.0	9.63	10.19	0.56	0.79	0.445	0.445	0.44	0.198	8%
10	10.38	0.80			0.367	0.504	1.0	10.19	10.56	0.38	0.80	0.436	0.436	0.30	0.131	5%
11	10.75	0.79			0.316	0.512	1.0	10.56	10.94	0.38	0.79	0.414	0.414	0.30	0.123	5%
12	11.13	0.84			0.318	0.482	1.0	10.94	11.31	0.38	0.84	0.400	0.400	0.32	0.126	5%
13	11.50	0.80			0.390	0.502	1.0	11.31	11.88	0.56	0.80	0.446	0.446	0.45	0.201	8%
14	12.25	0.74		0.369			1.0	11.88	12.63	0.75	0.74	0.369	0.369	0.56	0.205	8%
15	13.00	0.68		0.388			1.0	12.63	13.38	0.75	0.68	0.388	0.388	0.51	0.198	8%
16	13.75	0.64		0.309			1.0	13.38	14.13	0.75	0.64	0.309	0.309	0.48	0.148	6%
17	14.50	0.52		0.367			1.0	14.13	14.88	0.75	0.52	0.367	0.367	0.39	0.143	5%
18	15.25	0.45		0.189			1.0	14.88	15.63	0.75	0.45	0.189	0.189	0.34	0.064	2%
19	16.00	0.38		0.204			1.0	15.63	16.38	0.75	0.38	0.204	0.204	0.29	0.058	2%
20	16.75	0.38		0.106			1.0	16.38	17.08	0.70	0.38	0.106	0.106	0.27	0.028	1%
LB	17.40	0.00	0.00	0.000	0.000	0.000	1.0	17.08	17.40	0.32	0.10	0.027	0.027	0.03	0.001	0%

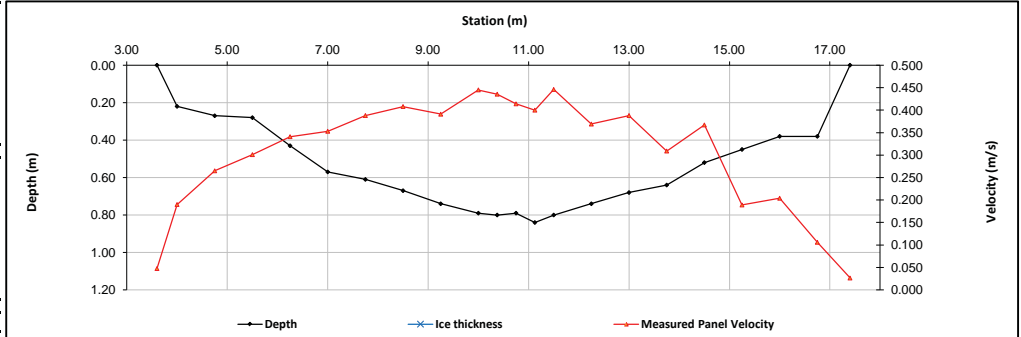
**Total Flow 2.62**

Measurement Details:	
Start Time (MST):	8:35
End Time (MST):	11:00
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	excellent
Weather:	clear, light breeze

Flow characteristics:		
Total Flow:	2.62	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	7.48	(m <sup>2</sup> )
Wetted Width:	13.80	(m)
Hydraulic Depth:	0.542	(m)
Mean Velocity:	0.351	(m/s)
Froude Number:	0.152	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	17.9	-
Battery (Main):	13.8	-
Datalogger Clock:	9:02	-
Laptop Clock:	9:01	-
Dessicant:	replaced	-
Logger# (if Δ):	16568	-
PT# (if Δ):	-	-

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:			0.999	100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.776	100.388	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.380	97.784		
Other:	1.164	101.164		100.000	100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:	0.986	101.151		100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.764	100.387	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.368	97.783		
Other:			1.153	99.998	100.000	Bolt in logger tree

Closing Error	0.002
WL Check	0.001

Average WL	97.784
Transducer Elevation	97.255

**General Notes:**

- 3 BMs installed. 1 needs to be shortened.
- TSS sampled at offset 10.3 m.

Field Personnel:		Trip Date:	
Data Entry Personnel:	SM, GB	Date:	22-Jun-12
Data Check Personnel:	CJ	Date:	28-Jun-12
	XP	Date:	6-Jul-12

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

August 17, 2012



## 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	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	1.0	1.50	1.65	0.15	0.03	0.006	0.006	0.00	0.000	0%
1	1.80	0.10		0.023				1.65	2.10	0.45	0.10	0.023	0.023	0.05	0.001	0%
2	2.40	0.14		0.023				2.10	2.70	0.60	0.14	0.023	0.023	0.08	0.002	0%
3	3.00	0.28		0.119				2.70	3.30	0.60	0.28	0.119	0.119	0.17	0.020	3%
4	3.60	0.24		0.163				3.30	3.90	0.60	0.24	0.163	0.163	0.14	0.023	3%
5	4.20	0.28		0.157				3.90	4.50	0.60	0.28	0.157	0.157	0.17	0.026	3%
6	4.80	0.34		0.173				4.50	5.10	0.60	0.34	0.173	0.173	0.20	0.035	5%
7	5.40	0.40		0.198				5.10	5.70	0.60	0.40	0.198	0.198	0.24	0.048	6%
8	6.00	0.44		0.193				5.70	6.30	0.60	0.44	0.193	0.193	0.26	0.051	7%
9	6.60	0.52		0.242				6.30	6.90	0.60	0.52	0.242	0.242	0.31	0.076	10%
10	7.20	0.48		0.235				6.90	7.50	0.60	0.48	0.235	0.235	0.29	0.068	9%
11	7.80	0.52		0.251				7.50	8.10	0.60	0.52	0.251	0.251	0.31	0.078	10%
12	8.40	0.56		0.236				8.10	8.70	0.60	0.56	0.236	0.236	0.34	0.079	10%
13	9.00	0.50		0.192				8.70	9.30	0.60	0.50	0.192	0.192	0.30	0.058	8%
14	9.60	0.61		0.161				9.30	9.90	0.60	0.61	0.161	0.161	0.37	0.059	8%
15	10.20	0.54		0.081				9.90	10.50	0.60	0.54	0.081	0.081	0.32	0.026	3%
16	10.80	0.44		0.126				10.50	11.10	0.60	0.44	0.126	0.126	0.28	0.033	4%
17	11.40	0.39		0.173				11.10	11.70	0.60	0.39	0.173	0.173	0.23	0.040	5%
18	12.00	0.32		0.162				11.70	12.30	0.60	0.32	0.162	0.162	0.19	0.031	4%
19	12.60	0.28		0.040				12.30	12.90	0.60	0.28	0.040	0.040	0.17	0.007	1%
20	13.20	0.23		0.016				12.90	13.50	0.60	0.23	0.016	0.016	0.14	0.002	0%
21	13.80	0.20		0.006				13.50	14.10	0.60	0.20	0.006	0.006	0.12	0.001	0%
22	14.40	0.12		0.002				14.10	14.70	0.60	0.12	0.002	0.002	0.07	0.000	0%
LB	15.00	0.00	0.00	0.00	0.00	0.00	1.0	14.70	15.00	0.30	0.03	0.001	0.001	0.01	0.000	0%
<b>Total Flow</b>															<b>0.765</b>	

## Measurement Details:

Start Time (MST):	15:15
End Time (MST):	16:45
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	good
Weather:	Partial cloud, 25

## Flow characteristics:

Total Flow:	0.765	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Cross Section Area:	4.76	(m <sup>2</sup> )
Wetted Width:	13.50	(m)
Hydraulic Depth:	0.352	(m)
Mean Velocity:	0.161	(m/s)
Froude Number:	0.087	

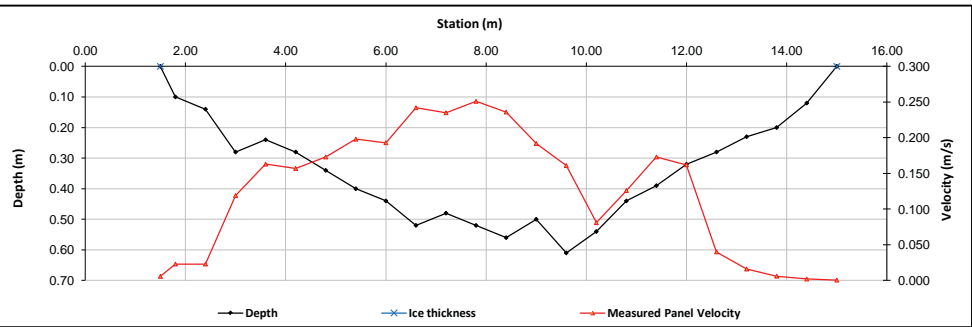
## Logger Details:

	Before	After
Transducer Reading (m):	0.371	0.582
Water (°C):	20.9	-
Battery (Main):	13.6	-
Datalogger Clock:	15:28	-
Laptop Clock:	15:28	-
Dessicant:	replaced	-
Logger# (if Δ):	16568	-
PT# (if Δ):	-	-

## Datalogger / Station Notes:


## General Notes:

- Didn't have pipe cutter to shorten BM.
- Moved PT deeper to avoid winter ice.
- Bear has been rubbing up against station tree.
- TSS sampled at offset 9 m.
- Didn't make hike up to ridge to check cell reception, however when heli. was that high, there was 1 bar.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:						
Bench Mark 2:			1.101	100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.878	100.388	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.657	97.609		
Other:	1.266	101.266		100.000	100.000	Bolt in logger tree
Setup #2						
Bench Mark 1:						
Bench Mark 2:	1.073	101.238		100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.849	100.389	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.628	97.610		
Other:			1.237	100.001	100.000	Bolt in logger tree

Closing Error	-0.001	Average WL	97.610
WL Check	0.001	Transducer Elevation	97.239

Field Personnel:	CJ, TR	Trip Date:	17-Aug-12
Data Entry Personnel:	CJ	Date:	3-Oct-12
Data Check Personnel:	MY	Date:	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

September 22, 2012



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	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	1.70	0.00	0.00	0.000	0.000	0.000	1.0	1.70	2.10	0.40	0.03	0.008	0.008	0.01	0.000	0%							
1	2.50	0.12		0.033			1.0	2.10	3.00	0.90	0.12	0.033	0.033	0.11	0.004	0%							
2	3.50	0.23		0.149			1.0	3.00	4.00	1.00	0.23	0.149	0.149	0.23	0.034	3%							
3	4.50	0.35		0.169			1.0	4.00	5.00	1.00	0.35	0.169	0.169	0.35	0.059	6%							
4	5.50	0.47		0.184			1.0	5.00	6.00	1.00	0.47	0.184	0.184	0.47	0.086	8%							
5	6.50	0.52		0.233			1.0	6.00	6.75	0.75	0.52	0.233	0.233	0.39	0.091	9%							
6	7.00	0.55		0.175			1.0	6.75	7.25	0.50	0.55	0.175	0.175	0.28	0.048	5%							
7	7.50	0.64		0.207			1.0	7.25	7.75	0.50	0.64	0.207	0.207	0.32	0.066	6%							
8	8.00	0.67		0.179			1.0	7.75	8.25	0.50	0.67	0.179	0.179	0.34	0.060	6%							
9	8.50	0.70		0.252			1.0	8.25	8.75	0.50	0.70	0.252	0.252	0.35	0.088	8%							
10	9.00	0.65		0.240			1.0	8.75	9.25	0.50	0.65	0.240	0.240	0.33	0.078	8%							
11	9.50	0.68		0.244			1.0	9.25	9.75	0.50	0.68	0.244	0.244	0.34	0.083	8%							
12	10.00	0.65		0.213			1.0	9.75	10.25	0.50	0.65	0.213	0.213	0.33	0.069	7%							
13	10.50	0.55		0.221			1.0	10.25	10.75	0.50	0.55	0.221	0.221	0.28	0.061	6%							
14	11.00	0.54		0.218			1.0	10.75	11.25	0.50	0.54	0.218	0.218	0.27	0.059	6%							
15	11.50	0.55		0.175			1.0	11.25	11.75	0.50	0.55	0.175	0.175	0.28	0.048	5%							
16	12.00	0.50		0.120			1.0	11.75	12.25	0.50	0.50	0.120	0.120	0.25	0.030	3%							
17	12.50	0.42		0.167			1.0	12.25	12.75	0.50	0.42	0.167	0.167	0.21	0.035	3%							
18	13.00	0.35		0.140			1.0	12.75	13.50	0.75	0.35	0.140	0.140	0.26	0.037	4%							
19	14.00	0.26		0.001			1.0	13.50	14.50	1.00	0.26	0.001	0.001	0.26	0.000	0%							
20	15.00	0.25		0.023			1.0	14.50	15.25	0.75	0.25	0.023	0.023	0.19	0.004	0%							
LB	15.50	0.00	0.00	0.000	0.000	0.000	1.0	15.25	15.50	0.25	0.06	0.006	0.006	0.02	0.000	0%							

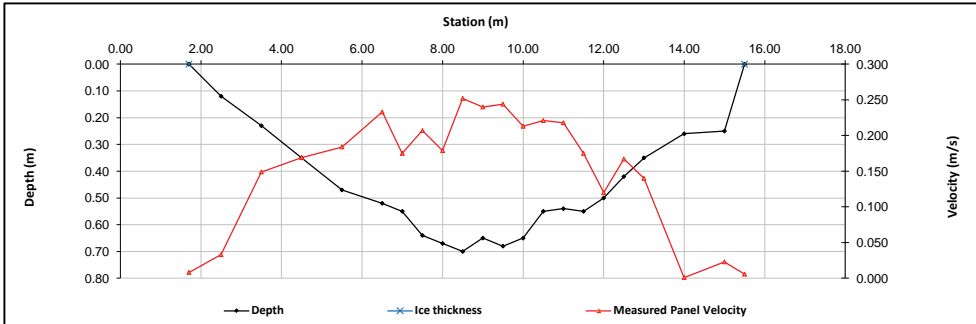
**Total Flow 1.04**

Measurement Details:	
Start Time (MST):	14:05
End Time (MST):	15:35
Equipment:	ADV
Method:	Wading
River Condition:	med. High flow
Quality/Error (see reverse):	Excellent
Weather:	20 deg. clear. Calm

Flow characteristics:	
Total Flow:	1.04 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	5.84 (m <sup>2</sup> )
Wetted Width:	13.80 (m)
Hydraulic Depth:	0.423 (m)
Mean Velocity:	0.178 (m/s)
Froude Number:	0.088

Logger Details:		Before	After
Transducer Reading (m):		0.613	
Water (°C):		11.7	
Battery (Main):		13.7	
Datalogger Clock:		14:21	
Laptop Clock:		14:22	
Dessicant:		replaced	
Logger# (if Δ):		16568	
PT# (if Δ):		-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.904	100.361	100.361	Pipe 5 m N of logger
Bench Mark 2:	1.100	101.265		100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.877	100.388	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.595	97.670		
Other:			1.265	100.000	100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:	0.892	101.253		100.361	100.361	Pipe 5 m N of logger
Bench Mark 2:			1.087	100.166	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.864	100.389	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.578	97.675		
Other:			1.253	100.000	100.000	Bolt in logger tree

Closing Error	-0.001	Average WL	97.673
WL Check	0.005	Transducer Elevation	97.060

**General Notes:**

- TSS @ 3.0 m.
- Installed 3rd BM.

Field Personnel:	SM, TR	Trip Date:	22-Sep-12
Data Entry Personnel:	SM (Field)	Date:	22-Sep-12
Data Check Personnel:	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date:

October 28, 2012



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	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	2.60	0.00	0.00	0.000	0.000	0.000	1.0	2.60	2.68	0.07	0.06	0.005	0.005	0.00	0.000	0%						
1	2.75	0.24		0.018			1.0	2.68	3.00	0.33	0.24	0.018	0.018	0.08	0.001	0%						
2	3.25	0.26		0.068			1.0	3.00	3.50	0.50	0.26	0.068	0.068	0.13	0.009	1%						
3	3.75	0.31		0.080			1.0	3.50	4.00	0.50	0.31	0.080	0.080	0.16	0.012	1%						
4	4.25	0.34		0.091			1.0	4.00	4.50	0.50	0.34	0.091	0.091	0.17	0.015	1%						
5	4.75	0.36		0.099			1.0	4.50	5.00	0.50	0.36	0.099	0.099	0.18	0.018	2%						
6	5.25	0.48		0.089			1.0	5.00	5.50	0.50	0.48	0.089	0.089	0.24	0.021	2%						
7	5.75	0.48		0.114			1.0	5.50	6.00	0.50	0.48	0.114	0.114	0.24	0.027	2%						
8	6.25	0.53		0.156			1.0	6.00	6.50	0.50	0.53	0.156	0.156	0.27	0.041	4%						
9	6.75	0.59		0.167			1.0	6.50	7.00	0.50	0.59	0.167	0.167	0.30	0.049	4%						
10	7.25	0.64		0.221			1.0	7.00	7.50	0.50	0.64	0.221	0.221	0.32	0.071	6%						
11	7.75	0.70		0.191			1.0	7.50	8.00	0.50	0.70	0.191	0.191	0.35	0.067	6%						
12	8.25	0.78		0.183			1.0	8.00	8.50	0.50	0.78	0.183	0.183	0.39	0.071	6%						
13	8.75	0.77		0.236			1.0	8.50	9.00	0.50	0.77	0.236	0.236	0.39	0.091	8%						
14	9.25	0.84		0.240			1.0	9.00	9.50	0.50	0.84	0.240	0.240	0.42	0.101	9%						
15	9.75	0.78		0.193			1.0	9.50	10.00	0.50	0.78	0.193	0.193	0.39	0.075	7%						
16	10.25	0.82		0.231			1.0	10.00	10.50	0.50	0.82	0.231	0.231	0.41	0.085	8%						
17	10.75	0.80		0.270			1.0	10.50	11.00	0.50	0.80	0.270	0.270	0.40	0.108	9%						
18	11.25	0.70		0.255			1.0	11.00	11.50	0.50	0.70	0.255	0.255	0.35	0.089	8%						
19	11.75	0.67		0.240			1.0	11.50	12.00	0.50	0.67	0.240	0.240	0.34	0.080	7%						
20	12.25	0.70		0.110			1.0	12.00	12.75	0.75	0.70	0.110	0.110	0.53	0.058	5%						
21	13.25	0.64		0.003			1.0	12.75	13.75	1.00	0.64	0.003	0.003	0.64	0.002	0%						
22	14.25	0.46		0.091			1.0	13.75	14.75	1.00	0.46	0.091	0.091	0.46	0.042	4%						
23	15.25	0.41		0.000			1.0	14.75	16.08	1.33	0.41	0.000	0.000	0.54	0.000	0%						
LB	16.90	0.00	0.00	0.00	0.00	0.00	1.0	16.08	16.90	0.82	0.10	0.000	0.000	0.08	0.000	0%						
<b>Total Flow</b>															<b>1.15</b>							

Measurement Details:	
Start Time (MST):	11:29
End Time (MST):	12:25
Equipment:	ADV
Method:	Wading
River Condition:	High, partial ice cover
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, -7 C

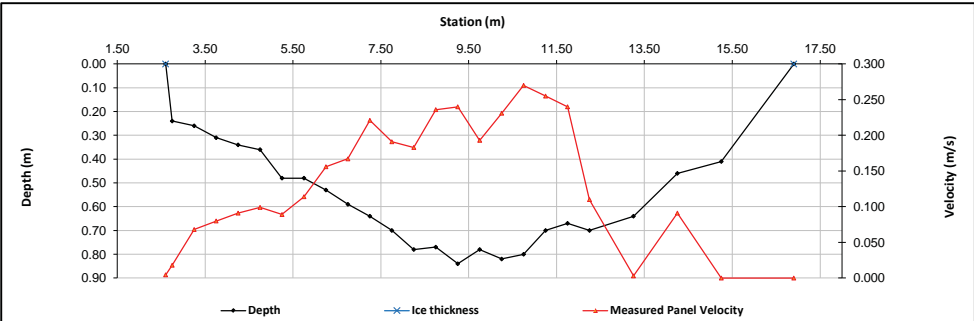
Flow characteristics:		
Total Flow:	1.15	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.76	(m <sup>2</sup> )
Wetted Width:	14.30	(m)
Hydraulic Depth:	0.543	(m)
Mean Velocity:	0.148	(m/s)
Froude Number:	0.064	

Logger Details:		
Transducer Reading (m):	0.745	
Water (°C):	0.1	
Battery (Main):	13.9	
Datalogger Clock:	12:31	
Laptop Clock:	12:31	
Dessicant:	replaced	
Logger# (if Δ):	16568	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Bearing to relay 22 deg.

**General Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.824	100.361	100.361	Pipe 5 m N of logger
Bench Mark 2:	1.020	101.185		100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.797	100.388	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.379	97.806		
Other:					100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:	0.813	101.174		100.361	100.361	Pipe 5 m N of logger
Bench Mark 2:			1.009	100.165	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.786	100.388	100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:			3.368	97.806		
Other:					100.000	Bolt in logger tree

Closing Error	0.000	Average WL	97.806
WL Check	0.000	Transducer Elevation	97.061

<b>Field Personnel:</b>	SM, TR	Trip Date:	28-Oct-12
<b>Data Entry Personnel:</b>	SM, TR	Date:	28-Oct-12
<b>Data Check Personnel:</b>	DW	Date:	8-Nov-12
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:

December 5, 2012



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	2.50	0.00	0.00	0.000	0.000	0.000	1.0	2.50	3.50	1.00	0.05	0.018	0.018	0.05	0.001	0%
1	4.50	0.19		0.073			1.0	3.50	4.90	1.40	0.19	0.073	0.073	0.27	0.019	3%
2	5.30	0.07		0.193			1.0	4.90	5.75	0.85	0.07	0.193	0.193	0.06	0.011	2%
3	6.20	0.38		0.000			1.0	5.75	6.45	0.70	0.38	0.000	0.000	0.27	0.000	0%
4	6.70	0.40	0.01	0.353			0.9	6.45	6.95	0.50	0.39	0.353	0.318	0.20	0.062	9%
5	7.20	0.40	0.03	0.311			0.9	6.95	7.45	0.50	0.37	0.311	0.280	0.19	0.052	8%
6	7.70	0.43	0.07	0.263			0.9	7.45	7.95	0.50	0.36	0.263	0.237	0.18	0.043	6%
7	8.20	0.28	0.12	0.002			0.9	7.95	8.40	0.45	0.16	0.002	0.002	0.07	0.000	0%
8	8.60	0.50	0.15	0.339			0.9	8.40	8.85	0.45	0.35	0.339	0.305	0.16	0.048	7%
9	9.10	0.52	0.17	0.468			0.9	8.85	9.30	0.45	0.35	0.468	0.421	0.16	0.066	10%
10	9.50	0.54	0.20	0.419			0.9	9.30	9.65	0.35	0.34	0.419	0.377	0.12	0.045	7%
11	9.80	0.51	0.21	0.313			0.9	9.65	10.05	0.40	0.30	0.313	0.282	0.12	0.034	5%
12	10.30	0.50	0.22	0.136			0.9	10.05	10.50	0.45	0.28	0.136	0.122	0.13	0.015	2%
13	10.70	0.56	0.23	0.373			0.9	10.50	10.88	0.38	0.33	0.373	0.336	0.12	0.042	6%
14	11.05	0.40	0.15	0.387			0.9	10.88	11.25	0.38	0.25	0.387	0.348	0.09	0.033	5%
15	11.45	0.45	0.20	0.405			0.9	11.25	11.78	0.52	0.25	0.405	0.365	0.13	0.048	7%
16	12.10	0.36	0.19	0.245			0.9	11.78	12.33	0.55	0.17	0.245	0.221	0.09	0.021	3%
17	12.55	0.37	0.17	0.298			0.9	12.33	13.13	0.80	0.20	0.298	0.268	0.16	0.043	6%
18	13.70	0.23	0.04	-0.001			0.9	13.13	14.25	1.13	0.19	-0.001	-0.001	0.21	0.000	0%
19	14.80	0.23	0.04	0.234			1.0	14.25	15.80	1.55	0.23	0.234	0.234	0.36	0.083	12%
LB	16.80	0.00	0.00	0.00	0.00	0.00	1.0	15.80	16.80	1.00	0.06	0.059	0.059	0.06	0.003	1%
<b>Total Flow</b>														<b>0.669</b>		

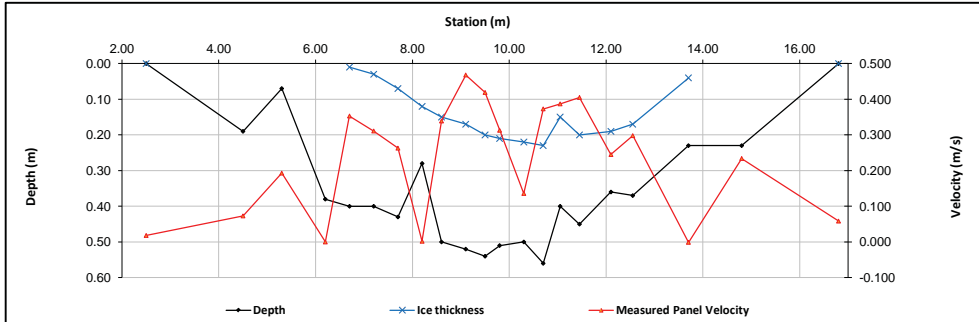
Measurement Details:	
Start Time (MST):	14:45
End Time (MST):	16:00
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Quality/Error (see reverse):	Poor
Weather:	Light cloud

Flow characteristics:	
Total Flow:	0.669 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor
Cross Section Area:	3.18 (m <sup>2</sup> )
Wetted Width:	14.30 (m)
Hydraulic Depth:	0.222 (m)
Mean Velocity:	0.210 (m/s)
Froude Number:	0.142

Logger Details:		
Transducer Reading (m):	Before	After
	0.498	0.501
Water (°C):	0.1	0.1
Battery (Main):	13.1	12.7
Datalogger Clock:	2:49	2:56
Laptop Clock:	2:49	2:56
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- Replaced battery because of low min's.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:					100.361	Pipe 5 m N of logger
Bench Mark 2:					100.165	Pipe 2 m SE of logger
Bench Mark 3:					100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:						
Other:					100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:					100.361	Pipe 5 m N of logger
Bench Mark 2:					100.165	Pipe 2 m SE of logger
Bench Mark 3:					100.388	Pipe 5 m E of logger
Ice/PT:						
Water Level:						
Other:					100.000	Bolt in logger tree
Closing Error	-			Average WL	-	
WL Check	-			Transducer Elevation	-	

**General Notes:**

- Ice is above WL from 4.5 m to 6.2 m and 14.8 m to 16.8 m.  
 - Ran out of time to perform the WL survey, Will need to return.

<b>Field Personnel:</b>	DW, TR	<b>Trip Date:</b>	5-Dec-12
<b>Data Entry Personnel:</b>	DW, TR	<b>Date:</b>	5-Dec-12
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	12-Dec-12
<b>Entered Digitally in the Field:</b>	<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:

December 15, 2012



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
No Flow Measurement Conducted (See Dec. 5, 2012 data)																

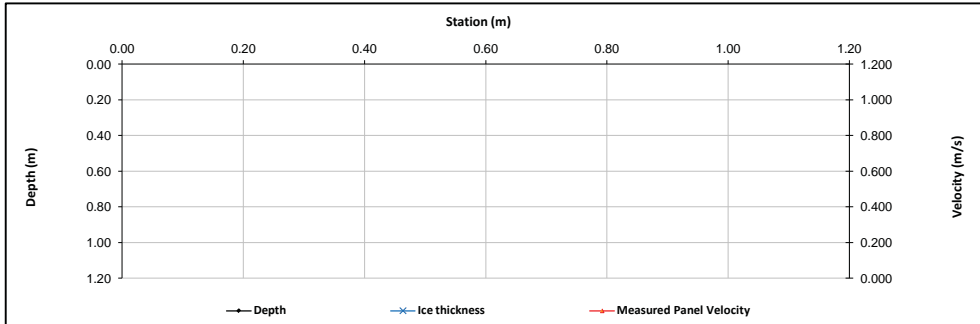
Total Flow

Measurement Details:	
Start Time (MST):	15:17
End Time (MST):	15:35
Equipment:	-
Method:	-
River Condition:	Frozen
Quality/Error (see reverse):	-
Weather:	P. CLOUDY, -13

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):	-	-
Water (°C):	-	-
Battery (Main):	-	-
Datalogger Clock:	-	-
Laptop Clock:	-	-
Dessicant:	-	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.026	101.387		100.361	100.361	Pipe 5 m N of logger
Bench Mark 2:			1.221	100.166	100.165	Pipe 2 m SE of logger
Bench Mark 3:			0.998	100.389	100.388	Pipe 5 m E of logger
Ice/PT:			3.735	97.652		
Water Level:			3.771	97.616		
Other:					100.000	Bolt in logger tree
<b>Setup #2</b>						
Bench Mark 1:			1.028	100.324	100.361	Pipe 5 m N of logger
Bench Mark 2:			1.167	100.185	100.165	Pipe 2 m SE of logger
Bench Mark 3:	0.963	101.352		100.389	100.388	Pipe 5 m E of logger
Ice/PT:			3.717	97.635		
Water Level:			3.752	97.600		
Other:					100.000	Bolt in logger tree

Closing Error	0.037
WL Check	0.016

Average WL	97.608
Transducer Elevation	-

General Notes:

<b>Field Personnel:</b>	TR and SM	Trip Date:	15-Dec-12
Data Entry Personnel:	SM	Date:	15-Dec-12
Data Check Personnel:	DW	Date:	19-Dec-12
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 17, 2012



## 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
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																
No Flow Measurement Conducted																
															<b>Total Flow</b>	<b>#NUM!</b>

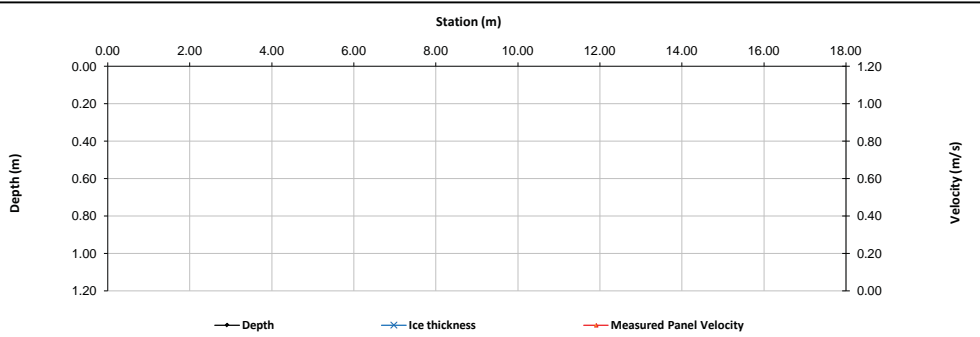
Measurement Details:	
Start Time (MST):	17:30
End Time (MST):	19:00
Equipment:	-
Method:	-
River Condition:	open
Quality/Error (see reverse):	-
Weather:	Sunny, calm

Flow characteristics:		
Total Flow:	#NUM!	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	0.00	(m)
Hydraulic Depth:	#DIV/0!	(m)
Mean Velocity:	#NUM!	(m/s)
Froude Number:	#NUM!	

Logger Details:	Before	After
Transducer Reading (m):	1.059	
Water (°C):	12.5	
Battery (Main):	13.2	
Datalogger Clock:	17:41	
Laptop Clock:	17:41	
Dessicant:	New	
Logger# (if Δ):	13899	
PT# (if Δ):	250995	

**Datalogger / Station Notes:**

- Installed data logger and PLS.
- Station needs modem and antenna.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
Setup #2						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error	#VALUE!	Average WL	#DIV/0!
WL Check	#VALUE!	Transducer Elevation	#DIV/0!

**General Notes:**

- Station still needs benchmarks.

Field Personnel:	CJ, SM	Trip Date:	17-May-12
Data Entry Personnel:	CJ	Date:	1-Jun-12
Data Check Personnel:	XP	Date:	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

May 31, 2012



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	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	1.60	0.00	0.00	0.000	0.000	0.000	1.0	1.60	1.80	0.20	0.11	-0.005	-0.005	0.02	0.000	0%	
1	2.00	0.44		-0.020			1.0	1.80	2.75	0.95	0.44	-0.020	-0.020	0.42	-0.008	0%	
2	3.50	0.56		0.050			1.0	2.75	4.25	1.50	0.56	0.050	0.050	0.84	0.042	1%	
3	5.00	0.64		0.024			1.0	4.25	5.50	1.25	0.64	0.024	0.024	0.80	0.019	1%	
4	6.00	0.71		0.036			1.0	5.50	6.50	1.00	0.71	0.036	0.036	0.71	0.026	1%	
5	7.00	0.75			0.087	0.168	1.0	6.50	7.50	1.00	0.75	0.128	0.128	0.75	0.096	3%	
6	8.00	0.71		0.219			1.0	7.50	8.50	1.00	0.71	0.219	0.219	0.71	0.155	5%	
7	9.00	0.81			0.225	0.378	1.0	8.50	9.50	1.00	0.81	0.302	0.302	0.81	0.244	7%	
8	10.00	0.84			0.237	0.320	1.0	9.50	10.50	1.00	0.84	0.279	0.279	0.84	0.234	7%	
9	11.00	0.92			0.224	0.374	1.0	10.50	11.50	1.00	0.92	0.299	0.299	0.92	0.275	8%	
10	12.00	0.84			0.313	0.372	1.0	11.50	12.50	1.00	0.84	0.343	0.343	0.84	0.288	9%	
11	13.00	0.77			0.254	0.330	1.0	12.50	13.50	1.00	0.77	0.292	0.292	0.77	0.225	7%	
12	14.00	0.66		0.318			1.0	13.50	14.50	1.00	0.66	0.318	0.318	0.66	0.210	6%	
13	15.00	0.68		0.275			1.0	14.50	15.50	1.00	0.68	0.275	0.275	0.68	0.187	6%	
14	16.00	0.71		0.378			1.0	15.50	16.50	1.00	0.71	0.378	0.378	0.71	0.268	8%	
15	17.00	0.72		0.398			1.0	16.50	17.50	1.00	0.72	0.398	0.398	0.72	0.287	9%	
16	18.00	0.68		0.369			1.0	17.50	18.50	1.00	0.68	0.369	0.369	0.68	0.251	8%	
17	19.00	0.74		0.211			1.0	18.50	19.50	1.00	0.74	0.211	0.211	0.74	0.156	5%	
18	20.00	0.68		0.248			1.0	19.50	20.50	1.00	0.68	0.248	0.248	0.68	0.169	5%	
19	21.00	0.63		0.240			1.0	20.50	21.50	1.00	0.63	0.240	0.240	0.63	0.151	5%	
20	22.00	0.66		0.101			1.0	21.50	22.50	1.00	0.66	0.101	0.101	0.66	0.067	2%	
21	23.00	0.69		0.023			1.0	22.50	23.50	1.00	0.69	0.023	0.023	0.69	0.016	0%	
22	24.00	0.62		-0.014			1.0	23.50	24.50	1.00	0.62	-0.014	-0.014	0.62	-0.009	0%	
23	25.00	0.34		-0.011			1.0	24.50	25.25	0.75	0.34	-0.011	-0.011	0.26	-0.003	0%	
LB	25.50	0.00	0.00	0.000	0.000	0.000	1.0	25.25	25.50	0.25	0.09	-0.003	-0.003	0.02	0.000	0%	
<b>Total Flow</b>															<b>3.34</b>		

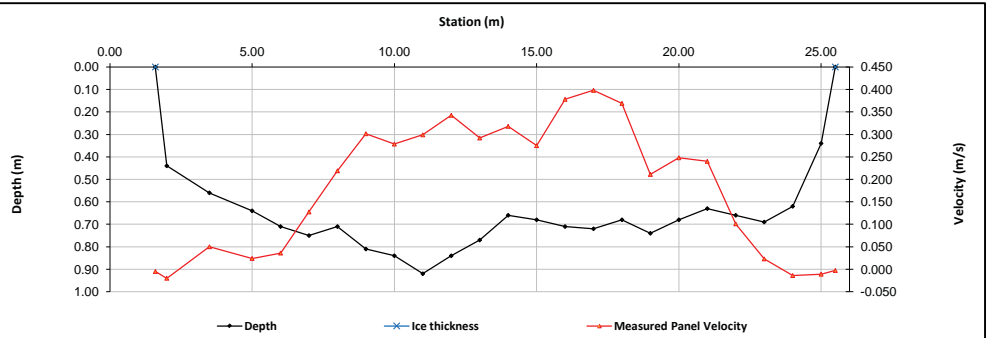
Measurement Details:	
Start Time (MST):	8:20
End Time (MST):	9:50
Equipment:	ADV
Method:	Wading
River Condition:	Full channel open
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, +15

Flow characteristics:	
Total Flow:	3.34 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	16.18 (m <sup>2</sup> )
Wetted Width:	23.90 (m)
Hydraulic Depth:	0.677 (m)
Mean Velocity:	0.206 (m/s)
Froude Number:	0.080

Logger Details:		
	Before	After
Transducer Reading (m):	0.780	
Water (°C):	14.5	
Battery (Main):	13.9	
Datalogger Clock:	8:26	
Laptop Clock:	8:26	
Dessicant:	replaced	
Logger# (if Δ):	13899	
PTH (if Δ):	-	

**Datalogger / Station Notes:**

- GOES 160 works.
- No cell service.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.006	99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.981	99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.772	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			3.035	97.645		
Other:	0.680	100.680		100.000	100.000	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:	0.960	100.634		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.935	99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.726	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			2.979	97.655		
Other:			0.634		100.000	Nail in tree

Closing Error	0.000	Average WL	97.650
WL Check	0.010	Transducer Elevation	96.870

**General Notes:**

Field Personnel:	SM, TR	Trip Date:	31-May-12
Data Entry Personnel:	CJ	Date:	7-Jun-12
Data Check Personnel:	XP	Date:	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

June 14, 2012



## 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
LB	4.00	0.00	0.00	0.000	0.000	0.000	1.0	4.00	4.50	0.50	0.13	-0.007	-0.007	0.06	0.000	0%
1	5.00	0.50		-0.027			1.0	4.50	6.00	1.50	0.50	-0.027	-0.027	0.75	-0.020	-1%
2	7.00	0.80			0.001	0.031	1.0	6.00	8.00	2.00	0.80	0.016	0.016	1.60	0.026	1%
3	9.00	0.86			0.137	0.224	1.0	8.00	9.50	1.50	0.86	0.181	0.181	1.29	0.233	7%
4	10.00	0.79			0.174	0.254	1.0	9.50	10.50	1.00	0.79	0.214	0.214	0.79	0.169	5%
5	11.00	0.72		0.225			1.0	10.50	11.50	1.00	0.72	0.225	0.225	0.72	0.162	5%
6	12.00	0.74		0.364			1.0	11.50	12.50	1.00	0.74	0.364	0.364	0.74	0.269	8%
7	13.00	0.78			0.141	0.422	1.0	12.50	13.50	1.00	0.78	0.282	0.282	0.78	0.220	6%
8	14.00	0.74		0.345			1.0	13.50	14.50	1.00	0.74	0.345	0.345	0.74	0.255	7%
9	15.00	0.73		0.294			1.0	14.50	15.50	1.00	0.73	0.294	0.294	0.73	0.215	6%
10	16.00	0.78			0.314	0.361	1.0	15.50	16.50	1.00	0.78	0.338	0.338	0.78	0.263	8%
11	17.00	0.82		0.239	0.239	0.346	1.0	16.50	17.50	1.00	0.82	0.293	0.293	0.82	0.240	7%
12	18.00	0.90		0.267	0.267	0.387	1.0	17.50	18.50	1.00	0.90	0.327	0.327	0.90	0.294	9%
13	19.00	0.90		0.282	0.282	0.361	1.0	18.50	19.50	1.00	0.90	0.322	0.322	0.90	0.289	8%
14	20.00	0.85		0.245	0.245	0.360	1.0	19.50	20.50	1.00	0.85	0.303	0.303	0.85	0.257	7%
15	21.00	0.79		0.359	0.359	0.251	1.0	20.50	21.50	1.00	0.79	0.305	0.305	0.79	0.241	7%
16	22.00	0.80		0.218	0.218	0.283	1.0	21.50	22.50	1.00	0.80	0.251	0.251	0.80	0.200	6%
17	23.00	0.82		0.086	0.086	0.096	1.0	22.50	23.50	1.00	0.82	0.091	0.091	0.82	0.075	2%
18	24.00	0.80		0.047	0.047	0.047	1.0	23.50	25.00	1.50	0.80	0.047	0.047	1.20	0.056	2%
19	26.00	0.65		0.024			1.0	25.00	27.00	2.00	0.65	0.024	0.024	1.30	0.031	1%
20	28.00	0.42		-0.022			1.0	27.00	28.65	1.65	0.42	-0.022	-0.022	0.69	-0.015	0%
RB	29.30	0.00	0.00	0.000	0.000	0.000	1.0	28.65	29.30	0.65	0.11	-0.006	-0.006	0.07	0.000	0%
<b>Total Flow</b>														<b>3.46</b>		

### Measurement Details:

Start Time (MST):	8:05
End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	level dropping
Quality/Error (see reverse):	excellent
Weather:	overcast, breezy, 10°

### Flow characteristics:

Total Flow:	3.46	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	18.12	(m <sup>2</sup> )
Wetted Width:	25.30	(m)
Hydraulic Depth:	0.716	(m)
Mean Velocity:	0.191	(m/s)
Froude Number:	0.072	

### Logger Details:

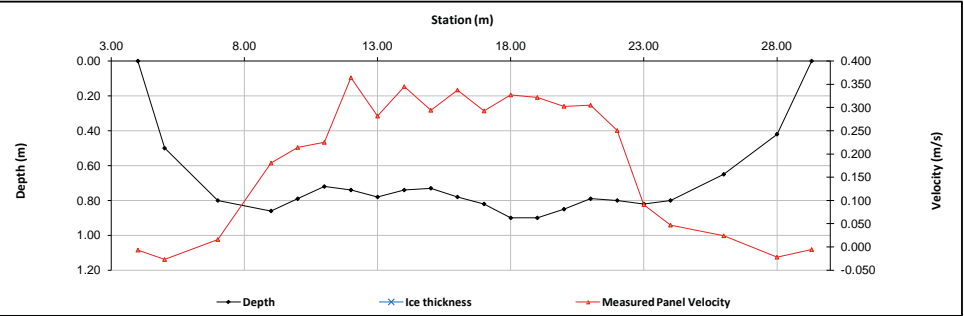
	Before	After
Transducer Reading (m):	0.795	-
Water (°C):	15.2	-
Battery (Main):	13.1	-
Datalogger Clock:	8:45	-
Laptop Clock:	8:45	-
Dessicant:	good	-
Logger# (if Δ):	13899	-
PT# (if Δ):	-	-

### Datalogger / Station Notes:

- PLS was pulled from logger, solar cable severed, all repaired.

### General Notes:

- TSS sampled at offset 12 m.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Setup #2						
Bench Mark 1:			1.006	99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.981	99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.772	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			3.035	97.645		
Other:	0.680	100.680		100.000	100.000	Nail in tree
Setup #2						
Bench Mark 1:	0.904	100.578		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.878	99.700	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.669	99.909	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			2.903	97.675		
Other:			0.577	100.001	100.000	Nail in tree

Closing Error	-0.001	Average WL	97.660
WL Check	0.030	Transducer Elevation	96.865

Field Personnel:	SM, CJ	Trip Date:	14-Jun-12
Data Entry Personnel:	CJ	Date:	27-Jun-12
Data Check Personnel:	DW	Date:	28-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

August 16, 2012



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	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	1.70	0.00	0.00	0.000	0.000	0.000	1.0	1.70	1.85	0.15	0.11	0.000	0.000	0.02	0.000	0%
1	2.00	0.42		0.001			1.0	1.85	2.63	0.78	0.42	0.001	0.001	0.33	0.000	0%
2	3.25	0.44		-0.003			1.0	2.63	3.88	1.25	0.44	-0.003	-0.003	0.55	-0.002	0%
3	4.50	0.68		0.057			1.0	3.88	5.13	1.25	0.68	0.057	0.057	0.85	0.048	2%
4	5.75	0.75		0.062			1.0	5.13	6.38	1.25	0.75	0.062	0.062	0.94	0.058	2%
5	7.00	0.76			0.046	0.079	1.0	6.38	7.63	1.25	0.76	0.063	0.063	0.95	0.059	2%
6	8.25	0.70		0.154			1.0	7.63	8.88	1.25	0.70	0.154	0.154	0.88	0.135	5%
7	9.50	0.68		0.339			1.0	8.88	9.75	0.88	0.68	0.339	0.339	0.60	0.202	7%
8	10.00	0.70		0.326			1.0	9.75	10.25	0.50	0.70	0.326	0.326	0.35	0.114	4%
9	10.50	0.70		0.493			1.0	10.25	11.00	0.75	0.70	0.493	0.493	0.53	0.259	9%
10	11.50	0.72		0.365			1.0	11.00	12.00	1.00	0.72	0.365	0.365	0.72	0.263	9%
11	12.50	0.72		0.283			1.0	12.00	13.00	1.00	0.72	0.283	0.283	0.72	0.204	7%
12	13.50	0.76			0.284	0.326	1.0	13.00	14.00	1.00	0.76	0.305	0.305	0.76	0.232	8%
13	14.50	0.82			0.270	0.323	1.0	14.00	15.00	1.00	0.82	0.297	0.297	0.82	0.243	8%
14	15.50	0.90			0.299	0.382	1.0	15.00	15.88	0.88	0.90	0.341	0.341	0.79	0.268	9%
15	16.25	0.88			0.269	0.336	1.0	15.88	16.63	0.75	0.88	0.303	0.303	0.66	0.200	7%
16	17.00	0.84			0.227	0.316	1.0	16.63	17.50	0.88	0.84	0.272	0.272	0.74	0.200	7%
17	18.00	0.78			0.223	0.271	1.0	17.50	18.25	0.75	0.78	0.247	0.247	0.59	0.144	5%
18	18.50	0.75			0.214	0.238	1.0	18.25	19.25	1.00	0.75	0.226	0.226	0.75	0.170	6%
19	20.00	0.80			0.027	0.073	1.0	19.25	20.75	1.50	0.80	0.050	0.050	1.20	0.060	2%
20	21.50	0.76			-0.002	0.023	1.0	20.75	22.50	1.75	0.76	0.011	0.011	1.33	0.014	0%
21	23.50	0.65		0.004			1.0	22.50	24.50	2.00	0.65	0.004	0.004	1.30	0.005	0%
22	25.50	0.35		-0.011			1.0	24.50	25.95	1.45	0.35	-0.011	-0.011	0.51	-0.006	0%
RB	26.40	0.00	0.00	0.00	0.00	0.00	1.0	25.95	26.40	0.45	0.09	-0.003	-0.003	0.04	0.000	0%
<b>Total Flow</b>															<b>2.87</b>	

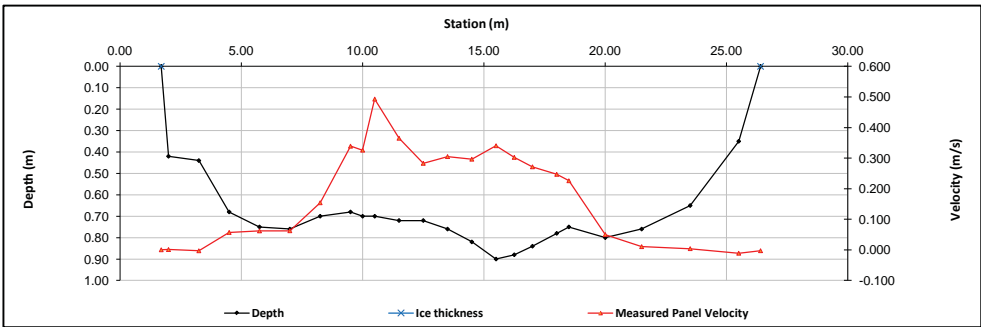
Measurement Details:	
Start Time (MST):	17:30
End Time (MST):	19:00
Equipment:	ADV
Method:	Wading
River Condition:	GOOD
Quality/Error (see reverse):	Excellent
Weather:	25 Degrees, clear

Flow characteristics:	
Total Flow:	2.87 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	16.89 (m <sup>2</sup> )
Wetted Width:	24.70 (m)
Hydraulic Depth:	0.684 (m)
Mean Velocity:	0.170 (m/s)
Froude Number:	0.066

Logger Details:		
	Before	After
Transducer Reading (m):	0.767	
Water (°C):	17.4	
Battery (Main):	13.7	
Datalogger Clock:	16:38	
Laptop Clock:	16:38	
Dessicant:	Changed	
Logger# (if Δ):	13899	
PT# (if Δ):	-	

**Datalogger / Station Notes:**  
- GOES west angle good.

**General Notes:**  
- TSS taken at 12.5 m.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.006	99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.981	99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.772	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			3.035	97.645		
Other:	0.680	100.680		100.000		Nail in tree
<b>Setup #2</b>						
Bench Mark 1:	0.961	100.635		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.935	99.700	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.725	99.910	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			2.993	97.642		
Other:			0.633	100.002	100.000	Nail in tree

Closing Error	-0.001	Average WL	97.644
WL Check	0.003	Transducer Elevation	96.877

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	16-Aug-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	16-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

August 23, 2012



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
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																
No Flow Measurement Conducted																
<b>Total Flow</b>															-	

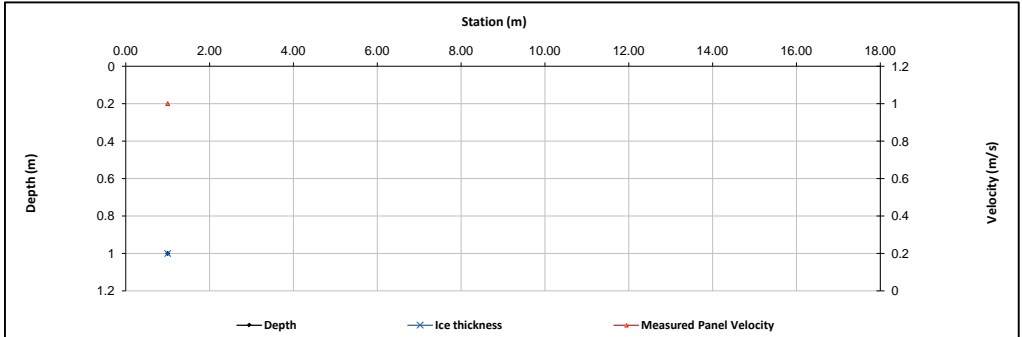
Measurement Details:	
Start Time (MST):	9:00
End Time (MST):	11:00
Equipment:	-
Method:	-
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

Flow characteristics:	
Total Flow:	- (m <sup>3</sup> /s)
Perceived Measurement Quality:	-
Cross Section Area:	0.00 (m <sup>2</sup> )
Wetted Width:	0.00 (m)
Hydraulic Depth:	#DIV/0! (m)
Mean Velocity:	#VALUE! (m/s)
Froude Number:	#VALUE!

Logger Details:		
	Before	After
Transducer Reading (m):	0.705	0.711
Water (°C):	17.6	17.5
Battery (Main):	13.09	13.09
Datalogger Clock:	7:44	9:03
Laptop Clock:	7:44	9:03
Dessicant:	OK	OK
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- Installed GOES transmitter
- GOES sin = 046769
- Antenna sin= 2A67032
- GPS Antenna =317110690
- First GOES transmission at 9:23:50 MST



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Depth	

**General Notes:**

Field Personnel:		Trip Date:	23-Aug-12
Data Entry Personnel:	HH, XP	Date:	23-Aug-12
Data Check Personnel:	XP (Field)	Date:	11-Oct-12
	CJ		

# Hydrometric Measurement Field Data Sheet

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

September 20, 2012



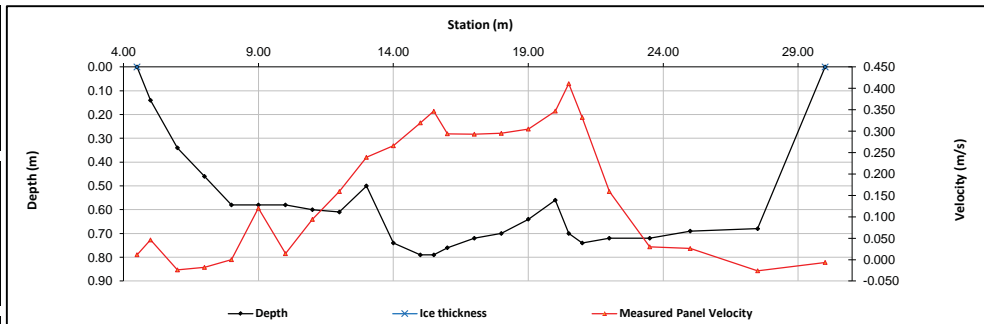
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	4.50	0.00	0.00	0.000	0.000	0.000	1.0	4.50	4.75	0.25	0.04	0.012	0.012	0.01	0.000	0%
1	5.00	0.14		0.046			1.0	4.75	5.50	0.75	0.14	0.046	0.046	0.11	0.005	0%
2	6.00	0.34		-0.024			1.0	5.50	6.50	1.00	0.34	-0.024	-0.024	0.34	-0.008	0%
3	7.00	0.46		-0.018			1.0	6.50	7.50	1.00	0.46	-0.018	-0.018	0.46	-0.008	0%
4	8.00	0.58		0.000			1.0	7.50	8.50	1.00	0.58	0.000	0.000	0.58	0.000	0%
5	9.00	0.58		0.120			1.0	8.50	9.50	1.00	0.58	0.120	0.120	0.58	0.070	3%
6	10.00	0.58		0.014			1.0	9.50	10.50	1.00	0.58	0.014	0.014	0.58	0.008	0%
7	11.00	0.60		0.094			1.0	10.50	11.50	1.00	0.60	0.094	0.094	0.60	0.056	2%
8	12.00	0.61		0.159			1.0	11.50	12.50	1.00	0.61	0.159	0.159	0.61	0.097	4%
9	13.00	0.50		0.239			1.0	12.50	13.50	1.00	0.50	0.239	0.239	0.50	0.120	5%
10	14.00	0.74		0.266			1.0	13.50	14.50	1.00	0.74	0.266	0.266	0.74	0.197	9%
11	15.00	0.79			0.285	0.354	1.0	14.50	15.25	0.75	0.79	0.320	0.320	0.59	0.189	8%
12	15.50	0.79			0.298	0.395	1.0	15.25	15.75	0.50	0.79	0.347	0.347	0.40	0.137	6%
13	16.00	0.76			0.255	0.333	1.0	15.75	16.50	0.75	0.76	0.294	0.294	0.57	0.168	7%
14	17.00	0.72		0.293			1.0	16.50	17.50	1.00	0.72	0.293	0.293	0.72	0.211	9%
15	18.00	0.70		0.295			1.0	17.50	18.50	1.00	0.70	0.295	0.295	0.70	0.207	9%
16	19.00	0.64		0.305			1.0	18.50	19.50	1.00	0.64	0.305	0.305	0.64	0.195	9%
17	20.00	0.56		0.347			1.0	19.50	20.25	0.75	0.56	0.347	0.347	0.42	0.146	6%
18	20.50	0.70		0.411			1.0	20.25	20.75	0.50	0.70	0.411	0.411	0.35	0.144	6%
19	21.00	0.74		0.332			1.0	20.75	21.50	0.75	0.74	0.332	0.332	0.56	0.184	8%
20	22.00	0.72		0.159			1.0	21.50	22.75	1.25	0.72	0.159	0.159	0.90	0.143	6%
21	23.50	0.72		0.030			1.0	22.75	24.25	1.50	0.72	0.030	0.030	1.08	0.032	1%
22	25.00	0.69		0.026			1.0	24.25	26.25	2.00	0.69	0.026	0.026	1.38	0.036	2%
23	27.50	0.68		-0.026			1.0	26.25	28.75	2.50	0.68	-0.026	-0.026	1.70	-0.044	-2%
LB	30.00	0.00	0.00	0.00	0.00	0.00	1.0	28.75	30.00	1.25	0.17	-0.007	-0.007	0.21	-0.001	0%
<b>Total Flow</b>														<b>2.28</b>		

Measurement Details:	
Start Time (MST):	11:50
End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	Low
Quality/Error (see reverse):	Excellent
Weather:	Sunny

Flow characteristics:	
Total Flow:	2.28 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	15.32 (m <sup>2</sup> )
Wetted Width:	25.50 (m)
Hydraulic Depth:	0.601 (m)
Mean Velocity:	0.149 (m/s)
Froude Number:	0.061

Logger Details:		Before	After
Transducer Reading (m):		0.723	
Water (°C):		9.7	
Battery (Main):		13.34	
Datalogger Clock:		11:55	
Laptop Clock:		11:55	
Dessicant:		Replaced	
Logger# (if Δ):		-	
PT# (if Δ):		-	

Datalogger / Station Notes:	
-	Installed GOES transmitter.
-	GOES sin = 046769.
-	Antenna sin= 2A67032.
-	GPS Antenna = 317110690.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.967	100.641		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.942	99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.733	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			3.033	97.608		
Other:					100.000	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.952	99.675	99.674	Pipe 3 m SW of logger
Bench Mark 2:	0.928	100.627		99.699	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.718	99.909	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			3.017	97.610		
Other:					100.000	Nail in tree

Closing Error	-0.001	Average WL	97.609
WL Check	0.002	Transducer Elevation	96.886

General Notes:	
-	TSS at 15.5 m.

Field Personnel:		TR, SG	Trip Date:	20-Sep-12
Data Entry Personnel:	TR (Field)		Date:	20-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12



# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

October 17, 2012



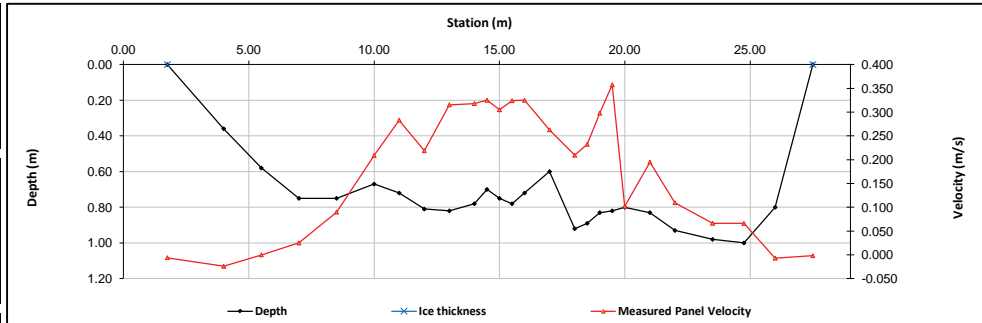
Flow Measurement:																
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel 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	1.75	0.00	0.00				1.0	1.75	2.88	1.13	0.09	-0.006	-0.006	0.10	-0.001	0%
1	4.00	0.36		-0.024			1.0	2.88	4.75	1.88	0.36	-0.024	-0.024	0.68	-0.016	-1%
2	5.50	0.58		0.000			1.0	4.75	6.25	1.50	0.58	0.000	0.000	0.87	0.000	0%
3	7.00	0.75		0.025			1.0	6.25	7.75	1.50	0.75	0.025	0.025	1.13	0.028	1%
4	8.50	0.75		0.090			1.0	7.75	9.25	1.50	0.75	0.090	0.090	1.13	0.101	4%
5	10.00	0.67		0.209			1.0	9.25	10.50	1.25	0.67	0.209	0.209	0.84	0.175	6%
6	11.00	0.72		0.283			1.0	10.50	11.50	1.00	0.72	0.283	0.283	0.72	0.204	7%
7	12.00	0.81			0.361	0.077	1.0	11.50	12.50	1.00	0.81	0.219	0.219	0.81	0.177	6%
8	13.00	0.82			0.268	0.363	1.0	12.50	13.50	1.00	0.82	0.316	0.316	0.82	0.259	9%
9	14.00	0.78		0.318			1.0	13.50	14.25	0.75	0.78	0.318	0.318	0.59	0.186	7%
10	14.50	0.70		0.325			1.0	14.25	14.75	0.50	0.70	0.325	0.325	0.35	0.114	4%
11	15.00	0.75		0.305			1.0	14.75	15.25	0.50	0.75	0.305	0.305	0.38	0.114	4%
12	15.50	0.78		0.324			1.0	15.25	15.75	0.50	0.78	0.324	0.324	0.39	0.126	4%
13	16.00	0.72		0.325			1.0	15.75	16.50	0.75	0.72	0.325	0.325	0.54	0.176	6%
14	17.00	0.60		0.263			1.0	16.50	17.50	1.00	0.60	0.263	0.263	0.60	0.158	6%
15	18.00	0.92			0.058	0.361	1.0	17.50	18.25	0.75	0.92	0.210	0.210	0.69	0.145	5%
16	18.50	0.89		0.150	0.150	0.315	1.0	18.25	18.75	0.50	0.89	0.233	0.233	0.45	0.103	4%
17	19.00	0.83		0.246	0.246	0.350	1.0	18.75	19.25	0.50	0.83	0.298	0.298	0.42	0.124	4%
18	19.50	0.82		0.306	0.306	0.409	1.0	19.25	19.75	0.50	0.82	0.358	0.358	0.41	0.147	5%
19	20.00	0.80		0.110	0.110	0.094	1.0	19.75	20.50	0.75	0.80	0.102	0.102	0.60	0.061	2%
20	21.00	0.83		0.296	0.296	0.094	1.0	20.50	21.50	1.00	0.83	0.195	0.195	0.83	0.162	6%
21	22.00	0.93		0.094	0.094	0.125	1.0	21.50	22.75	1.25	0.93	0.110	0.110	1.16	0.127	4%
22	23.50	0.98		0.065	0.065	0.068	1.0	22.75	24.13	1.38	0.98	0.067	0.067	1.35	0.090	3%
23	24.75	1.00		0.049	0.049	0.083	1.0	24.13	25.38	1.25	1.00	0.066	0.066	1.25	0.083	3%
24	26.00	0.80		-0.012	-0.012	-0.002	1.0	25.38	26.75	1.38	0.80	-0.007	-0.007	1.10	-0.008	0%
LB	27.50	0.00	0.00	0.00	0.00	0.00	1.0	26.75	27.50	0.75	0.20	-0.002	-0.002	0.15	0.000	0%
<b>Total Flow</b>															<b>2.83</b>	

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	13:40
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	Clear, 3C

Flow characteristics:	
Total Flow:	2.83 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	18.32 (m <sup>2</sup> )
Wetted Width:	25.75 (m)
Hydraulic Depth:	0.712 (m)
Mean Velocity:	0.154 (m/s)
Froude Number:	0.058

Logger Details:		
	Before	After
Transducer Reading (m):	0.780	
Water (°C):	2.1	
Battery (Main):	13:32	
Datalogger Clock:	12:33	
Laptop Clock:	12:33	
Dessicant:	changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.819	100.493		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			0.793	99.700	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.585	99.908	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			2.832	97.661		
Other:					100.000	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			0.801	99.676	99.674	Pipe 3 m SW of logger
Bench Mark 2:	0.777	100.477		99.700	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.567	99.910	99.908	Pipe 6 m SE of Logger
Ice/PT:						
Water Level:			2.816	97.661		
Other:					100.000	Nail in tree

Closing Error	-0.002	Average WL	97.661
WL Check	0.000	Transducer Elevation	96.881

**General Notes:**

- Ice on RB .
- Beaver dam construction 20 m down stream .

Field Personnel:		Trip Date:	18-Oct-12
Data Entry Personnel:	TR, DW, AM	Date:	26-Oct-12
Data Check Personnel:	DW	Date:	8-Nov-12
Entered Digitally in the Field:	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date:

December 5, 2012



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	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	1.60	0.00	0.00	0.000	0.000	0.000	0.9	1.60	2.10	0.50	0.13	0.011	0.010	0.06	0.001	0%					
1	2.60	0.75	0.25	0.043			0.9	2.10	3.10	1.00	0.50	0.043	0.039	0.50	0.019	2%					
2	3.60	0.90	0.31	0.043			0.9	3.10	4.30	1.20	0.59	0.043	0.039	0.71	0.027	3%					
3	5.00	0.95	0.35	0.036			0.9	4.30	5.75	1.45	0.60	0.036	0.032	0.87	0.028	3%					
4	6.50	0.93	0.35	0.056			0.9	5.75	7.30	1.55	0.58	0.056	0.050	0.90	0.045	4%					
5	8.10	0.90	0.35	0.182			0.9	7.30	8.15	0.85	0.55	0.182	0.164	0.47	0.077	7%					
6	8.20	0.80	0.30	0.192			0.9	8.15	8.70	0.55	0.50	0.192	0.173	0.28	0.048	5%					
7	9.20	0.99	0.33	0.207			0.9	8.70	9.25	0.55	0.66	0.207	0.186	0.36	0.068	7%					
8	9.30	0.80	0.24	0.196			0.9	9.25	9.85	0.60	0.56	0.196	0.176	0.34	0.059	6%					
9	10.40	0.73	0.33	0.180			0.9	9.85	10.90	1.05	0.40	0.180	0.162	0.42	0.068	7%					
10	11.40	0.65	0.35	0.113			0.9	10.90	11.95	1.05	0.30	0.113	0.102	0.32	0.032	3%					
11	12.50	0.70	0.35	0.074			0.9	11.95	13.00	1.05	0.35	0.074	0.067	0.37	0.024	2%					
12	13.50	0.85	0.25	0.087			0.9	13.00	13.95	0.95	0.60	0.087	0.078	0.57	0.045	4%					
13	14.40	0.70	0.27	0.117			0.9	13.95	14.85	0.90	0.43	0.117	0.105	0.39	0.041	4%					
14	15.30	0.80	0.27	0.142			0.9	14.85	15.65	0.80	0.53	0.142	0.128	0.42	0.054	5%					
15	16.00	0.80	0.28	0.161			0.9	15.65	16.40	0.75	0.52	0.161	0.145	0.39	0.057	5%					
16	16.80	0.78	0.27	0.165			0.9	16.40	17.15	0.75	0.51	0.165	0.149	0.38	0.057	5%					
17	17.50	0.77	0.29	0.136			0.9	17.15	17.95	0.80	0.48	0.136	0.122	0.38	0.047	5%					
18	18.40	0.70	0.26	0.176			0.9	17.95	18.80	0.85	0.44	0.176	0.158	0.37	0.059	6%					
19	19.20	0.65	0.25	0.179			0.9	18.80	19.80	1.00	0.40	0.179	0.161	0.40	0.064	6%					
20	20.40	0.70	0.27	0.131			0.9	19.80	20.90	1.10	0.43	0.131	0.118	0.47	0.056	5%					
21	21.40	0.68	0.33	0.075			0.9	20.90	21.95	1.05	0.35	0.075	0.068	0.37	0.025	2%					
22	22.50	0.70	0.30	0.048			0.9	21.95	23.70	1.75	0.40	0.048	0.043	0.70	0.030	3%					
23	24.90	0.40	0.20	0.024			0.9	23.70	25.70	2.00	0.20	0.024	0.022	0.40	0.009	1%					
RB	26.50	0.00	0.00	0.00	0.00	0.00	1.0	25.70	26.50	0.80	0.05	0.006	0.006	0.04	0.000	0%					
<b>Total Flow</b>														<b>1.04</b>							

Measurement Details:	
Start Time (MST):	12:30
End Time (MST):	14:01
Equipment:	ADV
Method:	Ice
River Condition:	Ice and snow covered
Quality/Error (see reverse):	Excellent
Weather:	Clear, Calm, -17 deg.

Flow characteristics:	
Total Flow:	1.04 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	10.88 (m <sup>2</sup> )
Wetted Width:	24.90 (m)
Hydraulic Depth:	0.437 (m)
Mean Velocity:	0.096 (m/s)
Froude Number:	0.046

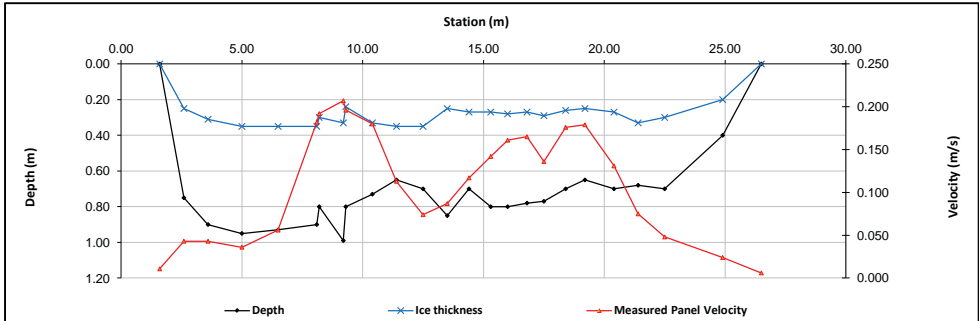
Logger Details:		Before	After
Transducer Reading (m):		0.724	-
Water (°C):		0.3	-
Battery (Main):		11.4	12.9
Datalogger Clock:		12:51	-
Laptop Clock:		12:51	-
Dessicant:		Replaced	-
Logger# (if Δ):		-	-
PT# (if Δ):		-	-

**Datalogger / Station Notes:**

- Battery did not have a high enough voltage to keep the station running, Added two new batteries.

**General Notes:**

- Tag line is nowhere to be seen.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.055	100.729		99.674	99.674	Pipe 3 m SW of logger
Bench Mark 2:			1.033	99.696	99.699	Pipe 2 m SE of logger
Bench Mark 3:			0.824	99.905	99.908	Pipe 6 m SE of Logger
Ice/PT:			3.139	97.590		
Water Level:			3.120	97.609		
Other:					100.000	Nail in tree
<b>Setup #2</b>						
Bench Mark 1:			1.046	99.671	99.674	Pipe 3 m SW of logger
Bench Mark 2:			1.021	99.696	99.699	Pipe 2 m SE of logger
Bench Mark 3:	0.812	100.717		99.905	99.908	Pipe 6 m SE of Logger
Ice/PT:			3.126	97.591		
Water Level:			3.109	97.608		
Other:					100.000	Nail in tree

Closing Error	0.003	Average WL	97.609
WL Check	0.001	Transducer Elevation	96.885

<b>Field Personnel:</b>	TR AND DW	Trip Date:	5-Dec-12
<b>Data Entry Personnel:</b>	TR	Date:	5-Dec-12
<b>Data Check Personnel:</b>	DW	Date:	12-Dec-12
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 20, 2012



## 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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.50	0.50	0.11	0.114	0.114	0.05	0.006	0%
1	4.00	0.43		0.455			1.0	3.50	4.38	0.88	0.43	0.455	0.455	0.38	0.171	3%
2	4.75	0.47		0.565			1.0	4.38	5.13	0.75	0.47	0.565	0.565	0.35	0.199	3%
3	5.50	0.58		0.569			1.0	5.13	5.88	0.75	0.58	0.569	0.569	0.44	0.248	4%
4	6.25	0.66		0.627			1.0	5.88	6.63	0.75	0.66	0.627	0.627	0.50	0.310	5%
5	7.00	0.70		0.658			1.0	6.63	7.38	0.75	0.70	0.658	0.658	0.53	0.345	5%
6	7.75	0.70		0.614			1.0	7.38	8.13	0.75	0.70	0.614	0.614	0.53	0.322	5%
7	8.50	0.80			0.506	0.719	1.0	8.13	8.88	0.75	0.80	0.613	0.613	0.60	0.368	6%
8	9.25	0.87			0.190	0.744	1.0	8.88	9.63	0.75	0.87	0.467	0.467	0.65	0.305	5%
9	10.00	0.78			0.509	0.814	1.0	9.63	10.38	0.75	0.78	0.662	0.662	0.59	0.387	6%
10	10.75	0.80			0.646	0.717	1.0	10.38	11.13	0.75	0.80	0.682	0.682	0.60	0.409	6%
11	11.50	0.75			0.511	0.738	1.0	11.13	11.88	0.75	0.75	0.625	0.625	0.56	0.351	5%
12	12.25	0.82			0.432	0.619	1.0	11.88	12.63	0.75	0.82	0.526	0.526	0.62	0.323	5%
13	13.00	0.80			0.209	0.668	1.0	12.63	13.38	0.75	0.80	0.439	0.439	0.60	0.263	4%
14	13.75	0.95			0.427	0.679	1.0	13.38	14.13	0.75	0.95	0.553	0.553	0.71	0.394	6%
15	14.50	0.90			0.619	0.675	1.0	14.13	14.88	0.75	0.90	0.647	0.647	0.68	0.437	7%
16	15.25	0.82			0.589	0.749	1.0	14.88	15.63	0.75	0.82	0.669	0.669	0.62	0.411	6%
17	16.00	0.86			0.568	0.759	1.0	15.63	16.38	0.75	0.86	0.664	0.664	0.65	0.428	6%
18	16.75	0.67		0.573			1.0	16.38	17.13	0.75	0.67	0.573	0.573	0.50	0.288	4%
19	17.50	0.64		0.571			1.0	17.13	18.00	0.88	0.64	0.571	0.571	0.56	0.320	5%
20	18.50	0.58		0.369			1.0	18.00	19.00	1.00	0.58	0.369	0.369	0.58	0.214	3%
21	19.50	0.40		0.423			1.0	19.00	20.00	1.00	0.40	0.423	0.423	0.40	0.169	3%
LB	20.50	0.00	0.00	0.000	0.000	0.000	1.0	20.00	20.50	0.50	0.10	0.106	0.106	0.05	0.005	0%
<b>Total Flow</b>														<b>6.67</b>		

## Measurement Details:

Start Time (MST):	14:40
End Time (MST):	17:25
Equipment:	ADV
Method:	Fishcat
River Condition:	open, high flow, no ice
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 15 deg.

## Flow characteristics:

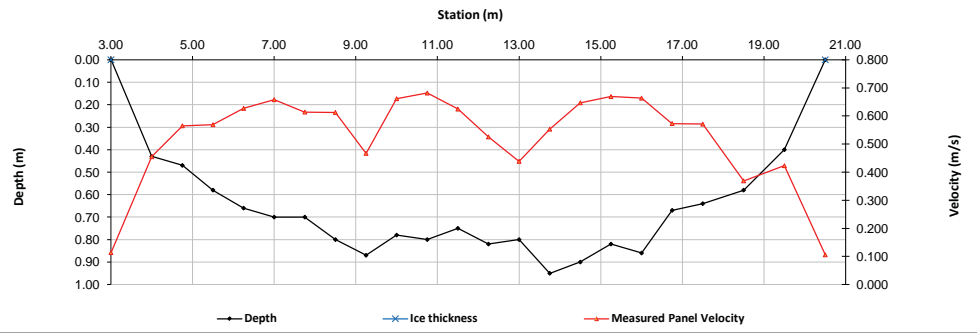
Total Flow:	6.67	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.72	(m <sup>2</sup> )
Wetted Width:	17.50	(m)
Hydraulic Depth:	0.670	(m)
Mean Velocity:	0.569	(m/s)
Froude Number:	0.222	

## Logger Details:

	Before	After
Transducer Reading (m):	0.606	
Water (°C):	10.2	
Battery (Main):	14.3	
Datalogger Clock:	17:01	
Laptop Clock:	17:01	
Dessicant:	new	
Logger# (if Δ):	9723	
PT# (if Δ):	298579	

## Datalogger / Station Notes:

- Station installed, no telemetry.



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.887	97.244		
Other:	1.131	101.131		100.000	100.000	Nail in spruce tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.877	97.243		
Other:	1.120	101.120		100.000	100.000	Nail in spruce tree
Closing Error	-				Average WL	97.244
WL Check	0.001				Transducer Elevation	96.638

## General Notes:

- 1 BM installed, bolt in spruce tree. Ground was frozen still, could not pound pipe BMs into ground.
- GOES 227 will work.
- No cell reception, station needs repeater.

<b>Field Personnel:</b>	SM, CJ	<b>Trip Date:</b>	20-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-Jun-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

June 20, 2012



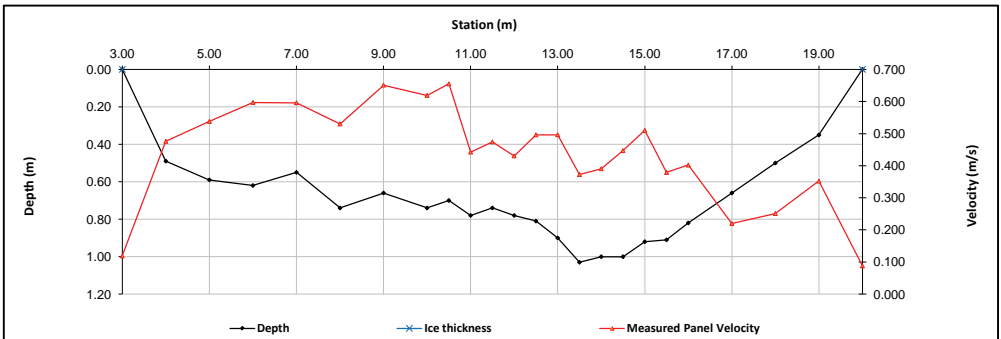
Flow Measurement: Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.50	0.50	0.12	0.119	0.119	0.06	0.007	0%
1	4.00	0.49		0.476			1.0	3.50	4.50	1.00	0.49	0.476	0.49	0.233	0.233	4%
2	5.00	0.59		0.538			1.0	4.50	5.50	1.00	0.59	0.538	0.59	0.317	0.317	6%
3	6.00	0.62		0.597			1.0	5.50	6.50	1.00	0.62	0.597	0.62	0.370	0.370	7%
4	7.00	0.55		0.596			1.0	6.50	7.50	1.00	0.55	0.596	0.596	0.55	0.328	6%
5	8.00	0.74		0.530			1.0	7.50	8.50	1.00	0.74	0.530	0.74	0.392	0.392	7%
6	9.00	0.66		0.651			1.0	8.50	9.50	1.00	0.66	0.651	0.66	0.430	0.430	8%
7	10.00	0.74		0.619			1.0	9.50	10.25	0.75	0.74	0.619	0.619	0.56	0.344	7%
8	10.50	0.70		0.655			1.0	10.25	10.75	0.50	0.70	0.655	0.655	0.35	0.229	4%
9	11.00	0.78			0.181	0.704	1.0	10.75	11.25	0.50	0.78	0.443	0.443	0.39	0.173	3%
10	11.50	0.74		0.474			1.0	11.25	11.75	0.50	0.74	0.474	0.474	0.37	0.175	3%
11	12.00	0.78			0.171	0.690	1.0	11.75	12.25	0.50	0.78	0.431	0.431	0.39	0.168	3%
12	12.50	0.81			0.379	0.613	1.0	12.25	12.75	0.50	0.81	0.496	0.496	0.41	0.201	4%
13	13.00	0.90			0.328	0.665	1.0	12.75	13.25	0.50	0.90	0.497	0.497	0.45	0.223	4%
14	13.50	1.03			0.167	0.578	1.0	13.25	13.75	0.50	1.03	0.373	0.373	0.52	0.192	4%
15	14.00	1.00			0.232	0.549	1.0	13.75	14.25	0.50	1.00	0.391	0.391	0.50	0.195	4%
16	14.50	1.00			0.275	0.619	1.0	14.25	14.75	0.50	1.00	0.447	0.447	0.50	0.224	4%
17	15.00	0.92			0.321	0.699	1.0	14.75	15.25	0.50	0.92	0.510	0.510	0.46	0.235	4%
18	15.50	0.91			0.074	0.684	1.0	15.25	15.75	0.50	0.91	0.379	0.379	0.46	0.172	3%
19	16.00	0.82			0.308	0.496	1.0	15.75	16.50	0.75	0.82	0.402	0.402	0.62	0.247	5%
20	17.00	0.66		0.220			1.0	16.50	17.50	1.00	0.66	0.220	0.220	0.66	0.145	3%
21	18.00	0.50		0.251			1.0	17.50	18.50	1.00	0.50	0.251	0.251	0.50	0.126	2%
22	19.00	0.35		0.352			1.0	18.50	19.50	1.00	0.35	0.352	0.352	0.35	0.123	2%
LB	20.00	0.00	0.00	0.000	0.000	0.000	1.0	19.50	20.00	0.50	0.09	0.088	0.088	0.04	0.004	0%
<b>Total Flow</b>															<b>5.25</b>	

Measurement Details:	
Start Time (MST):	14:30
End Time (MST):	16:15
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Quality/Error (see reverse):	Excellent
Weather:	20 deg, clear, breezy.

Flow Characteristics:	
Total Flow:	5.25 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.22 (m <sup>2</sup> )
Wetted Width:	17.00 (m)
Hydraulic Depth:	0.660 (m)
Mean Velocity:	0.468 (m/s)
Froude Number:	0.184

Logger Details:		
	Before	After
Transducer Reading (m):	0.544	
Water (°C):	16.6	
Battery (Main):	13.71	
Datalogger Clock:	14:47	
Laptop Clock:	14:47	
Dessicant:	Replaced	
Logger# (if Δ):	9723	
PT# (if Δ):	298579	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.942	97.192		
Other:	1.134	101.134		100.000	100.000	Nail in spruce tree
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:			3.932	97.191		
Other:	1.123	101.123		100.000	100.000	Nail in spruce tree
Closing Error			-			Average WL
WL Check			0.001			Transducer Elevation
				97.192		
				96.648		

General Notes:	
- TSS sampled @ 17.0 m.	
- Cleared some rose bushes.	

Field Personnel:		Trip Date:	
SM & GB		20-Jun-12	
Data Entry Personnel:	TR	21-Jun-12	
Data Check Personnel:	CJ	22-Jun-12	

# Hydrometric Measurement Field Data Sheet

Site: S55 Gregoire River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: August 14, 2012



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	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	2.50	0.00	0.00	0.000	0.000	0.000	1.0	2.50	2.75	0.25	0.10	0.098	0.098	0.03	0.002	0%							
1	3.00	0.40		0.390			1.0	2.75	3.50	0.75	0.40	0.390	0.390	0.30	0.117	2%							
2	4.00	0.51		0.522			1.0	3.50	4.50	1.00	0.51	0.522	0.522	0.51	0.266	5%							
3	5.00	0.55		0.584			1.0	4.50	5.50	1.00	0.55	0.584	0.584	0.55	0.321	6%							
4	6.00	0.61		0.629			1.0	5.50	6.50	1.00	0.61	0.629	0.629	0.61	0.384	7%							
5	7.00	0.62		0.596			1.0	6.50	7.50	1.00	0.62	0.596	0.596	0.62	0.370	7%							
6	8.00	0.67		0.605			1.0	7.50	8.50	1.00	0.67	0.605	0.605	0.67	0.405	8%							
7	9.00	0.68		0.614			1.0	8.50	9.50	1.00	0.68	0.614	0.614	0.68	0.418	8%							
8	10.00	0.78			0.286	0.730	1.0	9.50	10.50	1.00	0.78	0.508	0.508	0.78	0.396	8%							
9	11.00	0.66		0.530			1.0	10.50	11.50	1.00	0.66	0.530	0.530	0.66	0.350	7%							
10	12.00	0.75			0.308	0.651	1.0	11.50	12.50	1.00	0.75	0.480	0.480	0.75	0.360	7%							
11	13.00	0.97			0.099	0.651	1.0	12.50	13.25	0.75	0.97	0.375	0.375	0.73	0.273	5%							
12	13.50	0.96			0.322	0.513	1.0	13.25	13.75	0.50	0.96	0.418	0.418	0.48	0.200	4%							
13	14.00	0.92			0.303	0.619	1.0	13.75	14.25	0.50	0.92	0.461	0.461	0.46	0.212	4%							
14	14.50	0.94			0.324	0.615	1.0	14.25	14.75	0.50	0.94	0.470	0.470	0.47	0.221	4%							
15	15.00	0.92			0.340	0.656	1.0	14.75	15.25	0.50	0.92	0.498	0.498	0.46	0.229	4%							
16	15.50	0.89			0.024	0.684	1.0	15.25	15.75	0.50	0.89	0.354	0.354	0.45	0.158	3%							
17	16.00	0.84			0.124	0.460	1.0	15.75	16.25	0.50	0.84	0.292	0.292	0.42	0.123	2%							
18	16.50	0.78			0.226	0.343	1.0	16.25	17.00	0.75	0.78	0.285	0.285	0.59	0.166	3%							
19	17.50	0.54		0.255			1.0	17.00	18.00	1.00	0.54	0.255	0.255	0.54	0.138	3%							
20	18.50	0.41		0.286			1.0	18.00	19.00	1.00	0.41	0.286	0.286	0.41	0.117	2%							
21	19.50	0.17		0.178			1.0	19.00	19.75	0.75	0.17	0.178	0.178	0.13	0.023	0%							
LB	20.00	0.00	0.00	0.00	0.00	0.00	1.0	19.75	20.00	0.25	0.04	0.045	0.045	0.01	0.000	0%							
<b>Total Flow</b>														<b>5.25</b>									

Measurement Details:	
Start Time (MST):	8:30
End Time (MST):	10:45
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	cloudy, calm, 15

Flow characteristics:	
Total Flow:	5.25 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	11.29 (m <sup>2</sup> )
Wetted Width:	17.50 (m)
Hydraulic Depth:	0.645 (m)
Mean Velocity:	0.465 (m/s)
Froude Number:	0.185

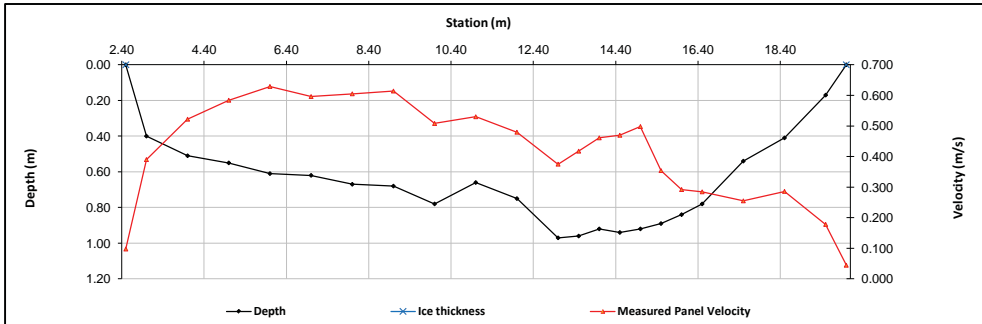
Logger Details:		Before	After
Transducer Reading (m):		0.386	
Water (°C):		16.1	
Battery (Main):		13.4	
Datalogger Clock:		8:49	
Laptop Clock:		9:49	
Dessicant:		replaced	
Logger# (if Δ):		9723	
PT# (if Δ):		-	

**Datalogger / Station Notes:**

- Installed yaggi on mast with cable, may need guy wires.

**General Notes:**

- Installed 2 BMs, one more needed.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						2" Pipe 2 m S of logger
Bench Mark 2:			1.337	99.806	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:			1.357	99.786	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.935	97.208		
Other:	1.143	101.143	1.046	100.097	100.000	Nail in spruce tree
<b>Setup #2</b>						
Bench Mark 1:						2" Pipe 2 m S of logger
Bench Mark 2:			1.326	99.805	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:	1.345	101.131		99.786	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.924	97.207		
Other:			1.036	100.095	100.000	Nail in spruce tree
Closing Error	0.000				Average WL	97.208
WL Check	0.001				Transducer Elevation	96.822

Field Personnel:		SM, CJ	Trip Date:	14-Aug-12
Data Entry Personnel:	CJ (Field)		Date:	14-Aug-12
Data Check Personnel:	CJ		Date:	28-Aug-12

# Hydrometric Measurement Field Data Sheet

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

September 19, 2012



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																
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>															-	

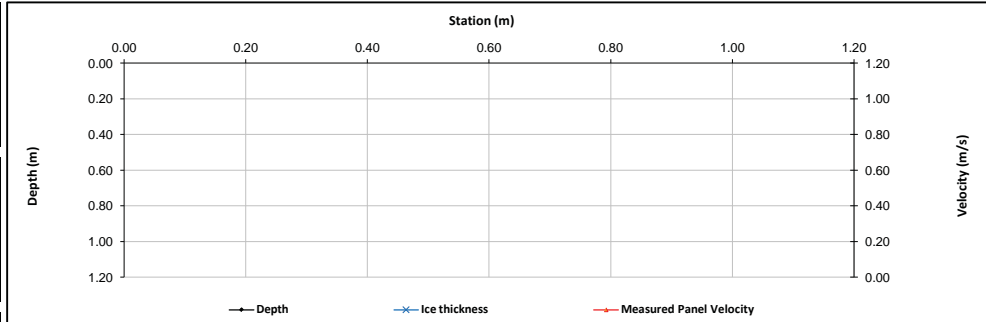
Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	17:20
Equipment:	
Method:	Wading
River Condition:	-
Quality/Error (see reverse):	-
Weather:	-

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):	0.526	
Water (°C):	10.8	
Battery (Main):	13.8	
Datalogger Clock:	15:04	
Laptop Clock:	15:03	
Dessicant:	replaced	
Logger# (if Δ):	9723	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Installed Radio Repeater (R4).



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						
<b>Setup #2</b>						
Bench Mark 1:						
Bench Mark 2:						
Bench Mark 3:						
Ice/PT:						
Water Level:						
Other:						

Closing Error		Average WL	
WL Check		Transducer Elevation	

**General Notes:**

Field Personnel:	SM, SG	Trip Date:	19-Sep-12
Data Entry Personnel:	SG (Field)	Date:	19-Sep-12
Data Check Personnel:	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: September 22, 2012



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	5.30	0.00	0.00	0.000	0.000	0.000	1.0	5.30	5.65	0.35	0.12	0.088	0.088	0.04	0.004	0%
1	6.00	0.48		0.351			1.0	5.65	6.50	0.85	0.48	0.351	0.351	0.41	0.143	2%
2	7.00	0.60		0.580			1.0	6.50	7.50	1.00	0.60	0.580	0.580	0.60	0.348	5%
3	8.00	0.67		0.590			1.0	7.50	8.50	1.00	0.67	0.590	0.590	0.67	0.395	5%
4	9.00	0.70		0.589			1.0	8.50	9.50	1.00	0.70	0.589	0.589	0.70	0.412	6%
5	10.00	0.80			0.527	0.684	1.0	9.50	10.50	1.00	0.80	0.606	0.606	0.80	0.484	7%
6	11.00	0.80			0.564	0.688	1.0	10.50	11.50	1.00	0.80	0.626	0.626	0.80	0.501	7%
7	12.00	0.56			0.701		1.0	11.50	12.50	1.00	0.56	0.701	0.701	0.56	0.393	5%
8	13.00	0.69			0.815		1.0	12.50	13.50	1.00	0.69	0.815	0.815	0.69	0.562	8%
9	14.00	0.69			0.820		1.0	13.50	14.50	1.00	0.69	0.820	0.820	0.69	0.566	8%
10	15.00	0.88			0.530	0.991	1.0	14.50	15.25	0.75	0.88	0.761	0.761	0.66	0.502	7%
11	15.50	0.86			0.511	0.901	1.0	15.25	15.75	0.50	0.86	0.706	0.706	0.43	0.304	4%
12	16.00	0.96			0.501	0.785	1.0	15.75	16.25	0.50	0.96	0.643	0.643	0.48	0.309	4%
13	16.50	1.00			0.359	0.827	1.0	16.25	16.75	0.50	1.00	0.593	0.593	0.50	0.297	4%
14	17.00	0.98			0.406	0.850	1.0	16.75	17.25	0.50	0.98	0.628	0.628	0.49	0.308	4%
15	17.50	1.00			0.411	0.856	1.0	17.25	17.75	0.50	1.00	0.634	0.634	0.50	0.317	4%
16	18.00	1.02			0.215	0.806	1.0	17.75	18.50	0.75	1.02	0.511	0.511	0.77	0.391	5%
17	19.00	0.88			0.297	0.769	1.0	18.50	19.50	1.00	0.88	0.533	0.533	0.88	0.469	6%
18	20.00	0.77			0.334	0.526	1.0	19.50	20.50	1.00	0.77	0.430	0.430	0.77	0.331	4%
19	21.00	0.58			0.426		1.0	20.50	21.50	1.00	0.58	0.426	0.426	0.58	0.247	3%
20	22.00	0.37			0.338		1.0	21.50	22.50	1.00	0.37	0.338	0.338	0.37	0.125	2%
LB	23.00	0.00	0.00	0.000	0.000	0.000	1.0	22.50	23.00	0.50	0.09	0.085	0.085	0.05	0.004	0%

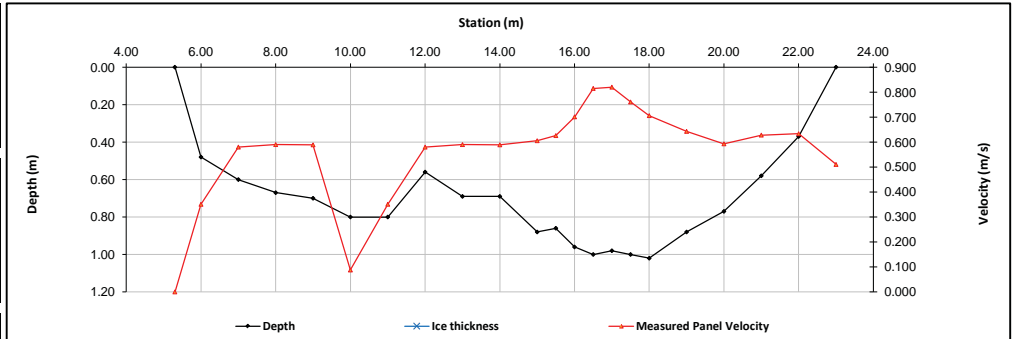
**Total Flow 7.41**

Measurement Details:	
Start Time (MST):	11:30
End Time (MST):	13:00
Equipment:	ADV
Method:	wading
River Condition:	high flow
Quality/Error (see reverse):	Excellent
Weather:	14 deg, clear, breezy

Flow characteristics:	
Total Flow:	7.41 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	12.43 (m <sup>2</sup> )
Wetted Width:	17.70 (m)
Hydraulic Depth:	0.702 (m)
Mean Velocity:	0.596 (m/s)
Froude Number:	0.227

Logger Details:		
	Before	After
Transducer Reading (m):	0.461	
Water (°C):	9.7	
Battery (Main):	13.88	
Datalogger Clock:	11:33	
Laptop Clock:	11:32	
Dessicant:	good	
Logger# (if Δ):	9723	
PT# (if Δ):	-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			0.867	100.181	100.181	2" Pipe 2 m S of logger
Bench Mark 2:	1.242	101.048	1.260	99.806	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:			1.260	99.788	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.785	97.263		
Other:			1.046	100.002	100.000	Nail in spruce tree
<b>Setup #2</b>						
Bench Mark 1:			0.857	100.181	100.181	2" Pipe 2 m S of logger
Bench Mark 2:			1.231	99.807	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:	1.250	101.038		99.788	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.775	97.263		
Other:			1.036	100.002	100.000	Nail in spruce tree

Closing Error	-0.001	Average WL	97.263
WL Check	0.000	Transducer Elevation	96.802

General Notes:	

Field Personnel:	SM, TR	Trip Date:	22-Sep-12
Data Entry Personnel:	SM (Field)	Date:	22-Sep-12
Data Check Personnel:	CJ	Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: October 18, 2012



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
LB	0.25	0.00	0.00	0.000	0.000	0.000	1.0	0.25	0.63	0.38	0.07	0.005	0.005	0.03	0.000	0%
1	1.00	0.28		0.020			1.0	0.63	1.50	0.88	0.28	0.020	0.020	0.25	0.005	0%
2	2.00	0.41		0.315			1.0	1.50	2.50	1.00	0.41	0.315	0.315	0.41	0.129	3%
3	3.00	0.55		0.228			1.0	2.50	3.50	1.00	0.55	0.228	0.228	0.55	0.125	3%
4	4.00	0.60		0.293			1.0	3.50	4.50	1.00	0.60	0.293	0.293	0.60	0.176	4%
5	5.00	0.93			0.183	0.628	1.0	4.50	5.38	0.88	0.93	0.406	0.406	0.81	0.330	7%
6	5.75	0.90			0.300	0.635	1.0	5.38	6.13	0.75	0.90	0.468	0.468	0.68	0.316	7%
7	6.50	0.87			0.433	0.579	1.0	6.13	6.88	0.75	0.87	0.506	0.506	0.65	0.330	7%
8	7.25	0.80			0.356	0.616	1.0	6.88	7.63	0.75	0.80	0.486	0.486	0.60	0.292	7%
9	8.00	0.75		0.409			1.0	7.63	8.38	0.75	0.75	0.409	0.409	0.56	0.230	5%
10	8.75	0.64		0.480			1.0	8.38	9.13	0.75	0.64	0.480	0.480	0.48	0.230	5%
11	9.50	0.65		0.558			1.0	9.13	9.88	0.75	0.65	0.558	0.558	0.49	0.272	6%
12	10.25	0.58		0.605			1.0	9.88	10.63	0.75	0.58	0.605	0.605	0.44	0.263	6%
13	11.00	0.65		0.519			1.0	10.63	11.38	0.75	0.65	0.519	0.519	0.49	0.253	6%
14	11.75	0.58		0.534			1.0	11.38	12.13	0.75	0.58	0.534	0.534	0.44	0.232	5%
15	12.50	0.66		0.472			1.0	12.13	12.88	0.75	0.66	0.472	0.472	0.50	0.234	5%
16	13.25	0.58		0.521			1.0	12.88	13.63	0.75	0.58	0.521	0.521	0.44	0.227	5%
17	14.00	0.62		0.542			1.0	13.63	14.38	0.75	0.62	0.542	0.542	0.47	0.252	6%
18	14.75	0.56		0.589			1.0	14.38	15.13	0.75	0.56	0.589	0.589	0.42	0.247	6%
19	15.50	0.52		0.519			1.0	15.13	15.88	0.75	0.52	0.519	0.519	0.39	0.202	5%
20	16.25	0.45		0.387			1.0	15.88	16.63	0.75	0.45	0.387	0.387	0.34	0.131	3%
RB	17.00	0.00	0.00	0.00	0.00	0.00	1.0	16.63	17.00	0.38	0.11	0.097	0.097	0.04	0.004	0%

**Total Flow 4.48**

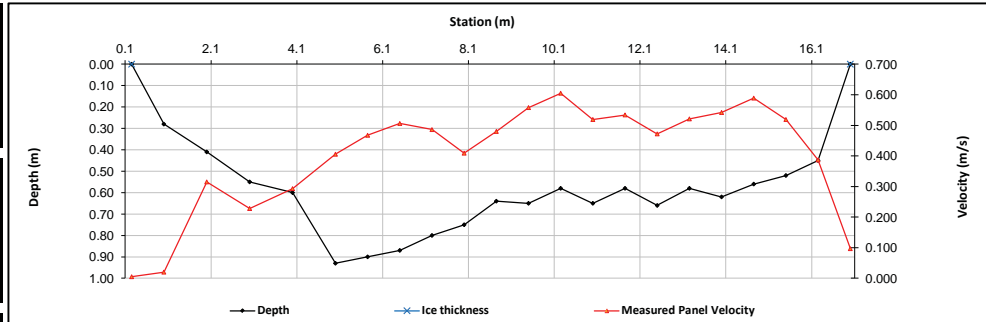
Measurement Details:	
Start Time (MST):	14:32
End Time (MST):	16:00
Equipment:	ADV
Method:	Wading
River Condition:	good flow
Quality/Error (see reverse):	Excellent
Weather:	clear, 5 deg

Flow characteristics:	
Total Flow:	4.48 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	10.04 (m <sup>2</sup> )
Wetted Width:	16.75 (m)
Hydraulic Depth:	0.600 (m)
Mean Velocity:	0.446 (m/s)
Froude Number:	0.184

Logger Details:		
	Before	After
Transducer Reading (m):	0.363	
Water (°C):	3.8	
Battery (Main):	14.08	
Datalogger Clock:	14:34	
Laptop Clock:	14:34	
Dessicant:	changed	
Logger# (if Δ):	-	
PT# (if Δ):	-	

Datalogger / Station Notes:	

General Notes:	
- TSS sampled @ 7.0 m .	



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	0.848	101.029		100.181	100.181	2" Pipe 2 m S of logger
Bench Mark 2:			1.220	99.809	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:			1.239	99.790	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.851	97.178		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			0.822	100.182	100.181	2" Pipe 2 m S of logger
Bench Mark 2:	1.195	101.004		99.809	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:			1.214	99.790	99.786	3/4" Pipe 4 m W of logger
Ice/PT:						
Water Level:			3.827	97.177		
Other:						

Closing Error	-0.001	Average WL	97.178
WL Check	0.001	Transducer Elevation	96.815

Field Personnel:		Trip Date:
Data Entry Personnel:	TR, DW, AM	18-Oct-12
Data Check Personnel:	TR	26-Oct-12
Entered Digitally in the Field:	TR	9-Nov-12
	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	



# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:

December 16, 2012



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	1.50	0.00	0.00	0.000	0.000	0.000	0.9	1.50	1.80	0.30	0.03	0.069	0.062	0.01	0.001	0%
1	2.10	0.35	0.23	0.274			0.9	1.80	2.60	0.80	0.12	0.274	0.247	0.10	0.024	1%
2	3.10	0.40	0.30	0.452			0.9	2.60	3.50	0.90	0.10	0.452	0.407	0.09	0.037	2%
3	3.90	0.60	0.25	-0.001			0.9	3.50	4.30	0.80	0.35	-0.001	-0.001	0.28	0.000	0%
4	4.70	0.70	0.30	0.403			0.9	4.30	5.15	0.85	0.40	0.403	0.363	0.34	0.123	6%
5	5.60	0.80	0.35	0.401			0.9	5.15	5.85	0.70	0.45	0.401	0.361	0.32	0.114	6%
6	6.10	0.85	0.30	0.459			0.9	5.85	6.35	0.50	0.55	0.459	0.413	0.28	0.114	6%
7	6.60	0.60	0.25	0.595			0.9	6.35	6.90	0.55	0.35	0.595	0.536	0.19	0.103	5%
8	7.20	0.85	0.30	0.577			0.9	6.90	7.45	0.55	0.35	0.577	0.519	0.19	0.100	5%
9	7.70	0.60	0.25	0.561			0.9	7.45	8.15	0.70	0.35	0.561	0.505	0.25	0.124	6%
10	8.60	0.50	0.15	0.347			0.9	8.15	9.05	0.90	0.35	0.347	0.312	0.32	0.098	5%
11	9.50	0.60	0.20	0.415			0.9	9.05	9.80	0.75	0.40	0.415	0.374	0.30	0.112	5%
12	10.10	0.80	0.23	0.522			0.9	9.80	10.35	0.55	0.57	0.522	0.470	0.31	0.147	7%
13	10.60	0.65	0.27	0.613			0.9	10.35	10.90	0.55	0.38	0.613	0.552	0.21	0.115	6%
14	11.20	0.85	0.30	0.460			0.9	10.90	11.50	0.60	0.55	0.460	0.414	0.33	0.137	7%
15	11.80	0.60	0.35	0.519			0.9	11.50	12.25	0.75	0.25	0.519	0.467	0.19	0.088	4%
16	12.70	0.80	0.30	0.442			0.9	12.25	13.30	1.05	0.50	0.442	0.398	0.53	0.209	10%
17	13.90	0.60	0.25	0.624			0.9	13.30	14.35	1.05	0.35	0.624	0.562	0.37	0.206	10%
18	14.80	0.50	0.30	0.589			0.9	14.35	15.35	1.00	0.20	0.589	0.530	0.20	0.106	5%
19	15.90	0.50	0.35	0.421			0.9	15.35	16.35	1.00	0.15	0.421	0.379	0.15	0.057	3%
20	16.80	0.40	0.25	0.338			0.9	16.35	17.20	0.85	0.15	0.338	0.304	0.13	0.039	2%
RB	17.60	0.00	0.00	0.00	0.00	0.00	1.0	17.20	17.60	0.40	0.04	0.085	0.085	0.01	0.001	0%

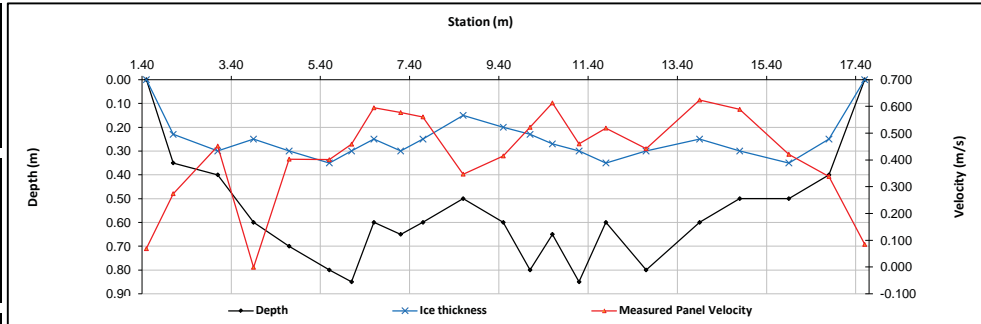
**Total Flow 2.05**

Measurement Details:	
Start Time (MST):	13:30
End Time (MST):	14:45
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	overcast, -6 deg.

Flow characteristics:	
Total Flow:	2.05 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	5.08 (m <sup>2</sup> )
Wetted Width:	16.10 (m)
Hydraulic Depth:	0.315 (m)
Mean Velocity:	0.404 (m/s)
Froude Number:	0.230

Logger Details:		Before	After
Transducer Reading (m):		0.411	
Water (°C):		0.3	
Battery (Main):		13.4	
Datalogger Clock:		13:40	
Laptop Clock:		13:40	
Dessicant:		replaced	
Logger# (if Δ):		9723	
PT# (if Δ):		-	

Datalogger / Station Notes:	



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.012	100.179	100.181	2" Pipe 2 m S of logger
Bench Mark 2:			1.386	99.805	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:	1.405	101.191		99.786	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			3.953	97.238		
Water Level:			3.973	97.218		
Other:					100.000	Nail in spruce tree
<b>Setup #2</b>						
Bench Mark 1:			1.024	100.180	100.181	2" Pipe 2 m S of logger
Bench Mark 2:	1.399	101.204		99.805	99.806	3/4" Pipe 5 m SW of logger
Bench Mark 3:			1.417	99.787	99.786	3/4" Pipe 4 m W of logger
Ice/PT:			3.965	97.239		
Water Level:			3.987	97.217		
Other:					100.000	

Closing Error	-0.001
WL Check	0.001

Average WL	97.218
Transducer Elevation	96.807

### General Notes:

- Evidence of overflow, slush/poor ice on surface.

<b>Field Personnel:</b>	TR AND SM	<b>Trip Date:</b>	16-Dec-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	16-Dec-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	20-Dec-12
<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 River

UTM Location: 493711 E, 6169759 N

Site Visit Date:

May 16, 2012



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
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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25																
26																
27																
28																
29																
30																

No Flow Measurement Conducted

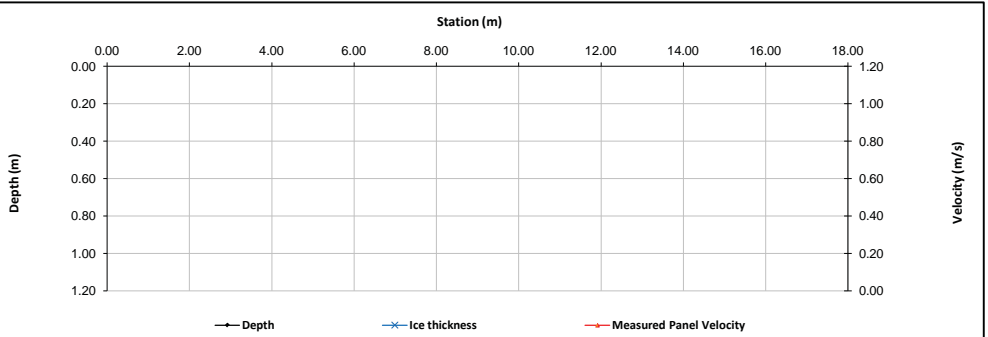
Total Flow

Measurement Details:	
Start Time (MST):	16:00
End Time (MST):	19:00
Equipment:	-
Method:	-
River Condition:	open
Quality/Error (see reverse):	-
Weather:	overcast, calm, +15

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):	0.456	
Water (°C):	8.0	
Battery (Main):	12.9	
Datalogger Clock:	17:19	
Laptop Clock:	17:19	
Dessicant:	New	
Logger# (if Δ):	20963	
PT# (if Δ):	284724	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.310	101.310		100.000	100.000	T-post
Bench Mark 2:			1.344	99.966	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.261	100.049	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.511	98.799		
Other:						
<b>Setup #1</b>						
Bench Mark 1:			1.296	99.999	100.000	T-post
Bench Mark 2:	1.329	101.295		99.966	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.245	100.050	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.499	98.796		
Other:						

Closing Error	0.001	Average WL	98.798
WL Check	0.003	Transducer Elevation	98.342

**General Notes:**

- No flow measurement performed due to time constraints.
- Telemetry installed but forgot to record phone #.

Field Personnel:	SM, DW, CJ	Trip Date:	16-May-12
Data Entry Personnel:	CJ	Date:	1-Jun-12
Data Check Personnel:	XP	Date:	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina River

UTM Location: 493711 E, 6169759 N

Site Visit Date:

May 25, 2012



## 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
LB	5.50	0.00	0.00	0.000	0.000	0.000	1.0	5.50	5.75	0.25	0.19	0.065	0.065	0.05	0.003	0%
1	6.00	0.74		0.261			1.0	5.75	6.50	0.75	0.74	0.261	0.261	0.56	0.145	2%
2	7.00	0.87			0.272	0.418	1.0	6.50	7.50	1.00	0.87	0.345	0.345	0.87	0.300	4%
3	8.00	0.86			0.241	0.385	1.0	7.50	8.50	1.00	0.86	0.313	0.313	0.86	0.269	3%
4	9.00	0.90			0.308	0.401	1.0	8.50	9.50	1.00	0.90	0.355	0.355	0.90	0.319	4%
5	10.00	1.20			0.213	0.398	1.0	9.50	10.50	1.00	1.20	0.306	0.306	1.20	0.367	4%
6	11.00	1.58			0.242	0.513	1.0	10.50	11.50	1.00	1.58	0.378	0.378	1.58	0.596	7%
7	12.00	1.62			0.274	0.463	1.0	11.50	12.50	1.00	1.62	0.369	0.369	1.62	0.597	7%
8	13.00	1.65			0.198	0.510	1.0	12.50	13.50	1.00	1.65	0.354	0.354	1.65	0.584	7%
9	14.00	1.46			0.267	0.554	1.0	13.50	14.50	1.00	1.46	0.411	0.411	1.46	0.599	7%
10	15.00	1.28			0.301	0.531	1.0	14.50	15.50	1.00	1.28	0.416	0.416	1.28	0.532	6%
11	16.00	1.14			0.467	0.516	1.0	15.50	16.50	1.00	1.14	0.492	0.492	1.14	0.560	7%
12	17.00	1.10			0.268	0.457	1.0	16.50	17.50	1.00	1.10	0.363	0.363	1.10	0.399	5%
13	18.00	1.08			0.348	0.419	1.0	17.50	18.50	1.00	1.08	0.384	0.384	1.08	0.414	5%
14	19.00	0.99			0.365	0.425	1.0	18.50	19.50	1.00	0.99	0.395	0.395	0.99	0.391	5%
15	20.00	0.83			0.415	0.463	1.0	19.50	20.50	1.00	0.83	0.439	0.439	0.83	0.364	4%
16	21.00	0.94			0.430	0.517	1.0	20.50	21.50	1.00	0.94	0.474	0.474	0.94	0.445	5%
17	22.00	1.00			0.389	0.468	1.0	21.50	22.50	1.00	1.00	0.429	0.429	1.00	0.429	5%
18	23.00	0.95			0.403	0.439	1.0	22.50	23.50	1.00	0.95	0.421	0.421	0.95	0.400	5%
19	24.00	0.82			0.316	0.392	1.0	23.50	24.50	1.00	0.82	0.354	0.354	0.82	0.290	3%
20	25.00	0.68		0.331			1.0	24.50	25.50	1.00	0.68	0.331	0.331	0.68	0.225	3%
21	26.00	0.48		0.359			1.0	25.50	26.50	1.00	0.48	0.359	0.359	0.48	0.172	2%
22	27.00	0.47		0.278			1.0	26.50	27.50	1.00	0.47	0.278	0.278	0.47	0.131	2%
23	28.00	0.34		0.174			1.0	27.50	28.20	0.70	0.34	0.174	0.174	0.24	0.041	0%
RB	28.40	0.00	0.00	0.000	0.000	0.000	1.0	28.20	28.40	0.20	0.09	0.044	0.044	0.02	0.001	0%
<b>Total Flow</b>															<b>8.57</b>	

## Measurement Details:

Start Time (MST):	16:30
End Time (MST):	19:10
Equipment:	ADV
Method:	Fishcat
River Condition:	Flowing well
Quality/Error (see reverse):	excellent
Weather:	partly cloudy, 15 deg.

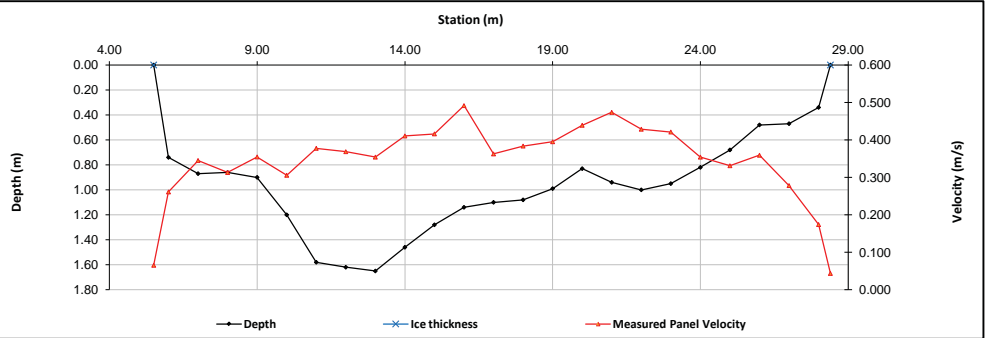
## Flow characteristics:

Total Flow:	8.57	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	22.76	(m <sup>2</sup> )
Wetted Width:	22.90	(m)
Hydraulic Depth:	0.994	(m)
Mean Velocity:	0.377	(m/s)
Froude Number:	0.121	

## Logger Details:

	Before	After
Transducer Reading (m):	0.389	
Water (°C):	11.1	
Battery (Main):	13.8	
Datalogger Clock:	16:37	
Laptop Clock:	16:37	
Dessicant:	replaced	
Logger# (if Δ):	20963	
PT# (if Δ):	-	

## Datalogger / Station Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.250	101.250		100.000	100.000	T-post
Bench Mark 2:			1.284	99.966	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.200	100.050	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.526	98.724		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.236	99.999	100.000	T-post
Bench Mark 2:	1.269	101.235		99.966	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.186	100.049	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.518	98.717		
Other:						

Closing Error	0.001	Average WL	98.721
WL Check	0.007	Transducer Elevation	98.332

## General Notes:

Modem phone#: 604-345-6861  
RSSI: -95

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	25-May-12
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	1-Jun-12
<b>Data Check Personnel:</b>	XP	<b>Date:</b>	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina River

UTM Location: 493711 E, 6169759 N

Site Visit Date:

June 17, 2012



## Flow Measurement:

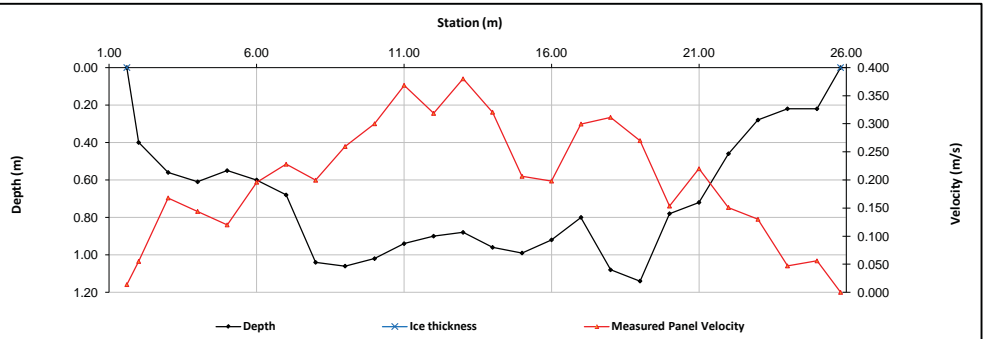
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	1.60	0.00	0.00	0.000	0.000	0.000	1.0	1.60	1.80	0.20	0.10	0.014	0.014	0.02	0.000	0%
1	2.00	0.40		0.055			1.0	1.80	2.50	0.70	0.40	0.055	0.055	0.28	0.015	0%
2	3.00	0.56		0.168			1.0	2.50	3.50	1.00	0.56	0.168	0.168	0.56	0.094	2%
3	4.00	0.61		0.144			1.0	3.50	4.50	1.00	0.61	0.144	0.144	0.61	0.088	2%
4	5.00	0.55		0.120			1.0	4.50	5.50	1.00	0.55	0.120	0.120	0.55	0.066	2%
5	6.00	0.60		0.196			1.0	5.50	6.50	1.00	0.60	0.196	0.196	0.60	0.118	3%
6	7.00	0.68		0.228			1.0	6.50	7.50	1.00	0.68	0.228	0.228	0.68	0.155	4%
7	8.00	1.04			0.045	0.354	1.0	7.50	8.50	1.00	1.04	0.200	0.200	1.04	0.207	5%
8	9.00	1.06			0.144	0.375	1.0	8.50	9.50	1.00	1.06	0.260	0.260	1.06	0.275	6%
9	10.00	1.02			0.214	0.386	1.0	9.50	10.50	1.00	1.02	0.300	0.300	1.02	0.306	7%
10	11.00	0.94			0.313	0.424	1.0	10.50	11.50	1.00	0.94	0.369	0.369	0.94	0.346	8%
11	12.00	0.90			0.247	0.390	1.0	11.50	12.50	1.00	0.90	0.319	0.319	0.90	0.287	7%
12	13.00	0.88			0.374	0.386	1.0	12.50	13.50	1.00	0.88	0.380	0.380	0.88	0.334	8%
13	14.00	0.96			0.259	0.382	1.0	13.50	14.50	1.00	0.96	0.321	0.321	0.96	0.308	7%
14	15.00	0.99			0.061	0.352	1.0	14.50	15.50	1.00	0.99	0.207	0.207	0.99	0.204	5%
15	16.00	0.92			0.104	0.292	1.0	15.50	16.50	1.00	0.92	0.198	0.198	0.92	0.182	4%
16	17.00	0.80			0.279	0.320	1.0	16.50	17.50	1.00	0.80	0.300	0.300	0.80	0.240	6%
17	18.00	1.08			0.255	0.368	1.0	17.50	18.50	1.00	1.08	0.312	0.312	1.08	0.336	8%
18	19.00	1.14			0.177	0.363	1.0	18.50	19.50	1.00	1.14	0.270	0.270	1.14	0.308	7%
19	20.00	0.78			0.105	0.202	1.0	19.50	20.50	1.00	0.78	0.154	0.154	0.78	0.120	3%
20	21.00	0.72		0.220			1.0	20.50	21.50	1.00	0.72	0.220	0.220	0.72	0.158	4%
21	22.00	0.46		0.151			1.0	21.50	22.50	1.00	0.46	0.151	0.151	0.46	0.069	2%
22	23.00	0.28		0.130			1.0	22.50	23.50	1.00	0.28	0.130	0.130	0.28	0.036	1%
23	24.00	0.22		0.047			1.0	23.50	24.50	1.00	0.22	0.047	0.047	0.22	0.010	0%
24	25.00	0.22		0.056			1.0	24.50	25.40	0.90	0.22	0.056	0.056	0.20	0.011	0%
RB	25.80	0.00	0.00	0.000	0.000	0.000	1.0	25.40	25.80	0.40	0.06	0.000	0.000	0.02	0.000	0%
<b>Total Flow</b>															<b>4.28</b>	

Measurement Details:	
Start Time (MST):	12:45
End Time (MST):	14:30
Equipment:	ADV
Method:	Fishcat
River Condition:	Open, good flow
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, rain, 15 deg.

Flow characteristics:		
Total Flow:	4.28	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.71	(m <sup>2</sup> )
Wetted Width:	24.20	(m)
Hydraulic Depth:	0.732	(m)
Mean Velocity:	0.242	(m/s)
Froude Number:	0.090	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	0.231	
Battery (Main):	15.9	
Datalogger Clock:	12.4	
Laptop Clock:	11:52	
Dessicant:	11:52	
Logger# (if Δ):	Replaced	
PT# (if Δ):	20963	
	-	

Datalogger / Station Notes:		



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.161	101.161		100.000	100.000	T-post
Bench Mark 2:			1.194	99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.109	100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.579	98.582		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.148	100.001	100.000	T-post
Bench Mark 2:	1.182	101.149		99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.098	100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.566	98.583		
Other:						
Closing Error	-0.001					Average WL 98.583
WL Check	0.001					Transducer Elevation 98.352

General Notes:	
- TSS sampled @ 12.0 m.	

Field Personnel:	TR & CJ	Trip Date:	17-Jun-12
Data Entry Personnel:	TR	Date:	21-Jun-12
Data Check Personnel:	CJ	Date:	22-Jun-12

# Hydrometric Measurement Field Data Sheet

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date:

August 11, 2012



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	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	1.40	0.00	0.00	0.000	0.000	0.000	1.0	1.40	1.70	0.30	0.14	0.004	0.004	0.04	0.000	0%							
1	2.00	0.56		0.015			1.0	1.70	2.50	0.80	0.56	0.015	0.015	0.45	0.007	0%							
2	3.00	0.58		0.000			1.0	2.50	3.50	1.00	0.58	0.000	0.000	0.58	0.000	0%							
3	4.00	0.72		-0.003			1.0	3.50	4.50	1.00	0.72	-0.003	-0.003	0.72	-0.002	0%							
4	5.00	0.78			0.002	0.027	1.0	4.50	5.50	1.00	0.78	0.015	0.015	0.78	0.011	0%							
5	6.00	0.90			0.012	0.113	1.0	5.50	6.50	1.00	0.90	0.063	0.063	0.90	0.056	2%							
6	7.00	1.13			0.171	0.206	1.0	6.50	7.50	1.00	1.13	0.189	0.189	1.13	0.213	9%							
7	8.00	1.16			0.213	0.209	1.0	7.50	8.50	1.00	1.16	0.211	0.211	1.16	0.245	10%							
8	9.00	1.16			0.119	0.218	1.0	8.50	9.50	1.00	1.16	0.169	0.169	1.16	0.195	8%							
9	10.00	1.08			0.213	0.315	1.0	9.50	10.50	1.00	1.08	0.264	0.264	1.08	0.285	11%							
10	11.00	1.00			0.235	0.324	1.0	10.50	11.50	1.00	1.00	0.280	0.280	1.00	0.280	11%							
11	12.00	0.55		0.357			1.0	11.50	12.50	1.00	0.55	0.357	0.357	0.55	0.196	8%							
12	13.00	0.81			0.001	0.294	1.0	12.50	13.50	1.00	0.81	0.148	0.148	0.81	0.119	5%							
13	14.00	0.90			0.145	0.293	1.0	13.50	14.50	1.00	0.90	0.219	0.219	0.90	0.197	8%							
14	15.00	0.83			0.042	0.316	1.0	14.50	15.50	1.00	0.83	0.179	0.179	0.83	0.149	6%							
15	16.00	0.72		0.286			1.0	15.50	16.50	1.00	0.72	0.286	0.286	0.72	0.206	8%							
16	17.00	0.50		0.203			1.0	16.50	17.50	1.00	0.50	0.203	0.203	0.50	0.102	4%							
17	18.00	0.38		0.140			1.0	17.50	18.50	1.00	0.38	0.140	0.140	0.38	0.053	2%							
18	19.00	0.32		0.164			1.0	18.50	19.50	1.00	0.32	0.164	0.164	0.32	0.052	2%							
19	20.00	0.26		0.135			1.0	19.50	20.50	1.00	0.26	0.135	0.135	0.26	0.035	1%							
20	21.00	0.20		0.149			1.0	20.50	21.50	1.00	0.20	0.149	0.149	0.20	0.030	1%							
21	22.00	0.20		0.148			1.0	21.50	22.50	1.00	0.20	0.148	0.148	0.20	0.030	1%							
22	23.00	0.22		0.138			1.0	22.50	23.50	1.00	0.22	0.138	0.138	0.22	0.030	1%							
23	24.00	0.22		0.002			1.0	23.50	24.60	1.10	0.22	0.002	0.002	0.24	0.000	0%							
RB	25.20	0.00	0.00	0.00	0.00	0.00	1.0	24.60	25.20	0.60	0.06	0.001	0.001	0.03	0.000	0%							
<b>Total Flow</b>														<b>2.49</b>									

Measurement Details:	
Start Time (MST):	12:20
End Time (MST):	14:30
Equipment:	ADV
Method:	Wading
River Condition:	good
Quality/Error (see reverse):	good
Weather:	P. cloud, breezy, 20 deg.

Flow characteristics:	
Total Flow:	2.49 (m <sup>3</sup> /s)
Perceived Measurement Quality:	good
Cross Section Area:	15.17 (m <sup>2</sup> )
Wetted Width:	23.80 (m)
Hydraulic Depth:	0.637 (m)
Mean Velocity:	0.164 (m/s)
Froude Number:	0.066

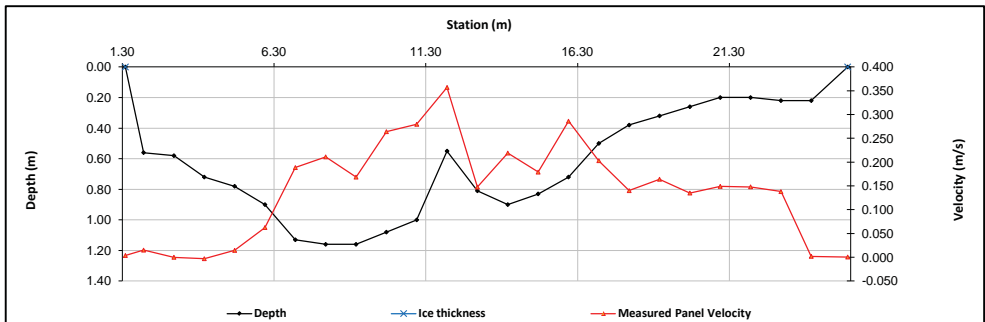
Logger Details:		
	Before	After
Transducer Reading (m):	0.179	0.566
Water (°C):	19.8	-
Battery (Main):	12.1	-
Datalogger Clock:	11:32	-
Laptop Clock:	11:33	-
Dessicant:	replaced	-
Logger# (if Δ):	20963	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**

- Checked solar panel voltage, good (19.74V).
- Changed solar controller and battery.
- Moved PT deeper to avoid winter ice.

**General Notes:**

- TSS taken at offset 11 m.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.203	101.203		100.000	100.000	T-post
Bench Mark 2:			1.235	99.968	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.152	100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.689	98.514		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.191	100.001	100.000	T-post
Bench Mark 2:	1.224	101.192		99.968	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.141	100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.675	98.517		
Other:						

Closing Error	-0.001	Average WL	98.516
WL Check	0.003	Transducer Elevation	98.337

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	11-Aug-12
<b>Data Entry Personnel:</b>	CJ (Field)	<b>Date:</b>	11-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	3-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

September 17, 2012



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
LB	4.90	0.00	0.00	0.000	0.000	0.000	1.0	4.90	4.95	0.05	0.14	0.008	0.008	0.01	0.000	0%
1	5.00	0.54		0.033			1.0	4.95	5.50	0.55	0.54	0.033	0.033	0.30	0.010	0%
2	6.00	0.59		0.016			1.0	5.50	6.50	1.00	0.59	0.016	0.016	0.59	0.009	0%
3	7.00	0.60		0.037			1.0	6.50	7.50	1.00	0.60	0.037	0.037	0.60	0.022	1%
4	8.00	0.59		0.030			1.0	7.50	8.50	1.00	0.59	0.030	0.030	0.59	0.018	1%
5	9.00	0.53		0.034			1.0	8.50	9.50	1.00	0.53	0.034	0.034	0.53	0.018	1%
6	10.00	0.93			0.054	0.311	1.0	9.50	10.50	1.00	0.93	0.183	0.183	0.93	0.170	7%
7	11.00	1.06			0.152	0.326	1.0	10.50	11.25	0.75	1.06	0.239	0.239	0.80	0.190	8%
8	11.50	1.00			0.096	0.358	1.0	11.25	11.75	0.50	1.00	0.227	0.227	0.50	0.114	5%
9	12.00	1.04			0.116	0.272	1.0	11.75	12.50	0.75	1.04	0.194	0.194	0.78	0.151	6%
10	13.00	0.95			-0.001	0.343	1.0	12.50	13.50	1.00	0.95	0.171	0.171	0.95	0.162	7%
11	14.00	0.90			-0.003	0.354	1.0	13.50	14.50	1.00	0.90	0.176	0.176	0.90	0.158	7%
12	15.00	0.82			0.270	0.328	1.0	14.50	15.50	1.00	0.82	0.299	0.299	0.82	0.245	10%
13	16.00	0.92			0.191	0.318	1.0	15.50	16.50	1.00	0.92	0.255	0.255	0.92	0.234	10%
14	17.00	0.94			-0.007	0.345	1.0	16.50	17.50	1.00	0.94	0.169	0.169	0.94	0.159	7%
15	18.00	0.87			0.091	0.310	1.0	17.50	18.50	1.00	0.87	0.201	0.201	0.87	0.174	7%
16	19.00	0.86			-0.003	0.317	1.0	18.50	19.50	1.00	0.86	0.157	0.157	0.86	0.135	6%
17	20.00	1.02			0.001	0.276	1.0	19.50	20.50	1.00	1.02	0.139	0.139	1.02	0.141	6%
18	21.00	0.96			0.000	0.248	1.0	20.50	21.50	1.00	0.96	0.124	0.124	0.96	0.119	5%
19	22.00	0.88			0.000	0.203	1.0	21.50	22.50	1.00	0.88	0.102	0.102	0.88	0.089	4%
20	23.00	0.67		0.040			1.0	22.50	23.50	1.00	0.67	0.040	0.040	0.67	0.027	1%
21	24.00	0.25		0.029			1.0	23.50	24.50	1.00	0.25	0.029	0.029	0.25	0.007	0%
22	25.00	0.30		0.019			1.0	24.50	25.50	1.00	0.30	0.019	0.019	0.30	0.006	0%
23	26.00	0.29		0.003			1.0	25.50	26.85	1.35	0.29	0.003	0.003	0.39	0.001	0%
RB	27.70	0.00	0.00	0.00	0.00	0.00	1.0	26.85	27.70	0.85	0.07	0.001	0.001	0.06	0.000	0%
<b>Total Flow</b>															<b>2.36</b>	

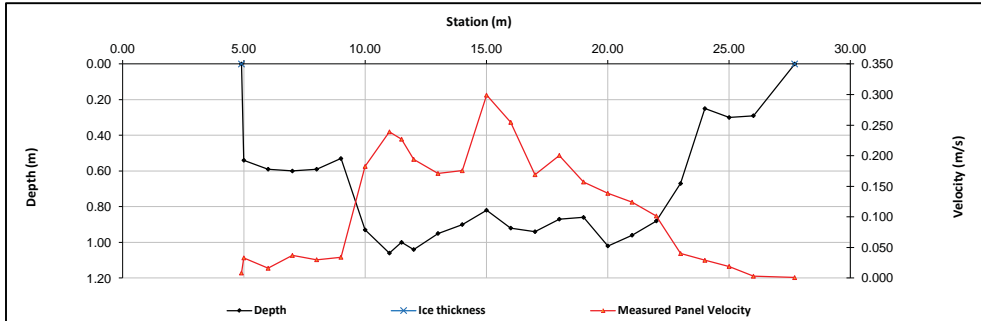
Measurement Details:	
Start Time (MST):	2:00
End Time (MST):	3:50
Equipment:	ADV
Method:	Wading
River Condition:	Normal
Quality/Error (see reverse):	Good
Weather:	Clear, 21 deg.

Flow characteristics:		
Total Flow:	2.36	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	16.41	(m <sup>2</sup> )
Wetted Width:	22.80	(m)
Hydraulic Depth:	0.720	(m)
Mean Velocity:	0.144	(m/s)
Froude Number:	0.054	

Logger Details:		
	Before	After
Transducer Reading (m):	0.581	0.581
Water (°C):	12.8	12.9
Battery (Main):	11.8	11.9
Datalogger Clock:	13:24	-
Laptop Clock:	13:24	-
Dessicant:	Replaced	-
Logger# (if Δ):	-	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
- Installed new solar panel.

**General Notes:**  
- Vegetation from offset 27.75 m to 23 m, after which they become sparse.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.274	101.274		100.000	100.000	T-post
Bench Mark 2:			1.307	99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.223	100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.744	98.530		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.253	100.001	100.000	T-post
Bench Mark 2:	1.287	101.254		99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.203	100.051	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.723	98.531		
Other:						
Closing Error	-0.001					
WL Check	0.001					
Average WL				98.531		
Transducer Elevation				97.950		

Field Personnel:		DW, TR	Trip Date:	17-Sep-12
Data Entry Personnel:	DW (FIELD)		Date:	17-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: October 13, 2012



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
LB	0.80	0.00	0.00	0.000	0.000	0.000	1.0	0.80	1.40	0.60	0.14	0.003	0.003	0.08	0.000	0%
1	2.00	0.56		0.011			1.0	1.40	2.50	1.10	0.56	0.011	0.011	0.62	0.007	0%
2	3.00	0.66		0.002			1.0	2.50	3.50	1.00	0.66	0.002	0.002	0.66	0.001	0%
3	4.00	0.64		0.048			1.0	3.50	4.50	1.00	0.64	0.048	0.048	0.64	0.031	1%
4	5.00	0.85			0.007	0.105	1.0	4.50	5.50	1.00	0.85	0.056	0.056	0.85	0.048	2%
5	6.00	1.11			0.103	0.190	1.0	5.50	6.25	0.75	1.11	0.147	0.147	0.83	0.122	6%
6	6.50	1.20			0.152	0.234	1.0	6.25	6.75	0.50	1.20	0.193	0.193	0.60	0.116	5%
7	7.00	1.25			0.151	0.218	1.0	6.75	7.50	0.75	1.25	0.185	0.185	0.94	0.173	8%
8	8.00	1.25			0.092	0.210	1.0	7.50	8.50	1.00	1.25	0.151	0.151	1.25	0.189	9%
9	9.00	1.13			0.123	0.249	1.0	8.50	9.25	0.75	1.13	0.186	0.186	0.85	0.158	7%
10	9.50	1.03			0.158	0.260	1.0	9.25	9.75	0.50	1.03	0.209	0.209	0.52	0.108	5%
11	10.00	1.00			0.182	0.250	1.0	9.75	10.50	0.75	1.00	0.216	0.216	0.75	0.162	8%
12	11.00	0.55		0.243			1.0	10.50	11.50	1.00	0.55	0.243	0.243	0.55	0.134	6%
13	12.00	0.60		0.233			1.0	11.50	12.50	1.00	0.60	0.233	0.233	0.60	0.140	6%
14	13.00	0.87			0.173	0.236	1.0	12.50	13.50	1.00	0.87	0.205	0.205	0.87	0.178	8%
15	14.00	0.82			0.057	0.263	1.0	13.50	14.50	1.00	0.82	0.160	0.160	0.82	0.131	6%
16	15.00	0.64		0.174			1.0	14.50	16.00	1.50	0.64	0.174	0.174	0.96	0.167	8%
17	17.00	0.38		0.196			1.0	16.00	18.00	2.00	0.38	0.196	0.196	0.76	0.149	7%
18	19.00	0.24		0.200			1.0	18.00	20.00	2.00	0.24	0.200	0.200	0.48	0.096	4%
19	21.00	0.14		0.162			1.0	20.00	22.00	2.00	0.14	0.162	0.162	0.28	0.045	2%
20	23.00	0.20		0.015			1.0	22.00	23.90	1.90	0.20	0.015	0.015	0.38	0.006	0%
RB	24.80	0.00	0.00	0.00	0.00	0.00	1.0	23.90	24.80	0.90	0.05	0.004	0.004	0.05	0.000	0%

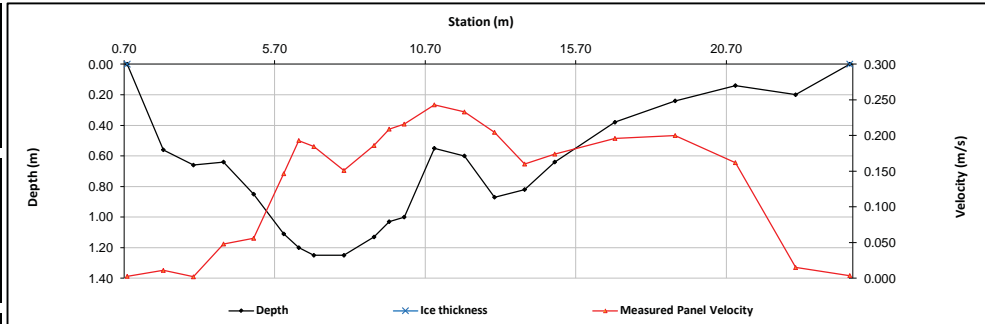
**Total Flow 2.16**

Measurement Details:	
Start Time (MST):	8:50
End Time (MST):	10:13
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Good
Weather:	2 deg, overcast, calm

Flow characteristics:	
Total Flow:	2.16 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	14.33 (m <sup>2</sup> )
Wetted Width:	24.00 (m)
Hydraulic Depth:	0.597 (m)
Mean Velocity:	0.151 (m/s)
Froude Number:	0.062

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	5.5	
Battery (Main):	13.6	
Datalogger Clock:	9:06	
Laptop Clock:	9:06	
Dessicant:	replaced	
Logger# (if Δ):	20963	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.277	101.277		100.000	100.000	T-post
Bench Mark 2:			1.309	99.968	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.225	100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.799	98.478		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.264	100.000	100.000	T-post
Bench Mark 2:			1.297	99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:	1.212	101.264		100.052	100.051	3/4" Pipe 4 m S of logger
Ice/PT:						
Water Level:			2.785	98.479		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	98.479
Transducer Elevation	97.949

**General Notes:**

- Measurement quality good, some large rocks and weeds in channel profile.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	13-Oct-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	13-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	9-Nov-12
<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:

December 1, 2012



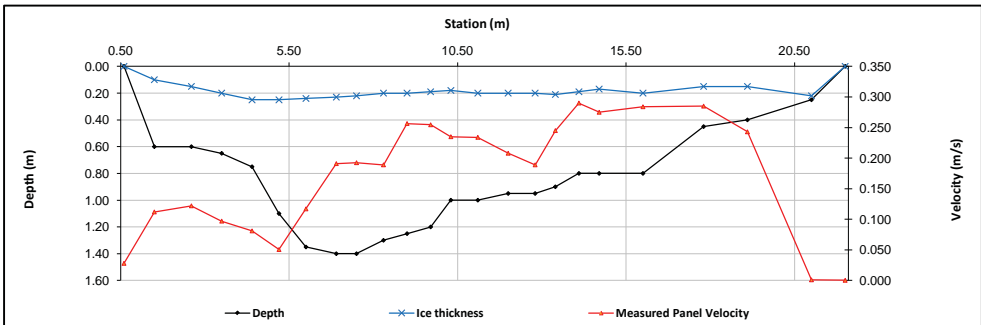
Flow Measurement:																
Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.5 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel 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	0.60	0.00	0.00	0.000	0.000	0.000	0.9	0.60	1.05	0.45	0.13	0.028	0.025	0.06	0.001	0%
1	1.50	0.60	0.10	0.112			0.9	1.05	2.05	1.00	0.50	0.101	0.101	0.50	0.050	2%
2	2.60	0.60	0.15	0.122			0.9	2.05	3.05	1.00	0.45	0.122	0.110	0.45	0.049	2%
3	3.50	0.65	0.20	0.097			0.9	3.05	3.95	0.90	0.45	0.097	0.087	0.41	0.035	1%
4	4.40	0.75	0.25	0.081			0.9	3.95	4.80	0.85	0.50	0.081	0.073	0.43	0.031	1%
5	5.20	1.10	0.25		0.017	0.084	1.0	4.80	5.60	0.80	0.85	0.051	0.051	0.68	0.034	1%
6	6.00	1.35	0.24		0.103	0.131	1.0	5.60	6.45	0.85	1.11	0.117	0.117	0.94	0.110	4%
7	6.90	1.40	0.23		0.154	0.228	1.0	6.45	7.20	0.75	1.17	0.191	0.191	0.88	0.168	7%
8	7.50	1.40	0.22		0.167	0.218	1.0	7.20	7.90	0.70	1.18	0.193	0.193	0.83	0.159	6%
9	8.30	1.30	0.20		0.124	0.254	1.0	7.90	8.65	0.75	1.10	0.189	0.189	0.83	0.156	6%
10	9.00	1.25	0.20		0.211	0.302	1.0	8.65	9.35	0.70	1.05	0.257	0.257	0.73	0.189	8%
11	9.70	1.20	0.19		0.235	0.274	1.0	9.35	10.00	0.65	1.01	0.255	0.255	0.66	0.167	7%
12	10.30	1.00	0.18		0.189	0.281	1.0	10.00	10.70	0.70	0.82	0.235	0.235	0.57	0.135	5%
13	11.10	1.00	0.20		0.209	0.259	1.0	10.70	11.55	0.85	0.80	0.234	0.234	0.68	0.159	6%
14	12.00	0.95	0.20		0.173	0.243	1.0	11.55	12.40	0.85	0.75	0.208	0.208	0.64	0.133	5%
15	12.80	0.95	0.20		0.150	0.228	1.0	12.40	13.10	0.70	0.75	0.189	0.189	0.53	0.099	4%
16	13.40	0.90	0.21	0.245			0.9	13.10	13.75	0.65	0.69	0.245	0.221	0.45	0.099	4%
17	14.10	0.80	0.19	0.290			0.9	13.75	14.40	0.65	0.61	0.290	0.261	0.40	0.103	4%
18	14.70	0.80	0.17	0.275			0.9	14.40	15.35	0.95	0.63	0.275	0.248	0.60	0.148	6%
19	16.00	0.80	0.20	0.284			0.9	15.35	16.90	1.55	0.60	0.284	0.256	0.93	0.238	10%
20	17.80	0.45	0.15	0.285			0.9	16.90	18.45	1.55	0.30	0.285	0.257	0.47	0.119	5%
21	19.10	0.40	0.15	0.243			0.9	18.45	20.05	1.60	0.25	0.219	0.219	0.40	0.087	4%
22	21.00	0.25	0.22	0.001			0.9	20.05	21.50	1.45	0.03	0.001	0.001	0.04	0.000	0%
RB	22.00	0.00	0.00	0.00	0.00	0.00	1.0	21.50	22.00	0.50	0.01	0.000	0.000	0.00	0.000	0%
<b>Total Flow</b>															<b>2.47</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:	light snow, -17 deg.

Flow characteristics:	
Total Flow:	2.47 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	13.08 (m <sup>2</sup> )
Wetted Width:	21.40 (m)
Hydraulic Depth:	0.611 (m)
Mean Velocity:	0.189 (m/s)
Froude Number:	0.077

Logger Details:		Before	After
Transducer Reading (m):		0.607	
Water (°C):		0.0	
Battery (Main):		12.9	
Datalogger Clock:		13:45	
Laptop Clock:		13:45	
Dessicant:		good	
Logger# (if Δ):		20963	
PT# (if Δ):		-	

**Datalogger / Station Notes:**  
 - PT is recording depth again, pack ice must have cleared from around sensor.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.336	100.002	100.000	T-post
Bench Mark 2:	1.371	101.338		99.967	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.285	100.053	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.730	98.608		
Water Level:			2.787	98.551		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.321	101.323		100.002	100.000	T-post
Bench Mark 2:			1.355	99.968	99.967	3/4" Pipe 2 m E of logger
Bench Mark 3:			1.269	100.054	100.051	3/4" Pipe 4 m S of logger
Ice/PT:			2.715	98.608		
Water Level:			2.775	98.548		
Other:						

Closing Error	-0.001	Average WL	98.550
WL Check	0.003	Transducer Elevation	97.943

**General Notes:**

Field Personnel:	SM, TR	Trip Date:	1-Dec-12
Data Entry Personnel:	SM	Date:	1-Dec-12
Data Check Personnel:	TR	Date:	18-Dec-12
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 16, 2012



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	3.00	0.00	0.00	0.000	0.000	0.000	1.0	3.00	3.38	0.38	0.11	0.030	0.030	0.04	0.001	0%
1	3.75	0.45		0.118			1.0	3.38	4.13	0.75	0.45	0.118	0.118	0.34	0.040	2%
2	4.50	0.63		0.153			1.0	4.13	4.88	0.75	0.63	0.153	0.153	0.47	0.072	3%
3	5.25	0.60		0.191			1.0	4.88	5.63	0.75	0.60	0.191	0.191	0.45	0.086	4%
4	6.00	0.67		0.208			1.0	5.63	6.38	0.75	0.67	0.208	0.208	0.50	0.105	5%
5	6.75	0.69		0.171			1.0	6.38	7.00	0.63	0.69	0.171	0.171	0.43	0.074	3%
6	7.25	0.75			0.251	0.345	1.0	7.00	7.50	0.50	0.75	0.298	0.298	0.38	0.112	5%
7	7.75	0.72			0.371		1.0	7.50	8.00	0.50	0.72	0.371	0.371	0.36	0.134	6%
8	8.25	0.78			0.229	0.400	1.0	8.00	8.50	0.50	0.78	0.315	0.315	0.39	0.123	5%
9	8.75	0.74			0.367		1.0	8.50	9.00	0.50	0.74	0.367	0.367	0.37	0.136	6%
10	9.25	0.85			0.350	0.467	1.0	9.00	9.50	0.50	0.85	0.409	0.409	0.43	0.174	8%
11	9.75	0.80			0.309	0.519	1.0	9.50	10.00	0.50	0.80	0.414	0.414	0.40	0.166	7%
12	10.25	0.78			0.315	0.477	1.0	10.00	10.50	0.50	0.78	0.396	0.396	0.39	0.154	7%
13	10.75	0.78			0.285	0.506	1.0	10.50	11.00	0.50	0.78	0.396	0.396	0.39	0.154	7%
14	11.25	0.76			0.256	0.471	1.0	11.00	11.50	0.50	0.76	0.364	0.364	0.38	0.138	6%
15	11.75	0.71			0.396		1.0	11.50	12.00	0.50	0.71	0.396	0.396	0.36	0.141	6%
16	12.25	0.74			0.346		1.0	12.00	12.50	0.50	0.74	0.346	0.346	0.37	0.128	6%
17	12.75	0.67			0.275		1.0	12.50	13.00	0.50	0.67	0.275	0.275	0.34	0.092	4%
18	13.25	0.67			0.296		1.0	13.00	13.50	0.50	0.67	0.296	0.296	0.34	0.099	4%
19	13.75	0.70			0.236		1.0	13.50	14.00	0.50	0.70	0.236	0.236	0.35	0.083	4%
20	14.25	0.51			0.092		1.0	14.00	14.50	0.50	0.51	0.092	0.092	0.26	0.023	1%
21	14.75	0.37			0.051		1.0	14.50	15.13	0.63	0.37	0.051	0.051	0.23	0.012	1%
LB	15.50	0.00	0.00	0.000	0.000	0.000	1.0	15.13	15.50	0.38	0.09	0.013	0.013	0.03	0.000	0%
<b>Total Flow</b>														<b>2.25</b>		

**Measurement Details:**

Start Time (MST):	13:23
End Time (MST):	15:15
Equipment:	ADV
Method:	Wading
River Condition:	open, no ice
Quality/Error (see reverse):	excellent
Weather:	overcast, calm, 15 deg.

**Flow characteristics:**

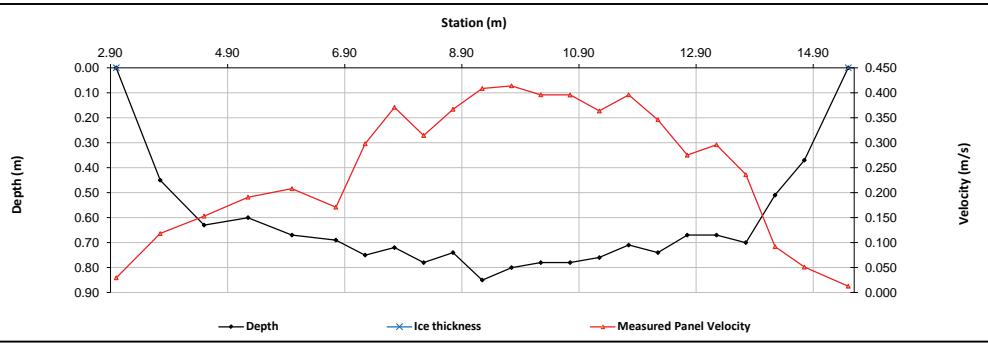
Total Flow:	2.25	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	7.98	(m <sup>2</sup> )
Wetted Width:	12.50	(m)
Hydraulic Depth:	0.639	(m)
Mean Velocity:	0.282	(m/s)
Froude Number:	0.113	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.242	
Water (°C):	10.4	
Battery (Main):	13.0	
Datalogger Clock:	13:36	
Laptop Clock:	13:36	
Dessicant:	new	
Logger# (if Δ):	20959	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Installed station, still requires telemetry.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:	1.489	101.489		100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.527	99.962	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.428	100.061	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.456	98.033		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.480	100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:	1.518	101.480		99.962	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.420	100.060	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.447	98.033		
Other:						

Closing Error	0.000	Average WL	98.033
WL Check	0.000	Transducer Elevation	97.791

**General Notes:**

- Station beside (to W) of Cenovus bridge.
- Straight reach, stable banks, sandy/silty substrate.
- Fastest flow in middle of reach.
- Golder has a logger and bubbler system several metres upstream.

**Field Personnel:**

SM, DW, CJ	Trip Date:	16-May-12
Data Entry Personnel: CJ	Date:	1-Jun-12
Data Check Personnel: XP	Date:	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

June 17, 2012



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	2.00	0.00	0.00	0.000	0.000	0.000	1.0	2.00	2.25	0.25	0.07	-0.006	-0.006	0.02	0.000	0%
1	2.50	0.28		-0.025			1.0	2.25	2.88	0.63	0.28	-0.025	-0.025	0.18	-0.004	0%
2	3.25	0.50		0.121			1.0	2.88	3.63	0.75	0.50	0.121	0.121	0.38	0.045	2%
3	4.00	0.57		0.119			1.0	3.63	4.25	0.63	0.57	0.119	0.119	0.36	0.042	2%
4	4.50	0.60		0.138			1.0	4.25	4.75	0.50	0.60	0.138	0.138	0.30	0.041	2%
5	5.00	0.64		0.190			1.0	4.75	5.25	0.50	0.64	0.190	0.190	0.32	0.061	3%
6	5.50	0.66		0.217			1.0	5.25	5.75	0.50	0.66	0.217	0.217	0.33	0.072	4%
7	6.00	0.71		0.217			1.0	5.75	6.25	0.50	0.71	0.217	0.217	0.36	0.077	4%
8	6.50	0.76			0.233	0.361	1.0	6.25	6.75	0.50	0.76	0.297	0.297	0.38	0.113	6%
9	7.00	0.74		0.344			1.0	6.75	7.25	0.50	0.74	0.344	0.344	0.37	0.127	7%
10	7.50	0.70		0.361			1.0	7.25	7.75	0.50	0.70	0.361	0.361	0.35	0.126	7%
11	8.00	0.76			0.249	0.399	1.0	7.75	8.25	0.50	0.76	0.324	0.324	0.38	0.123	6%
12	8.50	0.77		0.275	0.400		1.0	8.25	8.75	0.50	0.77	0.338	0.338	0.39	0.130	7%
13	9.00	0.77		0.280	0.416		1.0	8.75	9.25	0.50	0.77	0.348	0.348	0.39	0.134	7%
14	9.50	0.77		0.291	0.443		1.0	9.25	9.75	0.50	0.77	0.367	0.367	0.39	0.141	7%
15	10.00	0.73		0.343			1.0	9.75	10.25	0.50	0.73	0.343	0.343	0.37	0.125	7%
16	10.50	0.70		0.349			1.0	10.25	10.75	0.50	0.70	0.349	0.349	0.35	0.122	6%
17	11.00	0.70		0.325			1.0	10.75	11.25	0.50	0.70	0.325	0.325	0.35	0.114	6%
18	11.50	0.66		0.271			1.0	11.25	11.75	0.50	0.66	0.271	0.271	0.33	0.089	5%
19	12.00	0.64		0.246			1.0	11.75	12.25	0.50	0.64	0.246	0.246	0.32	0.079	4%
20	12.50	0.68		0.215			1.0	12.25	12.75	0.50	0.68	0.215	0.215	0.34	0.073	4%
21	13.00	0.58		0.165			1.0	12.75	13.25	0.50	0.58	0.165	0.165	0.29	0.048	3%
22	13.50	0.38		0.082			1.0	13.25	13.75	0.50	0.38	0.082	0.082	0.19	0.016	1%
23	14.00	0.20		0.047			1.0	13.75	14.25	0.50	0.20	0.047	0.047	0.10	0.005	0%
LB	14.50	0.00	0.00	0.000	0.000	0.000	1.0	14.25	14.50	0.25	0.05	0.012	0.012	0.01	0.000	0%
<b>Total Flow</b>															<b>1.90</b>	

Measurement Details:	
Start Time (MST):	10:30
End Time (MST):	11:45
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Quality/Error (see reverse):	Excellent
Weather:	Rain, 12 deg.

Flow characteristics:	
Total Flow:	1.90 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	7.51 (m <sup>2</sup> )
Wetted Width:	12.50 (m)
Hydraulic Depth:	0.601 (m)
Mean Velocity:	0.253 (m/s)
Froude Number:	0.104

Logger Details:		
	Before	After
Transducer Reading (m):	0.662	
Water (°C):	13.7	
Battery (Main):	14.2	
Datalogger Clock:	9:35	
Laptop Clock:	9:35	
Dessicant:	Replaced	
Logger# (if Δ):	20959	
PT# (if Δ):	-	

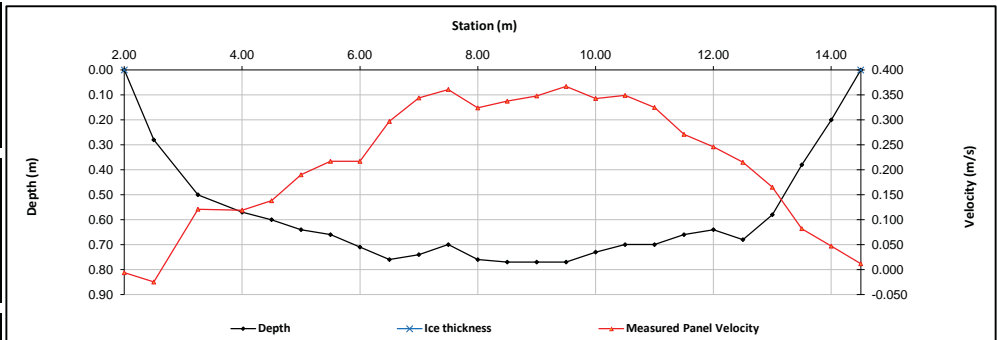
**Datalogger / Station Notes:**

- Installed surge protector, signal isolator and modern, 1206607131.
- Bring grey modem cable next trip.

**General Notes:**

- TSS sampled @ 9.0 m.
- Good cell reception at site.

Field Personnel:		Trip Date:	
Data Entry Personnel:	TR & CJ	Date:	17-Jun-12
Data Check Personnel:	TR	Date:	21-Jun-12
	CJ	Date:	22-Jun-12



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.391	101.391		100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.428	99.963	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.329	100.062	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.391	98.000		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.351	100.002	100.000	3/4" Pipe closest to logger
Bench Mark 2:	1.390	101.353		99.963	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.291	100.062	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.353	98.000		
Other:						
Closing Error	-0.002					
WL Check	0.000					
Average WL				98.000		
Transducer Elevation				97.338		

# Hydrometric Measurement Field Data Sheet

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date:

August 11, 2012



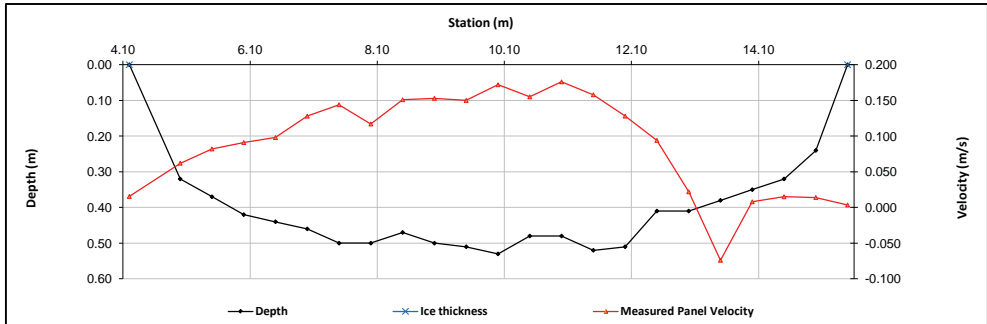
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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
LB	4.20	0.00	0.00	0.000	0.000	0.000	1.0	4.20	4.60	0.40	0.08	0.016	0.016	0.03	0.000	0%
1	5.00	0.32		0.062			1.0	4.60	5.25	0.65	0.32	0.062	0.062	0.21	0.013	3%
2	5.50	0.37		0.082			1.0	5.25	5.75	0.50	0.37	0.082	0.082	0.19	0.015	3%
3	6.00	0.42		0.091			1.0	5.75	6.25	0.50	0.42	0.091	0.091	0.21	0.019	4%
4	6.50	0.44		0.098			1.0	6.25	6.75	0.50	0.44	0.098	0.098	0.22	0.022	4%
5	7.00	0.46		0.128			1.0	6.75	7.25	0.50	0.46	0.128	0.128	0.23	0.029	6%
6	7.50	0.50		0.144			1.0	7.25	7.75	0.50	0.50	0.144	0.144	0.25	0.036	7%
7	8.00	0.50		0.117			1.0	7.75	8.25	0.50	0.50	0.117	0.117	0.25	0.029	6%
8	8.50	0.47		0.151			1.0	8.25	8.75	0.50	0.47	0.151	0.151	0.24	0.035	7%
9	9.00	0.50		0.153			1.0	8.75	9.25	0.50	0.50	0.153	0.153	0.25	0.038	8%
10	9.50	0.51		0.150			1.0	9.25	9.75	0.50	0.51	0.150	0.150	0.26	0.038	8%
11	10.00	0.53		0.172			1.0	9.75	10.25	0.50	0.53	0.172	0.172	0.27	0.046	9%
12	10.50	0.48		0.155			1.0	10.25	10.75	0.50	0.48	0.155	0.155	0.24	0.037	8%
13	11.00	0.48		0.176			1.0	10.75	11.25	0.50	0.48	0.176	0.176	0.24	0.042	9%
14	11.50	0.52		0.158			1.0	11.25	11.75	0.50	0.52	0.158	0.158	0.26	0.041	8%
15	12.00	0.51		0.128			1.0	11.75	12.25	0.50	0.51	0.128	0.128	0.26	0.033	7%
16	12.50	0.41		0.094			1.0	12.25	12.75	0.50	0.41	0.094	0.094	0.21	0.019	4%
17	13.00	0.41		0.022			1.0	12.75	13.25	0.50	0.41	0.022	0.022	0.21	0.005	1%
18	13.50	0.38		-0.074			1.0	13.25	13.75	0.50	0.38	-0.074	-0.074	0.19	-0.014	-3%
19	14.00	0.35		0.008			1.0	13.75	14.25	0.50	0.35	0.008	0.008	0.18	0.001	0%
20	14.50	0.32		0.015			1.0	14.25	14.75	0.50	0.32	0.015	0.015	0.16	0.002	0%
21	15.00	0.24		0.014			1.0	14.75	15.25	0.50	0.24	0.014	0.014	0.12	0.002	0%
RB	15.50	0.00	0.00	0.00	0.00	0.00	1.0	15.25	15.50	0.25	0.06	0.004	0.004	0.02	0.000	0%
														<b>Total Flow</b>	<b>0.490</b>	

Measurement Details:	
Start Time (MST):	9:45
End Time (MST):	11:20
Equipment:	ADV
Method:	Wading
River Condition:	Good
Quality/Error (see reverse):	Excellent
Weather:	Clear, 20 deg.

Flow characteristics:		
Total Flow:	0.490	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.66	(m <sup>2</sup> )
Wetted Width:	11.30	(m)
Hydraulic Depth:	0.412	(m)
Mean Velocity:	0.105	(m/s)
Froude Number:	0.052	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	17.4	17.2
Battery (Main):	13.8	13.7
Datalogger Clock:	9:00	-
Laptop Clock:	9:00	-
Dessicant:	Changed	-
Logger# (if Δ):	20959	-
PT# (if Δ):	-	-

**Datalogger / Station Notes:**  
 - Moved PT deeper to avoid winter ice cover.



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.261	101.261		100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.300	99.961	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.201	100.060	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.481	97.780		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.218	99.998	100.000	3/4" Pipe closest to logger
Bench Mark 2:	1.255	101.216		99.961	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.157	100.059	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.433	97.783		
Other:						
Closing Error 0.002						
WL Check 0.003						
				Average WL	97.782	
				Transducer Elevation	97.317	

**General Notes:**  
 - TSS taken at 8.5 m.  
 - Vegetation matt from offset of 13 m to RB.

Field Personnel:		Trip Date:	11-Aug-12
Data Entry Personnel:	TR (Field)	Date:	11-Aug-12
Data Check Personnel:	CJ	Date:	4-Oct-12



# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date:

October 13, 2012



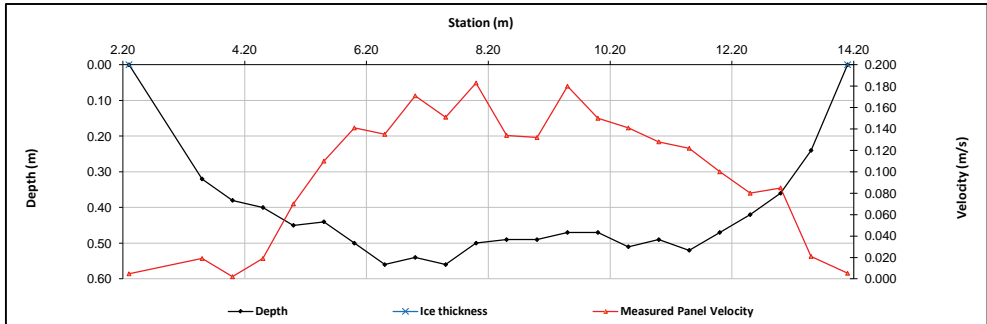
Measured Data										Calculated Data						
0	Offset	Depth	Ice Thickness	Velocity @ 0.6 Depth	Velocity @ 0.8 Depth	Velocity @ 0.2 Depth	Velocity Correction Factor	Pannel Start	Pannel End	Pannel Width	Effective Pannel Depth	Measured Pannel Velocity	Effective Average Pannel Velocity	Pannel Area	Pannel Discharge	Percent of Total Flow
Mmt #	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m/s)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	(%)
RB	2.30	0.00	0.00	0.000	0.000	0.000	1.0	2.30	2.90	0.60	0.08	0.005	0.005	0.05	0.000	0%
1	3.50	0.32		0.019			1.0	2.90	3.75	0.85	0.32	0.019	0.019	0.27	0.005	1%
2	4.00	0.38		0.002			1.0	3.75	4.25	0.50	0.38	0.002	0.002	0.19	0.000	0%
3	4.50	0.40		0.019			1.0	4.25	4.75	0.50	0.40	0.019	0.019	0.20	0.004	1%
4	5.00	0.45		0.070			1.0	4.75	5.25	0.50	0.45	0.070	0.070	0.23	0.016	3%
5	5.50	0.44		0.110			1.0	5.25	5.75	0.50	0.44	0.110	0.110	0.22	0.024	4%
6	6.00	0.50		0.141			1.0	5.75	6.25	0.50	0.50	0.141	0.141	0.25	0.035	6%
7	6.50	0.56		0.135			1.0	6.25	6.75	0.50	0.56	0.135	0.135	0.28	0.038	7%
8	7.00	0.54		0.171			1.0	6.75	7.25	0.50	0.54	0.171	0.171	0.27	0.046	8%
9	7.50	0.56		0.151			1.0	7.25	7.75	0.50	0.56	0.151	0.151	0.28	0.042	8%
10	8.00	0.50		0.183			1.0	7.75	8.25	0.50	0.50	0.183	0.183	0.25	0.046	8%
11	8.50	0.49		0.134			1.0	8.25	8.75	0.50	0.49	0.134	0.134	0.25	0.033	6%
12	9.00	0.49		0.132			1.0	8.75	9.25	0.50	0.49	0.132	0.132	0.25	0.032	6%
13	9.50	0.47		0.180			1.0	9.25	9.75	0.50	0.47	0.180	0.180	0.24	0.042	8%
14	10.00	0.47		0.150			1.0	9.75	10.25	0.50	0.47	0.150	0.150	0.24	0.035	6%
15	10.50	0.51		0.141			1.0	10.25	10.75	0.50	0.51	0.141	0.141	0.26	0.036	6%
16	11.00	0.49		0.128			1.0	10.75	11.25	0.50	0.49	0.128	0.128	0.25	0.031	6%
17	11.50	0.52		0.122			1.0	11.25	11.75	0.50	0.52	0.122	0.122	0.26	0.032	6%
18	12.00	0.47		0.100			1.0	11.75	12.25	0.50	0.47	0.100	0.100	0.24	0.024	4%
19	12.50	0.42		0.080			1.0	12.25	12.75	0.50	0.42	0.080	0.080	0.21	0.017	3%
20	13.00	0.36		0.085			1.0	12.75	13.25	0.50	0.36	0.085	0.085	0.18	0.015	3%
21	13.50	0.24		0.021			1.0	13.25	13.80	0.55	0.24	0.021	0.021	0.13	0.003	0%
LB	14.10	0.00	0.00	0.00	0.00	0.00	1.0	13.80	14.10	0.30	0.06	0.005	0.005	0.02	0.000	0%
<b>Total Flow</b>															<b>0.557</b>	

Measurement Details:	
Start Time (MST):	11:29
End Time (MST):	12:12
Equipment:	ADV
Method:	Wading
River Condition:	med flow
Quality/Error (see reverse):	Excellent
Weather:	5 deg. clear, calm

Flow characteristics:		
Total Flow:	0.557	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.98	(m <sup>2</sup> )
Wetted Width:	11.80	(m)
Hydraulic Depth:	0.422	(m)
Mean Velocity:	0.112	(m/s)
Froude Number:	0.055	

Logger Details:		
	Before	After
Transducer Reading (m):	0.579	
Water (°C):	2.5	
Battery (Main):	14.2	
Datalogger Clock:	11:32	
Laptop Clock:	11:32	
Dessicant:	replaced	
Logger# (if Δ):	20959	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.300	100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.337	99.963	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:	1.240	101.300		100.060	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.481	97.819		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.290	101.290		100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.328	99.962	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.230	100.060	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:						
Water Level:			3.472	97.818		
Other:						

Closing Error	0.000
WL Check	0.001

Average WL	97.819
Transducer Elevation	97.240

**General Notes:**

- TSS Collected 8.5 m.

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	13-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	13-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	9-Nov-12
<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: December 1, 2012



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	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	3.05	0.25	0.04	0.001	0.001	0.01	0.000	0%
1	3.30	0.35	0.20	0.003			0.9	3.05	3.55	0.50	0.15	0.003	0.003	0.08	0.000	0%
2	3.80	0.47	0.22	0.076			0.9	3.55	4.05	0.50	0.25	0.076	0.068	0.13	0.009	2%
3	4.30	0.58	0.23	0.104			0.9	4.05	4.50	0.45	0.35	0.104	0.094	0.16	0.015	4%
4	4.70	0.60	0.25	0.152			0.9	4.50	4.95	0.45	0.35	0.152	0.137	0.16	0.022	5%
5	5.20	0.68	0.25	0.154			0.9	4.95	5.45	0.50	0.43	0.154	0.139	0.22	0.030	7%
6	5.70	0.70	0.25	0.159			0.9	5.45	5.95	0.50	0.45	0.159	0.143	0.23	0.032	8%
7	6.20	0.58	0.24	0.106			0.9	5.95	6.45	0.50	0.34	0.106	0.095	0.17	0.016	4%
8	6.70	0.57	0.23	0.149			0.9	6.45	6.95	0.50	0.34	0.149	0.134	0.17	0.023	6%
9	7.20	0.60	0.24	0.193			0.9	6.95	7.45	0.50	0.36	0.193	0.174	0.18	0.031	8%
10	7.70	0.65	0.24	0.162			0.9	7.45	7.98	0.52	0.41	0.162	0.146	0.22	0.031	8%
11	8.25	0.68	0.25	0.170			0.9	7.98	8.48	0.50	0.43	0.170	0.153	0.22	0.033	8%
12	8.70	0.78	0.24	0.173			0.9	8.48	8.95	0.48	0.54	0.173	0.156	0.26	0.040	10%
13	9.20	0.83	0.24	0.169			0.9	8.95	9.45	0.50	0.59	0.169	0.152	0.30	0.045	11%
14	9.70	0.80	0.23	0.140			0.9	9.45	9.93	0.48	0.57	0.140	0.126	0.27	0.034	8%
15	10.15	0.77	0.24	0.115			0.9	9.93	10.40	0.48	0.53	0.115	0.104	0.25	0.026	6%
16	10.65	0.80	0.23	0.081			0.9	10.40	10.85	0.45	0.57	0.081	0.073	0.26	0.019	5%
17	11.05	0.69	0.24	0.029			0.9	10.85	11.28	0.42	0.45	0.029	0.026	0.19	0.005	1%
18	11.50	0.53	0.23	-0.005			0.9	11.28	11.75	0.48	0.30	-0.005	-0.005	0.14	-0.001	0%
19	12.00	0.51	0.24	-0.013			0.9	11.75	12.25	0.50	0.27	-0.013	-0.012	0.14	-0.002	0%
20	12.50	0.40	0.22	-0.014			0.9	12.25	12.90	0.65	0.18	-0.014	-0.013	0.12	-0.001	0%
RB	13.30	0.00	0.00	0.00	0.00	0.00	1.0	12.90	13.30	0.40	0.05	-0.004	-0.004	0.02	0.000	0%

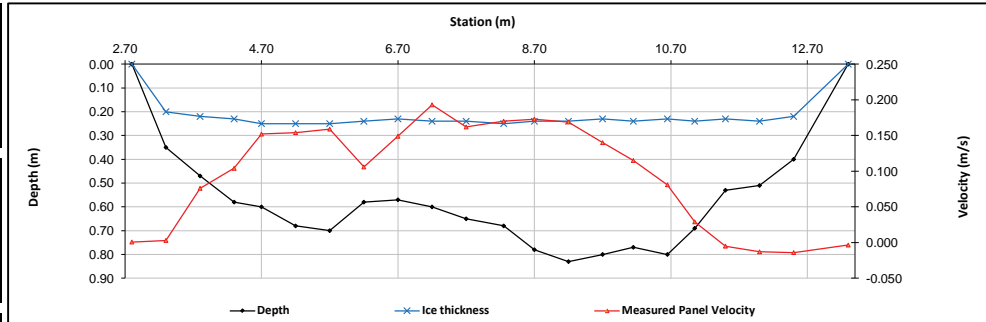
**Total Flow 0.407**

Measurement Details:	
Start Time (MST):	11:20
End Time (MST):	12:35
Equipment:	ADV
Method:	Ice
River Condition:	full ice cover
Quality/Error (see reverse):	Good
Weather:	light snow, -17 deg.

Flow characteristics:	
Total Flow:	0.407 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	3.85 (m <sup>2</sup> )
Wetted Width:	10.50 (m)
Hydraulic Depth:	0.367 (m)
Mean Velocity:	0.106 (m/s)
Froude Number:	0.056

Logger Details:		
	Before	After
Transducer Reading (m):	0.606	
Water (°C):	0.2	
Battery (Main):	13.2	
Datalogger Clock:	11:27	
Laptop Clock:	11:27	
Dessicant:	replaced	
Logger# (if Δ):	20959	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:	1.304	101.304		100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:			1.343	99.961	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.245	100.059	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:			3.402	97.902		
Water Level:			3.469	97.835		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.293	100.000	100.000	3/4" Pipe closest to logger
Bench Mark 2:	1.332	101.293		99.961	99.961	3/4" Pipe 5 m W of logger
Bench Mark 3:			1.233	100.060	100.060	3/4" Pipe furthest (W) from logger
Ice/PT:			3.389	97.904		
Water Level:			3.455	97.838		
Other:						

Closing Error	0.000	Average WL	97.837
WL Check	0.003	Transducer Elevation	97.231

**General Notes:**

<b>Field Personnel:</b>	SM, TR	<b>Trip Date:</b>	1-Dec-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	1-Dec-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	18-Dec-12
<b>Entered Digitally in the Field:</b>	<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 25, 2012



## 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
LB	3.90	0.00	0.00	0.000	0.000	0.000	1.0	3.90	4.08	0.18	0.07	0.018	0.018	0.01	0.000	0%
1	4.25	0.28		0.071			1.0	4.08	4.38	0.30	0.28	0.071	0.071	0.08	0.006	1%
2	4.50	0.90			0.109	0.114	1.0	4.38	4.63	0.25	0.90	0.112	0.112	0.23	0.025	3%
3	4.75	0.96			0.200	0.188	1.0	4.63	4.88	0.25	0.96	0.194	0.194	0.24	0.047	5%
4	5.00	0.98			0.179	0.184	1.0	4.88	5.13	0.25	0.98	0.182	0.182	0.25	0.044	5%
5	5.25	1.04			0.144	0.210	1.0	5.13	5.38	0.25	1.04	0.177	0.177	0.26	0.046	5%
6	5.50	0.98			0.163	0.187	1.0	5.38	5.63	0.25	0.98	0.175	0.175	0.25	0.043	4%
7	5.75	1.03			0.131	0.165	1.0	5.63	5.88	0.25	1.03	0.148	0.148	0.26	0.038	4%
8	6.00	1.10			0.202	0.180	1.0	5.88	6.13	0.25	1.10	0.191	0.191	0.28	0.053	5%
9	6.25	1.20			0.196	0.189	1.0	6.13	6.38	0.25	1.20	0.193	0.193	0.30	0.058	6%
10	6.50	1.30			0.189	0.189	1.0	6.38	6.63	0.25	1.30	0.189	0.189	0.33	0.061	6%
11	6.75	1.36			0.225	0.138	1.0	6.63	6.88	0.25	1.36	0.182	0.182	0.34	0.062	6%
12	7.00	1.36			0.197	0.188	1.0	6.88	7.13	0.25	1.36	0.193	0.193	0.34	0.065	7%
13	7.25	1.37			0.197	0.192	1.0	7.13	7.38	0.25	1.37	0.195	0.195	0.34	0.067	7%
14	7.50	1.38			0.196	0.199	1.0	7.38	7.63	0.25	1.38	0.198	0.198	0.35	0.068	7%
15	7.75	1.34			0.206	0.218	1.0	7.63	7.88	0.25	1.34	0.212	0.212	0.34	0.071	7%
16	8.00	1.30			0.190	0.233	1.0	7.88	8.13	0.25	1.30	0.212	0.212	0.33	0.069	7%
17	8.25	1.06			0.189	0.214	1.0	8.13	8.38	0.25	1.06	0.202	0.202	0.27	0.053	5%
18	8.50	0.80				0.198	0.195	1.0	8.38	8.63	0.25	0.80	0.197	0.20	0.039	4%
19	8.75	0.70		0.222			1.0	8.63	8.88	0.25	0.70	0.222	0.222	0.18	0.039	4%
20	9.00	0.53		0.170			1.0	8.88	9.15	0.28	0.53	0.170	0.170	0.15	0.025	3%
RB	9.30	0.00	0.00	0.000	0.000	0.000	1.0	9.15	9.30	0.15	0.13	0.043	0.043	0.02	0.001	0%
<b>Total Flow</b>															<b>0.980</b>	

## Measurement Details:

Start Time (MST):	13:30
End Time (MST):	16:45
Equipment:	ADV
Method:	Fishcat
River Condition:	high flow, no ice
Quality/Error (see reverse):	excellent
Weather:	overcast, calm, +16

## Flow characteristics:

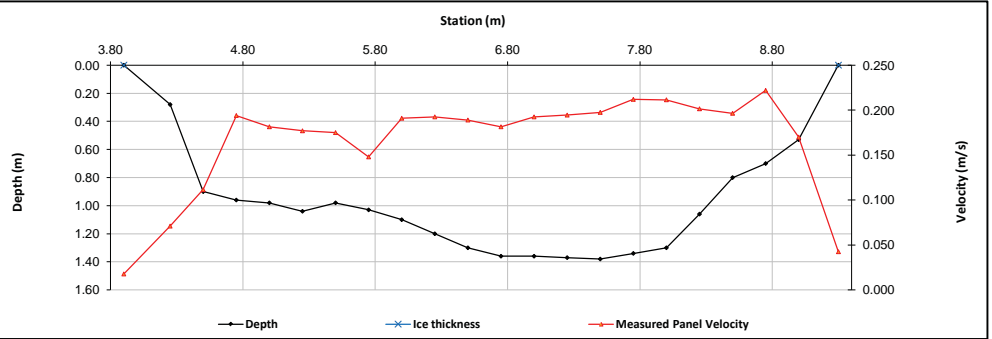
Total Flow:	0.980	(m <sup>3</sup> /s)
Perceived Measurement Quality:	excellent	
Cross Section Area:	5.30	(m <sup>2</sup> )
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.982	(m)
Mean Velocity:	0.185	(m/s)
Froude Number:	0.060	

## Logger Details:

	Before	After
Transducer Reading (m):	0.977	
Water (°C):	10.1	
Battery (Main):	12.87	
Datalogger Clock:	14:06	
Laptop Clock:	14:06	
Dessicant:	Replaced	
Logger# (if Δ):	20953	
PT# (if Δ):	298578	

## Datalogger / Station Notes:

- Installed station on mast, no telemetry.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:					99.865	3/4" Pipe S of logger
Bench Mark 2:			1.140	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:	1.013	101.013		100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			2.176	98.837		
Other:						
<b>Setup #2</b>						
Bench Mark 1:					99.865	3/4" Pipe S of logger
Bench Mark 2:	1.128	101.001		99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:			1.002	99.999	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			2.163	98.838		
Other:						

Closing Error	0.001	Average WL	98.838
WL Check	0.001	Transducer Elevation	97.861

## General Notes:

- Added 2 BM.  
- TSS sampled at 6.0 m.

Field Personnel:	SM, TR	Trip Date:	25-May-12
Data Entry Personnel:	CJ	Date:	1-Jun-12
Data Check Personnel:	XP	Date:	8-Jun-12

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date:

June 17, 2012



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	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.40	4.70	0.30	0.25	0.015	0.015	0.07	0.001	0%
1	5.00	0.98		0.045	0.073		1.0	4.70	5.13	0.43	0.98	0.059	0.059	0.42	0.025	6%
2	5.25	1.05		0.059	0.027		1.0	5.13	5.38	0.25	1.05	0.043	0.043	0.26	0.011	3%
3	5.50	1.08		0.073	0.046		1.0	5.38	5.63	0.25	1.08	0.060	0.060	0.27	0.016	4%
4	5.75	1.13		0.073	0.047		1.0	5.63	5.88	0.25	1.13	0.060	0.060	0.28	0.017	4%
5	6.00	1.10		0.065	0.058		1.0	5.88	6.13	0.25	1.10	0.062	0.062	0.28	0.017	4%
6	6.25	1.15		0.068	0.065		1.0	6.13	6.38	0.25	1.15	0.067	0.067	0.29	0.019	5%
7	6.50	1.20		0.062	0.064		1.0	6.38	6.63	0.25	1.20	0.063	0.063	0.30	0.019	5%
8	6.75	1.28		0.058	0.054		1.0	6.63	6.88	0.25	1.28	0.056	0.056	0.32	0.018	5%
9	7.00	1.30		0.063	0.077		1.0	6.88	7.13	0.25	1.30	0.070	0.070	0.33	0.023	6%
10	7.25	1.42		0.057	0.078		1.0	7.13	7.38	0.25	1.42	0.068	0.068	0.36	0.024	6%
11	7.50	1.40		0.083	0.082		1.0	7.38	7.63	0.25	1.40	0.083	0.083	0.35	0.029	7%
12	7.75	1.42		0.086	0.083		1.0	7.63	7.88	0.25	1.42	0.085	0.085	0.36	0.030	8%
13	8.00	1.40		0.089	0.084		1.0	7.88	8.13	0.25	1.40	0.087	0.087	0.35	0.030	8%
14	8.25	1.40		0.073	0.076		1.0	8.13	8.38	0.25	1.40	0.075	0.075	0.35	0.026	7%
15	8.50	1.35		0.071	0.086		1.0	8.38	8.63	0.25	1.35	0.079	0.079	0.34	0.026	7%
16	8.75	1.22		0.058	0.061		1.0	8.63	8.88	0.25	1.22	0.060	0.060	0.31	0.018	5%
17	9.00	1.00		0.057	0.067		1.0	8.88	9.13	0.25	1.00	0.062	0.062	0.25	0.016	4%
18	9.25	0.92		0.051	0.044		1.0	9.13	9.38	0.25	0.92	0.048	0.048	0.23	0.011	3%
19	9.50	0.78		0.036	0.042		1.0	9.38	9.63	0.25	0.78	0.039	0.039	0.20	0.008	2%
20	9.75	0.60		0.038			1.0	9.63	9.88	0.25	0.60	0.038	0.038	0.15	0.006	1%
LB	10.00	0.00	0.00	0.000	0.000	0.000	1.0	9.88	10.00	0.13	0.15	0.000	0.010	0.02	0.000	0%

**Total Flow 0.389**

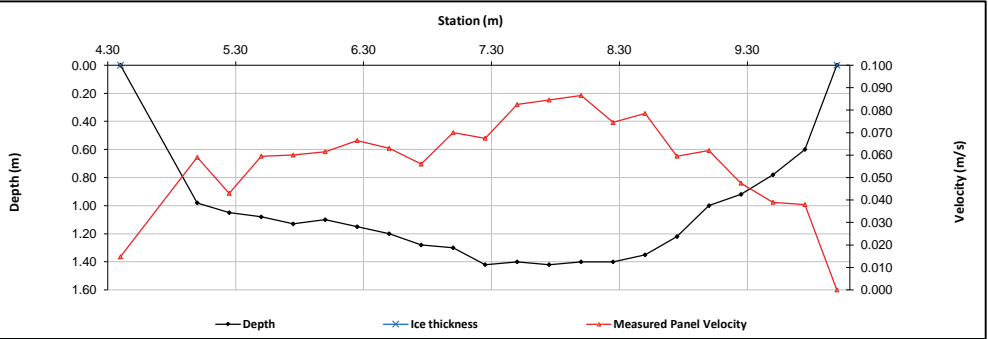
Measurement Details:	
Start Time (MST):	15:15
End Time (MST):	17:15
Equipment:	ADV
Method:	FISHCAT
River Condition:	Good flow
Quality/Error (see reverse):	Excellent
Weather:	Rain, 15 deg.

Flow characteristics:	
Total Flow:	0.389 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent
Cross Section Area:	6.06 (m <sup>2</sup> )
Wetted Width:	5.60 (m)
Hydraulic Depth:	1.082 (m)
Mean Velocity:	0.064 (m/s)
Froude Number:	0.020

Logger Details:		
	Before	After
Transducer Reading (m):	1.071	
Water (°C):	14.4	
Battery (Main):	13.9	
Datalogger Clock:	14:38	
Laptop Clock:	14:39	
Dessicant:	Replaced	
Logger# (if Δ):	20953	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Installed signal isolator and modem, 1206607125.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.158	99.864	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.149	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:	1.022	101.022		100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			2.100	98.922		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.115	99.865	99.865	3/4" Pipe S of logger
Bench Mark 2:	1.107	100.980		99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:			0.980	100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			2.057	98.923		
Other:						

Closing Error	0.000	Average WL	98.923
WL Check	0.001	Transducer Elevation	97.852

**General Notes:**

- TSS sampled @ 7.0 m.  
- Installed 1 BM.

<b>Field Personnel:</b>	TR & CJ	<b>Trip Date:</b>	17-Jun-12
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	21-Jun-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	22-Jun-12



# Hydrometric Measurement Field Data Sheet

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date:

August 11, 2012



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	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	4.63	0.13	0.27	0.000	0.000	0.03	0.000	0%					
1	4.75	1.06		0.000	0.003		1.0	4.63	4.88	0.25	1.06	0.002	0.002	0.27	0.000	0%					
2	5.00	1.20		-0.033	0.003		1.0	4.88	5.13	0.25	1.20	-0.015	-0.015	0.30	-0.005	-3%					
3	5.25	1.23		0.000	0.001		1.0	5.13	5.38	0.25	1.23	0.001	0.001	0.31	0.000	0%					
4	5.50	1.28		0.022	0.023		1.0	5.38	5.63	0.25	1.28	0.023	0.023	0.32	0.007	4%					
5	5.75	1.34		0.101	0.016		1.0	5.63	5.88	0.25	1.34	0.059	0.059	0.34	0.020	12%					
6	6.00	1.34		-0.004	0.001		1.0	5.88	6.13	0.25	1.34	-0.002	-0.002	0.34	-0.001	0%					
7	6.25	1.36		0.011	0.005		1.0	6.13	6.38	0.25	1.36	0.008	0.008	0.34	0.003	2%					
8	6.50	1.42		0.012	0.001		1.0	6.38	6.63	0.25	1.42	0.007	0.007	0.36	0.002	1%					
9	6.75	1.51		0.142	0.029		1.0	6.63	6.88	0.25	1.51	0.086	0.086	0.38	0.032	19%					
10	7.00	1.60		0.024	0.049		1.0	6.88	7.13	0.25	1.60	0.037	0.037	0.40	0.015	9%					
11	7.25	1.64		0.046	0.016		1.0	7.13	7.38	0.25	1.64	0.031	0.031	0.41	0.013	7%					
12	7.50	1.62		0.001	0.051		1.0	7.38	7.63	0.25	1.62	0.026	0.026	0.41	0.011	6%					
13	7.75	1.66		0.001	0.055		1.0	7.63	7.88	0.25	1.66	0.028	0.028	0.42	0.012	7%					
14	8.00	1.62		0.021	0.049		1.0	7.88	8.13	0.25	1.62	0.035	0.035	0.41	0.014	8%					
15	8.25	1.64		0.021	0.058		1.0	8.13	8.38	0.25	1.64	0.040	0.040	0.41	0.016	10%					
16	8.50	1.56		0.020	0.040		1.0	8.38	8.63	0.25	1.56	0.030	0.030	0.39	0.012	7%					
17	8.75	1.50		0.004	0.052		1.0	8.63	8.88	0.25	1.50	0.028	0.028	0.38	0.011	6%					
18	9.00	1.24		0.004	0.006		1.0	8.88	9.13	0.25	1.24	0.005	0.005	0.31	0.002	1%					
19	9.25	1.08		0.000	0.038		1.0	9.13	9.38	0.25	1.08	0.019	0.019	0.27	0.005	3%					
20	9.50	0.95		0.003	0.008		1.0	9.38	9.75	0.38	0.95	0.005	0.005	0.36	0.002	1%					
RB	10.00	0.00	0.00	0.000	0.000	0.000	1.0	9.75	10.00	0.25	0.24	0.001	0.001	0.06	0.000	0%					

**Total Flow 0.17**

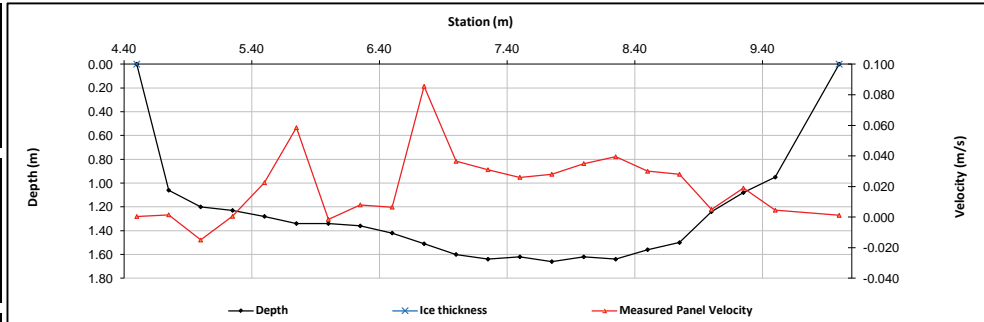
Measurement Details:	
Start Time (MST):	15:00
End Time (MST):	18:15
Equipment:	ADV
Method:	Fishcat
River Condition:	High
Quality/Error (see reverse):	Fair
Weather:	Clear, 25 deg.

Flow characteristics:	
Total Flow:	0.17 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair
Cross Section Area:	7.17 (m <sup>2</sup> )
Wetted Width:	5.50 (m)
Hydraulic Depth:	1.304 (m)
Mean Velocity:	0.024 (m/s)
Froude Number:	0.007

Logger Details:		
	Before	After
Transducer Reading (m):	1.305	
Water (°C):	17.7	
Battery (Main):	13.7	
Datalogger Clock:	14:20	
Laptop Clock:	14:20	
Dessicant:	Changed	
Logger# (if Δ):	20953	
PT# (if Δ):	-	

**Datalogger / Station Notes:**

- Added a mast, Yaggi, and surge protector.
- RSSI : -87



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.088	99.864	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.079	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:	0.952	100.952		100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.788	99.164		
Other:						
<b>Setup #2</b>						
Bench Mark 1:			1.059	99.865	99.865	3/4" Pipe S of logger
Bench Mark 2:	1.051	100.924		99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:			0.924	100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.757	99.167		
Other:						

Closing Error	0.000
WL Check	0.003

Average WL	99.166
Transducer Elevation	97.861

**General Notes:**

- TSS taken at 7 m.
- A lot of vegetation on bottom.

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	11-Aug-12
<b>Data Entry Personnel:</b>	TR (Field)	<b>Date:</b>	11-Aug-12
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	4-Oct-12

# Hydrometric Measurement Field Data Sheet

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date:

September 17, 2012



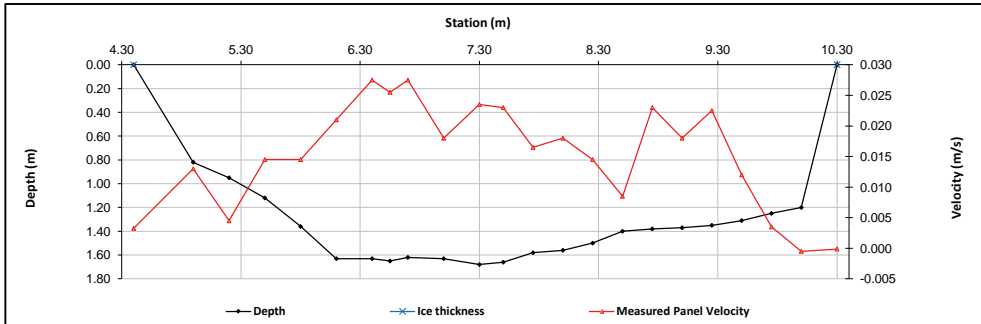
Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth (m)	Ice Thickness (m)	Velocity @ 0.6 Depth (m/s)	Velocity @ 0.8 Depth (m/s)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Start (m)	Pannel End (m)	Pannel Width (m)	Effective Pannel Depth (m)	Measured Pannel Velocity (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	4.40	0.00	0.00	0.000	0.000	0.000	1.0	4.40	4.65	0.25	0.21	0.003	0.003	0.05	0.000	0%
1	4.90	0.82		0.008	0.018		1.0	4.65	5.05	0.40	0.82	0.013	0.013	0.33	0.004	3%
2	5.20	0.95		-0.009	0.018		1.0	5.05	5.35	0.30	0.95	0.005	0.005	0.28	0.001	1%
3	5.50	1.12		-0.001	0.030		1.0	5.35	5.65	0.30	1.12	0.015	0.015	0.34	0.005	4%
4	5.80	1.36		0.006	0.023		1.0	5.65	5.95	0.30	1.36	0.015	0.015	0.41	0.006	5%
5	6.10	1.63		0.013	0.029		1.0	5.95	6.25	0.30	1.63	0.021	0.021	0.49	0.010	8%
6	6.40	1.63		0.019	0.036		1.0	6.25	6.48	0.23	1.63	0.028	0.028	0.37	0.010	8%
7	6.55	1.65		0.011	0.040		1.0	6.48	6.63	0.15	1.65	0.026	0.026	0.25	0.006	5%
8	6.70	1.62		0.018	0.037		1.0	6.63	6.85	0.23	1.62	0.028	0.028	0.36	0.010	8%
9	7.00	1.63		0.006	0.030		1.0	6.85	7.15	0.30	1.63	0.018	0.018	0.49	0.009	7%
10	7.30	1.68		0.022	0.025		1.0	7.15	7.40	0.25	1.68	0.024	0.024	0.42	0.010	8%
11	7.50	1.66		0.017	0.029		1.0	7.40	7.63	0.23	1.66	0.023	0.023	0.37	0.009	7%
12	7.75	1.58		0.008	0.025		1.0	7.63	7.88	0.25	1.58	0.017	0.017	0.40	0.007	5%
13	8.00	1.56		0.006	0.030		1.0	7.88	8.13	0.25	1.56	0.018	0.018	0.39	0.007	5%
14	8.25	1.50		0.011	0.018		1.0	8.13	8.38	0.25	1.50	0.015	0.015	0.38	0.005	4%
15	8.50	1.40		0.004	0.013		1.0	8.38	8.63	0.25	1.40	0.009	0.009	0.35	0.003	2%
16	8.75	1.38		0.019	0.027		1.0	8.63	8.88	0.25	1.38	0.023	0.023	0.35	0.008	6%
17	9.00	1.37		0.020	0.016		1.0	8.88	9.13	0.25	1.37	0.018	0.018	0.34	0.006	5%
18	9.25	1.35		0.019	0.026		1.0	9.13	9.38	0.25	1.35	0.023	0.023	0.34	0.008	6%
19	9.50	1.31		0.006	0.018		1.0	9.38	9.63	0.25	1.31	0.012	0.012	0.33	0.004	3%
20	9.75	1.25		0.002	0.005		1.0	9.63	9.88	0.25	1.25	0.004	0.004	0.31	0.001	1%
21	10.00	1.20		-0.001	0.000		1.0	9.88	10.15	0.28	1.20	-0.001	-0.001	0.33	0.000	0%
LB	10.30	0.00	0.00	0.00	0.00	0.00	1.0	10.15	10.30	0.15	0.30	0.000	0.000	0.05	0.000	0%
<b>Total Flow</b>														<b>0.129</b>		

Measurement Details:	
Start Time (MST):	8:55
End Time (MST):	10:50
Equipment:	ADV
Method:	Fishcat
River Condition:	High water, slow, flooded
Quality/Error (see reverse):	Good
Weather:	Clear, 13 deg.

Flow characteristics:		
Total Flow:	0.129	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.71	(m <sup>2</sup> )
Wetted Width:	5.90	(m)
Hydraulic Depth:	1.307	(m)
Mean Velocity:	0.017	(m/s)
Froude Number:	0.005	

Logger Details:		
	Before	After
Transducer Reading (m):	1.335	
Water (°C):	8.5	
Battery (Main):	14.5	
Datalogger Clock:	8:11	
Laptop Clock:	8:11	
Dessicant:	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	

**Datalogger / Station Notes:**



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #1</b>						
Bench Mark 1:			1.076	99.865	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.069	99.872	99.872	3/4" Pipe SE of logger
Bench Mark 3:	0.941	100.941		100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.745	99.196		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.066	100.931		99.865	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.058	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:			0.930	100.001	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.732	99.199		
Other:						
Closing Error	-0.001					
WL Check	0.003					
Average WL				99.198		
Transducer Elevation				97.863		

**General Notes:**

- Bed covered in vegetation and soft, wading rod sinks.
- Banks flooded.
- TSS @ 6.9 m.

Field Personnel:		DW, TR	Trip Date:	17-Sep-12
Data Entry Personnel:	DW (Field)		Date:	17-Sep-12
Data Check Personnel:	CJ		Date:	11-Oct-12

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date:

October 13, 2012



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					
LB	2.50	0.00	0.00	0.000	0.000	0.000	1.0	2.50	2.75	0.25	0.29	0.001	0.001	0.07	0.000	0%					
1	3.00	1.14		-0.006	0.011		1.0	2.75	3.13	0.38	1.14	0.003	0.003	0.43	0.001	1%					
2	3.25	1.24		0.005	0.013		1.0	3.13	3.38	0.25	1.24	0.009	0.009	0.31	0.003	3%					
3	3.50	1.34		0.011	0.016		1.0	3.38	3.63	0.25	1.34	0.014	0.014	0.34	0.005	4%					
4	3.75	1.36		0.014	0.019		1.0	3.63	3.88	0.25	1.36	0.017	0.017	0.34	0.006	5%					
5	4.00	1.36		0.016	0.015		1.0	3.88	4.13	0.25	1.36	0.016	0.016	0.34	0.005	5%					
6	4.25	1.40		0.015	0.021		1.0	4.13	4.38	0.25	1.40	0.018	0.018	0.35	0.006	6%					
7	4.50	1.49		0.015	0.025		1.0	4.38	4.63	0.25	1.49	0.020	0.020	0.37	0.007	7%					
8	4.75	1.54		0.016	0.019		1.0	4.63	4.88	0.25	1.54	0.018	0.018	0.39	0.007	6%					
9	5.00	1.56		0.013	0.022		1.0	4.88	5.13	0.25	1.56	0.018	0.018	0.39	0.007	6%					
10	5.25	1.62		0.013	0.026		1.0	5.13	5.38	0.25	1.62	0.020	0.020	0.41	0.008	7%					
11	5.50	1.61		0.013	0.028		1.0	5.38	5.63	0.25	1.61	0.021	0.021	0.40	0.008	8%					
12	5.75	1.63		0.017	0.033		1.0	5.63	5.88	0.25	1.63	0.025	0.025	0.41	0.010	9%					
13	6.00	1.64		0.013	0.029		1.0	5.88	6.13	0.25	1.64	0.021	0.021	0.41	0.009	8%					
14	6.25	1.60		0.015	0.029		1.0	6.13	6.38	0.25	1.60	0.022	0.022	0.40	0.009	8%					
15	6.50	1.56		0.006	0.027		1.0	6.38	6.63	0.25	1.56	0.017	0.017	0.39	0.006	6%					
16	6.75	1.58		-0.002	0.016		1.0	6.63	6.88	0.25	1.58	0.007	0.007	0.40	0.003	3%					
17	7.00	1.28		0.005	0.017		1.0	6.88	7.13	0.25	1.28	0.011	0.011	0.32	0.004	3%					
18	7.25	1.08		0.004	0.019		1.0	7.13	7.38	0.25	1.08	0.012	0.012	0.27	0.003	3%					
19	7.50	0.93		0.005	0.012		1.0	7.38	7.63	0.25	0.93	0.009	0.009	0.23	0.002	2%					
20	7.75	0.85		0.003	0.010		1.0	7.63	7.88	0.25	0.85	0.007	0.007	0.21	0.001	1%					
RB	8.00	0.00	0.00	0.00	0.00	0.00	1.0	7.88	8.00	0.13	0.21	0.002	0.002	0.03	0.000	0%					

**Total Flow 0.11**

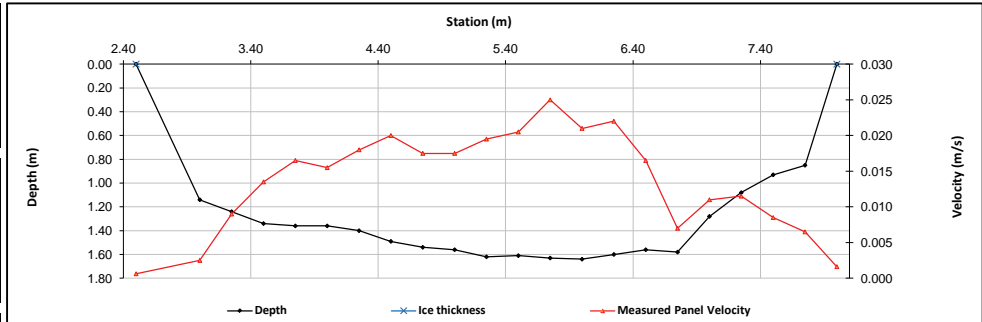
Measurement Details:	
Start Time (MST):	13:45
End Time (MST):	15:27
Equipment:	ADV
Method:	Fishcat
River Condition:	high level
Quality/Error (see reverse):	Good
Weather:	5 deg, overcast, calm

Flow characteristics:	
Total Flow:	0.11 (m <sup>3</sup> /s)
Perceived Measurement Quality:	Good
Cross Section Area:	7.19 (m <sup>2</sup> )
Wetted Width:	5.50 (m)
Hydraulic Depth:	1.308 (m)
Mean Velocity:	0.015 (m/s)
Froude Number:	0.004

Logger Details:		Before	After
Transducer Reading (m):		1.318	
Water (°C):		2.4	
Battery (Main):		13.2	
Datalogger Clock:		14:21	
Laptop Clock:		14:22	
Dessicant:		replaced	
Logger# (if Δ):		20953	
PT# (if Δ):		-	

**Datalogger / Station Notes:**

- Reoriented antenna (RSSI -98).



Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Setup #2</b>						
Bench Mark 1:			1.067	99.866	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.060	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:	0.933	100.933		100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.751	99.182		
Other:						
<b>Setup #2</b>						
Bench Mark 1:	1.056	100.922		99.866	99.865	3/4" Pipe S of logger
Bench Mark 2:			1.049	99.873	99.872	3/4" Pipe SE of logger
Bench Mark 3:			0.922	100.000	100.000	3/4" Pipe E of logger
Ice/PT:						
Water Level:			1.739	99.183		
Other:						

Closing Error	0.000	Average WL	99.183
WL Check	0.001	Transducer Elevation	97.865

**General Notes:**

- TSS collected 5.5 m.  
- Right bank is flooded, No flow in flooded area.

<b>Field Personnel:</b>	SM & TR	<b>Trip Date:</b>	13-Oct-12
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	13-Oct-12
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	9-Nov-12
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

## **C.8 2012 WATER YEAR NATURALIZED FLOW CALCULATION RESULTS**

The method used to calculate naturalized flows was outlined in Appendix C.3.3. The results from these calculations for the 2012 WY are presented below.

**RAMP Station S46, Athabasca River near Embarras Airport**  
**RAMP funders (i.e., focal projects only)**

**NOTES**

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**LAND AREAS**

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	15,545,539	8676	37529	15,508,010
RAMP site (km <sup>2</sup> )	155,455.4	86.8	375.3	155,080.1

Incremental Runoff from clearing Factor 20%

**RESULTS SUMMARY**

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
23,476.579	Annual Sum (million cumecs)	23,651.382	-0.7%
1183.685	Mean open-water season (1-May : 31-Oct)	1190.420	-0.6%
224.057	Mean winter discharge (1-Nov : 31-Mar)	228.263	-1.8%
3488.243	Annual maximum daily discharge	3499.101	-0.3%
502.253	Open-water season minimum daily discharge	507.117	-1.0%

**ANNUAL WATER BALANCE COMPONENTS**

Observed Hydrograph	million m <sup>3</sup>	23,476.579
Closed-circuit loss	million m <sup>3</sup>	-57.098
Incremental runoff from land clearing	million m <sup>3</sup>	2.640
Withdrawals from the stream	million m <sup>3</sup>	-114.348
Releases into the stream	million m <sup>3</sup>	1.158
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	-7.156
Incremental volume	million m <sup>3</sup>	-174.803
Naturalized Hydrograph	million m <sup>3</sup>	23,651.4
Incremental volume	% of natural	-0.739%

**RAMP Station S46 (WSC Station 07DD001), Athabasca River near Embarras Airport**  
**All development**

**NOTES**

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**LAND AREAS**

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	15,545,539	8839	37605	15,507,934
RAMP site (km <sup>2</sup> )	155,455.4	88.4	376.1	155,079.3

Incremental Runoff from clearing Factor 20%

**RESULTS SUMMARY**

Observed (m <sup>3</sup> / s) Endpoint	Baseline	
	Baseline (m <sup>3</sup> / s)	% change of natural
23,476.579 Annual Sum (million cumecs)	23,651.421	-0.7%
1183.685 Mean open-water season (1-May : 31-Oct)	1190.423	-0.6%
224.057 Mean winter discharge (1-Nov : 31-Mar)	228.263	-1.8%
3488.243 Annual maximum daily discharge	3499.110	-0.3%
502.253 Open-water season minimum daily discharge	507.118	-1.0%

**ANNUAL WATER BALANCE COMPONENTS**

Observed Hydrograph	million m <sup>3</sup>	23,476.579
Closed-circuit loss	million m <sup>3</sup>	-57.213
Incremental runoff from land clearing	million m <sup>3</sup>	2.690
Withdrawals from the stream	million m <sup>3</sup>	-114.348
Releases into the stream	million m <sup>3</sup>	1.158
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	-7.129
Incremental volume	million m <sup>3</sup>	-174.843
Naturalized Hydrograph	million m <sup>3</sup>	23,651.421
Incremental volume	% of natural	-0.739%

## WSC Station 07DA008 (RAMP Station S7), Muskeg River near Fort McKay

### NOTES

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### LAND AREAS

	Total Area	Other Areas		Effective
		Cleared	Closed-circuited	
RAMP site (ha)	<b>145,700</b>	<b>8,854</b>	<b>12,619</b>	<b>133,081</b>
RAMP site (km <sup>2</sup> )	1,457.0	88.5	126.2	1,330.8
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
109.96	Annual Sum (million cumecs)	113.02	-2.7%
6.44	Mean open-water season (1-May : 31-Oct)	6.79	-5.2%
0.31	Mean winter discharge (1-Nov : 31-Mar)	0.13	140.3%
29.40	Annual maximum daily discharge	31.55	-6.8%
0.45	Open-water season minimum daily discharge	0.33	34.8%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	109.96
Closed-circuit loss	million m <sup>3</sup>	-9.79
Incremental runoff from land clearing	million m <sup>3</sup>	1.37
Withdrawals from the stream	million m <sup>3</sup>	-0.07
Releases into the stream	million m <sup>3</sup>	0.01
Diversion into/out of watershed	million m <sup>3</sup>	5.50
Tributary changes	million m <sup>3</sup>	0.00
Incremental volume	million m <sup>3</sup>	-2.97
Naturalized Hydrograph	million m <sup>3</sup>	113.02
Incremental volume	% of natural	-2.71%

## WSC Station 07DA006 (RAMP Station S38), Steepbank River near Fort McMurray

### NOTES

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### LAND AREAS

	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	132000	4529	488	131,512
RAMP site (km <sup>2</sup> )	1,320.0	45.3	4.9	1,315.1

Incremental Runoff from clearing Factor 20%

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
197.651	Annual Sum (million cumecs)	197.048	0.31%
11.493	Mean open-water season (1-May : 31-Oct)	11.458	0.31%
0.512	Mean winter discharge (1-Nov : 31-Mar)	0.510	0.32%
51.900	Annual maximum daily discharge	51.736	0.32%
2.370	Open-water season minimum daily discharge	2.364	0.26%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	197.651
Closed-circuit loss	million m <sup>3</sup>	-0.728
Incremental runoff from land clearing	million m <sup>3</sup>	1.352
Withdrawals from the stream	million m <sup>3</sup>	-0.021
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>	0.603
Naturalized Hydrograph	million m <sup>3</sup>	197.048
Incremental volume	% of natural	0.306%





## WSC Station 07DB001 (RAMP Station S26), MacKay River near Fort McKay

### NOTES

Using WSC area of 5569.3 km<sup>2</sup>, not total area (5570.0 km<sup>2</sup>): WSC area ~ same.

### LAND AREAS

	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
RAMP site (ha)	556930	3185	619	556,311
RAMP site (km <sup>2</sup> )	5,569.3	31.8	6.2	5,563.1

Incremental Runoff from clearing Factor 20%

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
239.175	Annual Sum (million cumecs)	239.179	-0.002%
13.443	Mean open-water season (1-May : 31-Oct)	13.443	-0.002%
0.801	Mean winter discharge (1-Nov : 31-Mar)	0.801	0.003%
33.300	Annual maximum daily discharge	33.300	0.000%
4.170	Open-water season minimum daily discharge	4.170	-0.004%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	239.18
Closed-circuit loss	million m <sup>3</sup>	-0.266
Incremental runoff from land clearing	million m <sup>3</sup>	0.274
Withdrawals from the stream	million m <sup>3</sup>	-0.012
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>	-0.004
Naturalized Hydrograph	million m <sup>3</sup>	239.18
Incremental volume	% of natural	-0.002%

## RAMP Station S16A, Calumet River near the mouth

### NOTES

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### LAND AREAS

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>17,354</b>	<b>130</b>	<b>68</b>	<b>17,286</b>
RAMP site (km <sup>2</sup> )	173.54	1.30	0.68	172.9

Incremental Runoff from clearing Factor 20%

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
2.518	Annual Sum (million cumecs)	2.524	-0.2%
0.173	Mean open-water season (1-May : 31-Oct)	0.174	-0.2%
-	Mean winter discharge (1-Nov : 31-Mar)	-	-
1.284	Annual maximum daily discharge	1.287	-0.2%
0.020	Open-water season minimum daily discharge	0.020	-0.2%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	2.518
Closed-circuit loss	million m <sup>3</sup>	-0.010
Incremental runoff from land clearing	million m <sup>3</sup>	0.004
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>	-0.006
Naturalized Hydrograph	million m <sup>3</sup>	2.524
Incremental volume	% of natural	-0.25%



## RAMP Station S14A, Ells River at CNRL Bridge

### NOTES

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### LAND AREAS

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	<b>245,000</b>	<b>2,273</b>	<b>342</b>	<b>244,658</b>
RAMP site (km <sup>2</sup> )	2,450.0	22.7	3.4	2,446.6

Incremental Runoff from clearing Factor 20%

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
126.03	Annual Sum (million cumecs)	125.99	0.04%
6.371	Mean open-water season (1-May : 31-Oct)	6.368	0.05%
1.535	Mean winter discharge (1-Nov : 31-Mar)	1.535	-0.01%
19.632	Annual maximum daily discharge	19.623	0.05%
3.537	Open-water season minimum daily discharge	3.535	0.05%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	126.034
Closed-circuit loss	million m <sup>3</sup>	-0.176
Incremental runoff from land clearing	million m <sup>3</sup>	0.234
Withdrawals from the stream	million m <sup>3</sup>	-0.011
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>	0.047
Naturalized Hydrograph	million m <sup>3</sup>	125.987
Incremental volume	% of natural	0.038%

**RAMP Station S47, Christina River near the mouth**  
**RAMP funders (i.e., focal projects only)**

**NOTES**

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**LAND AREAS**

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	<b>1,303,805</b>	<b>6,507</b>	<b>785</b>	<b>1,303,019</b>
RAMP site (km <sup>2</sup> )	13,038.0	65.1	7.9	13,030.2
<i>Incremental Runoff from clearing</i>		<i>Factor</i>		<i>20%</i>

**RESULTS SUMMARY**

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
1,100.39	Annual Sum (million cumecs)	1,100.17	0.02%
57.91	Mean open-water season (1-May : 31-Oct)	57.88	0.04%
10.23	Mean winter discharge (1-Nov : 31-Mar)	10.25	-0.11%
116.65	Annual maximum daily discharge	116.61	0.04%
24.83	Open-water season minimum daily discharge	24.82	0.03%

**ANNUAL WATER BALANCE COMPONENTS**

<b>Observed Hydrograph</b>	million m <sup>3</sup>	1,100.39
<b>Closed-circuit loss</b>	million m <sup>3</sup>	-0.66
<b>Incremental runoff from land clearing</b>	million m <sup>3</sup>	1.10
<b>Withdrawals from the stream</b>	million m <sup>3</sup>	-0.22
<b>Releases into the stream</b>	million m <sup>3</sup>	0.00
<b>Diversion into/out of watershed</b>	million m <sup>3</sup>	0.00
<b>Tributary changes</b>	million m <sup>3</sup>	0.00
<b>Incremental volume</b>	million m <sup>3</sup>	0.22
<b>Naturalized Hydrograph</b>	million m <sup>3</sup>	1,100.17
<b>Incremental volume</b>	% of natural	0.02%

**RAMP Station S47, Christina River near the mouth**  
**All development**

**NOTES**

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**LAND AREAS**

	Total Area		Other Areas	
	Cleared	Closed-circuited	Effective	
RAMP site (ha)	1,303,805	6,665	785	1,303,019
RAMP site (km <sup>2</sup> )	13,038.0	66.6	7.9	13,030.2
Incremental Runoff from clearing		Factor	20%	

**RESULTS SUMMARY**

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
1,100.39	Annual Sum (million cumecs)	1,100.14	0.02%
57.91	Mean open-water season (1-May : 31-Oct)	57.88	0.04%
10.23	Mean winter discharge (1-Nov : 31-Mar)	10.25	-0.11%
116.65	Annual maximum daily discharge	116.60	0.04%
24.83	Open-water season minimum daily discharge	24.82	0.04%

**ANNUAL WATER BALANCE COMPONENTS**

Observed Hydrograph	million m <sup>3</sup>	1,100.39
Closed-circuit loss	million m <sup>3</sup>	-0.66
Incremental runoff from land clearing	million m <sup>3</sup>	1.12
Withdrawals from the stream	million m <sup>3</sup>	-0.22
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>	0.24
Naturalized Hydrograph	million m <sup>3</sup>	1,100.14
Incremental volume	% of natural	0.02%







## RAMP Station S12, Fort Creek at Highway 63

### NOTES

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### LAND AREAS

	Total Area		Other Areas		
	Cleared	Closed-circuited	Effective		
RAMP site (ha)	3,193	2,042	33.3	3,160	
RAMP site (km <sup>2</sup> )	31.9	20.4	0.3	31.6	64.989
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%	

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> / s)	% change of natural
1.473	Annual Sum (million cumecs)	1.318	11.7%
0.089	Mean open-water season (1-May : 31-Oct)	0.079	11.7%
-	Mean winter discharge (1-Nov : 31-Mar)	-	-
0.220	Annual maximum daily discharge	0.197	11.7%
0.016	Open-water season minimum daily discharge	0.014	11.7%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	1.473
Closed-circuit loss	million m <sup>3</sup>	-0.014
Incremental runoff from land clearing	million m <sup>3</sup>	0.169
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>	0.155
Naturalized Hydrograph	million m <sup>3</sup>	1.318
Incremental volume	% of natural	11.746%

## RAMP Station S6, Mills Creek at Highway 63

### NOTES

Hatfield- Mills Creek 890 ha, or 8.9 km<sup>2</sup>. Using 600 ha as estimated upstream area from geomatics group.

### LAND AREAS

	Total Area		Other Areas	
		Cleared	Closed-circuited	Effective
RAMP site (ha)	600	58.0	235.0	365
RAMP site (km <sup>2</sup> )	6.0	0.6	2.4	3.6

*Incremental Runoff from clearing* Factor 20%

### RESULTS SUMMARY

Observed (m <sup>3</sup> / s) Endpoint	Baseline	
	Baseline (m <sup>3</sup> / s)	% change of natural
0.502 Annual Sum (million cumecs)	0.799	-37.2%
0.023 Mean open-water season (1-May : 31-Oct)	0.037	-37.2%
0.009 Mean winter discharge (1-Nov : 31-Mar)	0.014	-37.2%
0.069 Annual maximum daily discharge	0.111	-37.2%
0.007 Open-water season minimum daily discharge	0.012	-37.2%

### ANNUAL WATER BALANCE COMPONENTS

Observed Hydrograph	million m <sup>3</sup>	0.502
Closed-circuit loss	million m <sup>3</sup>	-0.313
Incremental runoff from land clearing	million m <sup>3</sup>	0.015
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>	-0.298
Naturalized Hydrograph	million m <sup>3</sup>	0.799
Incremental volume	% of natural	-37.24%

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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 benthos samples, and the results of Quality Assurance/Quality Control (QA/QC). This appendix also documents the calculations used to estimate the *baseline* ranges of variability for benthic invertebrate community measurement endpoints 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 into appropriate size fractions in the laboratory. The most commonly used fractions were coarse (> 1.00 mm) and fine (250 µm - 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-mm sieve. All fractions were sorted. The fractions were sub-sampled if the samples contained large numbers of organisms (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**

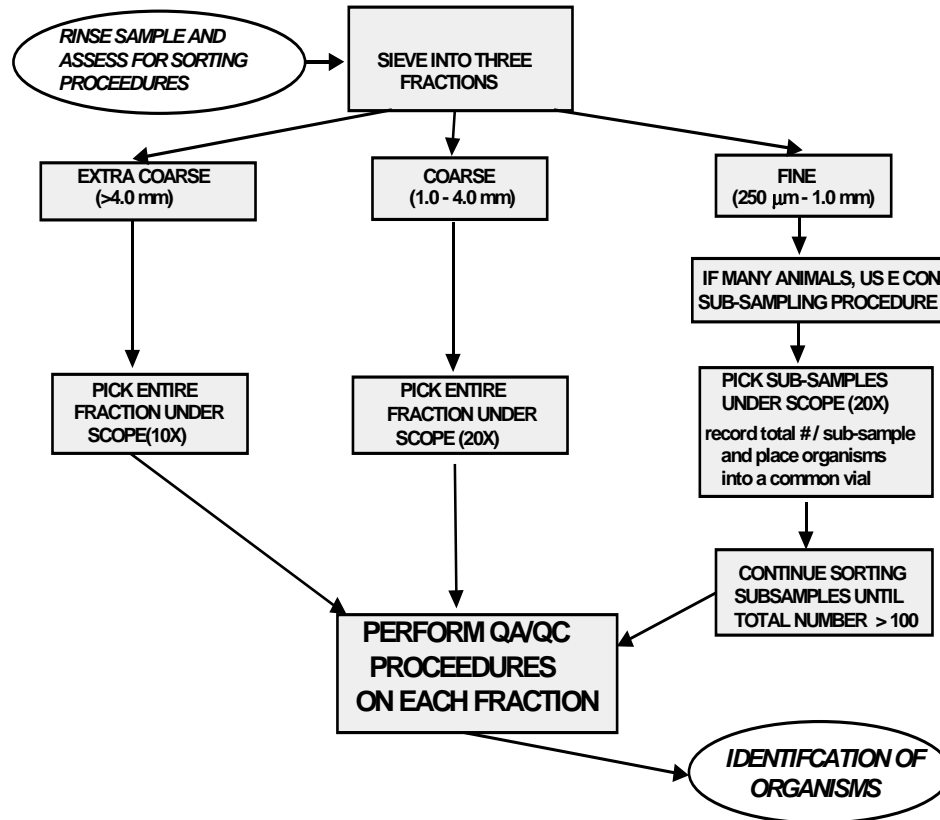
The coarse fraction (contents of the 2-mm and 1-mm sieves) was transferred into individual containers and 70% alcohol added, prior to sorting. At least ¼ of the coarse fraction was sorted, with the amount of material sorted determined either by volume or weight.

##### **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 magnifying glass for heavy-shelled or stone-cased animals.

The fine fraction was sorted in its entirety when possible. When there was a lot of organic material in the fine fractions and/or large numbers of organisms, 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 haematoxalin 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.**



Note: This is an illustrative example only, which should be modified as necessary for station-specific samples.

#### 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 1983, 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
Hydracarina	Leave at this level
Cladocera	Leave at this level
Copepoda	Order
Ostracoda	Leave at this level
Amphipoda	Genus
Insecta	Genus/Species
Terrestrial	Leave at this level

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 Calculating *Baseline* 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 effects that are negligible. The variability observed in regional *baseline* locations can be used to set observed effects into context, as per Kilgour et al. (1998). Watercourses were classified as either erosional or depositional river reaches, or a lake, and the "*baseline* range of variability" for *baseline* watercourses were calculated within each of those habitat types. Observed variations in *test* watercourses were then compared to the observed range of variability for *baseline* watercourses.

As in the main report, the following measurement endpoints were calculated:

- Total abundance (No. individuals/m<sup>2</sup>);
- Richness (number of distinct taxa);
- Simpson's Diversity;
- Equitability; and
- %EPT (percent of the fauna as Ephemeroptera, Plecoptera and Trichoptera).

*Baseline* ranges for abundance, richness, diversity, equitability, and percent EPT were derived based on habitat type (erosional, depositional, lake) and are provided in the relevant figures for each reach or lake in the main body of the report.

Correspondence Analysis (CA), a multivariate ordination procedure was also used. CA ordines the data such that a biplot of site scores represents the similarities among reaches. Reaches close together in the biplot have similar fauna, while reaches far apart tend to have fewer similarities in their fauna. CA also orders the taxa, and a biplot of taxa can be overlain over the biplot of reaches. The position of taxa in the biplot indicates, roughly, the samples in which taxa were most abundant. The CA was generated using data from both *baseline* and *test* watercourses. Separate analyses were performed for depositional river reaches, erosional river reaches, and for lakes, on the basis that those three habitat classes contained very different types of benthic invertebrates as determined from analyses from previous years. Differences in composition among those three basic habitat types were borne out again this year.

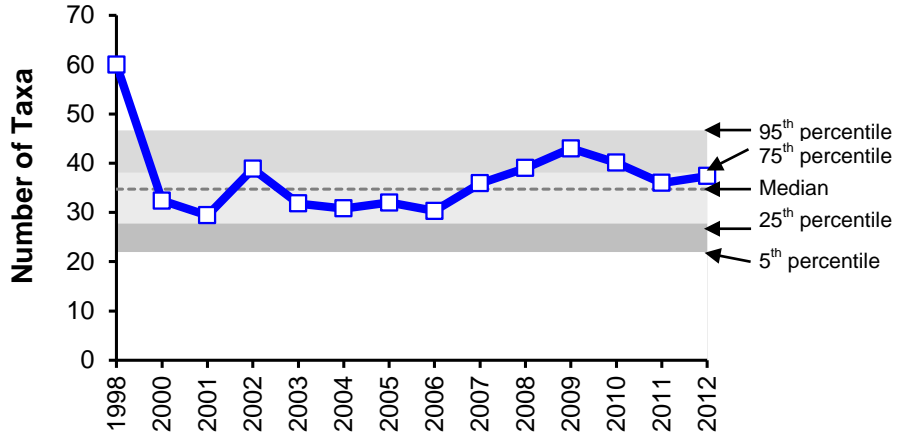
With CA, the configuration of ordination diagrams tends to be sensitive to rare taxa (Gauch 1982). Therefore, the taxonomy was summarized to family level identifications and only those taxa (i.e., families) found in at least 10% of samples from a system were retained for the analysis. Taxa abundances were  $\log_{10}$ -transformed prior to analysis. The CA was conducted using an MS Excel® add-in (Biplot 1.1; Lipkovich and Smith 2002).

The ordination was carried out using data for all available samples. Average CA axis scores were then computed for each reach (or lake) – year combination. CA annual-average axis scores were illustrated in a biplot, with a 95% confidence ellipse around the *baseline* data. Reaches that fall outside the ellipse for the *baseline* watercourses could be considered to be unusual, providing evidence of a possible change in the benthic community (Kilgour et al., 1998).

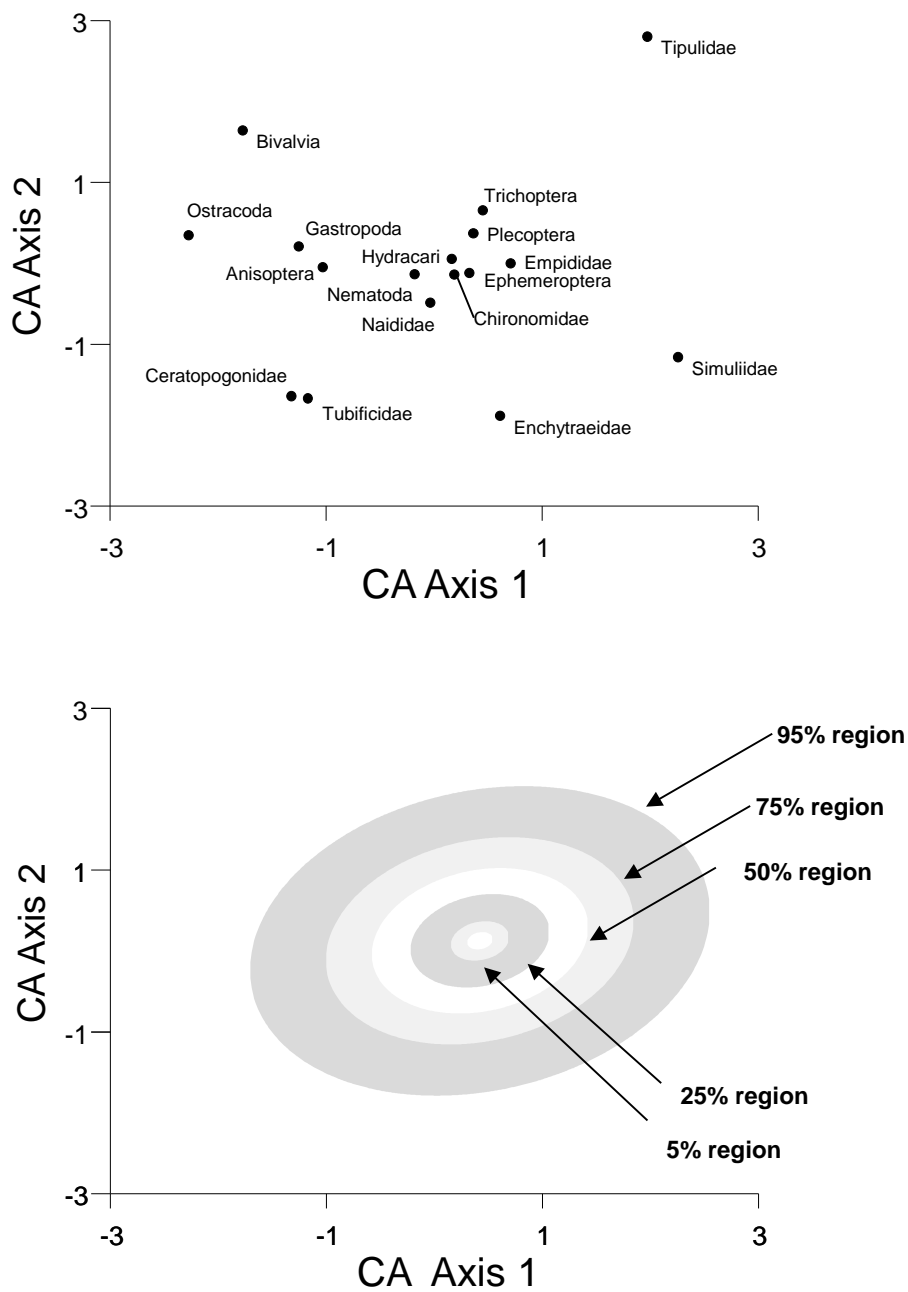
*Baseline* data were identified for lake and river habitats. The *baseline* range of variation was non-parametrically computed as the range of values that included the 5<sup>th</sup> and 95<sup>th</sup> percentiles for abundance, number of taxa, diversity, equitability, and percent EPT for each of lake, erosional river and depositional river habitats (similar to what is done with the water quality data; and see Figure D.1-2). The ordination axis scores were treated somewhat differently. The *baseline* range of variation was depicted as an ellipse in a biplot of the first two CA axes with the *baseline* range being defined parametrically as the region enclosing the 95% region, equivalent to a non-parametric estimate of the 95<sup>th</sup> percentile (Figure D.1-3). The Athabasca River delta was considered unique in the analysis because there were no true regional *baseline* reaches that provided an adequate comparison. In this report, the *baseline* condition for the delta habitat was considered to be all of the previous data from 1998 to 2011. This approach to estimating *baseline* conditions is roughly equivalent to control charting techniques that are designed to determine when processes are “out of control” (Shewart 1931).



Figure D.1-2 Example time trend chart for benthic invertebrate community taxa richness in relation to regional *baseline* conditions, in this case, for depositional reaches.



**Figure D.1-3 Example biplot showing time trend of benthic invertebrate CA Axis scores in relation to regional *baseline* conditions.**



## D.2 SEDIMENT QUALITY COMPONENT

### 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:

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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 2012.

**Table E.1-1 Common and scientific names for fish species captured during Fish Populations component activities, 2012.**

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 artedi</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 assess the health of captured fish in a rapid process to minimize the fish holding time in the field (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.**

<b>Variable</b>	<b>Location</b>	<b>Code</b>
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 fish assemblage data involved three steps, combined to determine if measurement endpoints varied in relation to measureable physical or chemical baseline conditions, and secondly to compute the baseline ranges of variability in measurement endpoints, taking into account natural habitat conditions. The first step involved a Principal Component Analysis (PCA) of the physical and chemical habitat data collected from reaches where fish assemblages were sampled. Physical and chemical descriptors of the reaches were selected from that PCA in order to quantify the variation in key measurement endpoints that they explained (Step 2). Normal ranges in key measurement endpoints were computed in Step 3.

#### **E.3.1 Principal Components Analysis of Habitat Data**

A PCA of the physical (and some chemical) habitat data for each of the 59 reach x year combinations was conducted to determine how the various habitat characteristics covaried to select a subset of variables that would be used to explore variability in measurement endpoints of fish assemblages. The PCA was conducted using the following suite of variables: average water depth, bankfull width, wetted channel width, left bank height, right bank height, left bank angle, right bank angle, dissolved oxygen concentration, conductivity, pH, water temperature at the time of the sampling, in-stream cover as attached algae, in-stream cover as macrophytes, in-stream cover as large woody debris (LWD), in-stream cover as small woody debris (SWD), in-stream cover as trees, in-stream

cover as over-hanging vegetation <1 m from the water surface, in-stream cover as undercut banks, in-stream cover as boulders, sum of canopy scores, sum of understory scores, and sum of LWD scores.

Principal component axes explaining >10% of the total variance in habitat characteristics were further explored (Jackson 1993). Pearson Correlations (i.e., Pearson  $r$ -values) between individual variables and the “significant” PCA axes that were  $> |0.6|$  were considered strongly associated with an axis. Variables that strongly correlated with an axis can be considered at least somewhat redundant. The PCA thus helps in identifying redundancies among the measured variables.

Three PCA axes explained >10% of variation in measured variables (Table E.3-1). Scores on the first PCA axis were strongly (i.e., Pearson  $r > |0.6|$ ) correlated with bankfull and wetted width, instream cover as small woody debris (SWD), and instream cover as undercut banks. The first PCA axis; therefore, indicated that the greatest variation among locations was in stream size. Reaches with a wider bankfull width (i.e., larger catchment) tended to have less instream cover. Scores on the second PCA axis were strongly correlated with left and right bank height and conductivity. Reaches with more incised channels (i.e., steeper banks) tended to have greater conductivity. Scores on the third PCA axis were not strongly correlated with any instream variables (i.e., all Pearson correlations were  $< |0.6|$ ).

Based on the results of the PCA, the following variables were carried forward into Step 2, which involved an assessment of the source of variability in measurement endpoints of fish assemblages:

- Bankfull width (as representative of PC Axis 1); and
- Conductivity (as representative of PC Axis 2). Conductivity was selected rather than bank height because it is considered to have a more likely proximal relation to fish assemblages.

**Table E.3-1 Principal Component Analysis of reaches where fish assemblages were sampled, 2009 to 2012.**

Variable	Principal Component		
	1	2	3
Water depth	0.36	-0.51	0.09
Bankfull width	<b>-0.74</b>	-0.42	-0.25
Wetted width	<b>-0.68</b>	-0.52	-0.23
Left bank height	-0.16	<b>0.76</b>	0.04
Right bank height	-0.20	<b>0.77</b>	-0.02
Left bank angle	-0.04	0.18	0.58
Right bank angle	0.30	0.13	0.56
Dissolved oxygen	-0.55	0.06	0.54
Conductivity	0.32	<b>0.61</b>	-0.42
pH	-0.41	0.33	0.36
Temperature	0.06	0.14	-0.36
Instream cover (algae)	-0.19	-0.02	0.36
Instream cover (macrophytes)	0.44	-0.38	0.08
Instream cover (LWD)	0.19	-0.10	-0.48
Instream cover (SWD)	<b>0.65</b>	0.22	-0.15
Instream cover (live trees)	0.41	0.03	-0.18
Instream cover (overhanging vegetation)	0.57	-0.54	0.17
Instream cover (undercut banks)	<b>0.64</b>	-0.14	0.34
Instream cover (boulders)	-0.55	-0.22	0.19
Canopy cover	-0.48	-0.08	-0.35
Large woody debris	0.06	0.16	-0.22
Understory	0.18	-0.11	0.09
<b>% of variance explained</b>	18	14	10

Note: values are Pearson Correlations (*r*); values in bold > |0.6| and considered strong associations with the PC axis.

### E.3.2 Sources of Baseline Variability in Measurement Endpoints

Bankfull width and conductivity were used in an ANOVA as predictors of fish assemblage measurement endpoints because they were strongly correlated with the first (bankfull width) and second (conductivity) PCA axes. Other habitat variables that were used as predictors included:

- Substrate class (i.e., Erosional or Depositional);
- Vegetation class (i.e., dominant vegetation in the riparian zone; deciduous, coniferous, mixed); and
- Habitat type (i.e., run, pool or riffle).

Table E.3-2 provides the results of the analyses of variance. Substrate class explained a marginally significant amount of variation in ATI (Assemblage Tolerance Index). None of the other habitat measures explained a significant fraction of the variation in any of the fish community measurement endpoints. Normal ranges for total abundances, richness, diversity and evenness were computed in the Step 3 below using all 20 baseline reaches combined. Normal ranges for ATI were computed separately for erosional and depositional reaches on the basis that substrate classification explained a significant fraction of variation in ATI.

**Table E.3-2 Results of ANOVA testing for the effect of habitat variables on fish assemblage measurement endpoints.**

Measurement Endpoint	Source	SS	df	MS	F-Ratio	p-Value
Abundance	Substrate class	0.011	1	0.011	0.15	0.704
	Error	1.296	18	0.072		
	Vegetation class	0.118	3	0.039	0.53	0.668
	Error	1.189	16	0.074		
	Habitat type	0.144	2	0.072	1.05	0.371
	Error	1.163	17	0.068		
	Bankfull width	0.012	1	0.012	0.16	0.691
	Error	1.295	18	0.072		
	Conductivity	0.053	1	0.053	0.76	0.395
	Error	1.254	18	0.070		
Richness	Substrate class	0.004	1	0.004	0.00	0.970
	Error	49.47	18	2.748		
	Vegetation class	7.735	3	2.578	0.99	0.423
	Error	41.73	16	2.608		
	Habitat type	0.04	2	0.020	0.01	0.993
	Error	49.43	17	2.908		
	Bankfull width	3.571	1	3.571	1.40	0.252
	Error	45.90	18	2.550		
	Conductivity	0.057	1	0.057	0.02	0.887
	Error	49.413	18	2.745		
Diversity	Substrate class	0.006	1	0.006	0.10	0.751
	Error	1.106	18	0.061		
	Vegetation class	0.103	3	0.034	0.55	0.658
	Error	1.009	16	0.063		
	Flow class	0.048	2	0.024	0.38	0.688
	Error	1.065	17	0.063		
	Bankfull width	0.111	1	0.111	2.00	0.174
	Error	1.001	18	0.056		
	Conductivity	0.015	1	0.015	0.25	0.625
	Error	1.098	18	0.061		

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

Measurement Endpoint	Source	SS	df	MS	F-Ratio	p-Value
ATI	Substrate class	12.11	1	12.11	5.35	0.033
	Error	40.70	18	2.261		
	Vegetation class	10.91	3	3.637	1.39	0.282
	Error	41.90	16	2.619		
	Habitat type	17.24	2	8.618	4.12	0.035
	Error	35.57	17	2.093		
	Bankfull width	0.148	1	0.148	0.05	0.824
	Error	52.66	18	2.926		
	Conductivity	2.736	1	2.736	0.98	0.334
	Error	50.07	18	2.782		

### E.3.3 Baseline Ranges

*Baseline* ranges were calculated using data from baseline reaches from 2009 to 2012. Sources of *baseline* variability in measurement endpoints of fish assemblages among the 20 *baseline* reaches (across years) were explored using general linear models. Substrate texture was demonstrated to explain significant variation in ATI values. No other physical variable explained variation in any measurement endpoint. *Baseline* ranges for abundance, richness, and diversity were; therefore, calculated from all 20 *baseline* reach datasets. *Baseline* ranges for the assemblage tolerance index (ATI) were calculated separately for *baseline* depositional (8) and erosional (12) reaches. Table E.3-3 provides the 5<sup>th</sup> and 95<sup>th</sup> percentiles of each measurement endpoint.

**Table E.3-3 Baseline ranges of variation for fish assemblage measurement endpoints.**

Reach	Statistic	Abundance	Richness	Diversity	ATI
All	Median	0.22	3.20	0.52	
	Mean	0.32	3.26	0.43	
	SD	0.26	1.61	0.24	
	5 <sup>th</sup>	0.02	0.59	0.00	
	95 <sup>th</sup>	0.72	5.05	0.70	
Depositional	Median				6.72
	Mean				6.65
	SD				1.24
	5 <sup>th</sup>				4.82
	95 <sup>th</sup>				8.06
Erosional	Median				5.34
	Mean				5.07
	SD				1.65
	5 <sup>th</sup>				3.06
	95 <sup>th</sup>				6.93

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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 2012. 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 are presented for the individual RAMP lakes;
- A test of the assumption that current base cation concentrations are the same as historical base cation concentrations in the RAMP lakes in the critical load calculations;
- Origin of the use of an  $ANC_{lim}$  of 75  $\mu\text{eq/L}$  in the critical load calculations;
- The chemistry of the 50 RAMP lakes in 2012 was compared to that in 450 lakes within the oil sands region reported by the  $\text{NO}_x\text{SO}_x$  Management Working Group (NSMWG);
- The characterization of the ion chemistry of the RAMP lakes in 2012 using Piper plots;
- A summary of the trace metal concentrations in the RAMP lakes and the relationships between metal concentrations, lake location, and water chemistry;
- Mann-Kendall trend analysis on selected metals to determine whether increases in metals have occurred in the ASL lakes over ten years of monitoring; and
- Water quality data from the 2012 spring acid pulse study on Rat Lake.

### F.1 RUNOFF CALCULATIONS FOR EACH RAMP LAKE

The runoff ( $Q$ ) to each lake, was calculated from analyses of heavy isotopes of oxygen ( $^{18}\text{O}$ ) and ( $^2\text{H}$ ) in each lake conducted by Dr. John Gibson (University of Victoria). With this technique, the natural evaporative enrichment of  $^{18}\text{O}$  and  $^2\text{H}$  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 Tables 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 and 2012, the runoff values using the IMB method were unavailable. The average yield and runoff values from 2002 to 2010 were; therefore, applied in calculating the critical loads for 2012. The runoff estimates for the RAMP lakes ranged from 0.001  $\text{m}^3/\text{s}$  to 2.431  $\text{m}^3/\text{s}$  (median: 0.077  $\text{m}^3/\text{s}$ ). As noted in Table F.1-1 and 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 over the years 2002 to 2010 was 36.4%. As noted by Gibson et al. (2010), yearly variations in the yield and runoff to a lake will have a direct effect on its critical load and acid sensitivity.



**Table F.1-1 Water yields to the RAMP lakes, 2002 to 2012<sup>1</sup>.**

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012 <sup>2</sup>	Lake Area (km <sup>2</sup> )	Catchment Area (km <sup>2</sup> )
		Water Yields (mm/y)											
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	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	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	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	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	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	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	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		
	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 in 2011 or 2012; therefore, the mean value from 2002 to 2010 was used for each lake.

**Table F.1-2 Runoff to the RAMP lakes, 2002 to 2012.**

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012 <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	0.070	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 value from 2002 to 2010 was used for each lake.

## F.2 TEST OF THE ASSUMPTION THAT CURRENT BASE CATIONS ARE SIMILAR TO HISTORIC BASE CATIONS IN THE RAMP LAKES

During the process of acidification of a catchment, base cations are released from the soils to the lake waters. In applying the Henriksen model, 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 ( $BC_0$ ).

The discrepancy between the original and the current base cation concentrations in a lake is normally calculated by an equation presented in Brakke et al. (1990) based on increases in concentrations of sulphur in a lake resulting from aerial deposition. The study by Henriksen et al. (2002) on lakes in Ontario gives an example on the use of this equation. To test the assumption that the base cations have not changed significantly in the RAMP lakes,  $BC_0$  was calculated for each lake using the equation in Brakke et al. (1990). A value of  $S$  (one of the terms in the equation) equal to  $400 \mu\text{eq/L}$  and an original sulphate concentration of  $1.67 \mu\text{eq/L}$  (corresponding to the 5<sup>th</sup> percentile of sulphate concentrations) were used in the calculations. As in the Henriksen et al. (2002) study, an  $F$  value of 1 was applied when the base cation concentrations were greater than  $400 \mu\text{eq/L}$ . Table F.2-1 showed that the discrepancy between  $BC_0$  and  $BC_T$  over the 50 lakes was relatively small. The mean discrepancy between the calculated original base cation concentration and measured base cation concentration is 7.2%. The largest discrepancies were found in four lakes located in the Birch Mountains subregion (lakes 454/BM8, 455/BM4, 457/BM5, 436/BM2). When these four lakes were eliminated, the mean discrepancy between the two estimates was 4.7%. The four lakes in the Birch Mountains subregion were relatively high in sulphate. The high sulphate levels in these lakes are likely natural in origin rather than from acid deposition given that the Birch Mountains subregion is remote from major sources of acidic emission. The assumption of using the current base cation concentrations for the original base cation concentrations appears to be 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 levels in the oil sands region have 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.**

Lake	AESRD Name	S	SO <sub>4</sub> (mg/L)	SO <sub>4</sub> (µeq/L)	F	BC <sub>T</sub> ueq/L	BC <sub>0</sub> (µeq/L)	% Difference
168	SM 10	400	1.01	21.0	0.459	121	113	7.2
169	SM9	400	0.56	11.7	0.330	85.6	82	3.7
170	SM 6	400	0.92	19.2	0.409	107.3	100	6.5
167	SM5	400	0.69	14.4	0.478	127	121	4.6
166	SM 7	400	1.45	30.2	0.902	286	261	8.9
287	SM 8	400	1.02	21.3	0.315	81.5	75	7.4
289	SM3	400	0.69	14.4	0.625	172	164	4.5
290	SM4	400	0.58	12.1	0.584	159	153	3.7
342	SM 2	400	0.02	0.4	0.940	311	313	-0.5
354	SM 1	400	0.11	2.29	1	470	470	0.0
165	WF 1	400	0.43	9.0	1	593	586	1.2
171	WF 2	400	1.31	27.3	1	408	383	6.2
172	WF 3	400	1.74	36.3	0.781	228	202	11.7
223	WF4	400	14.28	297.5	1	1543	1247	19.1
225	WF5	400	1.07	22.3	1	1246	1226	1.6
226	WF6	400	0.84	17.5	1	598	583	2.6
227	WF7	400	0.68	14.2	1	1212	1200	1.0
267	WF8	400	0.21	4.4	1	1078	1076	0.2
452	NE1	400	0.86	17.9	0.994	373	357	4.2
470	NE2	400	0.73	15.2	1.000	509	496	2.6
471	NE3	400	1.36	28.3	1	689	663	3.8
400	NE4	400	1.59	33.1	0.986	357	326	8.6
268	NE5	400	0.10	2.1	1	726	726	0.0
182	NE6	400	0.17	3.5	1	1515	1513	0.1
185	NE7	400	0.77	16.0	0.992	368	354	3.8
209	NE8	400	0.34	7.1	1.000	535	530	0.9
270	NE9	400	0.26	5.4	1	1545	1541	0.2
271	NE10	400	0.02	0.4	1	1569	1571	-0.1
418	NE11	400	1.65	34.4	1	2411	2379	1.3
436	BM 2	400	7.75	161.5	1	701	542	22.7
442	BM 9	400	1.06	22.1	0.882	275	258	6.4
444	BM 1	400	2.78	57.9	0.985	356	301	15.5
447	BM 6	400	1.20	25.0	0.813	242	223	7.7
448	BM 7	400	0.10	2.1	0.168	43.1	43	0.0
454	BM 8	400	9.99	208.1	1	636	430	32.4
455	BM 4	400	12.81	266.9	1	709	444	37.3
457	BM 5	400	14.96	311.7	1	624	314	49.6
464	BM 3	400	5.11	106.5	1	809	705	12.9
175	BM10	400	1.82	37.9	1	1430	1395	2.5
199	BM11	400	1.50	31.3	1.000	1453	1423	2.0
473	S4	400	1.63	34.0	1	706	674	4.5
118	S1	400	1.07	22.3	1	670	650	3.0
84	S2	400	0.56	11.7	1	727	717	1.3
88	S5	400	0.82	17.1	1	462	447	3.2
90	S3	400	0.68	14.2	1	525	513	2.3
146	CM1	400	4.46	92.9	1	954	863	9.5
152	CM2	400	1.79	37.3	0.974	341	307	10.0
89	CM3	400	1.50	31.3	1.000	451	421	6.5
97	CM4	400	1.28	26.7	1.000	416	392	5.9
91	CM5	400	2.78	57.9	1.000	549	493	10.2

BC<sub>T</sub> : current base cation concentration; BC<sub>0</sub>: original base cation concentration.

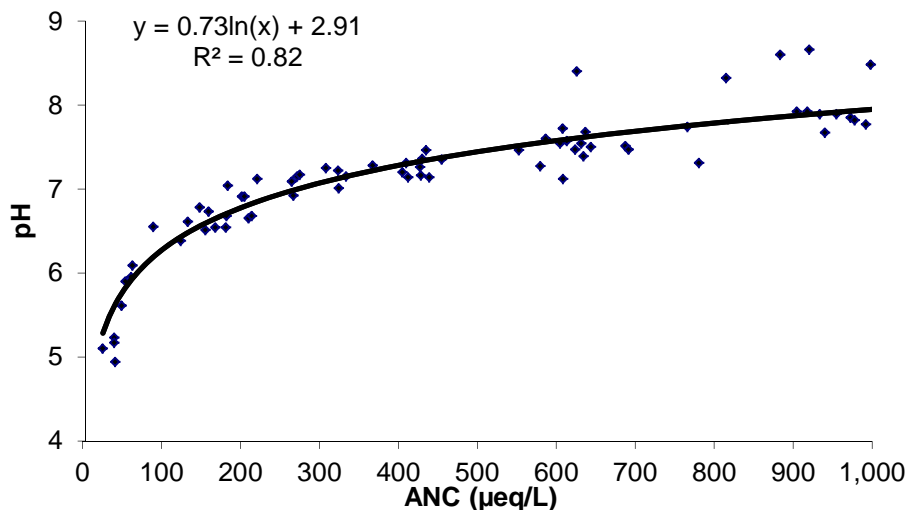
### F.3 ORIGIN OF THE USE OF $ANC_{LIM} = 75 \mu\text{EQ/L}$ IN THE CRITICAL LOAD CALCULATIONS

The limiting critical load ( $ANC_{lim}$ ) of  $75 \mu\text{eq/L}$  used in calculating the critical loads was derived in a study by WRS (2001) from regional data from 180 lakes and relates to Environment Canada's assumption that a  $\text{pH} > 6$  is required to maintain a healthy aquatic ecosystem.

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 (alkalinity) 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 and 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  $ANC_{lim}$  (WRS 2001). 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 over the given population of 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 2012 TO REGIONAL LAKES

In order to determine how representative the RAMP lakes are of regional lake chemistry, water chemistry in 2012 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 box plots (Figure F.4-1). Key results are as follows:

- The RAMP lakes covered a slightly narrower pH range (4.47 to 8.73), with a lower median value (7.24 vs. 7.70). 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 0 µeq/L to 2,032 µeq/L, with a median of 292 µeq/L, which was much lower than the regional median of 1,020 µeq/L. The median total alkalinity across the RAMP lakes in 2012 was significantly lower than that in the NSMWG database ( $p < 0.05$ );
- Conductivity was relatively low in the RAMP lakes and ranged from 10.3 µS/cm to 196 µS/cm (median: 38.8 µS/cm). The median conductivity in the regional database was 125 µS/cm. The median conductivity of the RAMP lakes in 2012 was significantly lower than that of the regional lakes ( $p < 0.05$ );
- Consistent with the 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 in the NSMWG database. Median SBC in the RAMP lakes in 2012 was 530 µeq/L compared to 1,247 µeq/L in the regional lakes. The median values of these measurement endpoints were all significantly less in the RAMP lakes ( $p < 0.05$ );
- The mean and median concentrations of the major anions (chloride, sulphate, and titration bicarbonate) were all less than those in the regional database;
- Total phosphorus was quite variable in the RAMP and regional lake databases, 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 2012 was 246 µg/L in Lake 175/BM 10 in the Birch Mountains subregion. The highest phosphorus concentration in the regional lake database was 495 µg/L. The median concentration of phosphorus in the RAMP lakes was 35 µg/L compared to 49 µg/L in the regional lakes database. There was no significant difference in the median concentration of total phosphorus between the RAMP lakes in 2012 and the regional lakes ( $p > 0.05$ );
- Concentrations of nitrate in the RAMP lakes were generally low (median: 4 µg/L), although several lakes had values an order of magnitude greater than the median (e.g., 79 µg/L in Lake 457/BM 5 in the Birch Mountains subregion). Concentrations of nitrate in the regional lakes database were similarly variable with a median of 2 µg/L, and some lakes having concentrations as high as 1,860 µg/L. There was no significant difference in the median concentration of nitrate between the RAMP lakes in 2012 and the regional database ( $p > 0.05$ ); and
- There was no significant difference between the median concentration of total dissolved nitrogen between the RAMP lakes in 2012 and the regional database ( $p > 0.05$ ).

The chemical differences between the RAMP lakes and the regional lakes reflect 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 2012 and 450 regional lakes in the NSMWG database.**

Variable	Units	RAMP Lakes (2012)				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		0.220	88.6	10.1	15.7	431	1.43	1178	13.0	26.2
Runoff	m <sup>3</sup> /s	0.00	8.57	0.04	0.300	432	0.00	5.00	0.04	0.258
Lab pH		4.47	8.73	7.24	7.02	432	4.20	10.0	7.70	7.66
Total Alkalinity	µeq/L	0	2032	292	434	432	0.00	4797	1020	1241
Specific Conductivity	µS/cm	10.3	196	38.8	53.3	399	11.0	481	125	144
Dissolved Organic Carbon	mg/L	6.9	92.2	23.1	27.4	383	0.2	60.0	19.4	20.4
Sodium	mg/L	0.18	12.35	1.06	1.98	432	0.28	49.0	2.00	4.07
Potassium	mg/L	0.110	2.45	0.59	0.63	432	0.05	14.0	0.62	0.94
Calcium	mg/L	0.35	22.7	5.86	7.03	432	0.25	64.0	14.3	17.0
Magnesium	mg/L	0.16	8.81	1.98	2.4	432	0.05	28.0	4.3	5.34
Sum of Base Cations	µeq/L	43	2411	530	650	432	46.0	5770	1247	1487
Chloride	mg/L	0.05	2.59	0.14	0.32	429	0.01	18.0	0.490	1.09
Sulphate	mg/L	0.020	15.0	1.04	2.22	431	0.025	99.0	2.50	6.73
Nitrate + Nitrite	µg/L	0.5	79	4	7.72	445	0.02	1860	2.00	21.0
Ammonia	µg/L	1	86	7	15.8	320	0.22	650	11.4	31.8
Total Dissolved Nitrogen	µg/L	108	2070	708	759	292	183	1904	861	869
Total Phosphorus	µg/L	5	246	35	54.9	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).



**Figure F.4-1** Box plots of selected chemical variables for the RAMP lakes in 2012 versus 432 regional lakes reported by the NSMWG (WRS 2004).

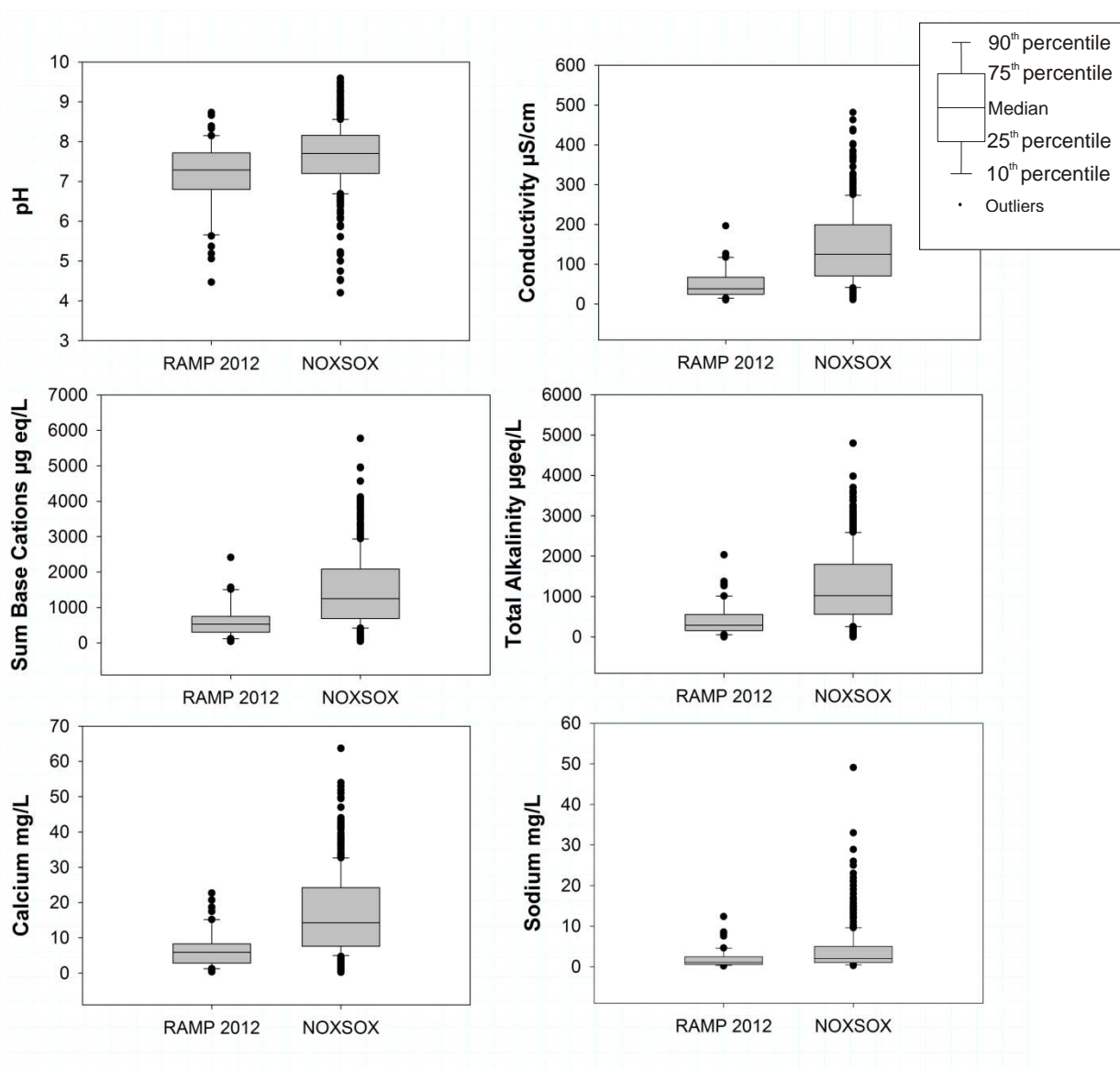
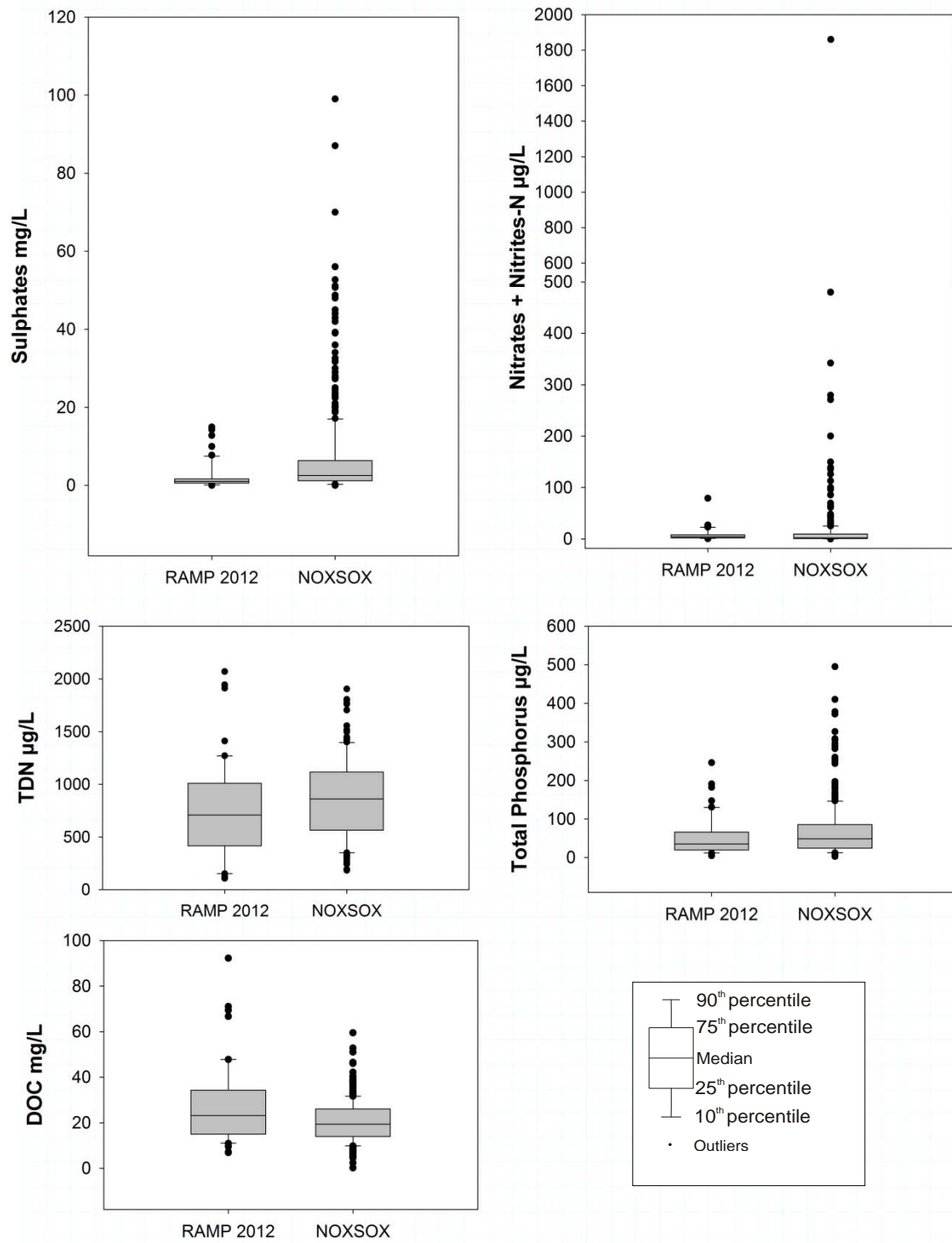


Figure F.4-1 (Cont'd.)



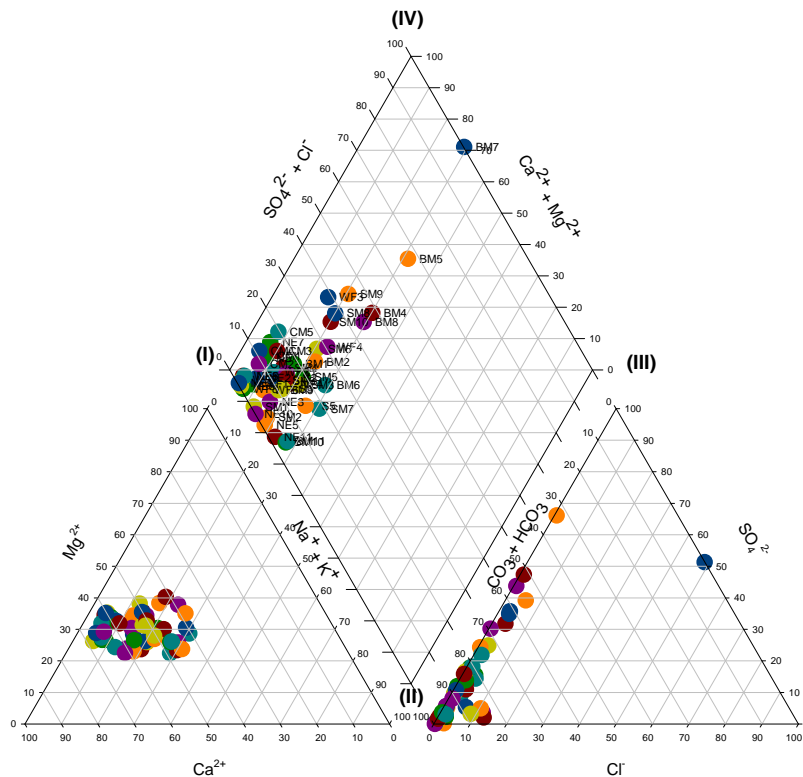
## F.5 CHARACTERIZATION OF ION CHEMISTRY IN THE RAMP LAKES

In order to characterize water in 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  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ .

In 2012, the Piper diagrams showed that the majority of the lakes were of the Ca-Mg-Bicarbonate type (Type I). In 2012, eight lakes had greater than 35% of the anion charge attributable to sulphate and chloride rather than bicarbonates and carbonates, and tended towards the Type IV water type (Table F.5-1). Most of these lakes are found in the Birch Mountains and Stony Mountains subregions and are larger than the median lake area (1.32 km<sup>2</sup>), but low in Gran alkalinity (poorly buffered). Three lakes, located in the Birch Mountains and Stony Mountains subregions in 2012 had at least 30% of the cationic charge attributable to sodium and potassium (Table F.5-2).

**Figure F.5-1 Piper plots showing the proportion of major cations and anions in the 2012 RAMP ASL lakes.**



**Table F.5-1 Key chemical characteristics of RAMP lakes with greater than 35% of anion charge attributable to sulphate and chloride.**

Lake	AESRD Name	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km <sup>2</sup> )
<b>Stony Mountains Subregion</b>						
168	SM 10	5.01	14.4	14.9	19.9	1.38
169	SM 9	4.66	2.0	16.1	20.9	1.45
287	SM 8	5.06	6.2	11.5	13.3	2.18
<b>West of Fort McMurray</b>						
172	WF 3	5.19	33.2	19.95	28.4	2.06
<b>Birch Mountains Subregion</b>						
448	BM 7	4.47	2.0	16.1	34.3	0.65
454	BM 8	7.15	242.0	53.9	24.8	1.20
455	BM 4	7.05	262.0	61.7	19.7	4.37
457	BM 5	6.75	124.0	60.8	23.0	2.61

**Table F.5-2 Key chemical characteristics of RAMP lakes with at least 30% of cation charge attributable 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>Birch Mountains Subregion</b>						
457	BM 5	6.75	124	60.8	23.0	2.61
455	BM4	7.05	262	61.7	19.7	4.37
<b>Stony Mountains Subregion</b>						
88	SM7	7.00	141	24.9	12.6	1.44

## F.6 ANALYSIS OF METALS IN THE RAMP LAKES

Elevated metals concentrations, in particular aluminum, have served as important indicators of lake acidification. Concentrations of metals in the RAMP lakes for the past ten years are in the RAMP database and summarized in Table F.6-1 and Table F.6-2 for the total and dissolved fractions, respectively. Table F.6-3 presents the mean concentration of each trace metal for the 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 the upland regions, particularly in the Birch Mountains and the Stony Mountains subregions. In the Birch Mountains, 50 individual metals in 11 lakes had mean concentrations greater than the 95<sup>th</sup> percentile for all lakes (Table F.6-3). The regional distribution of dissolved aluminum, iron, and cobalt in the RAMP lakes clearly showed the higher concentrations of trace metals were found in these upland regions in 2012 (Figure F.6-1 to Figure F.6-3). The lakes with the highest concentrations of metals included those identified in the Piper plots as having more than 40% of the anionic charge attributable to chloride and sulphate rather than bicarbonates (Figure F.5-1, Table F.5-1). Concentrations of mercury in 2012 were low and ranged from 0.000326 µg/L to 0.00607 µg/L, with a median concentration of 0.0018 µg/L. The highest concentrations of mercury were found in the Birch Mountain subregion.

The reasons for the higher concentrations of metals in the upland regions, especially the Birch Mountains, are 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 the Birch Mountain lakes 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, Mann-Kendall trend analysis was conducted on dissolved aluminum, cadmium, cobalt, iron, and lead in all 50 lakes from 2003 to 2012. Significant increases in iron were detected in Lake 91/CM5, located in the Caribou Mountains subregion and aluminum in Lakes 557/BM5 and 452 NE1, located in the Birch Mountains subregion and northeast of Fort McMurray, respectively (Figure F.6-4). Of the three lakes, only iron in Lake 91/CM5 showed a true increasing trend. Given that this lake is located in the remote Caribou Mountains subregion and considered a *baseline* lake, this increase cannot be attributed to acidification from oil sands emissions. There is no evidence to date that metals are increasing in the RAMP lakes.

The number of exceedances of CCME Surface Water Quality Guidelines for the protection of aquatic life in 2012 and the associated lakes are provided in Table F.6-5. Exceedances were observed for aluminum, iron, cadmium, copper, and lead. The guideline exceedances were scattered throughout the various subregions, with a large number from lakes in the Birch Mountains subregion, which was consistent with the high concentrations of metals found in this subregion. Concentrations of mercury did not exceed the CCME guideline; however, three lakes (Lakes 457/BM5 and 447/BM6 in the Birch Mountains and in Lake 165/WF1 from West of Fort McMurray) exceeded the more conservative Alberta surface water quality guideline for mercury. Concentrations of cadmium exceeded the water quality guideline in ten 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.

**Table F.6-1 Statistical summary of total trace metals in the RAMP lakes, 2001 to 2012.**

Metal (µg/L)	All Years (2001 to 2012)						2012					
	Maximum	Minimum	Mean	Median	95 <sup>th</sup> %tile	N	Maximum	Minimum	Mean	Median	95 <sup>th</sup> %tile	% Non-Detects
Ag	0.103	0.00025	0.00573	0.0025	0.0217	519	0.0118	0.00025	0.00282	0.0018	0.00863	18
Al	8690	0.25	192	63.4	717	519	1010	6.33	112	59.7	386	0
As	2.9	0.13	0.513	0.395	1.26	518	1.98	0.163	0.563	0.402	1.47	0
Ba	83.2	1.24	14.8	11.9	34.7	519	54.7	2.76	15.6	12.3	35.8	0
Be	55.7	0.0015	1.17	0.0129	8.1	519	0.0997	0.0015	0.0164	0.0115	0.0408	18
Bi	0.359	0.0005	0.00644	0.0028	0.0199	519	0.0108	0.0005	0.000806	0.0005	0.0005	96
B	71.2	0.0005	11.9	8.1	32.3	519	71.2	6.36	22.3	20.5	53.1	0
Cd	9.94	0.001	0.0383	0.01	0.0631	519	0.0844	0.001	0.014	0.0067	0.0511	6
Co	2.2	0.0005	0.165	0.0877	0.521	519	0.816	0.0005	0.167	0.0829	0.512	2
Cr	7.3	0.015	0.396	0.24	1.36	519	2	0.0779	0.311	0.229	0.811	0
Cu	16.7	0.025	0.638	0.343	1.89	519	2.34	0.183	0.678	0.599	1.54	0
Fe	6530	2.37	624	369	2250	519	3710	4	693	463	2490	0
Hg	1.22	0.000326	0.0128	0.005	0.012	168	0.00607	0.000326	0.00226	0.0018	0.00534	0
Li	16.9	0.01	2.63	1.78	8.26	519	12.2	0.244	2.95	1.86	9.17	0
Mn	260	3.24	43.5	30.4	123	519	152	6.79	51	42.4	126	0
Mo	1.1	0.0005	0.12	0.0854	0.371	519	0.556	0.0005	0.108	0.0736	0.371	2
Ni	46	0.0025	0.733	0.296	3.21	519	4.57	0.0025	0.517	0.16	2.4	32
Pb	95.3	0.0005	0.399	0.124	0.694	519	0.73	0.0005	0.104	0.0545	0.348	4
Sb	0.2	0.002	0.029	0.02	0.0865	519	0.147	0.0032	0.0248	0.016	0.0779	0
Se	0.9	0.02	0.118	0.05	0.25	519	0.26	0.05	0.0661	0.05	0.143	82
Sn	3.02	0.015	0.0933	0.015	0.105	519	0.0452	0.015	0.019	0.015	0.0375	82
Sr	109	3	24.1	19.3	58.7	519	85.1	2.55	27.9	23.5	66.3	0
Th	0.72	0.00015	0.0327	0.0103	0.136	519	0.236	0.00015	0.0145	0.00015	0.0788	80
Ti	79	0.1	3.02	1.1	13	519	19.3	0.166	1.94	1.16	5.58	0
Tl	0.077	0.00015	0.00383	0.0021	0.0128	519	0.0247	0.00015	0.00322	0.00215	0.00893	22
U	0.432	0.0004	0.042	0.0141	0.175	519	0.348	0.0014	0.0361	0.014	0.132	0
V	15.5	0.0025	0.767	0.369	3.05	519	5.75	0.041	0.607	0.354	1.88	0
Zn	34.4	0.131	3.59	2.71	9.02	519	23.4	0.303	2.83	1.45	6.7	0

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 2012.**

Metal (µg/L)	2003 to 2012						2012					
	Maximum	Minimum	Mean	Median	95 <sup>th</sup> %tile	N	Maximum	Minimum	Mean	Median	95 <sup>th</sup> %tile	% Non-Detects
Ag	0.102	0.00025	0.00269	0.00025	0.00963	416	0.0109	0.00025	0.00149	0.00025	0.00644	52
Al	734	0.1	70.4	23.8	329	416	646	0.378	63.2	14.7	225	0
As	2	0.08	0.438	0.338	1.06	416	1.7	0.131	0.484	0.358	1.21	0
Ba	41	0.754	11.4	9.69	25.1	416	41	0.754	12.5	10.2	28.2	8.5
Be	0.3	0.0015	0.0149	0.00715	0.0551	416	0.093	0.0015	0.0123	0.0086	0.0333	32
Bi	0.053	0.0005	0.00404	0.0023	0.0132	416	0.0107	0.0005	0.00075	0.0005	0.0005	96
B	62.3	1.8	11	7.12	27.6	416	52.9	2.8	12.1	7.66	36.1	0
Cd	5.82	0.001	0.0257	0.00525	0.0396	416	0.0483	0.001	0.00809	0.00275	0.027	28
Co	1.27	0.0005	0.111	0.0414	0.43	416	0.534	0.0005	0.113	0.0382	0.46	6
Cr	1.88	0.02	0.235	0.171	0.662	416	1.37	0.077	0.249	0.194	0.576	0
Cu	2.13	0.005	0.422	0.277	1.34	416	1.71	0.0828	0.384	0.293	1.1	0
Fe	3130	0.01	375	116	1630	416	2840	1	423	116	1860	14
Li	16.4	0.01	2.46	1.58	7.88	372	12	0.23	2.85	1.66	8.92	0
Mn	248	0.07	17.5	3.3	73.7	416	119	0.076	19.3	2.11	79.1	0
Mo	1.43	0.0005	0.101	0.0682	0.327	416	0.55	0.0005	0.0945	0.0609	0.357	6
Ni	4.01	0.0025	0.486	0.198	2.56	416	4.01	0.0025	0.418	0.0759	2.17	30
Pb	16.3	0.0005	0.137	0.0449	0.39	416	0.562	0.0005	0.0596	0.0102	0.271	26
Sb	0.179	0.002	0.0279	0.0192	0.0815	416	0.145	0.0031	0.0245	0.0158	0.077	0
Se	0.9	0.005	0.0898	0.05	0.25	416	0.218	0.05	0.056	0.05	0.05	96
Sn	0.065	0.015	0.0205	0.015	0.05	416	0.0447	0.015	0.0166	0.015	0.0309	92
Sr	101	2.32	22.8	18.1	55.9	416	81.4	2.32	26.6	22.7	65.4	0
Th	0.438	0.00015	0.0264	0.0095	0.119	416	0.233	0.00015	0.0148	0.00015	0.0779	74
Ti	15.9	0.02	1.24	0.471	5.95	416	15.9	0.02	1.27	0.514	4.66	2
Tl	0.043	0.00015	0.00277	0.0017	0.008	416	0.0145	0.00015	0.00218	0.0014	0.00604	30
U	0.365	0.0002	0.03	0.0087	0.127	416	0.301	0.0011	0.0298	0.0086	0.12	0
V	3.94	0.011	0.387	0.202	1.5	416	3.94	0.0298	0.374	0.179	1.09	0
Zn	29.5	0.13	2.8	2.18	6.75	416	7.19	0.207	2.03	1.21	5.25	0

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 2012.**

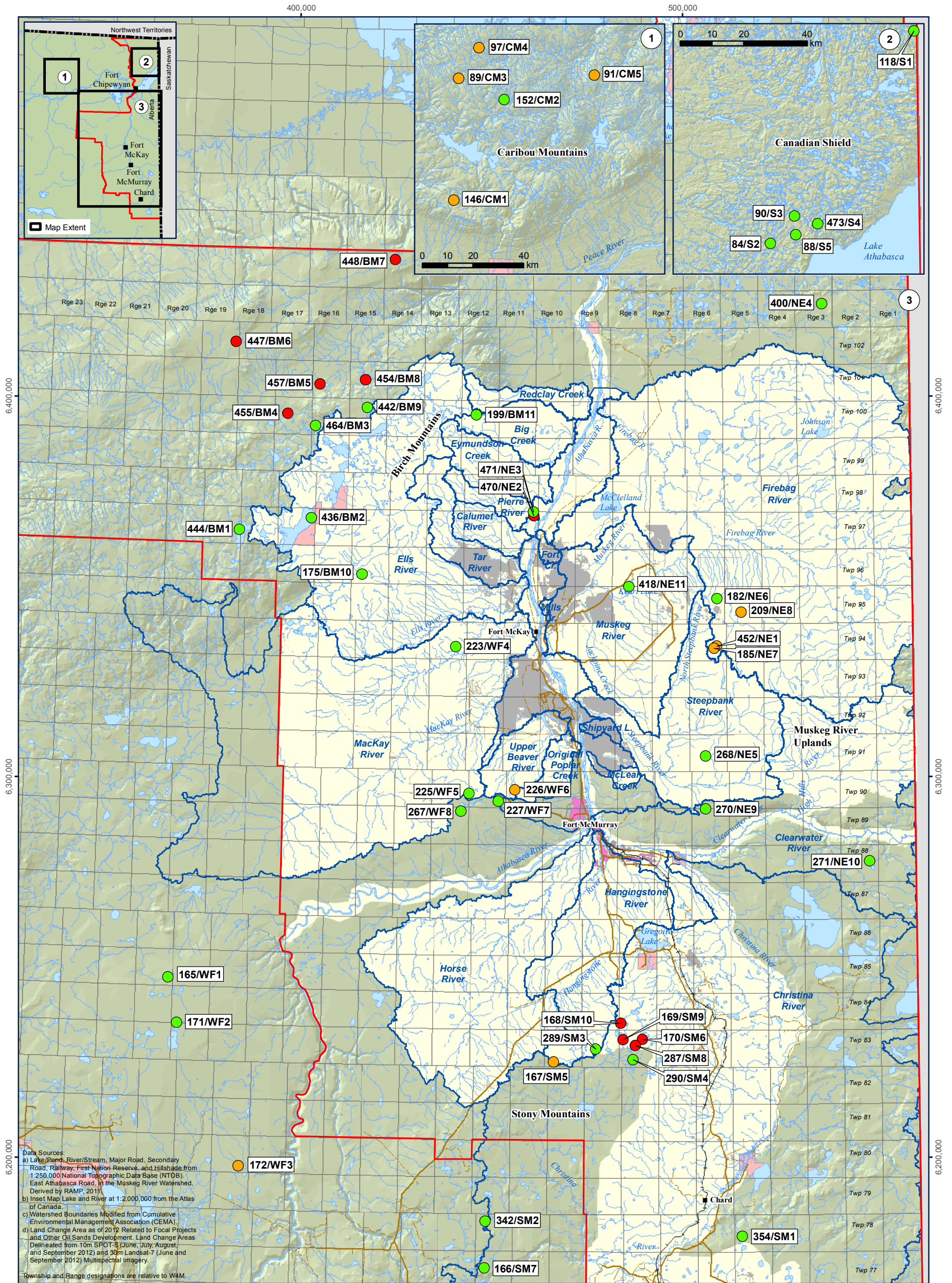
Metal	Mean Concentrations µg/L - Dissolved Metals						Mean Concentrations µg/L - Total Metals					
	SM	WFM	NEFM	BM	CS	CM	SM	WFM	NEFM	BM	CS	CM
Ag	0.00141	0.00239	0.0012	0.00487	0.00424	0.00263	0.00483	0.00515	0.00458	0.00858	0.00466	0.00539
Al	78.5	17.6	34.8	156	15.7	62.1	247	47.5	63.1	449	37.4	143
As	0.334	0.336	0.393	0.723	0.182	0.497	0.393	0.398	0.429	0.873	0.199	0.593
Ba	7.77	9.69	10.5	17.4	6	15.4	9.94	14.1	13.2	23	7.22	17.8
B	6.45	12.6	11.3	18.2	5.87	5.3	7.26	14.6	12.1	18.4	7.31	6.61
Be	0.0159	0.00505	0.00805	0.0269	0.0158	0.0137	0.737	1.49	1.32	1.69	0.644	0.587
Bi	0.00465	0.00317	0.00349	0.00502	0.00225	0.00457	0.00678	0.00522	0.00678	0.00865	0.00276	0.00551
Cd	0.0163	0.0103	0.0732	0.0171	0.00362	0.00922	0.0244	0.0187	0.102	0.0265	0.00655	0.0177
Co	0.162	0.044	0.0656	0.207	0.0155	0.0599	0.22	0.0833	0.0982	0.31	0.0376	0.121
Cr	0.215	0.149	0.188	0.362	0.204	0.242	0.333	0.203	0.271	0.777	0.242	0.361
Cu	0.362	0.204	0.246	0.705	0.35	0.682	0.566	0.514	0.497	0.902	0.4	0.898
Fe	276	102	209	845	149	483	446	286	438	1260	329	734
Hg							0.00412	0.00432	0.0366	0.00432	0.00384	0.0138
Li	0.804	2.72	2.13	5.13	1.09	1.57	0.861	2.92	2.1	5.46	1.31	1.71
Mn	27.3	18.3	12.9	23	1.65	6.32	42.6	65.8	45.4	47.5	25.1	17.4
Mo	0.0925	0.0405	0.0433	0.176	0.145	0.122	0.101	0.0594	0.0609	0.196	0.176	0.142
Ni	0.325	0.118	0.142	1.29	0.109	0.63	0.906	0.242	0.212	1.64	0.139	0.777
Pb	0.0987	0.0632	0.23	0.193	0.0281	0.104	0.203	0.148	0.995	0.369	0.159	0.198
Sb	0.022	0.019	0.0168	0.0544	0.0112	0.032	0.0229	0.0204	0.0173	0.0572	0.0113	0.0324
Se	0.0848	0.0747	0.0761	0.119	0.0971	0.0787	0.111	0.094	0.101	0.158	0.118	0.108
Sn	0.0191	0.0195	0.0213	0.0208	0.0217	0.0215	0.0784	0.0239	0.0552	0.127	0.151	0.172
Sr	9.02	33.2	25.4	27.5	30.6	13	9.66	35.2	25.7	29.1	32.2	13.6
Th	0.0201	0.00592	0.00917	0.063	0.0149	0.0347	0.0238	0.00966	0.0104	0.0833	0.015	0.0347
Ti	1.05	0.371	0.525	3.08	0.411	1	2.66	1.08	1.17	7.6	0.833	2.35
Tl	0.00421	0.00147	0.0016	0.00362	0.00276	0.00217	0.00469	0.00232	0.00167	0.00722	0.00222	0.00289
U	0.0123	0.00476	0.00576	0.0464	0.104	0.0544	0.0208	0.0084	0.00821	0.064	0.134	0.0648
V	0.335	0.194	0.297	0.802	0.0907	0.299	0.631	0.356	0.482	1.76	0.171	0.589
Zn	3.25	2.51	2.37	3.89	0.845	2.41	3.93	3.02	3.39	5.04	1.14	3.29

SM = Stony Mountains, WFM = west of Fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains  
 For purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.



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Figure F.6-1 Concentrations of dissolved aluminum in the RAMP lakes, 2012.



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 Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

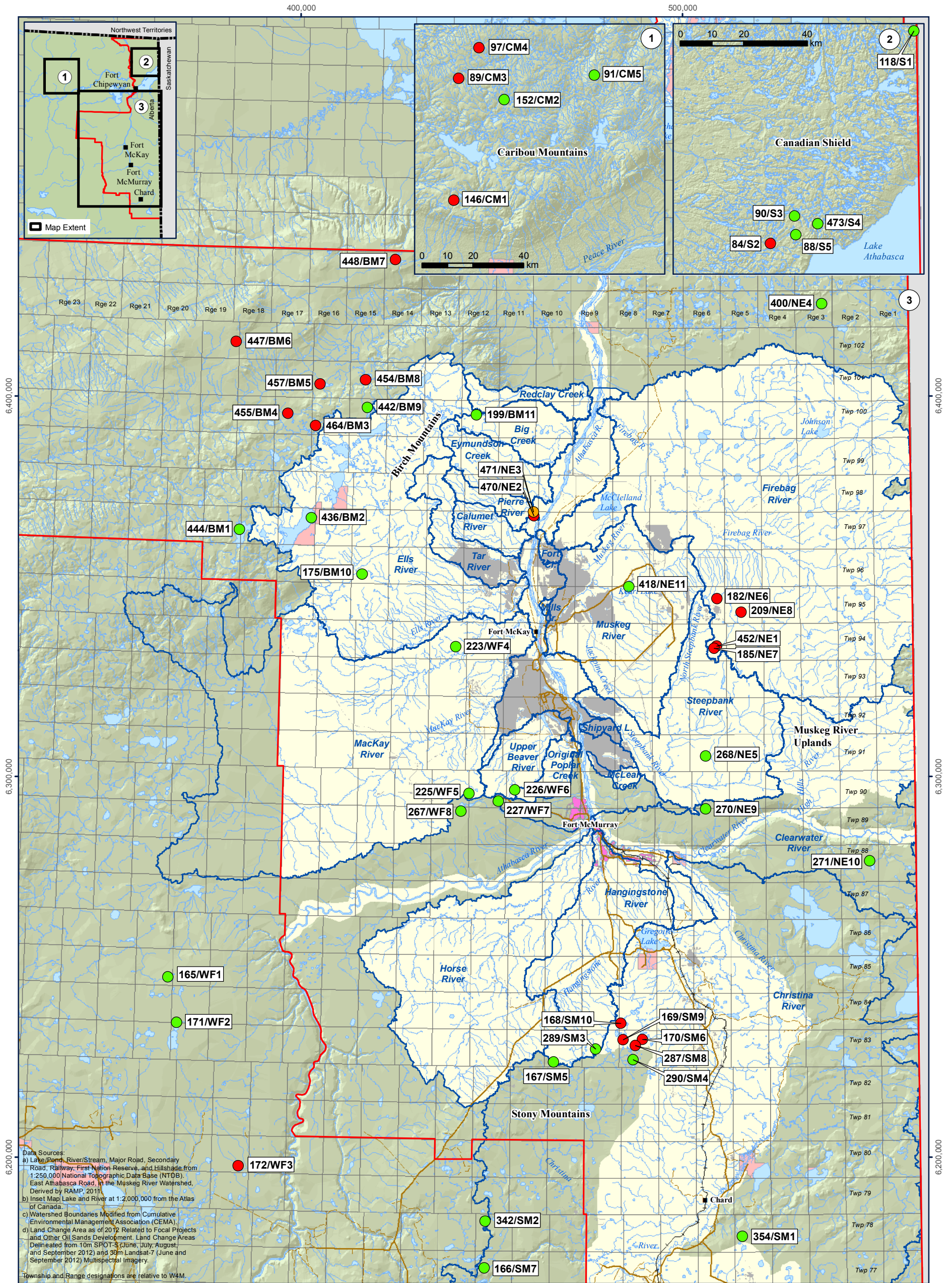
- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - RAMP Regional Study Area Boundary
  - RAMP Focus Study Area
  - Town of Fort McMurray
  - Land Change Area as of 2012<sup>d</sup>

- 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, 2012.



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 Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) Multispectral Imagery.

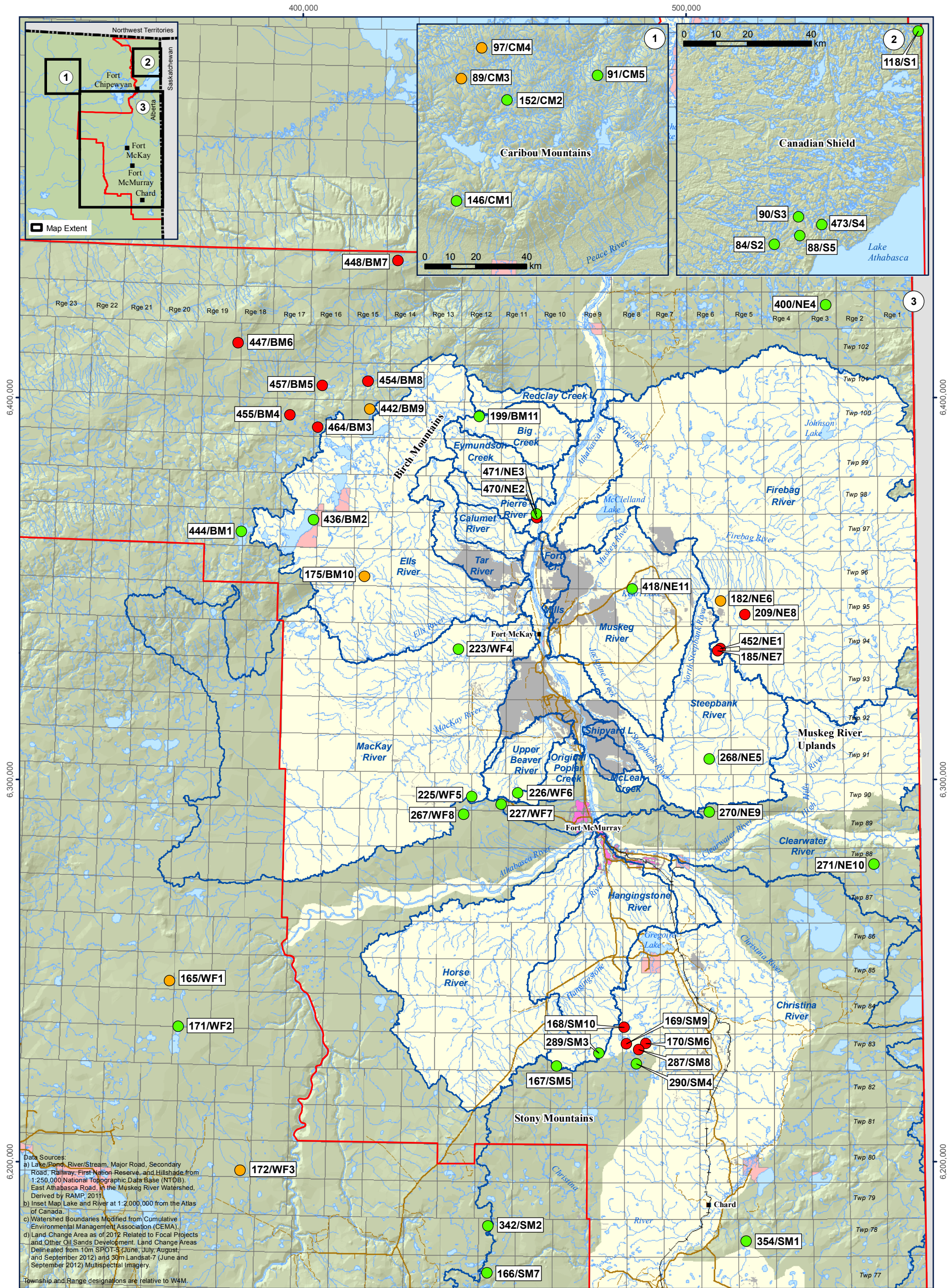
- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - RAMP Regional Study Area Boundary
  - RAMP Focus Study Area
  - Town of Fort McMurray
  - Land Change Area as of 2012<sup>d</sup>

- Dissolved Iron Concentration**
- Low (< 199 µg/L)
  - Medium (200 to 399 µg/L)
  - High (≥ 400 µg/L)

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, 2012.



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 Modified from Cumulative Environmental Management Association (CEMA).  
 d) Land Change Area as of 2012 Related to Focal Projects and Other Oil Sands Development. Land Change Areas Delineated from 10m SPOT-5 (June, July, August, and September 2012) and 30m Landsat-7 (June and September 2012) 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 2012<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



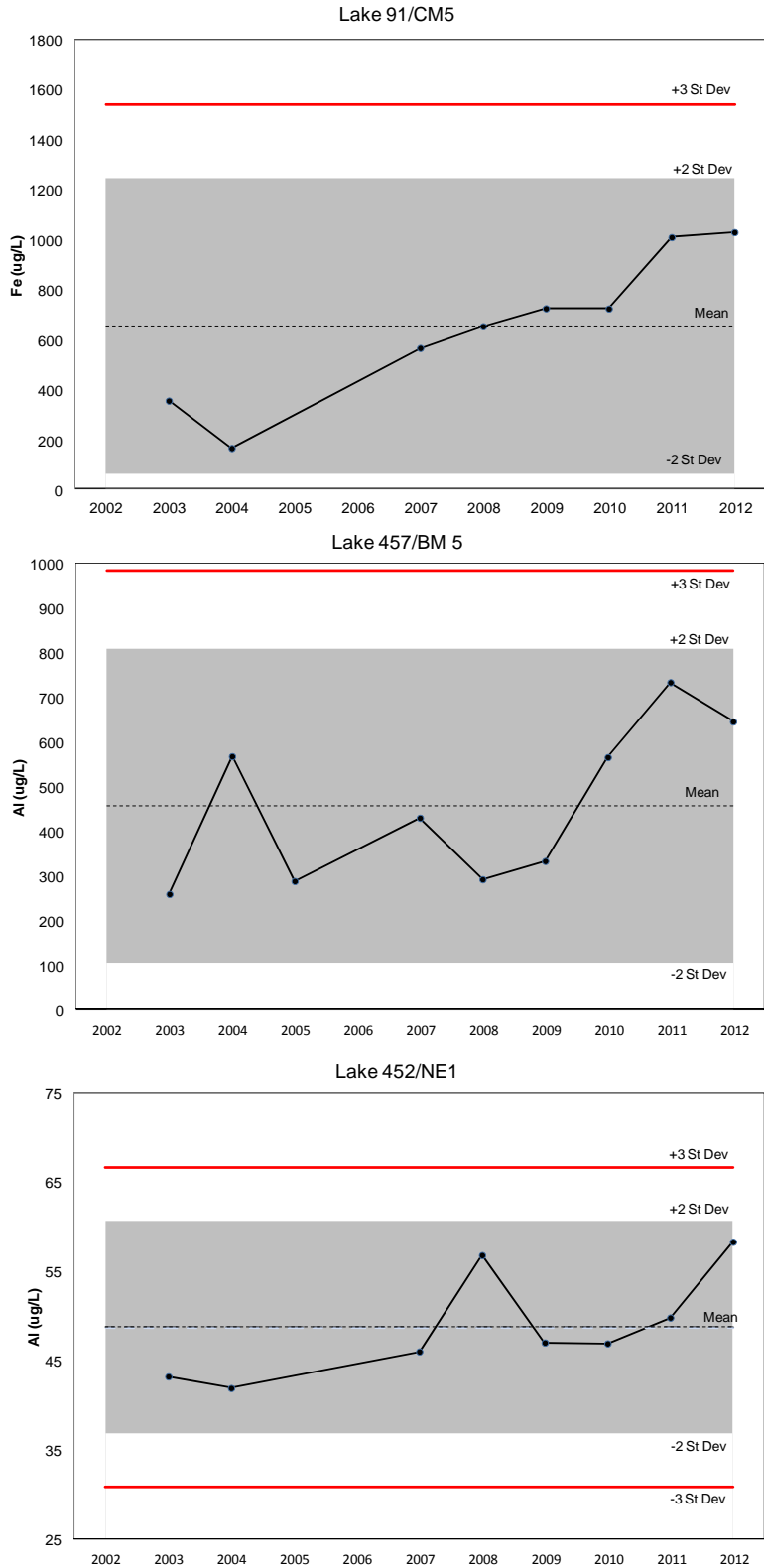
**Table F.6-4 Number of lakes in each subregion with mean individual trace metal concentrations greater than the 95<sup>th</sup> percentile.**

Subregion	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 in Subregion (2012)
Stony Mountains	10	7	0.70	6.03
West of Fort McMurray	8	2	0.25	7.20
Northeast of Fort McMurray	11	6	0.55	7.37
Birch Mountains	11	50	4.55	7.08
Canadian Shield	5	2	0.40	7.62
Caribou Mountains	5	2	0.40	7.23
<b>Total</b>	<b>50</b>	<b>69</b>		<b>42.51</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.

**Figure F.6-4 Control charts for three of the RAMP lakes with significant increases in concentrations of metals from 2003 to 2012.**



**Table F.6-5 RAMP lakes with exceedances of CCME surface water quality guidelines for metals in 2012.**

<b>Metal</b>	<b>Number of Exceedances</b>	<b>Lakes with Exceedances</b>
Al	17	89, 91, 165, 167, 168, 169, 170, 209, 287, 400, 444, 447, 448, 454, 455, 457, 470
Fe	32	84, 88, 89, 91, 97, 146, 152, 165, 167, 168, 169, 170, 172, 175, 182, 185, 199, 209, 268, 271, 287, 400, 444, 447, 448, 452, 454, 455, 457, 464, 470, 471
Cd	32	88, 89, 91, 97, 146, 152, 165, 167, 168, 169, 170, 171, 172, 185, 199, 209, 223, 267, 287, 289, 290, 342, 418, 444, 447, 448, 452, 454, 455, 457, 464, 470
Cu	1	457
Pb	1	457
Hg	3	457 <sup>1</sup> , 447 <sup>1</sup> , 165 <sup>1</sup>

<sup>1</sup> Mercury values exceeded the Alberta surface water quality guideline (0.005 µg/L).

## F.7 SPRING ACID PULSE STUDY

Detailed water quality results from the spring acid pulse sampling study on Rat Lake in 2012 are provided in Table F.7-1 and Table F.7-2. Historical water quality data from spring and fall sampling of Rat Lake in 2009 (Hatfield 2010) are provided in Table F.7-3.

**Table F.7-1 Analytical water quality results of grab samples from Rat Lake, 2012.**

Variable	Units	5-Mar-12	17-Apr-12	27-Apr-12	2-May-12	9-May-12	15-May-12	25-May-12
<b>Conventional Variables</b>								
Alkalinity (Total as CaCO <sub>3</sub> )	mg/L	160	61	65	48	84	88	89
Gran alkalinity	mg/L	158.88	59.26	68.79	48.97	82.23	85.36	87.15
Gran alkalinity 2	µeq/L	3177.6	1185.2	1375.8	979.4	1644.6	1707.2	1743.0
Conductivity	µS/cm	320	140	160	120	180	190	190
Dissolved Organic Carbon	mg/L	25	14	17	15	17	18	18
Hardness (as CaCO <sub>3</sub> )	mg/L	150	62	71	50	81	89	87
pH	-	7.65	7.92	7.97	7.77	7.90	8.10	7.96
Total Dissolved Solids	mg/L	170	69	76	57	90	96	96
<b>Major Ions</b>								
Bicarbonate (HCO <sub>3</sub> )	mg/L	190	74	79	59	100	110	110
Calcium	mg/L	40	17	19	13	22	24	24
Chloride	mg/L	4.7	3.2	4.0	3.1	3.3	2.9	2.6
Magnesium	mg/L	11.0	5.0	5.8	4.2	6.4	6.8	6.7
Potassium	mg/L	2.8	2.5	3.1	2.8	2.3	2.4	2.4
Sodium	mg/L	11.0	5.0	5.8	4.6	6.1	7.0	7.1
Sulphate	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
<b>Nutrients</b>								
Nitrate + Nitrite	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
<b>Dissolved Metals</b>								
Aluminum	µg/L	2.80	1.99	1.30	2.12	1.85	1.32	0.92
Antimony	µg/L	0.040	<0.020	0.024	<0.020	0.024	0.021	0.026
Arsenic	µg/L	0.430	0.247	0.320	0.199	0.268	0.258	0.290
Barium	µg/L	34.5	10.9	13.0	8.9	15.3	15.7	16.7
Beryllium	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	µg/L	<50	<50	<50	<50	<50	<50	<50
Cadmium	µg/L	<0.0050	0.0058	0.008	<0.0050	<0.0050	<0.0050	0.0128
Calcium	mg/L	36.4	14.7	18.8	12.3	21.4	22.4	22.4
Chromium	µg/L	0.20	<0.10	0.31	<0.10	<0.10	<0.10	<0.10
Cobalt	µg/L	0.053	0.037	0.041	0.026	0.033	0.034	0.026
Copper	µg/L	0.730	0.347	0.364	0.136	0.150	0.114	0.174
Iron	µg/L	186.0	216.0	134.0	97.2	57.4	66.0	36.9
Lead	µg/L	0.11	0.182	0.119	0.007	<0.005	0.009	0.0136
Lithium	µg/L	10.40	4.09	5.31	4.32	5.42	5.55	6.24
Manganese	µg/L	1.80	8.33	1.28	1.10	0.91	0.92	0.40
Molybdenum	µg/L	0.10	0.08	0.14	0.08	0.16	0.19	0.12
Nickel	µg/L	0.470	0.315	0.344	0.223	0.341	0.355	0.309



**Table F.7-1 (Cont'd.)**

Variable	Units	5-Mar-12	17-Apr-12	27-Apr-12	2-May-12	9-May-12	15-May-12	25-May-12
<b>Dissolved Metals (Cont'd.)</b>								
Selenium	µg/L	0.060	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Silver	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Strontium	µg/L	130.0	49.7	60.3	46.2	74.5	76.0	79.0
Sulphur	mg/L	<10	<10	<10	<10	<10	<10	<10
Thallium	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tin	µg/L	<0.20	<0.20	1.57	<0.20	<0.20	<0.20	<0.20
Titanium	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Uranium	µg/L	0.065	0.030	0.051	0.024	0.035	0.044	0.047
Vanadium	µg/L	<0.20	<0.20	0.71	<0.20	<0.20	<0.20	<0.20
Zinc	µg/L	6.60	2.95	0.96	0.51	0.69	0.30	0.47
<b>Total Metals</b>								
Total Aluminum (Al)	µg/L	53.8	90.2	31.6	13.8	27.0	23.7	6.7
Total Antimony (Sb)	µg/L	0.040	0.027	0.048	<0.020	<0.020	0.023	0.036
Total Arsenic (As)	µg/L	0.490	0.291	0.361	0.219	0.258	0.326	0.312
Total Barium (Ba)	µg/L	41.6	13.6	17.0	10.0	17.8	18.3	17.5
Total Beryllium (Be)	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Bismuth (Bi)	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Boron (B)	µg/L	<50	<50	<50	<50	<50	<50	<50
Total Cadmium (Cd)	µg/L	0.024	0.017	0.016	<0.0050	0.008	0.013	0.019
Total Calcium (Ca)	mg/L	39.5	15.6	17.6	13.1	22.5	21.7	22.4
Total Chromium (Cr)	µg/L	<0.10	<0.10	0.62	<0.10	<0.10	<0.10	<0.10
Total Cobalt (Co)	µg/L	0.173	0.106	0.095	0.068	0.083	0.063	0.061
Total Copper (Cu)	µg/L	1.460	0.680	0.837	0.182	0.164	0.279	0.227
Total Iron (Fe)	µg/L	1070	432	359	211	383	329	197
Total Lead (Pb)	µg/L	0.880	0.466	0.734	0.026	0.048	0.057	0.039
Total Lithium (Li)	µg/L	11.20	4.39	5.00	4.54	5.88	6.31	6.36
Total Manganese (Mn)	µg/L	446.0	73.9	57.0	49.2	132.0	101.0	80.6
Total Molybdenum (Mo)	µg/L	0.070	0.093	0.093	0.066	0.089	0.095	0.113
Total Nickel (Ni)	µg/L	0.630	0.426	0.517	0.309	0.437	0.374	0.386
Total Selenium (Se)	µg/L	0.070	<0.040	<0.040	0.058	<0.040	0.048	<0.040
Total Silver (Ag)	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Strontium (Sr)	µg/L	143.0	53.1	61.7	47.9	76.0	76.3	79.8
Total Sulphur (S)	mg/L	<10	<10	<10	<10	<10	<10	<10
Total Thallium (Tl)	µg/L	<0.0020	0.002	<0.0020	<0.0020	0.002	<0.0020	<0.0020
Total Tin (Sn)	µg/L	<0.20	<0.20	33.30	<0.20	<0.20	<0.20	<0.20
Total Titanium (Ti)	µg/L	0.80	1.98	1.45	<0.50	1.63	<0.50	<0.50
Total Uranium (U)	µg/L	0.088	0.037	0.044	0.027	0.038	0.0482	0.0422
Total Vanadium (V)	µg/L	0.30	0.26	0.51	<0.20	<0.20	0.44	<0.20
Total Zinc (Zn)	µg/L	17.00	6.72	3.83	1.15	1.57	1.86	1.26

**Table F.7-2 Field water quality measurements from Rat Lake, 2012.**

Date	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	pH
5-Mar-12	0.26	-	1.13	325	6.15
17-Apr-12	2.47	-	0.70	255	6.54
27-Apr-12	3.37	73.8	9.84	158	6.05
2-May-12	8.13	52.4	5.85	126	6.72
9-May-12	9.46	78.2	9.25	178	6.61
16-May-12	13.80	98.6	10.20	182	6.79
26-May-12	14.71	108.4	10.99	190	7.11

**Table F.7-3 Historical water quality data from Rat Lake (RAL-1), spring and fall 2009 (Hatfield 2010).**

Variable	Unit	Detection Limit	Spring 2009	Fall 2009
<b>Conventional Variables</b>				
Total Alkalinity	mg/L	5	82.5	101.0
True Colour	T.C.U.	2	72	61
Specific Conductivity	uS/cm	0.2	177	209
Dissolved organic carbon	mg/L	1	19.1	22.4
Hardness (as CaCO <sub>3</sub> )	mg/L	-	0.0	98.4
pH	pH	0.1	7.95	8.15
Total Dissolved Solids	mg/L	10	132	160
Total organic carbon	mg/L	1	19.3	24.7
Total Suspended Solids	mg/L	3	6	3
<b>General Organics</b>				
Recoverable Hydrocarbons	mg/L	1	<1	<1
Naphthenic Acids	mg/L	0.02	-	0.12
Total Phenols	mg/L	0.001	0.009	0.004
<b>Major Ions</b>				
Bicarbonate	mg/L	5	101	123
Calcium	mg/L	0.5	22.6	26.8
Carbonate	mg/L	5	<5	<5
Chloride	mg/L	0.50	3.48	2.58
Hydroxide	mg/L	5	<5	<5
Magnesium	mg/L	0.10	6.52	7.64
Potassium	mg/L	0.05	2.48	1.59
Sodium	mg/L	1.0	7.4	7.6
Sulphate	mg/L	0.50	4.01	2.17
Sulphide	mg/L	0.002	0.003	0.007

**Table F.7-3 (Cont'd.)**

<b>Variable</b>	<b>Unit</b>	<b>Detection Limit</b>	<b>Spring 2009</b>	<b>Fall 2009</b>
<b>Nutrients and BOD</b>				
Ammonia-N	mg/L	0.05	<0.05	<0.05
Biochemical oxygen demand	mg/L	2	<2	3
Nitrate+Nitrite-N	mg/L	0.071	<0.071	<0.071
Dissolved Phosphorus	mg/L	0.001	0.0141	0.0127
Total Phosphorus	mg/L	0.001	0.0519	0.0349
Total Kjeldahl Nitrogen	mg/L	0.2	1.6	1.1
<b>Dissolved Metals</b>				
Aluminum	mg/L	0.0010	0.0033	0.0011
Antimony	mg/L	0.000001	0.000019	0.000021
Arsenic	mg/L	0.00006	0.00029	0.00038
Barium	mg/L	0.0001	0.0173	0.0201
Beryllium	mg/L	0.00001	<0.00001	<0.00001
Bismuth	mg/L	0.000010	0.000014	<0.000010
Boron	mg/L	0.0008	0.0245	0.0307
Cadmium	mg/L	0.000006	<0.000006	<0.000006
Calcium	mg/L	0.1	20.2	25.2
Chlorine	mg/L	0.3	2.53	2.67
Chromium	mg/L	0.0003	<0.0003	<0.0003
Cobalt	mg/L	0.00001	0.00003	0.00002
Copper	mg/L	0.00010	0.00015	0.00011
Iron	mg/L	0.004	0.294	0.123
Lead	mg/L	0.000006	<0.000006	0.000015
Lithium	mg/L	0.0002	0.0058	0.0068
Manganese	mg/L	0.00003	0.00243	0.00148
Mercury	mg/L	0.00005	<0.00005	<0.00005
Molybdenum	mg/L	0.000008	0.000120	0.000061
Nickel	mg/L	0.00006	0.00017	<0.00006
Selenium	mg/L	0.0002	<0.0002	<0.0002
Silver	mg/L	0.000005	<0.000005	<0.000005
Strontium	mg/L	0.000008	0.071700	0.100000
Sulphur	mg/L	0.600	0.931	0.851
Thallium	mg/L	0.0000030	0.0000035	<0.0000030
Thorium	mg/L	0.00003	<0.00003	<0.00003
Tin	mg/L	0.00007	<0.00007	<0.00007
Titanium	mg/L	0.00007	0.000736	0.000662
Uranium	mg/L	0.000003	0.000029	0.000021
Vanadium	mg/L	0.00005	0.00011	0.00010
Zinc	mg/L	0.0002	<0.0002	0.0007
<b>Total Metals</b>				
Aluminum	mg/L	0.002	0.029	0.016
Antimony	mg/L	0.000001	0.000019	0.000021
Arsenic	mg/L	0.00006	0.00032	0.00040
Barium	mg/L	0.0001	0.0201	0.0230

**Table F.7-3 (Cont'd.)**

<b>Variable</b>	<b>Unit</b>	<b>Detection Limit</b>	<b>Spring 2009</b>	<b>Fall 2009</b>
Beryllium	mg/L	0.00001	<0.00001	<0.00001
Bismuth	mg/L	0.000010	0.000015	<0.000010
Boron	mg/L	0.0008	0.0252	0.0311
Cadmium	mg/L	0.0000060	<0.0000060	0.0000064
Calcium	mg/L	0.1	21.3	25.4
Chlorine	mg/L	0.3	2.6	2.7
Chromium	mg/L	0.0003	<0.0003	<0.0003
Cobalt	mg/L	0.00001	0.00005	0.00003
Copper	mg/L	0.00010	0.00017	0.00011
Iron	mg/L	0.004	0.665	0.533
Lead	mg/L	0.000006	0.000020	0.000036
Lithium	mg/L	0.0002	0.0062	0.0068
Manganese	mg/L	0.00003	0.1010	0.1060
Mercury	mg/L	0.00005	<0.00005	<0.00005
Mercury (ultra-trace)	mg/L	0.0000012	<0.0000012	0.0000014
Molybdenum	mg/L	0.000008	0.000120	0.000091
Nickel	mg/L	0.00006	0.00017	<0.00006
Selenium	mg/L	0.0002	<0.0002	<0.0002
Silver	mg/L	0.0000050	0.0000053	<0.0000050
Strontium	mg/L	0.000008	0.075800	0.100000
Sulphur	mg/L	0.60	0.94	0.86
Thallium	mg/L	0.0000030	0.0000036	<0.0000030
Thorium	mg/L	0.00003	<0.00003	<0.00003
Tin	mg/L	0.00007	<0.00007	<0.00007
Titanium	mg/L	0.00007	0.00110	0.00142
Uranium	mg/L	0.000003	0.000033	0.000022
Vanadium	mg/L	0.00005	0.00020	0.00015
Zinc	mg/L	0.00020	0.00029	0.00066